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Društvo za varstvo rastlin Slovenije
Plant Protection Society of Slovenia

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Uvodni referati

Vpliv nove predlagane zakonodaje na področju registracije fitofarmacevtskih sredstev

Jernej DROFENIK

Ministrstvo za kmetijstvo, gozdarstvo in prehrano, Fitosanitarna uprava RS, Einspielerjeva 6, SI-1000 Ljubljana

Tako imenovani pesticidni paket zakonodaje, ki je v zaključni fazi sprejemanja na nivoju skupnosti, vključuje; novo Uredbo o dajanju fitofarmacevtskih sredstev na trg, kot tudi Direktivo o trajnostni rabi fitofarmacevtskih sredstev. Od obeh predlaganih zakonskih okvirov je za Slovenijo bistvenega pomena Uredba, ki za razliko od Direktive, kjer je glavnina novih ukrepov že nacionalno urejena, kot so izobraževanje uporabnikov, trgovcev, kot tudi testiranje aplikacijske tehnike do strategije za zmanjšanje uporabe fitofarmacevtskih sredstev, prinaša Uredba bistvene spremembe na področju registracije, ki bodo imele vpliv tako na postopek registracije in pogoje le te, kot tudi na končne uporabnike teh sredstev. V predstaviti bomo predstavili ključne spremembe zakonodaje predvsem na področju fitofarmacevtskih sredstev.

Angleški izvleček ni bil predložen.

Prihodnost in konkurenčnost evropskega kmetjistva v luči nove pesticidne zakonodaje

Euros JONES

European Crop Protection Association, 6 Avenue E van Nieuwenhuyse B-1160 Brussels

- Po sprejetju nove evropske pesticidne zakonodaje ocenjujemo vpliv novosti in že dosedanjih postopov na razpoložljivost sredstev za varstvo rastlin.
- Grožnje nove zakonodaje so: produktivnost, izguba posameznih kultur, rezistenca, mikotoksini, zviševanje cen hrane, slabša kakovost, slabša prehranjenost, nestabilna gospodarnost kmetij, povečan uvoz, trgovinske omejitve, vpliv psevdoznanosti in amaterizma na vlade.
- Izzivi nove zakonodaje so: trajnostni razvoj, varna raba, biotična raznovrstnost, skrbno okoljsko ravnanje.
- Prihodnji izzivi: prilagoditev kmetijstva v razmerah povečanega nadzora, odmika od realnosti in zmanjšanja zaupanja, s ciljem, da si pridobi podporo za svoj prispevek k evropski kakovosti življenja.

ABSTRACT

The Future and Competiveness of European Agriculture in Light of the New Legislation"

- Evaluation of the meaning of the legislative package.

- The impact of this legislation plus the prior existing review process on the Farmers pest management tool box.
- The threats presented by the legislation: productivity, lost crops, resistance and microtoxins, escalating food prices, low quality, poor nutrition, declining farm economy, more imports, export of pesticide use, trade restrictions, influence of junk science and amateurism on government.
- The opportunities presented by the legislation: the sustainable agriculture initiative formalizes the industry's commitment to safe use, biodiversity and sound environmental practice.
- The way ahead: how the agricultural sector must conduct itself in a climate of heightened scrutiny, detachment from reality and lack of trust in order to reveal, validate and gain support for its contribution to Europe's quality of life.

Zastopanost fitofarmacevtskih sredstev v kontrolirani integrirani pridelavi

Doroteja OZIMIČ

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Zahteve po zdravi in kakovostni hrani, brez ostankov sredstev za varstvo rastlin, so pogojevale uvedbo okolju prijaznih načinov kmetovanja, med katerimi je tudi integrirana pridelava. Tovrstno pridelovanje je tako postalo pomemben člen trajnostnega razvoja. Z integrirano pridelavo kot uravnoteženim načinom kmetovanja, kjer se prepletajo agrotehnični z naravnimi ukrepi in imajo oboji prednost pred fitofarmacevtskimi in biotehnološkimi ukrepi, dolgoročno ohranjamo zdravo okolje in ustvarjamo ugodne življenjske razmere za živa bitja. Skladno z določili Pravilnikov za integrirano pridelavo, kjer so predpisane tehnološke zahteve in omejitve, mora pridelovalec upoštevati tudi Tehnološka navodila za integrirano pridelavo, v katerih se vsako leto med drugim določi seznam dovoljenih fitofarmacevtskih sredstev (FFS). Uporaba FFS je še vedno nujen ukrep, ki omogoča ekonomično upravičen način kmetovanja. Žal pa se zaradi uporabe FFS tudi pri kontrolirani integrirani pridelavi srečujemo z njihovimi ostanki. V prispevku prikazujemo zastopanost FFS pri obveznih 5% odvzetih vzorcev kmetijskih pridelkov oz. delov rastlin z namenom ugotavljanja morebitnih ostankov FFS. Podatki zaokrožajo obdobje od začetka izvajanja postopka certificiranja integrirane pridelave do zdaj. Vzorčenje kmetijskih pridelkov oz. delov rastlin, pri katerih so se analitsko določale aktivne snovi, smo opravili v času rastne sezone pred spravilom pridelkov. Preglednice v prispevku prikazujejo število strank vključenih v postopek certificiranja po letih, po posameznih področjih integrirane pridelave (poljščine, zelenjava, sadje in grozdje), število odvzetih vzorcev ter število analiziranih aktivnih snovi.
Pri obdelavi podatkov smo ugotovili, da se v večini primerov analitsko ugotavljajo aktivne snovi, ki so dovoljene v integrirani pridelavi. Vrednosti le-teh ne presegajo zakonsko določenih mejnih vrednosti (angl. MRLs-maximum residue levels). Žal pa pridelovalci, v želji učinkovitega varstva kmetijskih rastlin, posežejo, kljub širokemu izboru, po takšnih FFS, ki niso registrirana ali pa niso dovoljena pri določenem ukrepu integrirane pridelave. Količina kot vrsta aktivnih snovi pa nista odvisni le od uporabljenih FFS, ampak tudi od števila aplikacij v rastni dobi, vremenskih razmer, uporabljene koncentracije in obdobja od zadnje aplikacije sredstva do spravila pridelka. Ob razčlenjevanju prisotnosti aktivnih

snovi pri odvzetih vzorcih smo ugotovili, da je v večini primerov razlog uporabe nedovoljenega FFS v pomanjkanju ustreznega FFS na trgu. Tako pridelovalci ob meji nemalokrat posežejo po FFS, ki so registrirana v drugih državah EU in vsebujejo aktivne snovi, dovoljene v slovenskih Tehnoloških navodilih za integrirano pridelavo. Paradoks, s katerim se srečujejo kontrolne organizacije v postopku certificiranja, ki ni v prid tako stroki, kot slovenskemu pridelovalcu.

Angleški izvleček ni bil predložen.

Prof. dr. Franc Janežič – utemeljitelj varstva rastlin v Sloveniji

Lea MILEVOJ

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Zaslužni profesor dr. F. Janežič (1908-1999) je končal študij na Agronomsko gozdarski fakulteti v Zagrebu (1934) in se po krajši specializaciji, leto kasneje vrnil v Slovenijo, kjer je začel pionirsko delo na področju varstva rastlin, najprej na strokovnem, po doseženem doktoratu iz fitopatološke tematike (1947), pa tudi na znanstvenem področju. Fitopatologiji se je najprej zapisal in sicer že s prvo zaposlitvijo (1935) na mestu fitopatologa na Kmetijski poskusni in kontrolni postaji (sedanjem Kmetijskem inštitutu), v drugem obdobju svojega delovanja pa se je preusmeril predvsem v aplicirano entomologijo. Dve leti po ustanovitvi Agronomske in gozdarske fakultete (sedaj Biotehniške) v Ljubljani (1949), se je odzval vabilu in začel tu predavati najprej honorarno, kasneje pa redno vse do upokojitve (1978), predmete s področja varstva rastlin (Zaščita kmetijskih rastlin, ki se kasneje preimenuje v Varstvo rastlin, Gozdna fitopatologija in Entomologija). Vseskozi se je zavedal, da je pisana beseda tista, ki za človeka in človekom ostane in prav na ta način se je stalno potrjeval. Objavljal je v znanstvenih revijah (Zbornik Biotehniške fakultete [sedaj *Acta agriculturae Slovenica*], Biološki vestnik, Zaštita bilja) in različnih strokovnih časopisih. Napisal je 15 knjig in brošur za potrebe dodiplomskega študija, pa tudi širše kmetijske prakse. V okviru pedagoškega in raziskovalnega dela je negoval in skrbel za slovensko izrazje s področja varstva rastlin. Objavil je Indeks rastlinskih bolezni (1957). Sestavil je seznam strokovnih izrazov (Kmetijski tehniški slovar, 1. knjiga, 3. zvezek, Varstvo rastlin) (1961), ki so v kakršni koli zvezi z rastlinskimi boleznimi in škodljivci, z namenom, da bi bili pristopni vsakomur, ki jih potrebuje. Upravičeno ga imenujemo za utemeljitelja slovenskega varstva rastlin kot specializirane kmetijske stroke in posebne znanstvene discipline - fitomedicine.

ABSTRACT

Prof. Dr. Franc Janežič - the Founder of Plant Protection in Slovenia

Emeritus Professor Dr. F. Janežič (1908-1999) finished his studies at the Faculty of Agronomy and Forestry in Zagreb (1934) . After a short specialization he returned a year later to Slovenia, where he started his pioneer work in the field of plant protection. At first he took on projects at professional level and then at scientific level after he had completed a doctor's degree in a phytopathological topic. His first field of interest was phytopathology

as he got a job as a phytopathologist (1935) at the Agricultural Test and Control Station (the present Agricultural Institut of Slovenia), while in the second part of his career he turned to applied entomology in particular. Two years after the Faculty of Agronomy and Forestry (the present Biotechnical Faculty) had been founded in Ljubljana (1949), he accepted the invitation to give lectures there, at first on a part-time basis and later as a full-time employee. He held this post until he retired (1978). He lectured on plant protection (Protection of Agricultural Plants, later renamed Plant Protection, Forest Phytopathology, and Entomology). He was all the time well aware that it is essential for a scientist to publish and in this way he also constantly asserted himself. He published in scientific magazines (Research Reports of Biotechnical Faculty [the present *Acta Agriculturae Slovenica*], *Biološki vestnik* - Biological Journal, *Zaštita bilja* – Plant Protection) and in different professional periodicals. He is the author of 15 books and brochures written for the needs of undergraduates studies as well as for agricultural practice in general. Within the framework of his educational and research work, he attended to Slovene terminology from the field of plant protection. He published an Index of plant diseases (1957). He compiled a list of professional words and expressions (*Kmetijski tehniški slovar* – Agricultural Technical Dictionary, Book 1, Volume 3, Plant Protection) (1961), which are in any way connected with plant diseases and pests, so that they are available for anyone concerned with the field. In conclusion it may be underlined that Prof. Janežič is justifiably regarded as the founder of plant protection in Slovenia as a specialized agricultural field and a special scientific discipline – phytomedicine.

Fitofarmacevtska sredstva

Uporaba fitofarmacevtskih sredstev pri ljubiteljskem pridelovanju vrtnin

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Anketo z osebnim spraševanjem, ki je vsebovala 47 vprašanj, smo izvedli v nekaterih naseljih v občini Kranj, v letu 2007. Anketirali smo 40 vrtičkarjev, da bi preučili uporabo fitofarmacevtskih sredstev (FFS) na njihovih vrtovih, zlasti koliko izpopolnjujejo svoje znanje o uporabi in delovanju FFS, ali pridobljene informacije razumejo in v praksi pravilno uporabljajo in v kakšni meri se dejansko zavedajo svojega vpliva na okolje. Raven izobrazbe anketirancev je dobra, vendar splošna izobrazba ne daje primernega strokovnega znanja s področja FFS. Ugotovili smo, da se 89,8% anketirancev iz našega vzorca dodatno izobražuje o gojenju in varstvu rastlin. Kljub temu je njihovo poznavanje in razumevanje nekaterih strokovnih pojmov slabo. Le 50,0 % anketirancev šteje k rastlinam škodljivim organizmom tudi plevele, 37,5 % jih ne ve, kaj je karenca, 77,5 % ne pozna praga gospodarske škode, 62,5 % ne ve, kaj je kritično število škodljivcev, pojasniti smo jim morali izraz fitotoksičnost, da so lahko odgovorili na vprašanje, 37,5 % jih še ni slišalo za omejitve pri uporabi FFS, 32,5 % ne pozna vseh možnih načinov zastrupitve s FFS, 30,0 % jih nenatančno pripravlja škropilno brozgo. Kljub temu je 66,7 % anketirancev odgovorilo, da navodila o uporabi FFS preberejo natančno in v celoti, za odmerjanje koncentracije 67,5 % anketirancev uporablja primerno menzuro. Kar 82,1 % anketirancev se posvetuje s prodajalcem o primernosti FFS, 62,5 % pa o prepoznavanju bolezni in škodljivcev. Vse možne načine zastrupitve s FFS pozna 67,5 %, a le 7,5% vprašanih izbere primerna osebna zaščitna sredstva. Le 10,0 % vprašanih ravna pravilno z ostanki škropilne brozge, 45,0 % ravna pravilno s pretečenimi sredstvi z vračanjem na prodajno mesto ali oddajo ob akciji zbiranja nevarnih odpadkov, odpadno embalažo pravilno odstrani le 37,5 % anketirancev, čeprav 66,6 % meni, da so dovolj informirani o akcijah zbiranja nevarnih odpadkov.

ABSTRACT

The use of plant protection products in the amateur gardening

The questionnaire which we have carried out in several villages in Kranj community in the year 2007, has contained 47 questions. The answers of 40 gardeners that participated in our survey gave us an opportunity to study thoroughly the application of plant protection products (PPP) on their gardens. We were especially interested in the following issues: how they improve their knowledge about the use and the effect of PPP, do they properly apply the knowledge that they have gained, do they use PPP in practice correctly and how strongly they are aware of their influence on the environment by using PPP. The level of education of the participants is quite good, although the general education does not give them a proper technical or professional knowledge of PPP. We found out that 89.8 % of them extra educate themselves about plant breeding and protection. In spite of that fact, their knowledge and understanding of some technical terms are low. Only half of them thinks that the pests are also weeds, 37.5 % do not know what preharvest interval is, 77.5 % do not know threshold of economic damage, and 62.5 % of them do not know what the critical mass of harmful insects is. In order to enable our participants to answer the question, we had to explain them a term of phytotoxicity, 37.5 % of them have never

heard of restriction to use PPP, 32.5 % of them are not aware of possible ways of toxication by PPP, and 30 % of them inaccurately prepare a spray deposit. In spite of all that 66.7 % of the questioned participants had answered that they read instructions for the use of PPP completely and accurately, but 67 % of them use an adequate measure for apportion of the concentration. 82.1 % of participants consult the proper use of PPP with a salesman, 62.5 % of them consult the recognising of diseases and pests. 67.5 % of them know all possible ways of poisoning with PPP, but only 7.5 % of them choose appropriate personal protection garmentor gear. A small amount of 10 % of the participants treat the spray deposit remains properly, 45 % handle with non-valid chemicals properly by returning the chemicals to the salesman or giving them away by organized collecting of waste. Only 37.5 % of participants remove the wasted package properly, though 66.6 % of them mean that they are informed about collecting of dangerous waste well enough.

Razvrščanje evropskih tal glede na njihovo sposobnost zadrževanja oz. prenosa fitofarmacevtskih sredstev

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Trenutni evropski registracijski postopki uporabljajo za izdelavo ocen tveganja rabe fitofarmacevtskih sredstev (FFS) omejeno število kmetijsko okoljskih scenarijev glede na talne in podnebne razmere ter podatke o rastlinah. Tako naj bi na primer 9 FOCUS (FOrum for Co-ordination of pesticide fate models and their USe) scenarijev za podzemne vode predstavljalo evropsko prostorsko variabilnost, vendarle pa se v realnosti srečujemo z veliko variabilnostjo že med majhnimi območji znotraj iste države. V okviru EU projekta »Functional TOOls for Pesticide RIsk assessment and managemeNT« z akronimom FOOTPRINT smo razvili metodologijo oblikovanja velikega števila generičnih scenarijev, ki se pojavljajo v evropskem kmetijskem prostoru. Vsak scenarij predstavlja unikatno kombinacijo tistih lastnosti okolja, ki določajo usodo FFS v Evropi (kmetijska praksa, talne in hidrološke lastnosti, podnebne značilnosti). Ključna komponenta scenarijev je razvrščanje evropskih tal v številčno omejene FOOTPRINTOVE talne tipe na osnovi njihovih hidroloških, teksturnih in sorptivnih značilnosti. Skupno število tako definiranih Footprintovih talnih tipov je 388, vsak je opredeljen s setom več lastnosti tal, ki pa so vezane na rabo zemljišč. Footprintovo hidrološko komponento sestavlja serija shematičnih modelov, ki opisujejo možne poti FFS tokov in spodnje mejne pogoje v talnem profilu. Hidrološka komponenta je zasnovana na integraciji dveh obstoječih sistemov; angleškega HOST (Hydrology Of Soil Types) in francoskega CORPEN (Comite d'Orientation pour des Pratiques agricoles respectueuses de l'Environment). Footprintov sistem kategorizacije razvršča tla na osnovi njihovega potenciala za hiter prenos vode s površine zemljišč v mrežo površinskih voda z različnimi hitrimi ali srednje hitrimi odzivnimi mehanizmi na padavine. Komponenta potenciala sorpcije je zasnovana na kombinaciji teksture tal in osnovnih razlik v stopnji in razporeditvenemu vzorcu organske snovi v talnem profilu. 388

Footprintovih talnih tipov je tako prvi poskus razvrstitve evropskih tal po njihovi sposobnosti zadrževanja oz. prenosa FFS, ki jih uporabljamo v kmetijstvu. V prispevku bomo predstavili Footprintovo metodologijo razvrščanja tal in transformacijo pedološko karte Slovenije v Footprintovo karto tal Slovenije, ter razpravljali o možnostih specifičnih omilitvenih ukrepov za zmanjševanje hitrih prenosov FFS.

ABSTRACT

Categorizing European soils according to their ability to retain or transmit pesticides

Current European pesticide risk assessment procedures use a limited number of agro-environmental scenarios with regard to soil, weather and cropping data to represent European spatial variability. For example, currently 9 FOCUS (FOrum for Co-ordination of pesticide fate models and their USe) ground water scenarios exist for the whole EU, but in reality high spatial variability already between small areas within the same country can be found. Within the EU-funded project: »Functional TOOls for Pesticide RIsk assessment and managemeNT« with acronym FOOTPRINT, a methodology has been developed for defining a large number of generic scenarios that characterise the complete spectrum of European agricultural environments. Each scenario represents a unique combination of those agronomic practices, soil and hydrological characteristics and climates that determine the fate of pesticides within Europe. A key component of the scenarios is the grouping of European soil types into a limited number of FOOTPRINT Soil Types (FSTs) based on their hydrological, textural and sorption characteristics. A total of 388 FSTs have been defined and each is characterized by a set of land use specific soil properties. The FST hydrological component encompasses a suite of conceptual models (Flow Pathway Categories, FPCs) of contaminant flow pathways and lower boundary conditions based on an integration of the Hydrology Of Soil Types (HOST) and French CORPEN (Comite d'Orientation pour des Pratiques agricoles respectueuses de l'Environment) systems. The FPCs differentiate soils according to their different potential for rapid transfer of water from the land surface to the surface water network by various fast or intermediate rainfall/runoff response mechanisms. The sorption potential component is based on a combination of soil texture and broad differences in the magnitude and distribution pattern of organic matter within the soil profile. The 388 FSTs thus represent a first attempt to group European soils according to their ability to retain or transmit agriculturally applied pesticides. Derivation of the FOOTPRINT Soil Types and transformation of Slovenian soil map into Footprint soil map of Slovenia will be described and their potential for identifying route-specific mitigation measures for reducing the rapid transfer of pesticides will be discussed.

Kemijska tveganja izdelkov iz žit; ostanki fitofarmacevtskih sredstev in mikotoksini

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Podan je pregled možnih kemijskih tveganj, značilnih za žita in izdelke iz žit. Izpostavljeni so ostanki pesticidov in mikotoksini. Varnost izdelkov se zagotavlja s sistematičnimi postopki, ki zajamejo vse pridelovalne in predelovalne faze od varstva rastlin med rastjo, do predelave in distribucije končnih izdelkov. Nevarnosti, ki jih prinašajo surovine lahko predstavljajo nesprejemljivo stopnjo tveganja za potrošnika.

Zagotavljanje varnosti vključuje aktivnosti in kontrole, ki so potrebne za obvladovanje proizvodnega procesa od razvoja, nabave surovin, izdelave izdelka do njegove prodaje. Primarna proizvodnja je integralni del varnosti živil. Kemijskih onesnaževalcev, ki izvirajo slabe kmetijske prakse z nadaljnjimi postopki v predelavi živil ni mogoče odstraniti in predstavljajo resno tveganje. Odkrivanje teh tveganj v surovinah in izdelkih je finančno zahtevno, zato je nujno potrebno preventivno ukrepanje v pridelavi s ciljem čim manjše verjetnosti pojavljanja.

ABSTRACT

Chemical risks of cereal products; pesticide residues and micotoxines

The article discusses possible chemical hazards typical for cereals and cereal products; pesticides and mycotoxins are focused. Food safety could be obtained by sistematical activities in all phases in primary production, processing and distribution. Hazards from raw material may pose an unacceptable health risk to the consumer. Food safety activities, control points and critical control points should be managed in all levels of the process. Primary production is an integral part of the food supply chain. Chemical hazards origined from primary production should not be reduced by procesing. Determination of chemical hazards in raw materials and in final products mean high level of expences, better practice are prevention activities primary production.

Vpliv različnih tehnologij varstva jablan pred boleznimi in škodljivci na ostanke fitofarmacevtskih sredstev v jabolkih

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V prispevku je obravnavana problematika ostankov fitofarmacevtskih sredstev (FFS) v jabolkah, ki so glede na domače kot tudi tuje rezultate spremljanja ostankov FFS v kmetijskih pridelkih še vedno med najbolj obremenjenimi. Prikazani so rezultati raziskave spremljanja vsebnosti ostankov FFS ter težkih kovin v jabolkah v poskusnem sadovnjaku Brdo pri Lukovici v letu 2008. V raziskavo je bilo vključenih več različnih tehnologij varstva proti boleznimi in škodljivci glede na uporabljene FFS. Uporabljeni škropilni programi so bili pripravljeni na podlagi priporočil integriranega ter ekološkega varstva jablan. Spremljali smo zdravstveno stanje jablan ter ostanke FFS ter težkih kovin. Ker med različnimi postopki varstva ni bilo razlik glede zdravstvenega stanja oziroma zastopanosti škodljivih organizmov ter povzročiteljev bolezni, smo v rezultatih predstavili le vpliv različnih tehnologij varstva na ostanke FFS ter težkih kovin. Iz rezultatov lahko ugotovimo, da med posameznimi škropilnimi programi obstajajo minimalne razlike glede na število ter vsebnost analiziranih aktivnih snovi, vendar nobeden izmed analiziranih vzorcev jablan ne glede na škropilni program ni vseboval ostankov FFS, ki bi presegali najvišje dovoljene količine (MRL).

ABSTRACT

The influence of different plant protection technologies on pests and deseases in orchards and their residues in fruits

The current paper discusses the problematic nature of the residues of plant protection products (PPP) in apples which, due to Slovene National Monitoring Programme as well as other official monitoring results performed in other countries, still represent the agricultural product containing the greatest number of PPP residues. The results of the investigation on the presence of PPP residues and heavy metals at the Experimental Station Brdo pri Lukovici in 2008 are presented. Different Integrated and Ecological Plant Protection Programmes were included in the investigation. The presence of pests and diseases as well as the residues of PPP were investigated. Since there were no differences regarding plant health, only the results on the presence of PPP residues and heavy metals are presented and discussed. From the results of analyses it could be seen that there were only minor insignificant differences between different spraying programmes on the number and the quantity of PPP residues in apple samples. Regardless of the spaying programme there were no samples with PPP residues exceeding the maximum residue level (MRL).

Perspektive uporabe fungicidov na podlagi bakra

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V prispevku so analizirani aktualni trendi glede zmanjševanja porabe fungicidov na podlagi bakra za zatiranje rastlinskih bolezni v Evropi. Predstavljene so nekatere nove formulacije bakrovih pripravkov, ki so učinkovite in ekološko sprejemljivejše od obstoječih klasičnih, s katerimi bi lahko zmanjšali bodoči vnos bakra v okolje in podaljšali njegovo uporabo v varstvu rastlin. Podajamo pregled stanja ponudbe alternativnih pripravkov in njihove možnosti za potencialno zamenjavo bakrovih pripravkov pri najpomembnejših kmetijskih rastlinah (jablana, vinska trta, krompir, …). Predstavljena so tudi nekatera prizadevanja slovenske kemične industrije za izdelavo novih formulacij bakrovih pripravkov.

ABSTRACT

The use of copper-based fungicides and their prospects for the future

We examined present trends for the reduction of use of copper-based fungicides for the control of plant diseases in Europe. Some new formulations of copper-based fungicides are presented, which are effective and environmentally more acceptable than the existing classical formulations. By switching to these new formulations, we could reduce the future input of copper compounds into agricultural environment and prolong the use of copper fungicides for plant protection purposes. New alternative plant protection products are discussed in respect with their usefulness and potential for replacing of copper compounds in the control of diseases of most important agricultural crops (apple, grapevine, potato, …). Efforts of domestic Slovenian chemical industry to develop new formulations of copper fungicides are also presented.

Preučevanje vpliva varstva hmelja pred boleznimi in škodljivci na ostanke fitofarmacevtskih sredstev tleh in podzemni vodi v Sloveniji

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Hmelj predstavlja eno izmed gojenih rastlin, ki potrebuje intenzivno varstvo pred boleznimi in škodljivci. Posledično sta zato kljub upoštevanju dobre kmetijske prakse ter integriranega varstva tudi število škropljenj ter uporaba fitofarmacevtskih sredstev (FFS) v primerjavi z večino ostalih gojenih rastlin nekoliko večja, kar pa v zadnjih letih v javnosti povzroča oblikovanje odklonilnega odnosa do pridelovanja hmelja. Z omenjeno raziskavo smo želeli ugotoviti vpliv varstva hmelja pred boleznimi in škodljivci na ostanke FFS v tleh in podzemni vodi. V prispevku so prikazani rezultati raziskave spremljanja ostankov FFS ter težkih kovin v hmeljiščih ter podzemni vodi med leti 2006 in 2008 na vseh območjih v Sloveniji, kjer se prideluje hmelj. Iz rezultatov je mogoče razbrati, da v hmeljiščih praktično ni ostankov FFS, prav tako pa tudi ne v vzorcih podzemne vode na območjih, kjer se prideluje hmelj. Smo pa v hmeljiščih ugotovili relativno visoke vrednosti bakra, ki je že več kot 30 let osnovni fungicid za zatiranje hmeljeve peronospore.

ABSTRACT

The influence of hop protection from pests and diseases on the appearance of plant protection product residues in soils and groundwater in Slovenia

Hop represents one of the crops which need relatively intensive protection from pests and diseases. Consequently, it requires despite of the Good Agricultural Practice and Integrated Plant Protection Approach in comparison to other grown crops, a slightly higher number of sprayings and used Plant Protection Products (PPP), which has made the hop growing very undesirable among broader public for many years. This paper reports the results obtained from 2006 to 2008 of the investigation on the presence of PPP residues and heavy metals in hop gardens and groundwater in all Slovene regions where hop is grown. From the results it could be seen that there are only few residues of PPP in hop garden soils and no residues coming from hop growing in ground water. Nevertheless, we found quite high amounts of copper in the majority of investigated hop gardens, since copper has been the main fungicide in hop growing to control downy mildew for more than 30 years.

Partnerstvo v prehranski verigi postaja realnost

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V EU se vse bolj uveljavljajo najnovejši koncepti na področju spremljanja pridelave hrane od setve do krožnika. Podjetje Bayer CropScience je vodilno podjetje v svetu na področju proizvodnje in prodaje fitofarmacvetskih sredstev (FFS). Skupaj s pridelovalci in predelovalci želi naše podjetje zagotoviti pridelovanje hrane na temelju najnovejših spoznanj in tehnologij, ki zagotavljajo transparentnost pridelave in sledljivost v vsakem trenutku ter omogočajo varnost hrane. Tak pristop zagotavlja porabnikom kakovostno in neoporečno hrano, pridelovalcem pa konkurenčno prednost pri plasmaju pridelkov in zagotovilo, da v pridelkih ni presežena dovoljena količina ostankov. Veletrgovske verige v EU že zahtevajo od pridelovalcev in predelovalne industrije take pridelke in hrano, ki je pridelana in predelana na temelju navedenih zahtev. S tem si te veletrgovske trgovine zagotovijo vedno številčnejše kupce, ki zahtevajo prav take pridelke in hrano na policah trgovin. Z implementacijo koncepta »Partnerstva v prehranski verigi« postane pridelovalec bolj konkurenčen na trgu, lažje se prebije v velike trgovske verige, pa tudi trgovec lažje promovira ponujen pridelek. Bayerjev projekt »Partnerstvo v prehranski verigi« postaja realnost tudi pri nas. V letu 2008 smo izvedli dva poskusna projekta – enega na krompirju v Sloveniji in drugega na namiznem grozdju v Makedoniji. Oba pridelovalca sta škropila natančno po navodilih Bayerjevih strokovnjakov za varstvo rastlin, v času spravila pridelka pa smo na Inštitutu za varstvo okolja mariborskega Zavoda za zdravstveno varstvo opravili analizo na ostanke vseh aktivnih snovi FFS, za katere je analizo moč opraviti. Rezultati so pokazali, da pridelki niso vsebovali niti ene aktivne snovi nad dovoljeno mejo (MRL), torej so za potrošnika povsem varni.

ABSTRACT

Food chain partnership is becoming reality

In EU there are more and more important new concepts in food production as described in one sentence: from sowing to plate. Bayer CropScience is a leading Plant Protection company in the World. Together with farmers and food processing industry our company would like to set the production of food on the base of new knowledge and high sophisticated technology which provide transparency of food production and traceability at any time. Such approach gives the consumers high quality food and the farmers competitive advantage by selling this products as there is assurance that in this products the residue level is below permitted level. There are a lot of supermarkets in EU which buy and sell just food produced on the base of mentioned criteria as their customers are looking for such a food. With the implementation of “Food Chain Partnership” Producers are more competitive on the market, their products are more acceptable by the supermarket chains and supermarkets have more arguments to promote and sell these agricultural products. Bayer's project »Food Chain Partnership« has become reality even in this part of Europe. In 2008 two pilot projects have been carried out – one on potatoes in Slovenia and the other on table grapes in Macedonia. Both producers have treated their plantations with PPP by exactly following the advice of plant protection experts from Bayer CropScience. At the time of harvest, potatoes and table grapes have been tested on MRLs for all active ingredients, for which there is a testing method. Analyses have shown that no residues have overcome the MRL and therefor this food is safe for the consumer.

Pinus DuPont: Coragen® in Talendo® - novosti

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Klorantraniliprol (DPX-E2Y45, Rynaxypyr®, Coragen®) je nova aktivna snov podjetja DuPont, ki pripada novi skupini selektivnih antranilnih diamidnih insekticidov z novim načinom delovanja (skupina 28 v IRAC razvrstitvi). Z aktiviranjem rianodinskih receptorjev pri členonožcih (RyRs) le-ti stimulirajo sproščanje in izpraznitev celičnih kalcijevih zalog iz sarkoplazmatskega retikuluma mišičnih celic, kar oslabi regulacijo in povzroči paralizo ter smrt občutljivih vrst. Obsežno preizkušanje poteka že od leta 2002, sredstvo je že registrirano ali pa pripravljeno za predstavitev na trgih v večini držav po svetu. Raziskave v Sloveniji potekajo v glavnem za foliarno uporabo na jablanah, grozdju in krompirju. Odmerki 10-60 g a.s./ha učinkovito zatirajo naslednje škodljivce: jabolčnega zavijača (*Cydia pomonella*), breskovega zavijača (*Cydia molesta*), križastega grozdnega sukača (*Lobesia botrana*), pasastega grozdnega sukača (*Eupoecilia ambiguella*), koloradskega hrošča (*Leptinotarsa decemlineata*), koruzno veščo (*Ostrinia nubilalis*) in južno plodovrtko (*Helicoverpa armigera*). Sredstvo ima nizko toksičnost za sesalce (akutno in kronično), učinkovito zatira občutljive vrste, ima močno ovicidno in larvidicno delovanje, majhne vrednosti ostankov, odličen učinek na jabolčnega zavijača in ostale grizajoče škodljivce, dobro učinkovitost ne glede na različne klimatske razmere in načine pridelave, navzkrižna rezistentnost na obstoječe insekte ni znana. Sredstvo ima minimalni vpliv na opraševalce, koristne insekte in predatorske pršice. Nov način delovanja klorantraniliprola je ponudil dodatno možnost pri izbiri programov za zatiranje škodljivcev, s katerimi se želimo izogniti rezistenci. Sredstvo ne deluje na koristne členonožce in čebele in omogoča uporabo v programih integrirane pridelave. Izredno nizka toksičnost klorantraniliprola ter nizki odmerki omogočajo varno uporabo. Predstavljeni so rezultati iz laboratorija, poljski in semi-poljski poskusi s sredstvom Coragen®.

ABSTRACT

Pinus DuPont: Coragen® in Talendo® - novelties

Chlorantraniliprole (DPX-E2Y45, Rynaxypyr®, Coragen®) is a new compound from DuPont belonging to a new class of selective insecticides (anthranilic diamides) featuring a novel mode of action (group 28 in the IRAC classification). By activating the arthropod ryanodine receptors (RyRs) it stimulates the release and depletion of intracellular calcium stores from the sarcoplasmic reticulum of muscle cells causing impaired regulation, paralysis and ultimately death of sensitive species. Extensively tested in the field since 2002, it is registered or next to market introduction in the majority of agricultural countries globally. Development in Slovenia is currently focused in foliar applications in apples, grapes and potatoes. Rates of 10-60 g a.s./ha are highly effective on important pests such as: *Cydia pomonella, Cydia molesta*, *Lobesia botrana, Eupoecilia ambiguella*, *Leptinotarsa decemlineata, Ostrinia nubilalis and Helicoverpa armigera.* It has very low toxicity for mammals (both acute and chronic), high biological activity on the sensitive species with strong ovi-larvicidal efficacy and good residual properties, excellent performance on codling moth and other chewing pests, stability of performance across the different climatic and farming conditions, no cross-resistance detected to any existing insecticide and minimal impact on pollinators, beneficial insects and predatory mites. Whereas the new mode of action makes chlorantraniliprole a valuable option for IRM (Insecticide Resistance Management) strategies, safety to key beneficial arthropods and honeybees confer a strong fit within IPM (Integrated Production Management) programmes. The remarkably favourable toxicity profile of chlorantraniliprole, combined with low use rates, provides

large margins of safety for consumers and agricultural workers. After reviewing the product profile, results from laboratory, field and semi-field tests are provided.

Novi fitofarmacevtski pripravki za ekološko pridelavo v programu podjetja Karsia Dutovlje, d.o.o.

Andrej KOS, Drago MAJCEN, Primož ŠTEPIC

Karsia Dutovlje, d.o.o.

Ekološka pridelava v Sloveniji je bila na določenih segmentih varstva rastlin nemogoča, saj na trgu do nedavnega ni bilo razpoložjivih oziroma registriranih sredstev. 23. člen zakona o varstvu rastlin omogoča registracijo nujno potrebnih sredstev, če za določeno bolezen ali škodljivca, na določeni kmetijski rastlini in načinu pridelave, ni registrirano nobeno ustrezno sredstvo za zatiranje. Podjetje KARSIA, Dutovlje, d.o.o. je v letu 2008 na podlagi 23. člena registiralo kar nekaj biotičnih FFS za uporabo v ekološki pridelavi. V februarju je pridobil registracijo biotični fungicid SERENADE WP na osnovi učinkovine bakterije *Bacillus subtilis*, za zatiranje jablanovega škrlupa *(Venturia inaequalis)* in bakterijskega hruševega ožiga *(Erwinia amylowora)* na jablanah in hruškah ter sive grozdne plesni *(Botryotinia fuckeliana)* in cika na vinski trti za pridelavo vinskega in namiznega grozdja. Junija je pridobil registracijo biotični insekticid GF-120, ki je vaba z naturalitetnim insekticidom na osnovi učinkovine spinosad za zatiranje oljčne muhe *(Bactrocera oleae)* ter v mesecu novembru biotični insekticid NATURALIS na osnovi glive *Beauveria bassiana*, soj ATCC 74040, za zatiranje sadne muhe (*Ceratitis capitata)* na koščičarjih, kakor tudi češnjeve muhe (*Rhagoletis cerasi*) na češnji, resarjev (*Frankliniella occidentalis, Thrips tabaci*) in listnih uši (Aphididae) ter navadne pršice (*Tetranychus urticae*) na malinah in robidah, lešnikarja (*Curculium nucum*) in strun (Elateridae) na krompirju in vrtninah. Prav tako je bila v letu 2008 biotičnemu fungicidu AQ-10 razširjena uporaba na jagodah za zatiranje jagodne pepelovke (*Sphaerotheca aphanis)*, insekticid LASER, na osnovi učinkovine spinosad, pa je bil uvrščen na evropsko eko listo. LASER je z decembrom 2008 prešel v distribucijo podjetja Karsia, v letu 2009 pa se pričakuje razširitev registracije na veliko število škodljivcev različnih kmetijskih rastlin. Vsa ta biotična FFS bodo izpolnila vrzeli v ekološki pridelavi, ter bodo tudi v veliko pomoč integrirani pridelavi pri doseganju pridelkov brez ostankov FFS, kar bo v bodoče pričakovanje in zahteva trgovcev kot tudi končnega potrošnika.

ABSTRACT

New phyto-phyrmaceutical products for ecological production in the programme of Karsia Dutovlje, d.o.o.

Ecological production in Slovenia on some segments of plant protection was impossible as until not long ago there were any available or registered products. Article 23 of the Law on plant protection enables to register urgently needed products if for some disease or pest on some plants and way of production there is no adequate registered product for protection. In 2008, the company KARSIA, Dutovlje, d.o.o., on the base of Art. 23 registered some biotic plant protection products for the use in ecological production. In February, the biotic fungicide SERENADE WP received registration on the basis of active ingredient bacterium B*acillus subtilis* for the control of apple scab

(Venturia inaequalis), fire blight *(Erwinia amylowora)* on apples and pears and grey mould *(Botrytis cinerea)* on vine plant for the production of wine and table grapes. In June the biotic insecticide GF-120, the bait with naturalite insecticide on the basis of spinosad for the control of olive fruit fly *(Bactrocera oleae)* received registration, in November biotic insekticide NATURALIS on base of fungus *Beauveria bassiana*, flare ATCC 74040, for control of fruit fly (*Ceratitis capitata)* on stone fruit, cherry fruit fly (*Rhagoletis cerasi*) on cherries, Thrips (*Frankliniella occidentalis)* on raspberries and blackberries, haselnut weevil (*Curculium nucum*) and click beetles (Elateridae) on tomato and vegetables. In 2008, the use was also extended to biotic fungicide AQ-10 on strawberries for the control of powdery mildew on strawberry (*Sphaerotheca aphanis);* insekticide LASER, on the bases of active ingredient spinosad was placed on European Eco List. In December 2008, LASER came into distribution of the company Karsia, and in 2009 it is expected that its registration will be extended to a great number of pests of various agricultural plants. All these biotic plant protection products will fill a vacancy in ecological production and will be of large help to integrated pest management at achieving the crops without residues of plant protection products which in the future will be the anticipation and demand of the merchants and final consumers.

Rezultati preizkušanj novega akaricida Milbeknock na hmelju in jablani

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Agroruše d.o.o.

Problematiki varstva jablan pred rdečo sadno pršico (*Panonychus ulmi*) in varstvo hmelja pred navadno pršico (*Tetranychus urticae*), sta v Sloveniji stalni. V prispevku so prikazani rezultati preizkušanj novega akaricida Milbeknock(a.s. milbemektin) v letih 2006-2008, v primerjavi s starejšima akaricidoma Nissorun 10 WP in Ortus 5 SC, ter novejšim Kanemitom. Delovanje Milbeknocka proti pršicam je bilo tako pri jablanah kot pri hmelju zelo dobro. Milbeknock ima v Sloveniji registracijo od pomladi 2008. Za akaricid Kanemite se registracija še pričakuje.

ABSTRACT

Results of experiments with new akaricide Milbeknock on apples and hops

Problems with red spider mite (*Panonychus ulmi*) in apples and twospotted spider mite (*Tetranychus urticae*) in hops, are significant for Slovenia. In the article are results of testing new akaricide Milbeknock (active ingridient Milbemectin) in years 2006-2008 in comparison with older akaricides Nissorun 10 WP, Ortus 5 SC and the new one, Kanemite. Efficiency of Milbeknock against mites was very good in apples and hops. The registration of Milbeknock in Slovenia started in spring 2008. Registration of Kanemite is in the process of confirmation.

Karathane Gold, Postalon in Esteron - novi Dow Agrosciences pripravki v programu sredstev za varstvo rastlin podjetja Karsia Dutovlje, d.o.

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Multinacionalka Dow AgroSciences je več let, preko firme Karsia, Dutovlje, d.o.o., zelo dobro zastopana na slovenskem tržišču. Najmočneje je zastopana pri varstvu vinske trte, sadnega drevja in krompirja, v zadnjem času pa tudi pšenice in koruze. V letošnji rastni dobi bo zastopana s tremi novimi pripravki. Karathane Gold - učinkovina dinokap je nastala že pred več kot 60 leti in je omogočala uspešno in učinkovito varstvo naših vinogradov, sadovnjakov in drugih kmetijskih rastlin pred pepelastimi plesnimi. Zaradi specifičnega načina delovanja, se na dinokap nikoli ni razvila rezistenca! Vendar, se je firma Dow AgroSciences, zaradi vedno večjih zahtev končnih potrošnikov po eko-toksikološko ugodnejših pesticidih, odločila narediti korak naprej in je od 6 izomerov dinokapa izolirala izomer z enako učinkovitostjo, vendar z ugodnejšimi ekotoksikološkimi karakteristikami. Izolirala je meptil-dinokap! Meptil-dinokap ima ugodnejši toksikološki profil za sesalce ter je dosti manj nevaren za koristne žuželke, predvsem plenilske pršice. V konvencionalnih programih varstva se lahko v eni rastni dobi koristi do štirikrat, v integrirani pa celo dvakrat (Italija). Ker ima enak, edinstven način delovanja kot dinokap, je verjetnost pojava rezistence skoraj nemogoča. Meptil dinokap deluje preventivno, kurativno in eradikativno, preprečuje dihanje glive in povzroča metabolitske nepravilnosti, ki vodijo k uničenju celice. Postalon 90 SC - je nov, visoko učinkoviti fungicid za zatiranje oidija na vinski trti. Postalon 90 SC je kombinacija dveh že znanih učinkovin, miklobutanila (45 g/L) in kvinoksifena (45 g/L). Prednost pripravka Postalon 90 SC je dodatek kurativnega delovanja kvinoksifenu in dodatek rezidualnega delovanja miklobutanilu. Z dvema učinkovinama, z dveh različnih mest in načinov delovanja, je idealno vklopljen v antirezistentno strategijo zatiranja oidija vinske trte. S kombinacijo teh dveh različnih učinkovin se ustvari trojna učinkovitost: dotikalno in sistemično delovanje ter delovanje preko plinske faze, kar omogoča varstvo grozdja in listja, ki ni varovano s kontaktnim ali sistemičnim delovanjem. Postalon 90 SC je varen za koristne organizme in ima odličen ekotoksikološki profil, ter se tako idealno vklaplja v program integriranega varstva vinske trte. Esteron - 2,4 D je prvi odkrit sintetični organski herbicid (leta 1941), s tem da ima še vedno pomembno vlogo proti širokolistnim plevelom. Zaradi odličnih karakteristik je nezamenljiv herbicid v žitih in koruzi. Večina eno in večletnih širokolistnih plevelov je občutljiva na 2,4-D. Esterska oblika 2,4-D je aktivnejša od 2,4-D amino soli in kislin, rastline jih hitreje absorbirajo, tako da so že eno uro po tretiranju odporni na izpiranje. Oljna formulacija prav tako izboljša omočljivost in preprečuje izpiranje.

ABSTRACT

Karathane Gold, Postalon and Esteron - new products of the firm Dow Agrosciences in the programme of plant protection products of Karsia Dutovlje, d.o.o.

The multinational Dow AgroSciences has been present on the Slovene market very well for many years through the firm Karsia, Dutovlje, d.o.o. The agricultural plants where the firm is present at the most are vine plant, fruits and potatoes but last time also wheat and maize. This year the firm will be present on the market with three new products. Karathane Gold - more than 60 years ago originated the active ingredient dinocap. It enabled successful and efficient protection of the vineyards, orchards and remaining cultural plants against powdery mildew. Because of specific activity there was never developed the resistance on dinocap! Because of more and more requests of the market

and end users for plant protection products with acceptable eco-toxicological properties, the firm Dow Agroscineces decided to adapt to new formed circumstances in the market and to isolate from 6 isomers from dinocap the isomer with the same efficacy but more convenient eco-toxicological properties of mepthyldinocap! Mepthyldinocap has much more acceptable toxicological profile for mammals and is much more safer for useful organisms e.g. useful aphids. In classic program of protection it can be use four times but in IPM only two times (Italy). The same is the unique way of action as at dinocap and the risk of resistance is negligible. The action of mepthyldinokap is preventive, curative and eradicative with prevention of breathing of fungus and provoking metabolic disturbances that results in death of cells. Postalon 90 SC - it is new high efficient fungicide for the control of powdery mildew of vine plant. Postalon 90 SC is a combination of two known active ingredients, myclobutanil (45 g/L) and quinoxyfen (45 g/L). The advantage of the product Postalon 90 SC is the addition of currative action to quinoxyfen and the addition of residual action to myclobutanil. With two active ingredients with two places and mode of actions it is ideally included in anti-resistent strategy at the control of powdery mildew of vine plant. With this combination of active ingredients also triple activity was obtained, systemic action, contact action and action by steam, i.e. gas phase which enables protection of grapes which are not protected by contact or systemic action. Postalon 90 SC is safe for useful organisms, has excellent eco-toxic profile and as such can be included in program IPM. Esteron – 2.4 D is the first discovered synthetic organic herbicide (in the year 1941) but it has still the important role in the battle against broadleaved weeds. Because of its excellent characteristics it is irreplaceable herbicide in cereals and maize. The majority annual and perennial weeds are sensitive to 2.4 D. Ester forms of 2.4 D are more active than 2.4 D amino salts and acids and are more quickly absorbed in the plant so that they become resistant to washing out one hour after the treatment already. Oil formulation also contributes to better sticking on the parts of plants and makes difficult washing out by rain.

Zakonodaja in nadzor škodljivih organizmov

Boljši predpisi na področju varstva rastlin

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Usmeritev v izboljšanje predpisov vključuje elemente kot so: ocena učinkov, posvetovanje z zainteresiranimi strankami, zmanjševanje administrativnih ovir in poenostavitev zakonodaje. Delo na izboljšanju predpisov se je začelo na podlagi Lizbonske strategije (2000) sprejete v okviru Sveta Evropske unije (EU), ki je postavila kot prioriteto vzpostavitev poslovanju prijaznega okolja z zmanjševanjem administrativnih bremen v obstoječih predpisih in s preprečevanjem nastajanja novih bremen. Jasnejša, enostavnejša in bolj razumljiva zakonodaja je ključna za učinkovitejše poslovanje in zadovoljnejše stranke oziroma državljane. Ena od prioritet slovenskega predsedovanja Svetu EU v letu 2008 je bila spodbujanje stalnega in sistematičnega zbiranja novih predlogov za poenostavitve predpisov na EU ravni. V prispevku obravnavamo dva primera s področja varstva rastlin. Prvi je razprava 27 držav članic EU o rezultatih vprašalnika o potencialnih vplivih registracije in drugih postopkov za zagotavljanje fitosanitarne varnosti izvoznih pošiljk. Drugi primer je začetek postopka za izvedbo celovitega pregleda režima zdravstvenega varstva rastlin v EU, ki ga opredeljuje direktiva Sveta 2000/29/EC. Pregled se bo nadaljeval do leta 2015, ko pričakujemo obravnavo revidiranega predpisa. Do takrat je potrebno spodbujati pridobivanje čim več predlogov za poenostavitve sedanje predpisane ureditve področja varstva rastlin kot tudi predpisov, povezanih z varstvom osebnih podatkov, ter drugih administrativnih bremen z vključevanjem zainteresiranih skupin v javnem in zasebnem sektorju tako na nacionalni kot EU ravni.

ABSTRACT

Better regulation in the plant health sector

Better regulation principles relate to the following elements: Impact assessments, Consultation of interested parties, Reduction of administrative burdens and Simplification of legislation. Better regulation activities started on the basis of the Lisbon strategy (2000) of the Council of the European Union (EU), which set as a priority a business friendly environment enhanced by reducing administrative burdens in the existing regulations and preventing imposing new ones. A clearer, simpler and more understandable regulation is the key for a more effective business and more satisfied customers/citizens. One of the priorities of the Slovenian Presidency to the EU in 2008 was to stimulate a permanent and systematic collecting of new proposals for regulation simplification at the EU level. In the paper two examples are given which are related to the plant health field: The first one is discussion of the outcome of questionnaires on potential implications of registration and other procedures for maintaining phytosanitary security of consignments for export, which was held by 27 EU Member States as an impact assessment of potential implications of registration of exporters and other procedures aiming at phytosanitary security after certification. The second example is start of the procedure for undertaking a complete review of the EU Plant Health regime set by the Council directive 2000/29/EC, which will continue until 2015, when new revised plant health legislation is expected. Meanwhile activities should be stimulated to obtain as many proposals as possible for a simplification

of the existing plant health legislation and the legislation connected to personal data protection and other administrative burdens, by including all interested parties in a public and private sector at the national and EU level.

Vnos organizmov v raziskovalne namene v Sloveniji v letih 1999-2008

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Od leta 1994 je v Evropski uniji (EU) v veljavi posebna zakonodaja, na podlagi katere nacionalni pristojni organi za varstvo rastlin dodeljujejo dovoljenja v skladu z zahtevami direktive 2008/61/ES (prej 95/44/ES), ki določa pogoje, pod katerimi je mogoče nekatere škodljive organizme, rastline, rastlinske proizvode in druge predmete, iz Prilog I do V Direktive Sveta 2000/29/ES, vnesti ali jih premeščati znotraj Skupnosti oziroma na nekaterih njenih varovanih območjih v preskusne ali znanstvene namene in za delo pri žlahtnjenju. Tudi v Sloveniji smo implementirali dodeljevanje dovoljenj za vnos, premeščanje in hranjenje materiala, ki je sicer prepovedan, ter nadzor uporabe tega materiala. Če se ugotovi, da so v raziskovalni ustanovi izpolnjeni predpisani splošni karantenski pogoji, so zadevne aktivnosti dovoljene. Karantenski ukrepi so odvisni od tipa materiala, njegovega porekla ter trajanja, narave in ciljev predvidenih aktivnosti. Enak postopek kot za vnos karantenskih organizmov je vpeljan tudi za vnos novih organizmov. V Sloveniji je bil v obdobju 1999 – 2008 izdanih 150 dovoljenj za vnos škodljivih organizmov, organizmov za biotično varstvo in drugih novih organizmov. Skupaj je v teh 10 letih 6 raziskovalnih organizacij in ena lokalna skupnost vneslo 79 različnih organizmov za znanstvene namene iz 18 držav (samo Kanada, Kolumbija in ZDA so bile neevropske). Zabeleženega ni bilo nobenega vnosa za žahtnjenje rastlin ali selekcijo.

ABSTRACT

Introduction of organisms for scientific purposes in Slovenia in the period 1999-2008

Since 1994, a specific legislation is in place in the EU to provide for the granting of licenses by National Plant Protection Organizations of Member States in accordance with the requirements of Commission Directive 2008/61/EC (ex 95/44/EC) establishing the conditions under which certain harmful organisms, plants, plant products and other objects listed in Annexes I to V to Council Directive 2000/29/EC may be introduced into or moved within the Community or certain protected zones thereof, for trial or scientific purposes and for work on varietal selections. In Slovenia the granting of licenses has also been implemented authorizing the introduction, movement and keeping of the material which would otherwise be prohibited, and control of the use of such material. If it is established that in a research institution the prescribed general quarantine conditions are satisfied, the activities concerned are approved. Quarantine measures depend on the type of material, its place of origin and duration, the nature and objectives of the activities envisaged. The same procedure as for the introduction of quarantine organisms applies also for new organisms. In Slovenia, 150 introductions of harmful organisms, biological control agents or other new organisms were allowed in the period 1999 – 2008. In total, 79 different organisms were introduced for scientific purposes from 18 countries (only

Canada, Columbia and USA as non-European) by 6 research institutions and one local municipality during these 10 years. No introduction was registered for plant breeding or varietal selection purposes.

Nadzor izvajanja ukrepov za preprečevanje širjenja koruznega hrošča

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Koruzni hrošč, *Diabrotica virgifera virgifera* LeConte, je pomemben škodljivec na koruzi, ki je bil v Sloveniji prvič ugotovljen leta 2003. Prvi hroščki so bili potrjeni v Prekmurju in Podravju ob meji z Madžarsko in Hrvaško. Prvi ukrepi za zatiranje koruznega hrošča so v Republiki Sloveniji bili sprejeti v letu 2004 z Odločbo o razmejitvi območij napada in ukrepih za zatiranje koruznega hrošča. V letu 2004 je bil sprejet tudi Pravilnik o fitosanitarnih ukrepih za preprečevanje širjenja koruznega hrošča, ki je še podrobneje opredelil te ukrepe. Fitosanitarna inšpekcija, ki v okviru IRSKGH deluje kot del nacionalne organizacije za varstvo rastlin Republike Slovenije, je po Zakonu o zdravstvenem varstvu rastlin pooblaščena za inšpekcijski nadzor izvajanja ukrepov, predpisanih z zakonodajo. Nadzor izvajanja ukrepov za preprečevanje širjenja koruznega hrošča smo začeli izvajati v letu 2005. Letno je bilo na razmejenih območjih koruznega hrošča pod nadzor vključenih 242 do 627 pridelovalcev koruze. Delež ugotovljenih pridelovalcev koruze, ki niso izvedli vseh ukrepov za preprečevanje širjenja koruznega hrošča se giblje od 11 do 21%. Če v analizo vključimo pridelovalne parcele, ugotovimo, da delež parcel na katerih niso bili izvedeni odrejeni ukrepi v letu 2007 znaša 5,5 %, v letu 2008 pa 4,2 %. Neizvajanje ukrepov je ugotovljeno pretežno na manjših parcelah s površino pod 0,5 ha in to v hribovitih živinorejskih območjih, kjer je strojno spravilo žit oteženo.

ABSTRACT

Supervision of implementation of measures to prevent the spread of western corn rootworm

Western corn rootworm, *Diabritica virgifera virgifera* LeConte, is an important pest which infests corn. First findings of *Diabritica virgifera virgifera* in Slovenia date back to 2003. First beetles were found in the area of Prekmurje and Podravje near the border with Hungary and Croatia.To prevent the spread of western corn rootworm in Slovenia, first measures were adopted in 2004 with the Decision on demarcated zones and measures to prevent the spread of western corn rootworm, and the Rules on phytosanitary measures with regard to the spread of *Diabritica virgifera virgifera*. Phytosanitary Inspectorate is a part of the National Plant Protection Organisation and operates within the framework of the Inspectorate of Agriculture, Forestry and Food. It is authorised to inspect if the measures provided for by the national legislation. The supervision of implementation of the measures to prevent the spread of western corn rootworm started in 2005. Annually, from 242 to 627 producers of corn have been inspected in the demarcated zones of *Diabrotica virgifera virgifera*. The percentage share of infringers ranges from 11% to 21%. But taking into account production agricultural parcels, the percentage share of the agricultural parcels where appropriate measures have not been taken was 5.5% in 2007

and 4.2% in 2008. Most frequently, the measures have not been implemented on livestock farms with smaller agricultural parcels (total area of less than 0.5 ha) which are located in hilly areas where machine harvesting of corn is difficult.

Predstavitev izvajanja nadzora zdravstvenega stanja zelenjadnic in rezultatov vzorčenj na zastopanost virusov

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Fitosanitarna inšpekcija v okviru svojih nalog opravi vsako leto tudi nadzor zdravstvenega stanja sadik vrtnin in rastlin za pridelavo plodov vrtnin. Nadzor se izvaja pri registriranih pridelovalcih sadik vrtnin, ki pridelavo napovejo z letno prijavo pridelave, pri pridelovalcih plodov vrtnin ter v vrtnih centrih in distribucijskih skladiščih. Nadzor obsega redne obvezne preglede pri pridelovalcih, ki so vpisani v Fito/Seme Register ter preglede načrtovane v programih posebnih nadzorov in inšpekcijskega spremljanja zdravstvenega stanja rastlin. Podrobneje je predstavljen posebni nadzor Pepino mosaic virusa, ki ga v celoti opravi Fitosanitarna inšpekcija. Pri pregledih so odvzeti vzorci na zastopanost virusov. Vse vzorce analizira Nacionalni inštitut za biologijo. Predstavljeni so rezultati analiz za vzorčenja v obdobju 2004-2008.

ABSTRACT

Presentation of plant health checks of vegetables and of the results of sampling on the presence of viruses

Within its duties, the Phytosanitary Inspectorate conducts also plant health checks of vegetable plants for planting and plants for the production of vegetables. The regular inspection is carried out at producers of vegetable plants for planting who declare annual production, at producers of vegetables, in garden centres and distribution warehouses. The inspection consists of regular annual checks at producers which are entered in the register, and additional checks according to the National programs of special surveys and inspection monitoring of plant health. In this article, the special survey on Pepino mosaic virus is presented. The survey is carried out by the Phytosanitary Inspectorate. It includes taking samples for testing on the presence of viruses which are analysed by the National Institute of Biology. In the article, the results of sampling from 2004 to 2008 are presented.

Posebni nadzor krompirjevih ogorčic *Globodera rostochiensis* in *G. pallida* in fitosanitarni ukrepi

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Krompirjeve ogorčice sistematično raziskujemo v Sloveniji že od leta 1963. Prva najdba rumene krompirjeve ogorčice *Globodera rostochiensis* (Woll.) Behrens sega v leto 1971. Ugotovljena je bila v okolici Dobrove pri Dravogradu. Novih najdb vse do leta 1999, ko je bila ista vrsta ugotovljena v Libeličah na Koroškem, ni bilo. Sledile so najdbe na Gorenjskem in v Čepovanu, ki so omejene na posamezne njive. V Trenti in njeni okolici je bilo leta 2004 ugotovljeno širše napadeno območje. Drugod najdb ni bilo. Z odločbo Fitosanitarne uprave, izdane na podlagi rezultatov posebnega nadzora krompirjevih ogorčic, je trenutno razmejenih 7 manjših žarišč *G. rostochiensis* z ustreznim varnostnim območjem in območje njene ustalitve, ki v Zgornjem Posočju obsega 9 katastrskih občin. Na območju Dobrove pri Dravogradu se ta škodljivi organizem obravnava kot izkoreninjen. Enako obravnavanje se pričakuje tudi za Libeliče. Fitosanitarni ukrepi, ki temeljijo na omejevanju sajenja gostiteljskih rastlin oziroma ustreznem kolobarju in sajenju odpornih sort krompirja, se glede na njihov namen in cilje razvrščajo v 3 skupine in sicer ukrepi za eradikacijo škodljivega organizma, ukrepi za preprečevanje širjenja in zmanjševanja njihove populacije in ukrepi zatiranja na območju, kjer eradikacija ni mogoča in se je škodljiv organizem že ustalil. Bela krompirjeva ogorčica *Globodera pallida* (Stone) Behrens v obdelovalnih tleh v Sloveniji še ni bila ugotovljena, bila pa je nekajkrat prestrežena med leti 2000 in 2003 pri nadzoru uvoza jedilnega krompirja na meji z Italijo. Ker vrsta *G. pallida* v obdelovalnih tleh v Sloveniji kljub intenzivnemu sistematičnemu nadzoru še ni bila ugotovljena, je celotno območje Slovenije glede tega škodljivega organizma razglašeno kot varovano območje.

ABSTRACT

Survey of potato cyst nematodes *Globodera rostochiensis* and *G. pallida* and phytosanitary measures

In Slovenia, potato cyst nematodes have been the subject to survey since 1963. Yellow potato cyst nematode *Globodera rostochiensis* (Woll.) Behrens was first found in 1971 at Dobrova near Dravograd. There were no new findings until 1999 when the same species was determined in Libeliče at Koroška. After that, several findings followed. At Gorenjska and in Čepovan, these were limited only to individual fields; however, in Trenta and the surroundings a wider area was attacked. All other areas were found free from the pest. According to the decision of the Phytosanitary Administration, 7 smaller foci with the appropriate buffer zones were delimited in relation to the found *G. rostochiensis*, as well as the area of its establishment, which includes 9 cadastral communities of Zgornje Posočje. In the area of Dobrova near Dravograd, this pest is considered as eradicated. The same is expected also for Libeliče. Phytosanitary measures which are based on the restriction of cultivation of host plants, or an appropriate crop rotation and planting of resistant potato varieties, are classified according to their purpose and aims into 3 groups: 1 - Measures for eradication, 2 - Protective measures with regard to the spread of *G. rostochiensis* and measures for decreasing their population, 3 - Suppression – measures on the infested area declared as a special regulated area where *G. rostochiensis* is established and eradication is not possible. White potato cyst nematode *Globodera pallida* (Stone) Behrens has not yet been found in the arable land. Between 2000 and 2003, it was several times intercepted during control of the imported ware potato at the borders with Italy. Since the occurrence of *G. pallida* despite of intensive survey has not yet been determined, the area of the whole Slovenia is recognized as protected zone in respect of this harmful organism.

Pridelava sadik rastlin, gostiteljic hruševega ožiga, na nevtralnih območjih

Jože JERMAN CVELBAR[1], Andrej POTOČNIK[1], Milan LUKMAN[1], Anita BENKO BELOGLAVEC[1], Bojan BERDEN[1], Radovan LIČEN[1], Primož PAJK [2]

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Posebni nadzor hruševega ožiga, ki ga povzroča bakterija *Erwinia amylovora* (Burrill) Winslow *et al*., je slovenska uradna služba za varstvo rastlin začela izvajati leta 1998. Prvič je bila bakterija ugotovljena leta 2001 v Naklem, potem pa beležimo še dva velika izbruha v letih 2003 in 2007. Izsledki nadzora v obdobju 2003-2008, so bili ključni za trenutno razmejitev v skladu z nacionalnim predpisom in Uredbo Komisije št. 690/2008. Z namenom preprečevanja širjenja bakterijske bolezni, varstva nasadov in pridelave rastlin za saditev, je Slovenija pridobila status varovanega območja za hrušev ožig, ki razen za gorenjsko, koroško, mariborsko in notranjsko regijo, velja do 31. marca 2010. V varovano območje se lahko premeščajo le rastline, ki so bile pridelane pod enakimi pogoji na varovanih območjih druge države članice ali na nevtralnih območjih, ki so pod posebej predpisanimi pogoji vzpostavljena znotraj okuženega oziroma ustaljenega območja. Bolezen se je v letih 2003-2008 razširila in se ustalila na Gorenjskem, na območju Maribora, na Koroškem in na Notranjskem. V letu 2003 so bile okužbe prvič ugotovljene tudi v varovalnih pasovih mest za pridelavo sadik rastlin na Gorenjskem, kjer sta bili že v letu 2004 vzpostavljeni prvi dve nevtralni območji, Sorško polje in Volčji potok (Arboretum), v letu 2008 pa še nevtralno območje Selo v Prekmurju. Nevtralna območja določi Fitosanitarna uprava z odločbo in sicer na predlog imetnikov rastlin ali njihovega združenja ali po uradni dolžnosti v skladu s pogoji, ki so opredeljeni v pravilniku o ukrepih za preprečevanje širjenja in zatiranje hruševega ožiga. Izpolnjevanje pogojev preverja uradna služba. Pri vzpostavitvi in vzdrževanju nevtralnega območja se upošteva ekonomski interes pridelovalca, podatke o navzočnosti in eradikaciji hruševega ožiga v nevtralnem območju, stroške vzpostavitve oziroma vzdrževanja območja (uradni pregledi, vzorčenja in izrekanje ukrepov), tržno vrednost predvidoma pridelanih sadik gostiteljskih rastlin, poleg tega pa tudi okoljske in socialne vidike. Glede na skupni trg Evropske unije s prostim pretokom blaga in širitev hruševega ožiga se torej zastavlja vprašanje kje je možno, smiselno in upravičeno vzpostavljanje novih oziroma vzdrževanje že določenih nevtralnih območij.

ABSTRACT

Production of host plants of fire blight intended for planting in Buffer Zones

In 1998, the Slovenian National Plant Protection Organisation implemented a survey of fire blight caused by *Erwinia amylovora* (Burrill) Winslow *et al*., which was first detected in 2001 in Naklo. This was followed by two larger outbreaks in 2003 and in 2007. Findings of the survey in the period from 2003 to 2008 were crucial for the existing demarcation of specific areas in compliance with the national legislation and Commission Regulation No 690/2008. To prevent the spread of the bacterial disease, and to protect orchards and the

production of plants for planting, the Republic of Slovenia was recognised as a Protected Zone for fire blight which is valid, except for Gorenjska, Mariborska and Notranjska regions, until 31 March 2010. Only the plants which were produced under the same conditions in Protected Zones of other member states, or in the Buffer Zones which are established under specific conditions within the infected or established region, are allowed to be moved to the Protected Zone for fire blight in Slovenia. From 2003 to 2007, the disease spread and settled down in Gorenjska, Koroška, Notranjska and Maribor region. In 2003, infections in the near vicinity of production areas of host plants of fire blight intended for planting were detected for the first time in the Gorenjska region, where the first two Buffer Zones were established: Sorško polje and Volčji potok (Arboretum). In 2008, a new Buffer Zone was established in Selo in the Prekmurje region. Buffer Zones are established by the Phytosanitary Administration at the request of producers of the plants or their associations, or *ex officio*, under the conditions laid down in the Rules on measures for the prevention of spread and suppression of fire blight. Compliance with the requirements is checked by the official service. In the establishment and maintenance of Buffer Zones, several factors are taken into account: economic interest of the producer; data on the presence and eradication of *Erwinia amylovora* in the Buffer Zone and it's surrounding; the costs of establishment and maintenance of the area (official inspection, sampling and ordering measures); market value of the host plants for planting that are expected to be produced; and environmental aspects and social dimensions. Regarding the common EU market with free movement of goods, and the spread of fire blight, it should be considered where the establishment of new, or maintenance of the established Buffer Zones would be possible, appropriate and reasonable.

Ugotavljanje pojava trsnih rumenic v Sloveniji v letu 2008

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Program posebnega nadzora trsnih rumenic se v Sloveniji izvaja v vseh vinorodnih deželah od leta 2002. Namen programa je ugotavljanje zastopanosti zlate trsne rumenice (povzročitelj fitoplazma Grapevine flavescence dorée - FD), trsne rumenice počrnelosti lesa (povzročitelj fitoplazma Bois noir - BN), zastopanosti fitoplazem v slaku (*Convolvulus arvensis*), navadnem srobotu (*Clematis vitalba*) in v škržatkih, ki so prenašalci trsnih rumenic. Spremlja se tudi ulov ameriškega škržatka (*Scaphoideus titanus*), ki je naravni prenašalec FD na okuženem območju. Karantenska zlata trsna rumenica je bila pri nas prvič najdena na Koprskem v letu 2005, nato pa še v letih 2006 in 2007, zato je Fitosanitarna uprava z odločbo razmejila žarišča in pripadajoča varnostna območja ter predpisala ukrepe z namenom izkoreninjenja in preprečevanja nadaljnjega širjenja. V letu 2008 je bila prvič ugotovljena vinorodni deželi Posavje na lokaciji Piroški vrh na Dolenjskem, ponovno je bila potrjena tudi v dveh žariščih v okolici Kopra, določenih v letih 2006 in 2007. V ameriškem škržatku v letu 2008 zastopanost FD ni bila ugotovljena, v navadnem srobotu pa je bila potrjena navzočnost FD v vseh treh vinorodnih deželah. Sistematični nadzor ameriškega škržatka v letu 2008 potrjuje njegovo zastopanost in splošno razširjenost v vseh treh vinorodnih deželah. Trsna rumenica počrnelosti lesa je pri nas razširjena v vseh vinorodnih deželah, kar je bilo ugotovljeno tudi v letu 2008. Ta

fitoplazma je bila v letu 2008 ugotovljena tudi v vzorcih njivskega slaka (*Convolvolus arvensis*) v Posavski in Podravski vinorodni želeli.

ABSTRACT

Survey of Grapevine Yellows in Slovenia in 2008

The survey of Grapevine Yellows has been carried out since 2002 in all Slovene wine regions with the aim to establish the occurrence of quarantine Grapevine flavescence dorée phytoplasma (FD), Bois noir phytoplasma (BN), the occurrence of phytoplasmas in *Convolvulus arvensis, Clematis vitalba* and in leafhoppers, which are the vectors of phytoplasmas. Also the monitoring of *Scaphoideus titanus* has been carried out. The first finding of FD in Slovenia was confirmed Koprsko in 2005, and after that in 2006 and 2007. Therefore, the foci and their buffer areas were delimited and the measures were implemented to eradicate the disease and to prevent its further spread. In 2008, FD was confirmed for the first time in the Posavje winegrowing region at the location Piroški vrh in Dolenjska and it also occurred in two foci in Koprsko, delimited in 2006 and in 2007. Furtheron, FD was not detected in its natural vector *S. titanus*, but it was confirmed in plants of *C. vitalba* in all three Slovene wine regions. In the monitoring in 2008 the presence and widespread of *S. titanus* was confirmed in all three Slovene wine regions. Also BN was confirmed as widespread in Slovenia. This phytoplasma was also detected in samples of *C. arvensis* from Posavje and Podravje winegrowing regions.

Rezultati izvajanja ukrepov za zatiranje zlate trsne rumenice na Koprskem

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Sistematični nadzor trsnih rumenic (Grapevine yellows) v Sloveniji izvajamo od leta 2002. V okviru tega je bila leta 2005 prvič potrjena zlata trsna rumenica (povzročitelj Grapevine flavescence dorée phytoplasma – FD) na lokaciji Purissima (v bližini Ankarana na Koprskem). Z odločbo Fitosanitarne uprave so bili predpisani fitosanitarni ukrepi v žarišču okužbe in pripadajočem 5 kilometrskem varnostnem območju, z namenom preprečevanja širjenja in zatiranja FD. V skladu s to odločbo je fitosanitarna inšpekcija izvajala vizualne preglede vinogradov na okuženem območju ter vzorčila rastline z znamenji napada trsnih rumenic. Na podlagi vzorčenj rastlin v 5 kilometrskem varnostnem pasu sta bili v letu 2006 ugotovljeni še dve žarišči: nad Ankaranom in Debeli rtič. V letu 2007 je bila FD potrjena v vzorcih odvzetih na širšem območju, v bližini Dragonje, na lokaciji Koštabona. V žariščih okužbe so bile odstranjene vse rastline vinske trte z znamenji napada trsnih rumenic. Fitosanitarni inšpektorji so nadzirali izvajanje ukrepov zatiranja ameriškega škržata (*Scaphoideus titanus*) na okuženem območju, tudi s pregledovanjem rumenih lepljivih plošč. V prispevku so predstavljeni rezultati nadzora v letih 2006 do 2008, ki kažejo na upadanje števila rastlin vinske trte z znamenji napada trsnih rumenic v žariščih, že v drugem letu po uvedbi ukrepov.

ABSTRACT

The results of surveys for controlling Grapevine yellows in the region of Koper

The survey of Grapevine yellows has been carried out in Slovenia since 2002. During the survey a Grapevine flavescence dorée phytoplasma (FD) was confirmed in 2005 (Ankaran, South-west Slovenia). With the aim to eradicate and prevent spreading of FD, the Phytosanitary administration of the Republic of Slovenia adopted a decision, which established phytosanitary measures in the focus and inside the five-kilometre buffer zone. On the basis of this decision phytosanitary inspectors visually inspected all vineyards in the infected area and took same samples from plants showing symptoms of Grapevine yellows. As a consequence of sampling symptomatic vine plants in the five-kilometre buffer zone in 2006, two new foci were identified: near Ankaran and Debeli rtič and in 2007 towards the Croatian border the focus Koštabona. All vine plants in foci showing symptoms of grapevine yellows were eliminated. Phytosanitary inspectors supervised the implementation of obligatory treatments against the vector *Scaphoideus titanus* Ball, also with a control of yellow sticky traps. The paper presents the results of the survey carried out in the period 2006 - 2008. The results show a decrease in the number of symptomatic plants with Grapevine yellows already in the second year after the implementation of phytosanitary measures.

Varstvo poljščin in vrtnin

Izkušnje pri biotičnem zatiranju poljskega majskega hrošča (*Melolontha melolontha* L.) z glivo *Beauveria brongniartii* (Sacc.) Petch, 1924

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Predstavljena je prerazmnožitev poljskega majskega hrošča (*Melolontha melolontha* L.) na Idrijskem od leta 2002 do leta 2008. V letu 2002 je poprečno 100 ogrcev na m^2 v stadiju 3. levitve (L_3) popolnoma uničilo travno rušo na 370 ha travnikov. Populacija škodljivca je v letu 2004 v novem ciklusu po izleganju jajčec še narasla. Na vseh travnih površinah je bilo v letu 2005 poprečno 226 ogrcev/m^2, kar je povzročilo uničenje 760 ha travne ruše oziroma 62 % vseh kmetijskih zemljišč na območju. Po uspešnem poskusnem tretiranju 92 ha travnikov z entomopatogeno glivo *Beauveria brongniartii* (Sacc.) Petch, 1924, smo v letu 2007 začeli izvajati program sistematičnega zatiranja poljskega majskega hrošča, ki ga je finančno podprlo MKGP, Fitosanitarna uprava Republike Slovenije. Biotično zatiranje z glivo *Beauveria brongniartii* je bilo izvedeno jeseni 2007 na 286 ha travnikov in v letu 2008 na 564 ha. Pred začetkom biotičnega zatiranja smo v Zadlogu našteli poprečno 86, leto dni kasneje pa 21 ogrcev/m^2. Na travnikih tretiranih z glivo *Beauverio brongniartii* se je število ogrcev zmanjšalo za 75%.

ABSTRACT

Experiences with biological control of Common Cockchafer (*Melolontha melolontha* L.) using *Beauveria brongniartii* (Sacc.) Petch, 1924

An outbreak of the Common Cockchafer (*Melolontha melolontha* L.) in Idrija region during 2002 and 2008 is reported. In 2002 the third larval stage of cockchafer by average of 100 grubs per m^2 completely damaged 370 ha of grasslands. In 2004 after eggs deposition the population increased on. In 2005 an average of 226 grubs per m^2 was observed in region. 760 ha of grasslands were damaged, that represents 62% of all agricultural land in the region. After the successfully preliminary testing of entomopathogenic fungus *Beauveria brongniartii* (Sacc.) Petch, 1924 on 92 ha of grasslands in 2005, in 2007 we started the programme for systematic suppression of the Common Cockchafer (*Melolontha melolontha* L.), supported by Ministry of Agriculture, Phytosanitary Administration of the Republic of Slovenia. Biological control of *Melolontha melolontha* by entomopathogenic fungus *Beauveria brongniartii* started in autumn 2007 on 286 ha of grasslands and was continuing in 2008 on 564 ha. Before the treatment an average of 86 grubs per m^2 was observed in Zadlog, one year later only 21 grubs per m^2 were counted. The total decrease in number of grubs on treated area was 75 %.

Načini varovanja kmetijskih zemljiščih pred divjadjo in njena škodljivost v Šaleški dolini

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Škoda, ki jo dela divjad vsako leto na kmetijskih zemljiščih v Sloveniji je še vedno previsoka. Na območju Šaleške doline smo v letu 2006 preučevali tipe poškodb po divjadi na različnih gojenih rastlinah (koruza, krompir, vrtnine) in trajnem travinju ter načine varovanja teh zemljišč, če so le-ta bila varovana. Skupno je bilo na tem območju med junijem in oktobrom opravljenih 99 ogledov kmetijskih zemljišč (travniki, njive, vrtovi). Od tega je bilo opravljenih v občini Šoštanj 37 ogledov, v občini Velenje 46 in 16 ogledov je bilo narejenih v občini Šmartno ob Paki. V juniju je bilo narejenih največ (30) ogledov. Sledijo julij z 27, avgust z 19, september z 17 in oktober s 6 ogledi. V opazovanje je bilo vključenih 179,98 ha zemljišč, ki so bila pred divjadjo varovana (12 %) ali pa ne (88 %). Največji delež opazovanih zemljišč sta zasedala trajno travinje (50 %) in njive s koruzo (49 %), preostanek je odpadel na vrtnine. Med zasejanimi vrtninami sta največji delež predstavljala fižol (22 %) ter krompir (20 %). Sledili so pesa (12 %), ter solata in korenje, vsaka z 11 %. Ostale vrtnine so bile zastopane z manj kot 10 %. Kot oblika varovanja so se pojavljale fizične ovire (mrežasta ograja, lesena ograja, ograja iz plastične mreže in plastičnega traku), strašila (vreča, oblačilo, svetlikajoč in barvasti trak) ter psihološka ovira (elektroograja). Delež varovanih vrtnin (59 %) je bil relativno večji kot delež njiv s koruzo (23 %) in trajnega travinja (0 %), absolutno pa ne. Delež njiv s koruzo, ki so bile poškodovane zaradi divjega prašiča je bil 8 %. Delež zemljišč, ki je bil varovan z elektroograjo je bil zelo majhen (2,5 %). Za najbolj škodljivo divjad se je pokazal divji prašič, medtem ko srnjad in damjak nista bila posebno škodljiva.

ABSTRACT

Protection measures on agricultural land against big game and damage they cause in Šaleška valley

Damage which is made by big game every year on agricultural land in Slovenia is still to high. We studied in 2006 in the area of Šaleška valley types of crop damage by big game on different cultivated plants (maize, potato, vegetables) and permanent grassland and also protection measures of crops if they were used. Between June and October in total 99 surveys of agricultural land (meadows, arable fields, gardens) were made in this area. From 99 surveys, 37 surveys were made in Šoštanj municipality, 46 surveys in Velenje municipality and 16 surveys were made in Šmartno ob Paki municipality. With 30 surveys June was the most observed month. Following were July with 27, August with 19, September with 17 and October with 6 surveys. In a observation process 179.98 hectares of land was included from which 12 % was protected and 88 % was unprotected against big game. The bigest portion of observed land presented permanent grassland (50 %) and maize fields (49 %). The rest was left to vegetables. Among vegetables the highest portion had bean (22 %) and potato (20 %). Succesive vegetables were beet (12 %), lettuce and carrot with 11 % each. The rest of the vegetables represented less than 10 % of observed land in vegetables. As protection measures physical barriers (mesh fence, wood fence, fence from plastic net and plastic tape), scarecrows (bag, clothes, glittering and coloured tape) and psychological barrier (electric fence) were used. Portion of protected vegetables was relatively higher (59 %) than maize fields (23 %) and permanent grassland (0 %), but not absolutely. Portion of maize fields damaged due to wild boar was 8 %. Observed land which was protected with electric fence was very low (2.5 %). The most damaging big game species in the area of Šoštanj and Velenje was wild boar (*Sus scrofa*), meanwhile roe deer (C*apreolus capreolus*) and fallow deer (*Dama* dama) caused less damage.

Hmeljev hrošč (*Neoplinthus tigratus porcatus* Panzer) in lucernin rilčkar (*Otiorhynchus ligustici* L.) v slovenskih hmeljiščih

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Hmeljev hrošč (*Neoplinthus tigratus porcatus* Panzer) in lucernin rilčkar (*Otiorhynchus ligustici* L.) sta skupaj z ostalimi škodljivci hmelja (hmeljevo listno ušjo, navadno pršico, koruzno veščo in hmeljevim bolhačem) zadnjih deset let pomembna škodljivca v slovenskih hmeljiščih. To je povezano predvsem s spremembo klime kot tudi z ostalimi agrotehničnimi ukrepi (predvsem zmanjšano uporabo kontaktnih insekticidov). Zaradi klimatskih sprememb se je spremenila tudi bionomija omenjenih rilčkarjev. Za zatiranje hmeljevega hrošča in lucerninega rilčkarja v hmelju trenutno nimamo na voljo nobenega insekticida. Zelo toksične insekticide za zatiranje rilčkarjev, katerih uporaba v hmeljiščih ni dovoljena, bi bilo potrebno nadomestiti z novimi insekticidi, ki bodo okolju bolj prijazni. Nove metode zatiranja rilčkarjev vključujejo tudi biotične pristope (uporabo entomopatogenih nematod), katerih praktično delovanje je potrebno preveriti v praksi, kar bo zelo težko.

ABSTRACT

The hop beetle **(*Neoplinthus tigratus porcatus* Panzer) and alfalfa snout weevil (*Otiorhynchus ligustici* L.) in Slovenian hop garden**

The hop beetle (*Neoplinthus tigratus porcatus* Panzer) and alfalfa snout weevil (*Otiorhynchus ligustici* L.) together with another hop pests (damson-hop aphid, two-spotted spider mite, European corn borer, hip flea beetle) are the most dangerous pests of Slovenian hop gardens in last ten years. It is connected with change climatic condition and agricultural measures (reduction use contact insecticides), consequence for climatic change is chance weevil bionomics. Hop protection against hop beetle and alfalfa snout weevil is difficult, because we don't have any insecticides yet. High toxic insecticides, which were use for this purpose will be replaced by a new insecticides, which will be more friendly to environment. New non-traditional methods for control weevils, including biological ones (entomopathogenic nematodes) are tested in spite of the fact that their utilization in practical conditions seems to be very difficult.

Preučevanje načinov delovanja izbranih rastlinskih izvlečkov na koloradskega hrošča (*Leptinotarsa decemlineata* Say) na jajčevcu

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Ugotavljali smo potencialne insekticidne oz. repelentne učinke rastlinskih izvlečkov (eterična olja: navadnega rožmarina [*Rosmarinus officinalis*], črnega popra [*Piper nigrum*], bergamota [*Citrus aurantium ssp. bergamia*], prave sivke [*Lavandula angustifolia*] in kafrovca [*Cinnamomum camphora*] ekstrakti: vinske rutice [*Ruta graveolens*], navadne breze [*Betula pendula*], vrtnega ognjiča [*Calendula officinalis*] in navadnega gabeza [*Symphytum officinale*], čisti snovi α+β-tujon in kafra) na več razvojnih stadijev koloradskega hrošča (*Leptinotarsa decemlineata*) na jajčevcu. V laboratoriju smo uporabili no-choice test, kjer je bil škodljivcu na voljo list jajčevca pomočen v izbran izvleček. Listi tretirani s katerokoli preskušano snovjo so bili signifikantno manj objedeni kot kontrolni listi. V poljskem poskusu smo rastline jajčevca škropili z dvema pripravkoma, ki sta v preliminarnem laboratorijskem poskusu pokazala zadovoljivo delovanje. Rezultati poljskega poskusa so pokazali signifikantno manj odraslih osebkov, mladih in starih ličink na rastlinah, ki so bile tretirane z eteričnim oljem rožmarina (1.8, 1.6, 0.24) kot v obravnavanju z bergamotko (3.0, 4.0, 0.88) in v kontrolnem obravnavanju (3.4, 3.5, 0.98). Prav tako so bile rastline signifikantno manj poškodovane v obravnavanju z rožmarinom, kot pri ostalih dveh. Signifikantno največ jajčnih legel na rastlino je bilo na kontrolnem obravnavanju.

ABSTRACT

Research on the modes of action of some plant extracts for controlling Colorado potato beetle (*Leptinotarsa decemlineata* Say) on eggplant

Potential insecticidal or repellent effects of several plants extract (essential oils of: rosemary [*Rosmarinus officinalis*], black pepper [*Piper nigrum*], bergamot [*Citrus aurantium ssp. bergamia*], lavender [*Lavandula angustifolia*], extracts: common rue [*Ruta graveolens*], European white birch [*Betula pendula*], garden marigold [*Calendula officinalis*] and blackwort [*Symphytum officinale*], camphor, α+β-thujone) on majority developmental stage of Colorado potato beetle (*Leptinotarsa decemlineata*) on eggplant were evaluated. In laboratory bioassay no-choice test was used, where one leaf of eggplant was placed in Petri dish and treated with chosen substance. In all cases, leafs treated with extracts were significant less nibbled compared with control treating. In field trail eggplants were treated with the two most promising extracts, which were chosen on the basis of preliminary tests. Results from field trail shows that there were significant less adults (1.8), young larvae (1.6) and old larvae (0.24) of Colorado potato beetle on plants treated with essential oil of rosemary compared with eggplants treated with essential oil of bergamot (3.0, 4.0, 0.88) and in control trail (3.4, 3.5, 0.98). Moreover, the eggplants treated with essential oil of rosemary, were significant less defoliated than eggplants in other two treating. Significant more egg parcels on one eggplant were on control treating.

Naravna odpornost zelja na napad tobakovega resarja (*Thrips tabaci* Lindeman, Thysanoptera, Thripidae) in pisane stenice (*Eurydema ventrale* Kolenati, Heteroptera, Pentatomidae)

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V prispevku bodo predstavljeni rezultati triletnega poljskega poskusa (2006-2008), v katerem smo preučevali škodljivost tobakovega resarja (*Thrips tabaci*) in pisane stenice (*Eurydema ventrale*) na 20 genotipih zelja. V letu 2006 smo v vseh genotipih določili vsebnost 11 sestavin zeljnih listov (epikutikularni vosek, α-amirin, β-amirin, lupeol, saharoza, glukoza, fruktoza, vitamin C, palmitinska kislina, stearinska kislina in arahidinska kislina) in preučili njihov vpliv na naravno odpornost zelja na napad omenjenih škodljivcev. Vsebnost epikutikularnega voska smo v vseh genotipih določili tudi v drugem in tretjem letu raziskave. V poljski poskus je bilo vključenih 9 zgodnjih, 5 srednje zgodnjih in 6 srednje poznih genotipov (glede na dolžino rastne dobe), 3 rdeči in 17 belih genotipov (glede na barvo), 14 hibridov in 6 sort (glede na poreklo). V vseh letih smo med genotipi ugotovili signifikantne razlike v povprečnem indeksu poškodb zaradi preučevanih škodljivcev na listih.

ABSTRACT

Natural resistance of cabbage against onion thrips (*Thrips tabaci* Lindeman, Thysanoptera, Thripidae) and cabbage stink bug (*Eurydema ventrale* Kolenati, Heteroptera, Pentatomidae) attack

The results of 3-years (2006-2008) field trial on harmfulness of onion thrips (*Thrips tabaci*) and cabbage stink bug (*Eurydema ventrale*) on 20 cabbage genotypes will be presented. In 2006, the mass of 11 compounds of cabbage leaves (epicuticular wax, α-amyrin, β-amyrin, lupeol, sucrose, glucose, fructose, C vitamin, palmitic acid, stearin acid, and arachidic acid) was determined, and their influence on natural resistance of cabbage against the pests in question was studied. Epicuticular wax content on the leaves of cabbage was determined also in the 2nd and in the 3rd year of investigation. In a field trial the following genotypes were included: 9 early, 5 mid-early, 6 mid-late (regarding the longevity of growing period), 3 red, 17 white (regarding the colour), 14 hybrids and 6 varieties (regarding genetic origin). Among genotypes studied in all years significant differences were determined between mean index of damage caused by feeding of the pests on the leaves.

Spremljanje pojava škodljivcev in koristnih organizmov na paradižniku, papriki in kumarah, gojenih v zavarovanih prostorih

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V letu 2007 smo na treh lokacijah na širšem celjskem območju (Loka pri Zidanem Mostu, Zavrh pri Galiciji in Mestinje) ugotavljali zastopanost škodljivcev in njihovih naravnih sovražnikov na paradižniku, papriki in kumarah gojenih v zavarovanih prostorih. Pojav škodljivcev in koristnih organizmov smo spremljali s pomočjo ulova na barvne lepljive

plošče (rumene in modre) in z vizualnimi pregledi rastlin od začetka maja do začetka oktobra 2007. Namen raziskave je bil proučiti vrste, čas pojavljanja ter zastopanost škodljivcev in koristnih organizmov na obravnavanih vrtninah. Rezultati spremljanja so potrdili našo hipotezo, da je zastopanost koristnih organizmov povezana s pojavom škodljivcev in da se koristni organizmi pogosteje pojavljajo v posevkih, kjer uporabljamo manj fitofarmacevtskih sredstev. Pojav škodljivih in koristnih vrst je odvisen od vremenskih razmer. V prispevku so predstavljene škodljive in koristne vrste, ki smo jih zasledili ter dinamika pojavljanja posameznih vrst in njihova medsebojna odvisnost.

ABSTRACT

Survey of pests and beneficial organisms on tomato, pepper and cucumber produces in greenhouses

In year 2007 we have studied the occurrence of the pests and the beneficial organisms on tomato, pepper and cucumber produced in greenhouses on three location the area of Celje (Loka pri Zidanem Mostu, Zavrh pri Galiciji and Mestinje). The occurrence of the pests and the beneficial organisms was monitored with yellow and blue sticky traps and visual control of the plants from the beginning of May till the beginning of October 2007. The aim of the research was to study the species and the seasonal dynamics of the pests and the beneficial organisms in the observed culture. The results of the monitoring confirmed our hypothesis that the occurrence of the beneficial organisms is connected with the occurrence of the pests. The results of the monitoring also confirmed our hypothesis that the beneficial organisms occur more frequently on the plants where fewer chemicals were sprayed. We established that the weather conditions have high influence on the dynamics of the pests and the beneficial organisms. In the article, the species of the pests and the beneficial organisms that were detected are presented, as well as the occurrence dynamics of some species and their mutual dependence is discussed.

Parazitoida *Lysiphlebus fabarum* in *Diaeretiella rapae* v Sloveniji v letih 2006 in 2008

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V letih 2006 in 2008 smo nabirali vzorce parazitoidov listnih uši v Sloveniji. Nabranih in identificiranih je bilo 2173 osebkov primarnih parazitoidov in med njimi je bilo 724 osebkov vrste *Lysiphlebus fabarum* in 801 osebkov *Diaeretiella rapae*. Največji razpon gostiteljskih rastlin je imela vrsta *Lysiphlebus fabarum*, ki smo jo našli na 17 različnih vrstah rastlin, ki jih uvrščamo v 9 različnih botaničnih družin. Vrsto *Diaeretiella rapae* smo našli na 5 rastlinah iz družine kapusnic. 76 % nabranih parazitoidov vrste *Diaeretiella. rapae* je bilo ženskega spola, medtem ko je bilo samic pri vrsti *Lysiphlebus fabarum* kar 96 % in le 4 % samcev. Vrsta *Diaeretiella rapae* je komercialno razširjena vrsta za uporabo v biotičnem varstvu rastlin predvsem pred mokasto kapusovo ušjo, *Brevicoryne brassicae*.

ABSTRACT

Parasitoids *Lysiphlebus fabarum* and *Diaeretiella rapae* in Slovenia in 2006 and 2008

In 2006 and 2008 samples of aphid parasitoids were collected in Slovenia. From samples we eliminated and identified 2173 individuals of aphid primary parasitoids, 724 individuals belonging to *Lysiphlebus fabarum* and 801 to *Diaeretiella rapae* species. Parasitoid *Lysiphlebus fabarum* had the widest range of host-plants; it was found on 17 different plants from 9 botanical families. Parasitoids of *Diaeretiella rapae* species were found on 5 different plants from Brassicaceae family. Sex ratio in our research was 76 % of female individuals in *Diaeretiella rapae* species, by *Lysiphlebus fabarum* sex ratio was 96 % of female and only 4 % of male parasitoids. Parasitoid *Diaeretiella rapae* is commercially available product for the biological control of cabbage aphid, *Brevicoryne brassicae*.

Fitosanitarni pomen kolobarja na poljedelsko-živinorejskih kmetijah

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Pravilno vrstenje posevkov ob hkratnem primernem deležu v kolobarju ima velik, vendar v sodobnem času premalo upoštevan fitosanitarni pomen. Izbor poljščin in vrtnin je v Sloveniji zelo ozek, vendar se ta po letu 2000 povečuje z uvajanjem integrirane pridelave, ekološkega kmetovanja in nekaterih ukrepov slovenskega kmetijskega okoljskega programa. Tudi pojav koruznega hrošča (*Diabrotica virgifera virgifera* LeConte) leta 2003, ki onemogoča pridelavo koruze v monokulturi, je vzrok, da se na kmetijah znova odločajo za setev več poljščin (strna žita, detelje, deteljno-travne mešanice, zrnate stročnice in oljnice). Hkrati pa se kolobar tudi oži, zaradi ukinitve pridelave sladkorne pese in zmanjšane pridelave krompirja. Z namenom preučitve sedanjih kolobarjev in s sestavo novih, biotično bolj uravnoteženih, so bili analizirani kolobarji na poljedelsko-živinorejskih kmetijah po letu 2000. Preučen je bil tudi njihov fitosanitarni učinek. Rezultati analize vrstenja poljščin na poljedelsko-živinorejskih kmetijah po Sloveniji kažejo, da so monokulturo koruze razbremenila druga žita, zlasti ječmen, manjkajo pa stročnice in dosevki. Na kmetijah, kjer so že pred letom 2004 vrstili koruzo na dve leti, se je s pristopom k integrirani pridelavi povečala ne le pestrost glavnih posevkov, ampak tudi dosevkov. Reja živine, ki je temeljna dejavnost poljedelsko-živinorejskih kmetij, zaradi pojava koruznega hrošča za zdaj ni ogrožena. Kljub temu pa analiza teh kolobarjev s fitosanitarnega stališča kaže, da so nekateri še vedno preozki. Predlagali smo kolobarje, sestavljene iz glavnih posevkov in dosevkov, ki upoštevajo fitosanitarno primernost, proizvodno usmeritev kmetij, tehnično opremljenost, navade, znanje in želje slovenskih kmetov. Pri uporabi predlaganih kolobarjev lahko v prihodnje pričakujemo vse bolj pozitiven vpliv kolobarja na pridelek in na zdravstveno stanje posevkov ob hkratnem zmanjšanju uporabe fitofarmacevtskih sredstev. Metoda načrtovanja biotično uravnoteženega in fitosanitarno primernega kolobarja lahko služi kot model za izboljšanje vrstenja posevkov na vseh poljedelsko-živinorejskih kmetijah po Sloveniji.

ABSTRACT

Phytosanitary importance of crop rotation on arable and livestock farms

Proper crop rotation with an appropriate portion of crops in rotation has a large but in modern time not enough considered phytosanitary importance. Choice of field crops and vegetables is very narrow in Slovenia, but after 2000 it started to increase due to integrated crop production, organic farming and some measures of Slovenian Agri-Environmental Programme. Also the appearance of western corn rootworm (*Diabrotica virgifera virgifera* LeConte) in 2003, which threatens maize production in monoculture, is the reason for farmers to decide for sowing more field crops (winter cereals, clovers, clover-grass mixtures, grain legumes and oil plants). At the same time crop rotation narrows also because of ending of sugar beet production and reduced production of potato. With the aim to look into present rotations and to plan new one which will be more biologically balanced, we analysed rotations on arable and livestock farms. Also studied was their phytosanitary importance. Results of field crop rotation analysis on arable and livestock farms in Slovenia show that maize production in monoculture was substituted by other cereals, particularly barley but with legumes and supplementary crops still missing in it. Farms, which started with a two year rotation of maize already before 2004, an increase of main crops diversity and also supplementary crops was noted after the accession to integrated production. Livestock production which is a main activity on arable livestock farms due to the appearance of western corn rootworm is for now not threaten. In spite of this fact the analysis shows that some rotations are still too narrow from the aspect of phytosanitary importance. We recommended rotations composed of main crops and supplementary crops and which took into consideration phytosanitary importance, farm's production orientation, technical level of equipment of farms, habits, knowledge and request of Slovenian farmers. In the future when recommended rotations are used we can expect increasingly positive influence of rotation on the yield and health status of crops and at the same time the reduction of use of plant protection products. Method of planning biologically balanced and phytosanitary appropriate rotation could serve as a model in improvement of crop rotation on all arable and livestock farms in Slovenia.

Možnosti zatiranja glive *Pseudoperonospora cubensis* v posevkih oljnih buč v Sloveniji

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V letih 2006 in 2007 smo na območju vzhodne Slovenije prvič odkrili večje število posevkov oljnih buč (*Cucurbita pepo* L.), ki so bile močno okužene z glivo *Pseudoperonospora cubensis* (Berk. & M.A. Curtis) Rostovzev. Zaradi tega smo izvedli dva poljska poskusa v katerih smo preverili učinkovitost nekaterih fungicidov za zatiranje te glive. Fungicide na podlagi AL-fosetila (Aliette Flash), metalaksila (Ridomil Gold MZ), azoksistrobina (Quadris) in manipropamida (Revus) smo nanesli z nahrbtno škropilnico dvakrat pri porabi vode 250 l/ha in polnih registriranih odmerkih. Oceno učinkovitosti (%, Abbot) smo opravili na podlagi vizualnega določanja deleža (%) površine listja napadenega od glive. Dosegli smo naslednje učinkovitosti: Aliette (60-80), Ridomil (73-90), Quadris (70-85) in Revus (68-85). Preučevani fungicidi so dovolj učinkoviti za zatiranje novega različka glive *P. cubensis*, če jih nanesemo ob ustreznem terminu. Potrebno je prilagoditi sistem setve buč (puščanje voznih stez), saj je škropljenja potrebno opraviti tudi v obdobju, ko vreže prerastejo medvrstni prostor.

ABSTRACT

Options for oil pumpkin downy mildey (*Pseudoperonospora cubensis*) control in Slovenia

During the growing seasons 2006 and 2007, in the eastern part of Slovenia many oil pumpkin (*Cucurbita pepo* L.) crops were for the first time severely infected by fungus *Pseudoperonospora cubensis* (Berk. & M.A. Curtis) Rostovzev. Therefore two field trials were conducted to evaluate the efficacy of fungicides for control of pumpkin downy mildew. Full labelled doses of fungicides based on AL-phosetyl (Aliette Flash), metalaxyl Ridomil Gold MZ), azoxystrobine (Quadris) and manipropamid (Revus) were applied twice per season with a backpack sprayer, using 250 l of water per hectare. The severity of downy mildew (percent total area of leaves affected) was visually evaluated and fungicide efficacy (%, Abbot) was calculated. The achieved efficacy rates of fungicides were: Aliette (60-80), Ridomil (73-90), Quadris (70-85) in Revus (68-85). Tested fungicides were efficient enough for control of new strains of pumpkin downy mildew if they were applied during the appropriate time period. The system of pumpkin seeding must be adapted (considering driving paths - tramlines) because fungicide application must be carried out also after the period when plants fully overgrow the inter-row spaces.

Pregled desetletnih poljskih poskusov z razkuževanjem semena žit

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Razkuževanje semena žit je v Sloveniji že več desetletij rutinski ukrep, s katerim preprečujemo razvoj bolezni, ki se prenašajo s semenom. Nekatere, v preteklosti pomembne bolezni kot so npr. sneti, so postale redke in se na poljih pojavljajo le še izjemoma. Med leti 1993 in 2004 smo v mikroposkusih ugotavljali vpliv razkuževanja semena pšenice in ječmena na pojav bolezni, prezimitev posevkov in količino pridelanega zrnja. Pri pšenici je bila le v petih od enajstih poskusov prezimitev značilno boljša pri razkuženem semenu v primerjavi z nerazkuženim, večji pridelek pa je razkuženo seme dalo samo enkrat. Pri ječmenu smo značilne razlike v prezimitvi zabeležili v dveh izmed osmih poskusov in v količini pridelka enkrat. Za obe vrsti žit je bilo kritično leto 1995/96. Ob pozni setvi in dolgotrajni snežni odeji (preko 100 dni), je prišlo do močnega pojava snežne plesni. Število rastlin se je pri nerazkuženi pšenici zmanjšalo za 57 % in pridelek za 15 % v primerjavi z najbolj učinkovitim razkužilom. Pri ječmenu je na parcelah z nerazkuženim semenom propadlo 62 % rastlin, pridelek pa je bil nižji za 32 % glede na najbolj učinkovito razkužilo. Čeprav v Sloveniji od leta 2003 dalje razkuževanje semena, ki izpolnjuje zahteve glede zdravstvenega stanja ni več obvezno, je vse certificirano seme pri nas razkuženo. Postopek je varovalo pred naraščanjem nekdaj nevarnih bolezni in preventivni ukrep zlasti pred boleznimi ki izvirajo iz tal. Snežna plesen, katere pojav je povezan z vremenskimi razmerami pozimi se v zadnjih letih pojavlja redkeje, kar sovpada s krajšim trajanjem snežne odeje. Ker sam postopek certifikacije semena žit zagotavlja, da seme ni prekomerno okuženo z boleznimi, razkuževanje ni vedno upravičeno. Pri kvalitetnem semenu bi bilo možno brez pomembne škode na pridelku občasno opustiti razkuževanje, predvsem pri setvi v območjih, kjer ni pričakovati dolgega trajanja snežne odeje.

ABSTRACT

Cereal seed treatment – comments on ten years of fiels trials

Cereal seed treatment with fungicides has been a routine measure in Slovenia for several decades. Some important diseases like smuts became less harmful and nowadays they rarely appear in the cereal fields. In the field trials with winter wheat and barley during the years from 1993 to 2004 the influence of seed treatment on disease incidence, overwintering and grain yields was assessed. In five out of eleven trials with wheat the overwintering was significantly better in the treated fields compared with the untreated ones; the yield was higher only once. The overwintering of the treated barley was better in five experiments out of eight but the yield was higher only once. The 1995/96 winter was critical for both cereal species because of late sowing time, long snow cover (more than 100 days) and high incidence of seedling blight (*Microdochium nivale*). In untreated plots the number of wheat plants was reduced for 57 % and the yield for 15 %. The number of barley plants was reduced for 62 % and the yield for 32 % if compared with the most effective fungicide for seed treatment. Although the treatment of seed which fulfil the requirements concerning the health condition has not been obligatory any more since 2003, all certified seed in Slovenia is treated. Beside the protection of seeds against historically harmful diseases, the routine seed treatment is perceived as a good insurance against seed-borne diseases. The incidence of seedling blight has been less intensive in the last years, which coincides with shorter duration of snow cover. The procedure of certification assures good seed health and seed treatment is not always justified. Untreated seed of good quality can be used without high risk of yield reduction, especially in regions, where long duration of snow blanket is not expected.

Sodobni pristopi pri varstvu pred boleznimi žit

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Pojav novih boleznih, kot je *Ramularia collo-cygni* na ječmenu in pa zgodnejše in virulentnejše pojavljanje listne pegavosti pšenice (*Mycosphaerella graminicola* [*Septoria tritici*]), je eden od pomembnih vzrokov za vse večje škode na žitih. Ob ugodnih vremenskih razmerah za pojav bolezni je lahko vpliv na zmanjšanje pridelka tudi do 40%. Cilj sodobnih tehnologij pridelave žita je, ob upoštevanju dobre kmetijske prakse z doslednim izvajanjem potrebnih ukrepov, med njim tudi varstva rastlin, doseči visoke in kakovostnejše pridelke. Amistar Opti je sodobna formulacija fungicida, ki vsebuje dve znani aktivni snovi: azoksistrobin in klorotalonil. Azoksistrobin, poleg širokega fungicidnega delovanja na najpomembnejše bolezni, zaznamuje tudi dokazan pozitiven vpliv na koriščenje vode, dušika in podaljševanje asimialcije, kar vodi k večjim pridelkom. Klorotalonil pa odlikuje vrhunsko delovanje na *Ramularia collo-cygni* na ječmenu in na listno pegavost (*Mycosphaerella graminicola* [*Septoria tritici*]) na pšenici v preventivnih programih varstva. Postavitev ustreznega preventivnega programa varstva žit pred boleznimi zahteva poznavanje povzročiteljev in spremljanje okoljskih razmer.

ABSTRACT

Advance approaches in crop protection against cereals diseases

The appearance of new diseases such as Ramularia leaf spot on barley (*Ramularia collo-cygn)i* on barley and the early and more virulent leaf spot on wheat *(Mycosphaerella graminicola* [*Septoria tritici*]) is one of the main causes for larger damages on cereals. In case of favourable weather conditions for diseases development the reduction of yield could be up to 40 %. The goal of advanced production of cereals is, bearing in mind good agricultural practice with consistent execution of all necessary measures, protection of plants is also between them, to achieve of high and qualitative yields. Amistar Opti is advanced formulation of fungicide, which contains two known active substances azoxystrobin and chlorothalonil. Azoxystrobin beside broad fungicide activity on most important diseases, have also proved positive impact on utilizing of water, of nitrogen usage and prolonging of assimilation which leads to higher yields. Chlorothalonil distinguishes top activity on Ramularia leaf spot on barley (*Ramularia collo-cygni)* and leaf spot on wheat (*Mycosphaerella graminicola* [*Septoria tritici*]) in preventive programs of protections. Setting up of suitable preventive program for protection of cereals demands knowledge on pathogens and monitoring environmental conditions.

Force 1,5 G® – zanesljiv talni insekticid za zatiranje strun (*Agriotes* spp.) in koruznega hrošča (*Diabrotica virgifera virgifera* LeConte)

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Force 1,5 G® je granulirani talni insekticid, ki nudi širok spekter delovanja na talne škodljivce, še posebno na strune *Agriotes* spp. in koruiznega hrošča *Diabrotica virgifera virgifera* LeConte z dobrim rezidualnim učinkom ter z odličnimi okoljskimi in uporabniškimi lastnostmi. Aktivna snov, ki jo vsebuje je teflutrin in spada v skupino piretroidov. Edinstven parni učinek Force 1,5 G® se prenese v okolico zrnca ter tvori ščit pred žuželkami. Na žuželke deluje preko povrhnjice, kjer moti prevodnost živčnega sistema, s čimer povzroči prenehanje hranjenja in posledično smrt. Dodatno varstvo mladih rastlin pa daje močno repelentno delovanje. Force 1,5 G® zanesljivo deluje na talne škodljivce, vendar je zaradi načina aplikacije in repelentnosti, prijazen do koristnih organizmov.

ABSTRACT

Force 1,5 G® – a reliable soil insecticide for control of wireworms (*Agriotes* spp.) and western corn rootworm (*Diabrotica virgifera virgifera LeConte*)

Force 1,5 G® is granular insecticide that provides broad – spectrum soil insect control, particularly of wireworms (*Agriotes* spp.) and western corn rootworm (*Diabrotica virgifera virgifera* LeConte), and residual activity, with excellent environmental an user profile. Active ingredient in Force 1,5 G® is tefluthrin, belonging to piretroids. The unique vapour action of Force 1,5 G® permeates the soil and penetrates the insect cuticle, disrupting nerve conductance and causing cessation of feeding and death. Strong repelence gives additional protection to young plants. Force 1,5 G® is potent against target pests, but due to application metod and its repellence does not harm beneficials.

Fiziološki in fungicidni učinek uporabe epoksikonazola na pridelek strnih žit na primeru sredstva Duett® Ultra

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Duet® Ultra je fungicid, namenjen zatiranju bolezni na žitih. Vsebuje dve aktivni snovi: epoksikonazol in tiofanat metil. Sredstvo ima pozitiven fungicidni in fiziološki učinek na tretiranih rastlinah. Aktivno snov epoksikonazol odlikuje dobro zatiranje številnih bolezni strnih žit in zmanjšanje nastajanja hormona staranja etilena posebej v neugodnih razmerah za rast rastlin. Etilen je hormon staranja, ki ga rastline tvorijo tudi, ko so v stresu. To signifikantno negativno vpliva na višino pridelka. Dve tretiranji z 0,6 L/ha Duett® Ultra pomembno povečata pridelek žit.

ABSTRACT

Epoxiconazole physiological and fungal effect on cereals yield by product Duett® Ultra

Duett® Ultra is fungicide, which protect cereals against fungi diseases. It contents two a.i.: epoxiconazole and thiophanate metyl. Product showed good fungal and physiological effect. Epoxiconazole reduced the natural formation of the plant hormone ethylene or else its action. This is additional effect by cereals production what is observed by plants in stress. Ethylene is a senescence and stress hormone induced by abiotic and biotic stress situations. Two application with 0.6 L/ha Duett® Ultra in vegetation show significant yield increase.

Nematologija

Proučevanje ogorčic koreninskih šišk v Sloveniji

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Ogorčice koreninskih šišk uvrščamo v rod *Meloidogyne* in so razširjene po vsem svetu. Napadajo zelo veliko različnih rastlinskih vrst, eno- in dvokaličnic, zelnatih in lesnatih rastlin. Škoda, ki jo povzročajo v kmetijski pridelavi je v svetovnem merilu ocenjena na približno 5 odstotni izpad pridelka. V Sloveniji so zastopane 4 vrste tega rodu: *M. hapla, M. arenaria, M. incognita ter M. ethiopica.* Ogorčice koreninskih šišk se hranijo in razmnožujejo v rastlinskih koreninah, na katerih posledično povzročajo šiške oz. zadebelitve. Napadena rastlina slabše sprejema hranila, kar se odrazi na kakovosti in količini pridelka. Znamenja napada ogorčic *Meloidogyne sp.* na nadzemnih delih rastlin so neznačilna in spominjajo na znamenja, ki jih na rastlinah povzročajo različni biotični ali abiotični dejavniki. Rastline so zakrnele, venejo, prihaja lahko do različnih razbarvanj. Pri močnem napadu lahko rastline propadejo, kar se najpogosteje zgodi v fazi oblikovanja plodov. V Sloveniji smo največkrat naleteli na vrsto *M. incognita*, ki je razširjena v rastlinjakih, ker za svoj razvoj potrebuje toplejše razmere. Trenutno opravljamo največ raziskav na vrsti *M. ethiopica*, ki smo jo ugotovili prvič v Evropi. Raziskave so usmerjene v proučevanje vrste *M. ethiopica* na različnih gostiteljskih rastlinah in v reprodukcijski krog pri različnih temperaturah. Proučujemo tudi vpliv napada na različne fiziološke procese v rastlini.

ABSTRACT

Research of the root-knot nematodes in Slovenia

Root knot nematodes (RKN) are distributed word-wide and are classified in the genus *Meloidogyne*. They can parasitize numerous higher plant species including monocotyledons, dicotyledons, herbaceous and woody plants. They cause approximately 5% of global crop losses in agricultural production. In Slovenia, four *Meloidogyne* species were detected so far: *M. hapla, M. arenaria, M. incognita* and *M. ethiopica.* RKN reproduce and feed inside the plant roots causing formation of root galls. RKN infested plants absorb less nutrients what results to lower yield quality and quantity. The above-ground symptoms, expressed as result of RKN feeding on roots, are non specific and are similar to those caused by different biotic or abiotic factors. The plants can show symptoms of stunting, wilting and chlorosis. Heavily infested plants may also decline in the fruit formation phase. Among *Meloidogyne, M. incognita* is the most prevalent species in greenhouses in Slovenia because of warm conditions that are needed for its reproduction. Our research is currently focused on *M. ethiopica* which was found for the first time in Europe. We investigate *M. ethiopica* host range, its reproduction cycle at different temperatures and the influence of *M. ethiopica* infestation on different plant physiological processes.

Molekularna diagnostika rastlinsko-parazitskih ogorčic v Sloveniji

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Nekatere rastlinsko-parazitske ogorčice lahko v kmetijstvu povzročijo veliko gospodarsko škodo. Ogorčice, ki se prehranjujejo na koreninah ali drugih rastlinskih delih, vplivajo na slabši pretok vode in hranil, s čimer slabšajo kondicijo rastlin in neposredno vplivajo na količino in kakovost pridelka. Ogorčice med zajedanjem rastlin naredijo vstopna mesta, skozi katera se v rastlino lahko razširijo tudi drugi patogeni mikroorganizmi in povzročijo določene rastlinske bolezni. Poleg tega lahko ogorčice prenašajo tudi številne karantenske in gospodarsko pomembne rastlinske viruse kot sta npr. virus obročkaste pegavosti paradižnika (*Tomato ringspot virus,* ToRSV) in virus pahljačavosti lista vinske trte (*Grape Fanleaf virus*, GFLV). Ocenjujejo, da dosega škoda, ki jo povzročijo ogorčice, v svetovnem merilu skoraj 100 milijard USD letno. Proti ogorčicam se borimo z ustreznim kolobarjem, gojenjem odpornih sort in uporabo kemičnih sredstev – nematicidov. Boj proti rastlinsko-parazitskim ogorčicam je izredno težaven, saj dolgoživost organizmov narekuje izredno dolg kolobar, odporne sorte niso na voljo za vse gojene rastline, kemična sredstva pa niso vedno dovolj učinkovita. Kemična sredstva predstavljajo poleg tega tudi zelo veliko breme za okolje, zato se njihova uporaba v zadnjem času omejuje. Za preprečevanje vnosa in širjenja rastlinsko-parazitskih ogorčic v Sloveniji oziroma znotraj nje je zato izredno pomemben fitosanitarni nadzor. Za ustrezen in učinkovit boj proti škodljivcem je ključnega pomena pravilna in hitra identifikacija vrste škodljivca. Poleg morfoloških analiz ogorčic so za identifikacijo izrednega pomena novejše molekularne metode. V prispevku predstavljamo molekularne metode za identifikacijo rastlinsko-parazitskih ogorčic, ki jih trenutno opravljamo v Sloveniji. Predstavljamo metode kot so PCR, PCR v realnem času, RFLP, določanje nukleotidnega zaporedja ter analize izoencimov za ogorčice rodov *Bursaphelenchus*, *Globodera* in *Meloidogyne*.

ABSTRACT

Molecular diagnostics of plant-parasitic nematodes in Slovenia

Some plant-parasitic nematodes cause severe damage in agriculture. Nematodes feeding on roots or other parts of the plant can cause dysfunction of nutrient and water translocation and result in reduced plant vigor, yields or quality of the harvest. Through the nematodes' entry point into the plant, other pathogenic microorganisms can also enter the plant and cause different plant diseases. Additionally, nematodes can transmit numerous quarantine and economically important plant viruses, such as *Tomato ringspot virus* (ToRSV) and *Grape Fanleaf virus* (GFLV). The costs of this damage on a worldwide basis have been calculated as being nearly 100 billion USD of crop losses annually. Nematodes are controlled through appropriate crop rotations, cultivation of resistant varieties and application of chemical agents - nematicides. The control of nematodes is difficult, since longevity of the organisms requires a long rotation time, resistance is often unavailable in commercially viable cultivars and nematicides are often ineffective. Additionally, nematicides are damaging to the environment and are consequently being withdrawn. Therefore, phytosanitary control is of the utmost importance for prevention and control of nematode infections in Slovenia. Correct and quick identification of the species is crucial for the suitable and efficient control of the nematodes. The new molecular methods are gaining importance in the identification of plant-parasitic nematodes in addition to morphometrical analyses of the nematodes. We present the molecular diagnostic methods used for identification of plant-parasitic nematodes in Slovenia today. Methods such as PCR, real-time PCR, RFLP, sequencing and analysis of isoenzymes for *Bursaphelenchus*, *Globodera* and *Meloidogyne* genera are discussed.

Borova ogorčica – nevaren škodljivec borovih sestojev

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Borova ogorčica *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle je povzročitelj propadanja borovcev in je uvrščena na A1 listo karantenskih škodljivih organizmov. Med najbolj občutljive gostiteljske rastline spadajo borovci iz rodu *Pinus*. Kot gostitelji lahko nastopajo tudi drugi iglavci (*Larix, Abies, Picea*), vendar so poročila o škodi, povzročeni na njih skromna. Leta 1999 je bila vrsta *B. xylophilus* ugotovljena na Portugalskem na vrsti *Pinus pinaster* Ait. Od takrat dalje so na Portugalskem poskušali vrsto izkoreniniti, vendar so bili do sedaj vsi poskusi neuspešni. V letu 2008 se je borova ogorčica na Portugalskem močno razširila in je bila v drugi polovici leta ugotovljena tudi v Španiji. V Sloveniji so razmere za nemoteno širjenje borove ogorčice precej ugodne, saj so gostiteljske rastline (*Pinus nigra* in *P. sylvestris*) precej razširjene, zastopani so hrošči rodu *Monochamus*, ki so prenašalci borove ogorčice in razmeroma ugodne podnebne razmere. Poleg tega, so v Sloveniji pogosti tudi dejavniki, ki vplivajo na stres gostiteljskih rastlin (poletna suša, pogosti vetrolomi in snegolomi, požari itn.) in s tem na hitrejši razvoj in širjenje vektorjev borove ogorčice, hroščev rodu *Monochamus.* Posebni nadzor borove ogorčice poteka v Sloveniji že od leta 2003. V šestih letih smo analizirali 263 vzorcev lesa iz gozdnih sestojev po Sloveniji, 24 vzorcev lesa iz uvoza in 78 vzorcev lesene pakirne embalaže. Borove ogorčice v Sloveniji nismo ugotovili, smo pa večkrat naleteli na zelo sorodno vrsto *B. mucronatus* in vrsto *B. hofmanni*. Ogorčico *B. mucronatus* smo izločili tudi iz dveh vzorcev lesene pakirne embalaže, ki je izvirala iz Izraela in Rusije.

ABSTRACT

PINEWOOD NEMATODE – DANGEROUS PEST OF PINE FORESTS

Pinewood nematode *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle causes pine tree decline and it is listed as A1 quarantine organism. *Pinus* trees are the most susceptible hosts but other conifer trees (*Larix, Abies, Picea*) can serve as host plants, however the information about the damage on these trees is scarce. *B. xylophilus* was discovered in Portugal in 1999 on *Pinus pinaster* Ait. Since then, the attempts to eradicate the nematode were unsuccessful. The spread of pinewood nematode increased in Portugal in 2008 and in the same year it was also detected in Spain. The environmental conditions in Slovenia are favourable for pinewood nematode spreading because of widespread distribution of host plants (*Pinus nigra* and *P. sylvestris*), the presence of *Monochamus* beetles which transmit pine wood nematodes and favourable climate conditions. Besides, the factors that influence on plant stress (summer droughts, windbreaks, snowbreaks, fires etc.) occur quite frequent in Slovenia causing greater multiplication and spread of vectors – beetles of *Monochamus* genus. The survey on pinewood nematode started in Slovenia in 2003. During six years now, we have analysed 263 samples from the Slovenian forests, 24 samples of imported wood and 78 samples of imported wood package material. Pinewood nematode has not been detected in Slovenia yet, but closely related species *B. mucronatus* and the species of *B. hofmanni* were found several times. *B. mucronatus* nematodes were also detected in two samples of wood package material which originated from Israel and Russia.

Prvi poljski poskus uporabe entomopatogenih ogorčic v Sloveniji

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Entomopatogene ogorčice (EPO) so učinkoviti biotični agensi za zatiranje žuželk. V prispevku so predstavljeni rezultati prvega poljskega poskusa uporabe EPO pri nas. Ciljna žuželka je bila koloradski hrošč (*Leptinotarsa decemlineata* [Say]). Poskus je bil razdeljen na 4 bloke, znotraj vsakega smo preučevali 6 različnih obravnavanj: *S. feltiae* B30 nkon., *S. feltiae* B30 vkonc., Entonem nkon., Entonem vkonc., Actara in kontrola. Glede na populacijsko dinamiko različnih razvojnih stadijev koloradskega hrošča smo ugotovili, da entomopatogene ogorčice učinkujejo le na larvalne stadije, medtem ko na jajčeca in image na prostem nimajo vpliva. Insekticid Actara se je izkazal kot najbolj učinkovito obravnavanje, saj je bil smrtnost žuželk tu največja. Preučevali smo tudi vpliv zatiranja škodljivca na pridelek krompirja in ugotovili, da med preučevanima koncentracijama suspenzije ogorčic ni bilo razlik, so se pa tretiranja z entomopatogenimi ogorčicami statistično značilno razlikovala od neškropljenega kontrolnega obravnavanja in obravnavanja z insekticidom Actara, ki je pokazal najučinkovitejše delovanje pri zatiranju preučevanega škodljivca.

ABSTRACT

First field experiment with entomopathogenic nematodes in Slovenia

Entomopathogenic nematodes (EPN) are effective biological agents to control insect pests. In this papper are presented the results of our first field experiment with entomopathogenic nematodes in Slovenia. Colorado potato beetle (*Leptinotarsa decemlineata* [Say]) was the target pest, which was controlled in our research. The experiment was divided in 4 blocks, in every block were 6 different treatments: *S.feltiae* B30 lconc., *S. feltiae* B30 hconc., Entonem lconc., Entonem hconc., Actara and control. Observing the population dynamcisc of Colorado potato beetle we conclude, that entomopathogenic nematodes have a big influence on larval stages but on the other hand no effect on egg and adults in field experiment. Insecticide Actara showed the best results among the observations. Here was the mortallity of the insect highest. We also studied the effect of controlling Colorado potato beetle on the yield of potato. There were no differences beetwen EPN treatments, however the results using EPN were better than in control treatments and worse as the results of insecticide Actara.

Fitobakteriologija

Razvoj metode PCR v realnem času za določanje *Erwinia amylovora* in njena uporaba v diagnostiki

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Detekcija bakterije *Erwinia amylovora* v vzorcih s simptomi je relativno enostavna, saj je bakterij običajno veliko in dobro rastejo na umetnih gojiščih. Določanje je težavnejše pri takih vzorcih, kjer je tkivo zelo propadlo, pri vzorcih tretiranih s fitofarmacevtskimi sredstvi in vzorcih, ki ne kažejo znamenj bolezni (prikrite ali latentne okužbe). V teh vzorcih je lahko število bakterij *Erwinia amylovora* majhno, zato potrebujemo zelo občutljive metode. Metoda, ki je zelo občutljiva, ter hkrati specifična in omogoča hkratno analizo večjega števila vzorcev je PCR v realnem času. Za detekcijo *Erwinia amylovora* je bil razvit PCR v realnem času s tarčnim zaporedjem na plazmidu pEA29, ki pa ni zastopan v vseh bakterijah v naravi. Bakterij brez plazmida s to metodo ne zaznamo, kljub temu, da so še vedno sposobne povzročati bolezenska znamenja. Za zaznavanje vseh bakterij *Erwinia amylovora* ne glede na njihov plazmidni profil smo razvili PCR v realnem času s tarčo na kromosomski DNA. V povezavi z avtomatizirano izolacijo DNA lahko v vzorcih z izraženimi znamenji bolezni zanesljivo zaznamo najmanj 10^3 celic/ml (≈4 celice na reakcijo). Pri testiranju vzorcev na prikrito okužbo nam PCR v realnem času omogoča kvantifikacijo bakterije pred obogatitvijo in po njej v splošnem in selektivnem gojišču s čimer ugotavljamo živost *E. amylovora*, tudi kadar bakterij po obogatitvi na gojišču ne moremo izolirati v čisti kulturi. Novo metodo lahko izvajamo tako na ABI PRISM® 7900 HT Sequence detekcijskem sistemu (Applied Biosystems) kakor tudi na prenosnem in hitrejšem aparatu Smart Cycler (Cepheid).

ABSTRACT

Development of real- time PCR for detection of *Erwinia amylovora* and its use in diagnostics

Detection of *Erwinia amylovora* in symptomatic samples is usually straightforward as bacteria are present in large numbers and grow well on artificial media. Reliable diagnosis, however, can be difficult when bacteria are hindered in their growth on artificial media or their numbers are low due to abundant tissue necrosis, samples treated with pesticides or bactericidal compounds, and symptomless samples. For such samples there is a need for a sensitive method of detection i.e. real-time PCR. Existing real-time PCR systems for detection of *E. amylovora* target pEA29, which is relatively stable but still not present in all pathogenic isolates in nature. We have developed real–time PCR systems targeting chromosomal DNA that enable specific detection of all *E. amylovora* regardless of their plasmid profile. Combined with an automated DNA extraction method the real-time PCR assays reliably detected at least 10^3 cells/ml of the pathogen from blighted woody plant material (≈ 4 cells per reaction). In testing of symptomless samples, absolute quantification of *E. amylovora* before and after enrichment in liquid media provided proof of *E. amylovora* viability and ability to multiply also in cases when subsequent isolation in pure culture was not possible. Real–time PCR reactions were successfully performed on an ABI PRISM® 7900 HT Sequence Detection System (Applied Biosystems) and also on portable and faster Smart Cycler instrument (Cepheid).

Laboratorijske metode določanja bakterije *Xylella fastidiosa* v vzorcih vinske trte

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Xylella fastidiosa, Wells *et al*. 1987, je povzročitelj Piercove bolezni vinske trte ter drugih gospodarsko pomembnih bolezni gojenih rastlin. Bolezen se širi z žuželkami, ki se hranijo z rastlinskim sokom in je zelo razširjena v ZDA, v Evropi pa je še ni. Bakterija je zato uvrščena na A1 karantensko listo. *X. fastidiosa* običajno težko izoliramo iz rastlinskega tkiva, zato je zelo pomembno, da imamo na voljo dovolj občutljivo metodo, ki bo zaznala zelo nizke koncentracije bakterij v njem. Naš namen je bil testirati metodo verižne reakcije polimeraze v realnem času ter še nekatere druge metode na vzorcih vinske trte iz slovenskih vinogradov. Izolacijo DNA smo izvedli s pomočjo magnetnih delcev ter jo nato analizirali s sistemi za PCR v realnem času Smart Cycler (Cepheid) in Light Cycler (Rosche). Bakterije, ki smo jih uporabili kot pozitivno kontrolo smo gojili v tekočih gojiščih PW in PD2, jih opazovali pod mikroskopom s testom indirektne imunofluorescence (IIF) ter njihovo zastopanost potrdili s PCR v realnem času. Preliminarni rezultati kažejo, da bakterije ni v vzorcih vinske trte iz slovenskih vinogradov. Glede na rezultate pozitivne kontrole je PCR v realnem času zelo občutljiva metoda za detekcijo bakterije *X. fastidiosa*, pomembno vlogo pri njeni detekciji in identifikaciji bakterije pa lahko igrajo tudi druge metode, kot so IIF, ELISA in test patogenosti.

ABSTRACT

Methods for detecting *Xylella fastidiosa* in vine samples

Xylella fastidiosa, Wells *et al*. 1987, is a causal agent of Pierce's disease on grape (PD) and many other economically important diseases of cultivated plants. The disease is spread by sap-feeding insect vectors and in many areas in the United States the disease is endemic, however it is not yet present in Europe. The pathogen is therefore placed on A1 quarantine list. Since isolation of the pathogen is difficult even from symptomatic samples, a reliable detection method of the pathogen is essential for monitoring the presence and spread of the disease. Our objective was to implement highly sensitive real-time PCR assays and other detection methods to screen grapevine samples from Slovenian vineyards. DNA was isolated using magnetic beads and real-time PCR on Smart Cycler (Cepheid) and Light Cycler (Rosche) apparatus were used for detection. Positive control strain was cultured in liquid PD2 and PW media and morphology was observed under the microscope with indirect immunofluorescence assay (IIF). We have successfully detected bacteria in positive control samples using real-time PCR assays. Preliminary results show that *X. fastidiosa* is not present in samples from Slovenian vineyards, however according to results of the positive control, real-time PCR is highly sensitive for detecting this bacterium. Other methods, such as IIF, ELISA and pathogenicity test, can also play an important role in detection and identification of *X. fastidiosa*.

Spremljanje bakterij iz rodu *Agrobacterium* na vinski trti v letih 2006 in 2007

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Rak koreninskega vratu vinske trte povzročajo bakterije iz rodu *Agrobacterium* od katerih je najbolj razširjena bakterija *Agrobacterium vitis*. Bolezen je v slovenskih vinogradih v manjšem obsegu zastopana že desetletja in ni povzročala večje škode. Zadnjih nekaj stresnih situacij kot je zimska pozeba je povzročilo pojav bolezenskih znamenj in odmiranje trte v povečanem obsegu. Prav tako je z odprtjem trga vse težje nadzirati kakovost in zdravstveno stanje sadilnega materiala. Bolezen se najhitreje širi prav z okuženimi rastlinami. Agrobakterije med rastlinskimi škodljivimi organizmi uvrščamo v kategorijo nadzorovanih nekarantenskih organizmov, ki so pod uradnim fitosanitarnim nadzorom v pridelavi in trženju sadilnega materiala vinske trte. Zaradi večjega pojava bolezenskih znamenj v vinogradih in trsnicah v zadnjih letih, se je FURS odločila za uvedbo dvoletnega posebnega programa, ki smo ga izvedli v letih 2006 in 2007. Program je obsegal vizualna opazovanja, odvzem vzorcev in laboratorijsko določitev povzročitelja. V okviru programa so bili odvzeti in analizirani 203 vzorci, od katerih smo v 161 primerih potrdili zastopanost agrobakterij. Bakterije smo izoliralirali iz bazičnega, certificiranega in standard sadilnega materiala. Prav tako smo bakterije potrdili v matičnih rastlinah.

ABSTRACT

Monitoring of bacteria from the genus *Agrobacterium* on grapevine in 2006 and 2007

Grapevine crown gall is caused by bacteria of the genus *Agrobacterium* among which the bacterium *Agrobacterium vitis* is the most widely spread. The disease has been present in the Slovene vineyards to a lesser extent for decades but has not caused any greater damage. A few recent stress situations such as winter frost have caused the appearance of disease symptoms and a more intensive decay of grapevine. Also, the opening of market has made more difficult the surveillance of quality and health condition of planting material. The disease has been spreading most rapidly by way of infected plants. Among organisms harmful to plants Agrobacteria are classified in the category of controlled non-quarantine organisms under the official phytosanitary surveillance in the production and marketing of grapevine planting material. Due to increasing number of disease symptoms in vineyards and nurseries in the recent years, the Phytosanitary Administration of the Republic of Slovenia decided to introduce a special two-year programme which was performed in 2006 and 2007. The programme included visual observations, sampling and laboratory determination of the agent. The number of samples taken and analysed in frame of the programme was 203; the presence of agrobacteria was confirmed on 161 of them. The bacteria were isolated from basic, certified and standard planting material. They were also confirmed in mother plants.

***Xanthomonas arboricola* pv. *juglandis* in občutljivost različnih sort orehov na orehov ožig**

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Xanthomonas arboricola pv. *juglandis* (*X. a.* pv. *juglandis*) povzroča orehov ožig. Bakterija kot povzročiteljica orehovega ožiga je bila potrjena v Španiji in nekaterih drugih državah. Laboratorijska potrditev bakterije temelji na klasičnih biokemijskih testih in značilni morfologiji na gojišču. V raziskavi smo poskušali ugotoviti odziv plodov različno občutljivih sort na izolat *X. a.* pv. *juglandis*. Orehe, nabrane v fenofazi GF + 30, smo površinsko sterilizirali in na treh točkah vbodli z iglo, impregrirano s *X. a.* pv. *juglandis*. Po inkubaciji smo orehe prečno in vzdolžno prerezali. Na osnovi izraženih bolezenskih znamenj smo določili občutljivost različnih sort na umetno okužbo s *X. a.* pv. *juglandis* in jo primerjali s stopnjo napada plodov *'in situ'*.

ABSTRACT

Xanthomonas arboricola pv. *juglandis* and susceptibility of different walnut cultivars on walnut blight

Xanthomonas arboricola pv. *juglandis* (*X. a.* pv. *juglandis*) causes walnut blight. Presence of bacteria, as an agent that causes walnut blight was confirmed in Spain and some other countries. Laboratory conformation of the bacteria is based on classical biochemical tests and typical morphology of *X. a.* pv. *juglandis* on nutrient medium. The aim of our research was to determine a response of different walnut cultivars to *X. a.* pv. *juglandis.* Walnut fruits were collected at GF + 30 phenophasis, surface sterilized and inoculated in three spots per fruit with a needle impregnated with *X. a.* pv. *juglandis.* After incubation, fruits were sliced vetically and horizontally. According to developed symptoms, susceptibility of different cultivars to artificial inoculation with *X. a.* pv. *juglandis* were determined and compared with a level of fruit infection *'in situ'*.

Fitoplazmologija

Raziskave izražanja genov vinske trte okužene s fitoplazmo povzročiteljico trsne rumenice 'počrnelost lesa', ki vodijo k boljšemu poznavanju bolezni in njeni diagnostiki

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'*Candidatus* Phytoplasma solani' je patogena bakterija iz skupine fitoplazem stolbur/16SrXII v razredu *Mollicutes*. Fitoplazme nimajo celične stene; velikosti njihove celice in genoma pa sta najmanjši med bakterijami. Med rastlinami jih prenašajo žuželčji vektorji, ki se hranijo z rastlinskim sokom. Razmnožujejo se tako v citoplazmi žuželk, kot tudi rastlin. V rastlinah kolonizirajo izključno s hranili bogata floemska tkiva. '*Ca.* P. solani' je povezana z boleznijo trsnih rumenic 'počrnelost lesa' ('Bois Noir') in je že epidemična v vinogradih na Štajerskem, zastopana pa je tudi v drugih vinorodnih območjih Slovenije. '*Ca.* P. solani' na vinski trti vpliva tako na količino pridelka, kot tudi na kakovost grozdja; ob tem pa je ekološko sporen tudi nadzor fitoplazemskih prenašalcev z uporabo različnih kemičnih sredstev. V tem pogledu imajo patofiziološke raziskave bolezni visoko prioriteto, saj bi poznavanje mehanizmov patogeneze lahko vodilo do zgodnjega odkrivanja bolezni in s tem omejitve širjenje bolezni. Poznavanje bolezni bi tudi zmanjšalo stroške njenega preprečevanja in potencilano vodilo do ekološko sprejemljivejših načinov zatiranja fitoplazem. Da bi bolje spoznali sposobnosti rastlin vinske trte, okužene s '*Ca.* P. solani' smo analizirali količinske in kakovostne spremembe v profilih globalnega genskega izražanja zdravih in okuženih rastlin sorte 'Chardonnay', ki so rastle v normalnem vinogradu. Analizirali smo značilnosti okužbe in ocenili prispevek posameznih metabolno-signalnih poti k statusu okužbe. V skladu s predpostavko, da fitoplazme odvzemajo fosforilirane heksoze iz celic spremljevalk floema in v skladu s številnimi dokazi o povečani ravni reducirajočih sladkorjev in saharoze v izvornih listih različnih rastlinskih vrst, smo se osredotočili na raven genskega izražanja tistih rastlinskih encimov, ki so vključeni v sladkorni metabolizem. Predvidoma naj bi bile spremembe metabolizma ogljikovih hidratov v okuženih rastlinah povezane s potrebami fitoplazem po energijii za rast in razvoj. Naša odkritja pomembno prispevajo k razumevanju potencialno glavnih stopenj v patogenosti fitoplazem, hkrati pa nam nudijo možnosti novih detekcijskih metod in iskanja markerjev okužbe v času ko bolezenska znamenja še niso izražena.

ABSTRACT

Gene expression studies in grapevines infected with phytoplasma associated with a grapevine yellows 'Bois Noir' lead to better understanding of disease and improved disease diagnostic

'*Candidatus* Phytoplasma solani' is a plant pathogenic bacterium belonging to the phytoplasma stolbur group/ 16SrXII within the class *Mollicutes.* Phytoplasmas are cell wall-free and both their cell size and genome size are the smallest among bacteria. They are transmitted from plant to plant by sap-feeding insect vectors and they propagate within the cytoplasm of both insects and plants. In plants they exclusively inhabit nutrient-rich phloem tissues. '*Ca.* P. solani' is associated with a grapevine yellows disease 'Bois Noir'. In Štajerska (Styria) vineyards it has already reached an epidemic status and it has also appeared in other wine producing regions of Slovenia. The presence of '*Ca.* P. solani' in

the grapevine affects both the yield and quality of grape berries. On the other hand the control of their vectors by applying different chemicals is environmentally questionable. In this regard the research of the phytoplasma pathogen city is of high priority in order to find the mechanisms of disease development which could help in early detection of disease and consequently to limit its spreading. Better understanding of pathogenicity would also help to find more ecologically acceptable ways of phytoplasma eradication at substantially lower cost. To provide insights into the potential of grapevine plants infected with '*Ca.* P. solani' to interact with its pathogen, we report here qualitative and quantitative changes in the global gene expression profiles of the healthy and infected plants of cv. 'Chardonnay' grown in a production vineyard. We analyzed the traits of infection, and further evaluated the contribution of several metabolic/signaling host pathways to the infection status. Based on the assumption that phytoplasmas mobilize phosphorylated hexoses from the companion cells of phloem and according with accumulating evidence of levels of reducing sugars and sucrose that are generally higher in source leaves of different plants, our focus was on the gene expression level of plant enzymes involved in carbohydrate metabolism. Presumably its changes in infected plants are related to the requirements of phytoplasma for energy and growth. Our findings collectively contribute to understanding of potential main steps in phytoplasma pathogenicity pathway and open new perspectives in phytoplasma diagnostic.

Razvoj diagnostične metode za določanje fitoplazme Aster yellows na vinski trti s PCR v realnem času

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Fitoplazme so rastlinske patogene bakterije brez celične stene. Sodijo v raznoliko skupino *Mollicutes* in niso sposobne samostojnega razmnoževanja. Najdemo jih izključno v sitastih ceveh floema rastlinskih gostiteljev. Med rastlinami se lahko širijo z žuželčjimi prenašalci, lahko pa tudi s cepilnim materialom. Rumenice vinske trte so bolezni, ki jih povzročajo različne, taksonomsko nesorodne fitoplazme, med njimi tudi fitoplazme iz skupine Aster yellows (AY)/16SrI. Skupina je velika in obsega raznolike in geografsko zelo razširjene fitoplazme. Fitoplazme AY prvenstveno okužujejo rastline iz družine *Asteraceae*, lahko pa se pojavijo tudi na drugih rastlinah. Povzročajo različna bolezenska znamenja, kot so: rumenenje, rdečenje listov, deformacije cvetov, metličavost, majhne plodove. Prizadete rastline imajo zato zmanjšan hektarski donos; v skrajnem primeru pa lahko tudi odmrejo. Fitoplazem ne moremo določati s klasičnimi mikrobiološkimi in biokemijskimi metodami. Zastopanost in tip fitoplazem najpogosteje ugotavljamo z molekularnimi metodami, kot je PCR v kombinaciji z RFLP in s PCR v realnem času (PCR-RČ). Ob pravilni izbiri in evalvaciji parametrov je slednja metoda zelo specifična in občutljiva. Pri razvoju metode za detekcijo fitoplazem AY s PCR-RČ smo najprej iz javno dostopne baze nukleotidnih zaporedij (GeneBank) pridobili zaporedja, na katerih smo po poravnavi izbrali primerne dele za načrtovanje začetnih oligonukleotidov in sonde. V naslednjem koraku smo *in-silico* ugotavljali specifičnosti oblikovanih oligonukleotidov s programom BLAST. Optimizirali smo pomnoževanje tarčne molekule (specifične za tip AY). Z nadaljnjimi testi smo preverjali specifičnosti načrtovanega amplikona na ekstraktih DNA različnih fitoplazem, preverili smo možne navzkrižne reaktivnosti z rastlinskim tkivom (zdrava vinska trta) ter z ekstrakti bakterij, ki predstavljajo del normalne rastlinske flore na vinski trti, določili mejo detekcije, kjer lahko še zagotavljamo veljavnost testa ter večkrat primerjali naš test z

dosedaj obstoječim testom. Razvili smo občutljiv test, ki nam omogoča detekcijo tipa AY na vinski trti, ki navzkrižno ne reagira z endofitskimi bakterijami in hkrati še vedno omogoča zanesljivo detekcijo fitoplazem.

ABSTRACT

Validation of real-time PCR method for detection of Aster yellows phytoplasma on grapevine

Phytoplasmas are small, plant pathogenic bacteria, lacking cell wall that belongs to the class Mollicutes. They live and propagate within phloem sieve elements in infected plant. Phytoplasmas are transmitted from plant to plant by sap-feeding insect vectors, or by grafting material and cause symptoms such as stunting, yellowing, "witches" broom, phyllody, virescence, and sometimes withering of plants. The Aster yellows phytoplasma group (AY)/16SrI) comprises of AY phytoplasma and numerous related phytoplasmas worldwide, representing the most diverse and widespread taxonomic group of phytoplasma. They present the causative agent of the so called aster yellows disease, present mostly on Asteraceae family, but can, however, also infect plants from other families, including grapevine. Due to the biology of phytoplasmas, classical microbiological methods cannot be used for their detection and the only way to determine and distinguish phytoplasma groups is by using molecular biology based methods such as PCR in combination with RFLP and/or real-time PCR. The real-time PCR detection system is a very good tool for specific and sensitive phytoplasma diagnostics on grapevine but it has to be carefully designed and validated. First, we obtained nucleotide sequences from publicly accessible database (GeneBank). Then we designed an appropriate amplicon to amplify species-specific DNA region and performed the in-silico analysis using BLAST software. The amplification of the target (AY specific) amplicon was optimized. In further tests we determined the specificity of the designed method on DNA isolates of different types of phytoplasmas and checked for the potential cross-reactivity with plant tissue (healthy grapevine) and with isolates of endophytic bacteria from grapevine, the limit of detection was determined. In the end the developed method was also compared several times to the already reported methods. A sensitive test was developed that does not show any cross-reactivity with endophytic flora of grapevine and enables reliable detection of the target pathogen.

Zagotavljanje zdravega izhodiščnega materiala koščičarjev z vzgojo matičnih dreves v mrežniku

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Fitoplazma European stone fruit yellows (ESFY) povzroča pri gojenju koščičastih sadnih vrst veliko gospodarsko škodo. Bolezen je razširjena tako v Evropi, kot tudi pri nas. Predvsem pri marelicah, slivah kitajsko-japonskega izvora ter breskvah in nektarinah

povzroča značilna rumenenja in propadanja dreves. Fitoplazma ESFY se na gostiteljske rastline iz roda *Prunus* prenaša z vektorjem češpljevo bolšico (*Cacopsylla pruni*), širi se tudi z vegetativnim razmnoževanjem. Z vidika širjenja bolezni so nevarne okužbe gostiteljskih rastlin, zlasti različnih vrst sliv (*P. domestica, P. spinosa, P. cerasifera*), ki ne kažejo bolezenskih znamenj in predstavljajo prikrit vir okužb. Vzgoja zdravih matičnih rastlin in uporaba zdravega izhodiščnega materiala je bistvenega pomena pri preprečevanju širjenja fitoplazem in drugih povzročiteljev bolezni. Z namenom poskusa vzdrževanja zdravih matičnih rastlin ter ugotavljanja možnosti pridelave kakovostnih cepičev so bile spomladi 2007 na lokaciji Sadjarskega centra v Biljah posajene matične sadike koščičarjev v mrežnik. Entomološka analiza spremljanja prenašalcev ESFY v letih 2007 in 2008 ni potrdila navzočnosti prenašalca češpljeve bolšice tako v mrežniku kot zunaj njega, ugotovljen pa je bil potencialni prenašalec breskov škržatek (*Asymmetrasca decedens*) pri kontrolnih drevesih zunaj mrežnika. Prav tako se v obeh opazovanih letih na rumene lepljive plošče v mrežniku ni lovila nobena druga fitofagna žuželka, kar potrjuje učinkovitost mrežnika pri preprečevanju okužb z boleznimi koščičarjev prenosljivimi z zračnimi vektorji. V prvih dveh letih spremljanja zdravstvenega stanja ni bila ugotovljena fitoplazma ESFY, bakterija *Xanthomonas pruni* ter virus šarke (PPV) na drevesih v mrežniku in na kontrolnih drevesih zunaj njega. Drevesa so v mrežniku v obeh rastnih dobah dosegla višjo rast kot kontrolna drevesa na prostem, pri čemer pa v letu 2008 ni bilo značilne razlike v številu primernih očes za cepljenje. Prvi rezultati cepljenja v letu 2007 so pokazali enakovreden prijem cepičev iz mrežnika in iz kontrolnih dreves zunaj njega.

ABSTRACT

Assurance of healthy propagating material of stone fruits by cultivating mother trees in insect-proof net-house

European stone fruit yellows (ESFY) phytoplasma is associated with a severe disease that affects stone fruit species. ESFY phytoplasma is present in several European countries as well as in Slovenia. It induces important disorders and decline of apricot (*Prunus armeniaca*), Japanese plum (*Prunus salicina*) and peach trees (*Prunus persica*). Different cultivated and wild *Prunus* species, such as *P. domestica*, *P. spinosa*, *P. cerasifera* are susceptible to the infection but generally do not show symptoms, hence they represent a hidden sources for infection. In the nature ESFY phytoplasma is transmitted to the host plants of *Prunus* spp. by the vector *Cacopsylla pruni*. The pathogen is also transmitted by grafting. The use of healthy propagating/planting material is therefore of great importance to prevent the spread of the pathogens. The purpose of this research was to maintain healthy mother plants under the protected environment in an insect-proof net-house and to assess the possibility of production of properly developed budwood. Thus the 'virus free' plants of stone fruits were planted in the insect-proof net-house located in the Fruit Growing Centre of Bilje in the spring 2007. Entomological analysis of the vectors of phytoplasma in 2007 and 2008 did not reveal the presence of *Cacopsylla pruni* either inside of the net-house or outdoors on the control trees in the close vicinity of net-house. However, it revealed a moderate presence of *Asymmetrasca decedens,* a potential vector of ESFY on the control trees outside the net-house. No phytophagous insect had been caught on yellow sticky traps inside the net-house. In the first two years after the material was planted no presence of ESFY, *Xanthomonas pruni* or PPV was confirmed in samples taken from trees inside the net-house as well as from outdoor control trees. The net-house trees were considerably higher compared to the control trees in both years, but there was no significant difference in the number of buds in the second growth year. The preliminary results of grafting in 2007 showed similar success in grafting performed with buds taken from the net-house and those taken from the control trees outside the net-house.

Obseg prenosa fitoplazme AP (*Candidatus* phytoplasma mali) v odvisnosti od načina cepljenja

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Pri jablanah sedmih sort ('Zlati delišes', 'Idared', 'Braeburn', 'Fuji', 'Gala', 'Elstar' in 'Jonagold') smo preučevali obseg prenosa fitoplazme AP (*Candidatus* phytoplasma mali) z okuženih matičnih dreves na sadike v odvisnosti od načina cepljenja. Sadike gojene v mrežniku, ki je preprečeval dostop žuželk prenašalk AP, smo več let zapored pridobili s cepljenjem na živo oko, izvedenem v februarju, in s postopkom ploščičaste okulacije v začetku avgusta. Skozi vsa obdobja smo sadike natančno opazovali in beležili pojavljanje znamenj okužbe z AP in opravljali laboratorijska testiranja za dokazovanje okuženosti z AP (ELISA in PCR). Povprečni delež okuženih sadik, ugotovljen z uporabo laboratorijskih metod, je bil pri okuliranih sadikah (enoletne 27-46 %, dveletne 44-51 % in triletne 59 %) podoben kot pri kopuliranih sadikah (enoletne 16–36 %, dvoletne 43-48 % in triletne 58 %). Obseg prenosa AP fitoplazme v zimskem času ni bil statistično značilno različen od obsega pri poletnih cepljenih.

ABSTRACT

Transmission of AP phytoplasma (*Candidatus* phytoplasma mali) in relation to the method of propagation

The transmission rate of Apple proliferation phytoplasma – "*Candidatus* phytoplasma mali" (AP) from infected mother trees to apple tree stocks of seven cultivars ('Golden delicious', 'Idared', 'Braeburn', 'Fuji', 'Gala', 'Elstar' and 'Jonagold') was studied in relation to the methods of propagation. Healthy rootstocks were top-grafted in February or budded in August with different apple cultivars infected with AP phytoplasma and were maintained under screenhouse conditions for four years. During the experiment the infected stocks were identified by laboratory testing of AP phytoplasma, using ELISA and PCR methods, and were monitored for presence of disease symptoms. The average portion of infected stocks detected by laboratory testing in budded stocks (27 - 46% one-year old, 44 - 51% two-year old, 59% three-year old stocks) was similar to the one of grafted stocks (16 – 36% one-year old, 43-48% two-year old, 58% three-year old stocks). The transmission rate obtained by grafting in dormant season did not statistically significantly differ from transmission rate obtained by summer budding.

Rezultati spremljanja pojava fitoplazem AP (*Candidatus* phytoplasma mali) in PD (*Candidatus* phytoplasma pyri) v Sloveniji

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Predstavljeni so podatki o pojavljanju fitoplazem povzročiteljic metličavosti jablan (apple proliferation - *Candidatus* Phytoplasma mali) in odmiranja hrušk (pear decline - *Candidatus* Phytoplasma pyri) v drevesnicah in matičnih nasadih, ugotovljeni pri delu fitosanitarne inšpekcije v obdobju od leta 2000 do leta 2008. Da bi ugotovili fitosanitrani status razmnoževalnega materiala je bilo v drevesnicah in matičnih nasadih odvzetih veliko vzorcev, ki so jih analizirali z uporabo različnih molekulskih PCR detekcijskih metod. Rezultati kažejo na konstanto zastopanost obeh fitoplazem v razmnoževalnem materialu. Pomembno je, da pridelujemo in sadimo neokužene sadike, da s tem zmanjšamo na minimum začetni inokulum povzročiteljev bolezni v sadovnjakih, ker so populacije vektorjev velike in ker je uspešnost zatiranja vektorjev v Sloveniji pogosto premalo učinkovita.

ABSTRACT

Results of surveillance of occurrence of AP (*Candidatus* phytoplasma mali) in PD (*Candidatus* phytoplasma pyri) phytoplasma in Slovenia

Data on occurrence of apple proliferation disease (c.o. *Candidatus* Phytoplasma mali) and pear decline disease (c.o. *Candidatus* Phytoplasma pyri) in nurseries and plantations of mother trees, carried out by phytosanitary inspection services are presented for the period from 2000 to 2008. Many samples were taken in nurseries and plantations of mother trees and were subjected to different molecular detection PCR methods to evaluate the presence of phytoplasma and the phytosanitary status of propagation material. Results show constant presence of both phytoplasmas on propagation material. It is very important to produce and to plant healthy stocks to minimize the starting inoculum of phytoplasma at planting of new orchards, since vector populations in Slovenia are big and their control is usually not sufficient.

Fitomikologija

Znotrajvrstna raznolikost fitopatogene glive *Monilinia laxa* in razvoj specifične detekcijske metode

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Monilinia laxa je fitopatogena gliva, predstavnica velikega rodu *Monilinia*, ki iz leta v leto, predvsem ob primernih okoljskih dejavnikih, povzroča vse večje izgube pridelka koščičarjev (*Prunoideae*). Ogrožene so predvsem marelice, višnje in češnje. Gliva okužuje cvetove, poganjke in vejice, kjer povzroča venenja, ožige in rakaste rane; na zorečih plodovih koščičarjev in pečkarjev pa povzroča značilno rjavo gnilobo. Leta 1997 so v sadovnjaku Resje na Gorenjskem opazili na jablanah nenavadno rjavenje in venenje poganjkov ter sušenje cvetnih šopov. S standardnimi fitopatološkimi metodami so kot povzročitelja identificirali glivo *Monilinia laxa*. Po umetnih inokulacijah potencialnih gostiteljev glive (pečkarji in koščičarji) z »jabolčnimi izolati« so se simptomi pojavili le na jablanah, s čimer so sklepali na obstoj specializirane forme (*Monilinia laxa* f. sp. *mali)*. Z razvojem molekulskih markerjev, ki temeljijo na verižni reakciji s polimerazo (PCR), so se povečale možnosti za preučevanje genetske variabilnosti, ki so nujne za natančnejše poznavanje in razumevanje patogena. Za iskanje polimorfizmov znotraj ozko sorodnih organizmov se med drugimi uporablja tudi dolžinski polimorfizem namnoženih fragmentov (AFLP). Z omenjeno metodo smo analizirali 67 izolatov glive *M. laxa* iz različnih gostiteljev (15 jabolčnih izolatov in 52 izolatov iz koščičarjev) ter z uporabo različnih statističnih orodij poskušali potrditi domneve o obstoju specializirane forme. Na osnovi nukleotidnega zaporedja specifičnih fragmentov, ki se namnožujejo pri jabolčnih izolatih poizkušamo izdelati hitro in zanesljivo diagnostično metodo za razlikovanje specializirane forme. Specializirana oblika glive ima podobna bolezenska znamenja kot karantenska bakterija *Erwinia amylovora* (hrušev ožig). Tako bi uspešno izdelani markerji služili kot nedvoumen test za razlikovanje glivnih oz. bakterijskih okužb v kratkem časovnem intervalu. V praksi bi se lahko izognili nepotrebnim sankcijam na terenu.

ABSTRACT

Intraspecific variability of the plant pathogenic fungus *Monilinia laxa* and the development of a reliable diagnostic method

Monilinia laxa is a plant pathogenic fungus, a member of the large *Monilinia* genus, which is causing ever more economic damage to pome fruits (*Prunoideae*) from year to year, especially in favourable conditions. It preferentially attacks apricots, sour and sweet cherries. It is primarily a pathogen of blossoms, shoots and twigs, causing wilts, blights and cankers, and characteristic brown rot of ripening stone and pome fruits. Severe and unusual desiccation of apple tree shoots and twigs was observed in 1997 in Resje, Gorenjska. Using a classical plant pathogenic approach, the pathogen was isolated and identified as *Monilinia laxa*. After artificial inoculation of potential fungus hosts (pome and stone fruits) in the next growing season, disease symptoms appeared only in apple trees, suggesting the possible existence of a specialized form (*Monilinia laxa* f. sp. *mali)*. With the advent of molecular techniques based on polymerase chain reaction (PCR), various genetic markers have become basic techniques for evaluating genetic variability, which is essential for better understanding fungal pathogenicity. Amplified fragment length

polymorphism (AFLP) is often used for detecting polymorphisms among closely related species. We report here on the results of AFLP analysis of 67 fungal isolates from various hosts (15 from apples, 52 from stone fruits). Using various statistical tools, apple isolates were clearly distinguished from others, confirming the possible existence of a specialized form. Selected polymorphic bands, amplified only in apple isolates were sequenced and transformed to SCAR markers with the aim of developing a rapid and unambiguous diagnostic tool for detecting the specialized. Such markers would be advantageous since *M. laxa* f.sp. *mali* causes similar symptoms as the quarantine bacterium *Erwinia amylovora* (fire blight) and the availability of a reliable test for rapidly distinguishing between fungal and bacterial infections would prevent unnecessary measures in orchards.

Fenolne snovi kot odziv jablane na okužbo z jablanovim škrlupm (*Venturia inaequalis*)

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V raziskavi smo proučevali vsebnost fenolnih spojin v zdravih in z glivo *Venturia inaequalis* okuženih listih in plodovih jablane. Vzorci listov so bili nabrani v rastni dobi od maja do septembra, vzorci plodov pa v njihovi tehnološki zrelosti. Z uporabo HPLC sistema smo v listih in plodovih določili naslednje hidroksicimetne kisline: klorogensko, kavino, ferulno in *p*-kumarno kislino; dihidrohalkone: floridzin in floretin; flavonoide: epikatehin, katehin, rutin in kvercitrin, ter v kožici jabolk še protokatehulno kislino. Antioksidativni potencial kožice jabolk in vsebnost skupnih fenolov v listih smo določili spektrofotometrično. Okužba z glivo *Venturia inaequalis* je spremenila metabolizem fenolnih spojin tako, da se je povečala njihova sinteza v okuženih delih listov in kožice. Kožica plodov in listi okuženi z *V. inaequalis* kažejo v primerjavi z zdravim tkivom več kot štiri krat večjo vsebnost klorogenske kisline, 1,5 do 3 krat več katehina in 2 do 4 krat več epikatehina. V okuženem tkivu je bila količina flavonolov (do 4,4 krat več rutina in do 4,2 krat več kvercitrina) značilna večja kot v zdravem tkivu. Zaradi večje vsebnosti posameznih fenolov, je bila tudi vsebnost skupnih fenolov v okuženem tkivu 1,4 do 2,4 krat večja kot v zdravih listih in plodovih.

ABSTRACT

Phenolic compounds in apple as response to scab (*Venturia inaequalis*) infection

The research dealt with phenolic compounds in healthy apple leaves and fruitS and in leaves and fruit infected with *Venturia inaequalis*. The leaf samples were picked in the period from May to September and the fruit samples at technological maturity. With the use of the HPLC system, the following hydroxycinnamic acids were detected in the apple leaves and fruit: chlorogenic, caffeic, ferulic and *p*-coumaric acid; dihydrochalcones: phloridzin and phloretin; flavonoids: epicatechin, catechin, rutin and quercitrin; and in apple fruit, protocatechuic acid. The antioxidant potential value of apple peel and the total phenolic compounds in apple leaves were determined spectrophotometrically. Infection with the *Venturia inequalis* fungus changed the metabolism of phenolic compounds, which caused their increased synthesis at the infected sites of leaves and peel. The peel of fruit and leaves infected with *V. inaequalis* showed – in comparison to the healthy sample – a

more than four-fold increase in chlorogenic acid, 1.5 to 3 times more catechin and 2 to 4 times more epicatechin. In the apple scab infected tissue, the amount of flavonols was statistically higher (up to 4.4 times more rutin and up to 4.2 times more quercitrin) than in healthy ones. Owing to the increased quantity of single phenolics, the content of total phenolics in the infected tissue was 1.4 to 2.4 times higher than in the healthy leaves and fruit.

Pojav cerkosporne pegavosti (*Cercospora cantuariensis*) in sive pegavosti (*Phoma exigua*) hmelja v Sloveniji

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V letih 2005 in 2007 je prišlo v Sloveniji na območju Koroške do izbruha še neidentificiranih bolezni hmelja, ki sta povzročili pegavost listja, odmiranje cvetov in rjavenje storžkov. V obeh letih je prišlo do zelo hitrega napredovanja bolezni na različnih sortah, zaradi česar je bilo potrebno izvesti predčasno spravilo pridelka. Pri oceni škode je delež obolelih storžkov nihal med 7 do 26 odstotki, kar je primerljivo z večjimi izbruhi hmelju najpomembnejše bolezni hmeljeve peronospore (*Pseudoperonospora humuli*). Na osnovi morfoloških lastnosti, patogenih testov in molekularnih diagnostičnih tehnik smo kot povzročiteljici identificirali glivi *Phoma exigua* in *Cercospora cantuariensis*. V prispevku so predstavljeni identifikacijski postopki, bolezenska znamenja z epidemiologijo omenjenih gliv, ukrepi za varstvo pridelka ter prihodnje aktivnosti.

ABSTRACT

The appearance of cercospora leaf spot (*Cercospora cantuariensis*) and grey leaf spot (*Phoma exigua*) on hops in Slovenia

In the years 2005 and 2007, an outbreaks of unidentified diseases on hop in Slovenia, were observed in Koroška region, which induced leaf spots, flower decaying and browning of cones. The diseases spread and progress rapidly on different varieties and the premature harvesting of hop cones was performed in these years. The disease damage assessments revealed 7 to 26 % of infected cones what could be comparable with large outbreaks of hop downy mildew (*Pseudoperonospora humuli*), which is the most important disease on hops. On the basis of morphology, pathogenicity tests and molecular techniques, fungi *Phoma exigua* and *Cercospora cantuariensis* were identified as the causal agents. The article presents the identification analysis, diseases symptoms with epidemiology of fungi, measures for crop protection and future activities.

Ramularijska pjegavost na ječmu u Republici Hrvatskoj

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Ramularijska pjegavost prvi je puta zabilježena i determinirana u Italiji 1898. godine. Od tada pa do osamdesetih godina prošlog stoljeća za tu se bolest gotovo nije ni znalo. Danas s njom imaju problema proizvođači ječma posebno pivarskog. Uzročnik ove bolesti je gljiva *Ramularia collo-cygni* Sutton et Waller. Topla jesen i jake rose idealni su uvjeti za zarazu mladih listova ozimog ječma, a znakove zaraze zapažamo u proljeće (stadij busanja), kod proljetnog ječma (stadij vlatanja). U većem razmjeru ramularijska pjegavost javlja se od klasanja do zriobe. Bolest se manifestira na svim nadzemnim dijelovima biljke (list, rukavac lista, vlat, brkovi (osje) i pljeva klasa). Na zelenom listu bolest karakteriziraju sitne smeđe pjege s nešto tamnijim središtem,1-3mm dužine i 0,5mm širine, okružene klorotičnom žutom aureolom. Na odumrlom listu pjege su gotovo crne. Gljiva luči fitotoksine (rubeline A-E) pa je odumiranje zaraženih listova veoma brzo (unutar 12 dana). To smanjuje urod za 25% i kvalitetu zrna za dobivanje slada. Izvori zaraze su zaraženi biljni ostaci, zaraženo sjeme, samonikli ječam, pšenica, triticale (pšenoraž) te drugi domaćini (pirika, divlja zob). U Hrvatskoj bolest je prvi puta uočena (Korić, Tomić) i determinirana (Tomić) na ječmu 2005. u Brodsko-posavskoj županiji, a u 2008. godini jak napad ove bolesti bio je na proljetnom ječmu. Pojava ove bolesti potakla je postavljanje pokusa (Tomić 2005., 2006., 2008.) kako bi se došlo do djelotvornih fungicidnih pripravaka. Za područje Hrvatske djelotvorni su fungicidni pripravci na osnovi tebukonazol + protiokonazol, epoksikonazol + krezoksim-metil. Glavne mjere borbe protiv te bolesti trebaju biti agrotehničke. Prašenje strništa i zaoravanje biljnih ostataka smanjuju pojavu samoniklih žitarica. Istraživanja su pokazala da je početkom rujna 80% do 90% samoniklog ječma zaraženo ovom bolešću. Trebamo sijati certificirano sjeme i otporne sorte. Nažalost u Hrvatskoj se siju mnoge dokazano osjetljive sorte ječma na ovu bolest.

ABSTRACT

Ramularia leaf spot on barley in the Republic of Croatia

Ramularia leaf spot was first time determined and described in Italy 1898. From than till the 80`s of the last century it was followed by a long time without any reports about this disease. Today this fungal disease becomes a problem in production of barley, because of the poor quality of barley for malting and brewing. This disease is caused by fungus *Ramularia collo-cygni* Sutton *et* Waller. Warm autumn and days with fall dew present favourable conditions for infection of young leaves, symptoms of infection (winter barley) we can see in the spring (tillering stage), and spring barley (stem elongation stage). Very strong infections of ramularia leaf spot appears between ear and maturity. Above ground disease attack all parts of barley (leaf, leaf sheath, culms, awns and sometimes glumes). On a green leaf disease has a characteristic small brown spots. Spots are the darkest in the middle, 1-3 mm long and 0,5 mm wide and sorrounded by a yellow chlorotic halo. On a death leaf spots are almost black. Infected leaves quickly die (within 12 days) because fungus secretes phytotoxins (rubellins A-E). This decrease the yield for 25% and grain quality for malting and brewing. The sources of infection are straw residue, infected seed, volunteer plants (barley, wheat, triticale) and wild grasses such as couchgrass, wild oats and wild barley. In Croatia this disease was espied (Korić, Tomić) and determined (Tomić) for the first time on barley in 2005 in Brodsko-posavska county. In 2008 hard

attack of this disease was on a spring barley. Occurrence of ramularia leaf spot induced the trials (Tomić 2005, 2006, 2008) with purpose of detection of an effective fungicides. For Croatia effective are combinations of tebukonazol + protiokonazol and epoksikonazol + krezoksim-metil. The main measures of controling this disease are agricultural measures such as ploughing in stubble-field and strawing to protect volunteer plants. Investigations showed that 80-90% of volunteer barleys were infested with this disease at the beginning of September. Need to sow protected seed and resistant varieties. Unfortunately in Croatia are sowing many of evidently susceptible varieties of barley.

Slovenski izvleček ni bil predložen!

Odpornost slovenskih genskih virov fižola na fižolov ožig

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Fižolov ožig je najpomembnejša glivična bolezen fižola (*Phaseolus vulgaris* L.). Pojavlja se v vseh pridelovalnih območjih in v letih, ko so vremenske razmere za razvoj bolezni ugodne, povzroča precejšnjo gospodarsko škodo. Povzročiteljica bolezni je gliva *Colletotrichum lindemuthianum* (Sacc. et Magnus) Briosi et Cav. V Sloveniji so bile doslej ugotovljene štiri fiziološke rase glive: 23, 55, 103 in 131. Med najučinkovitejšimi metodami za varstvo pred boleznijo je vzgoja odpornih sort fižola. Opisanih je enajst neodvisnih genov za odpornost (*Co* geni), deset jih izvira iz srednjeameriške in eden iz andske dednine fižola. Vnos posameznih genov za odpornost ne zagotavlja popolne in trajne odpornosti zaradi velike variabilnosti glive in hitrega razvoja novih ras, ki so sposobne okužiti odporne genotipe. Zato je potrebno stalno spremljati dinamiko pojavljanja fizioloških ras glive in preverjati odpornost posameznih genotipov fižola. Z umetnimi inokulacijami smo preizkusili odpornost slovenskih genskih virov fižola na posamezne rase glive in ugotovili, da nobeden od 26 preizkušenih genotipov ni povsem odporen na domače rase glive, šest pa je zmerno odpornih. V poskus smo vključili tudi izbrane tuje, t. i. diferencialne sorte fižola. Visoko stopnjo odpornosti smo ugotovili zlasti pri tistih diferencialnih sortah, ki izvirajo iz srednjeameriške dednine. Na podlagi dobljenih rezultatov sklepamo, da bi z vnosom nekaterih genov iz srednjeameriške dednine lahko bistveno prispevali k izboljšanju odpornosti slovenskih genskih virov fižola.

ABSTRACT

Resistance of slovene common bean germplasm to bean anthraconose

Bean anthracnose is the most destructive fungal disease of common bean (*Phaseolus vulgaris* L.). It is widespread in all common bean producing regions in Slovenia and can cause high yield losses in years with conductive disease conditions. It is caused by a mytosporic fungus *Colletotrichum lindemuthianum* (Sacc. et Magnus) Briosi et Cav. Four physiological races of the pathogen have previously been identified in common bean growing regions in Slovenia: 23, 55, 103 and 131. Growing resistant common bean varieties is the most effective control measure against *C. lindemuthianum.* Eleven independent resistance genes (*Co*-genes) have been described in common bean; 10 genes were identified from Mesoamerican germplasm and one from Andean germplasm. Introgression of specific resistance genes has not always provided durable resistance due

to the continuous development of new races of the pathogen capable of overcoming the resistant germplasm. Continual monitoring or race composition and evaluation of common bean germplasm for resistance to bean anthracnose is therefore needed. Artificial inoculations were used to evaluate resistance of Slovene common bean accesions to the four races of the pathogen. A set of international differential common bean cultivars was evaluated as well. None of the 26 Slovene common bean accessions tested was resistant to local races of the pathogen; however, six accessions reacted as moderately resistant. Considerably higher level of resistance was recorded among differential common bean cultivars, particularly those derived from the Mesoamerican germplasm. The results of the study suggest that wider incorporation of genes from the Mesoamerican germplasm could significantly improve the level of resistance of Slovene common bean germplasm.

Fitovirologija

Razporeditev virusa pahljačavosti listov vinske trte (GFLV) po rastlini med rastno sezono

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Virus pahljačavosti listov vinske trte (*Grapevine fanleaf virus*, GFLV) je *Nepovirus*, ki povzroča veliko izgubo pridelka grozdja po celem svetu, saj zmanjšuje njegovo kvaliteto in količino ter skrajšuje življenjsko dobo trsov. Bolezenska znamenja, ki jih ob tem povzroča so še različna rumenenja listov, deformacije listov in nepravilna rast poganjkov. V nekaterih primerih okuženi trsi ne kažejo bolezenskih znamenj, a so kljub temu vir nadaljnjih okužb, kar je še posebej pomembno pri izboru trsov za selekcijske vinograde. Za detekcijo virusa GFLV zato potrebujemo hitro, zanesljivo, natančno in cenovno ugodno metodo, ki omogoča pregled velikega števila vzorcev, ter znanje o tem, v katerem letnem času in katere dele rastline je potrebno vzorčiti, da dobimo zanesljive rezultate. Da bi določili najprimernejši čas vzorčenja ter najprimernejše dele rastline za vzorčenje, smo s serološko metodo ELISA skozi vso rastno sezono vsak mesec na GFLV testirali različne dele (mlade liste, stare liste, vitice, cvetove/plodove, floem in korenine) 6 rastlin vinske trte (dveh sort iz 3 lokacij na Krasu, Slovenija). Ker literaturni podatki navajajo, da koncentracija mnogih nepovirusov v poletnem času zaradi vročine upade, smo skozi celotno rastno sezono vsak mesec s testom ELISA analizirali virus GFLV tudi v mladih poganjkih več kot 50 z GFLV okuženih trsov (5 različnih sort iz sedmih različnih lokacij na Krasu). Naši rezultati kažejo, da je znotraj rastne sezone najboljši čas za vzorčenje mesec junij, prav tako pa je za večino vzorcev sprejemljivo diagnosticiranje virusa GFLV s testom ELISA v juliju, avgustu in septembru. Upad koncentracije virusa v mesecih juliju in avgustu do meje, kjer s testom ELISA virus GFLV ni bil več določljiv, smo zaznali pri 4% testiranih trsov sort Volovnik in Refošk. Ugotovili smo, da so najprimernejši deli rastline vinske trte za vzorčenje mladi listi in mlade vitice, medtem ko sta floem in korenine najmanj primerna materiala za detekcijo virusa GFLV.

ABSTRACT

Distribution of *Grapevine fanleaf virus* (GFLV) in plant during the growing season

Grapevine fanleaf virus (GFLV) is a *Nepovirus*, which causes substantial crop losses world-wide since it reduces fruit quality, its quantity and shortens the longevity of grapevines in vineyards. Symptoms of GFLV infection are also: various types of leaf yellowing, leaf deformations, canes' malformations and plant death. In some cases infected plants do not show symptoms at all, but still present the source of further infections, which is especially important for selection of healthy grapevines for selection vineyards. Therefore we need fast, reliable, sensitive and inexpensive method for detection of GFLV, and knowledge about which time of the year and which part of the plant is the most appropriate for sampling to get reliable results. To find the answer to the last two questions, a serological method ELISA was used for detection of GFLV in different parts (young and old leaves, tendrils, flowers/fruits, phloem and roots) of 6 grapevine plants (2 cultivars from 3 locations in Karst region, Slovenia) every month during the growing season. According to reference, the concentration of many *Nepovirus* species decline during the high summer. In order to determine the GFLV detectability in that period, young shoots of 50 plants (five different cultivars from seven locations) were also tested every month during the growth season. Our results show that June is the most

appropriate month for sampling during the growing season. July, August and September are also acceptable for GFLV detection with ELISA method, since decline of virus concentration to the undeterminable level was shown only for 4% of grapevines (cv. Volovnik and Refošk). The young leaves and young tendrils are the most appropriate parts of the grapevine plant for sampling, whereas phloem and roots are least appropriate for GFLV detection during the whole growing season.

Virus ovenelosti boba 1 (BBWV1) – nov gospodarsko pomemben virus paprik v Sloveniji

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Poleti 2006 so bile v jugovzhodni Sloveniji, v nasadu za pridelavo paprike (*Capsicum annuum*), opažene rastline z bolezenskimi znamenji značilnimi za okužbo z virusi. Zaradi razbarvanja, obročev in temnih izboklin na plodovih je bila izguba pridelka v okuženem območju skoraj 100 %. Na večini listov so bila opazna rahla razbarvanja, na nekaterih pa je bil izrazit vzorec kot nekakšen okras v mavrskem slogu ali v obliki koncentričnih obročev. V jesenskem obdobju so bili plodovi istih rastlin brez bolezenskih znamenj. Liste in plodove z različnimi tipi bolezenskih znamenj, smo analizirali z ELISA na prisotnost različnih virusov, vendar smo pozitiven rezultat dobili le na BBWV 1 (*Broad bean wilt virus* 1, slov.: virus ovenelosti boba 1) in sicer za vse vzorce paprike, nabrane na okuženem območju. Rezultat je bil potrjen z imunsko-serološko elektronsko mikroskopijo (ISEM), testnimi rastlinami, z RT-PCR s specifičnimi začetnimi oligonukleotidi za BBWV 1 in z ugotavljanjem nukleotidnega zaporedja DNA v specifičnem pomnožku. Virus BBWV 1 smo dokazali tudi v plevelni rastlini iz družine radičevk z rahlo vidnim mozaikom, ki je rasla v neposredni bližini okuženih paprik. Virus BBWV 1 smo v srednji Sloveniji odkrili že leta 2005 na vzorcu verbene s klorotičnimi pegami na listih. Diagnoza obeh vzorcev predstavljata prvo določitev virusa BBWV1 v Sloveniji (Mehle in sod., 2008). Leta 2007 smo ga ponovno našli na dveh vzorcih paprike, ki pa sta bili hkrati okuženi tudi s CMV. Poleg orisa stanja okuženosti z BBWV 1 v Sloveniji, bomo v prispevku predstavili tudi biotične karakteristike tega gospodarsko pomembnega virusa paprik.

ABSTRACT

***Broad bean wilt virus* 1 (BBWV 1) – the new economically important virus of pepper in Slovenia**

During summer of 2006, pepper plants (*Capsicum annuum*) showing virus-like symptoms, were observed in a commercial field in south-eastern Slovenia. Discolorations, rings or dark bumps on fruits led to almost 100% loss of the yield in some areas. Symptoms on leaves were usually expressed as slight discolorations, but also as arabesques or concentring rings. In autumn, infected plants expressed less severe symptoms and produced symptomless fruits. The infected leaves and fruits, with different types of symptoms, were tested by ELISA for the presence of different viruses, but positive results were obtained only with BBWV 1 (*Broad bean wilt virus* 1) in all samples collected from the epidemic area. Immuno-serological electron microscopy (ISEM), test plants, RT-PCR with BBWV 1 specific primers and the sequence of the RT-PCR product confirmed BBWV

1 infection. The BBWV 1 was also identified in one weed species belonging to family *Cichoriaceae*, expressing mild mosaic and growing near the epidemic area. Previously, in 2005, the BBWV 1 was found in central Slovenia on Verbena plants, showing chlorotic spots on leaves. The diagnosis of both samples is the first determination of BBWV 1 in Slovenia (Mehle *et al*., 2008). Later, in 2007, the BBWV 1 was found in mix infection with CMV again on samples of pepper. Besides the situation of BBWV 1 in Slovenia, the biological characteristics of this economically important virus of pepper will be provided.

Entomologija

Opazovanje in identifikacija pravih listnih uši (Sternorrhyncha: Aphidoidea) na gojenih rastlinah v Sloveniji

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V okviru opazovalno napovedovalne službe za varstvo rastlin na Kmetijskem inštitutu Slovenije spremljamo nalet pravih listnih uši, ki prenašajo viruse v nasadih semenskega krompirja. V obdobju od leta 2003 do 2008 smo sistematično spremljali dinamiko leta pravih listnih uši (Aphididae) na štirih območjih pridelave semenskega krompirja: Komenda, Jablje, Šentvid pri Stični in Libeliče. Največ ujetih listnih uši iz družine Aphididae je pripadalo rodu *Aphis*. V krompiriščih so bile najštevilčnejše vrste: *Aphis fabae* (Scopoli 1763), *Cavariella aegopodii* (Scopoli 1763), *Phorodon humuli* (Schrank 1801), *Rhopalosiphum padi* (Linnaeus 1758), *Sitobion avenae* (Fabricius 1775) *Macrosiphum euphorbiae* (Thomas 1878), *Brachycaudus cardui* (Linnaeus 1758), *Myzus persicae* Sluzer 1776, *Brevicoryne brassicae* (Linnaeus 1758), *Brachycaudus helichrysi* (Kaltenbach 1843), *Metopolophium dirhodum* (Walker 1849), *Aulacorthum solani* Kaltenbach 1843 in *Aphis nasturtii* Kaltenbach 1843. Nekatere od navedenih vrst lahko prenašajo tudi viruse v žitih. Zaradi pojavljanja virusa rumene pritlikavosti ječmena (BYDV - Barley Yellow Dwarf Virus) smo ugotavljali zastopanost vrst in dinamiko leta listnih uši tudi v posevkih ozimnih žit. V ječmenu in pšenici smo ugotovili: veliko žitno uš (*Sitobion avenae),* čremsovo uš (*Rhopalosiphum padi*) in koruzno uš (*Rhopalosiphum maidis*). Poleg morfološke smo opravili tudi molekularno identifikacijo listnih uši na podlagi sekvenčne analiza gena za citokrom oksidazo I, v mitohondrijski DNK.

ABSTRACT

Monitoring and identification of aphids (Sternorrhyncha: Aphidoidea) on cultivated plants in Slovenia

In frame of the Forecasting and Warning Service for Pests and Diseases at Agricultural Institute of Slovenia, the peak flight of aphids transmitting viruses in seed potato plantations is being monitored. In the period from 2003 to 2008, the dynamics of aphid flight was monitored systematically on four locations of seed potato production: Komenda, Jablje, Šentvid pri Stični and Libeliče. The majority of aphids of the family Aphididae that were caught belong to the genus *Aphis*. In areas of potato seed production, following were the most numerously represented species: *Aphis fabae* (Scopoli 1763), *Cavariella aegopodii* (Scopoli 1763), *Phorodon humuli* (Schrank 1801), *Rhopalosiphum padi* (Linnaeus 1758), *Sitobion avenae* (Fabricius 1775) *Macrosiphum euphorbiae* (Thomas 1878), *Brachycaudus cardui* (Linnaeus 1758), *Myzus persicae* Sluzer 1776, *Brevicoryne brassicae* (Linnaeus 1758), *Brachycaudus helichrysi* (Kaltenbach 1843), *Metopolophium dirhodum* (Walker 1849), *Aulacorthum solani* Kaltenbach 1843, *Aphis nasturtii* Kaltenbach 1843. Some of the quoted aphid species can transmit the viruses in cereals. Due to the presence of Barley Yellow Dwarf Virus (BYDV) in winter cereal crops, we started to monitor aphids also in these field crops. It was found out that on winter barley and wheat the species Grain aphid - *Sitobion avenae,* Apple-grain aphid - *Rhopalosiphum padi* and Cereal leaf aphid - (*Rhopalosiphum maidis*), appeared. Beside morphological identification, molecular identification of aphid species based on sequence analysis of gene for cytochrome oxidase I, was done, too.

Škržatki, ulovljeni v vinogradih JV Slovenije v letih 2007 in 2008

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V letih 2007 in 2008 smo na območju JV Slovenije (Dolenjska, Bela Krajina ter Posavje) v sklopu nadzora trsnih rumenic spremljali tudi vrstno pestrost škržatov (Auchenorrhyncha), ki so znani naravni prenašalci teh vrst fitoplazem. Spremljanja smo izvajali na vinski trti in v podrasti. Spremljanja je potekalo obe leti v obdobju med mesecem julijem in septembrom. Lov smo izvajali z entomološko mrežo (kečerjem) in sesalnikom. Ulovljene osebke smo shranjevali v 96% etanol in jih pošiljali v določitev v Entomološki laboratorij KGZS – Zavod Nova Gorica. V letu 2007 so bili odvzeti vzorci na 5 lokacijah, v letu 2008 pa na 4 lokacijah, v katerih je bil velik delež okuženih trsov s simptomi rumenic. Določenih je bilo 48 vrst škržatov, od tega 31 v letu 2007 in 17 v 2008. V obeh letih je bil na 4 lokacijah ulovljen prenašalec zlate trsne rumenice (Grapevine flavescence dorée phytoplasma) *Scaphoideus titanus* Ball. Vrsta *Hyalesthes obsoletus* Signoret je glavni prenašalec fitoplazme počrnelosti lesa (Grapevine bois noir phytoplasma), ki smo ga v lovilnem obdobju našli v vinogradih, prav tako pa smo zabeležili kar nekaj vrst, ki bi po navedbah v literaturi lahko bile potencialni prenašalci omenjene fitoplazme. Med njimi so: *Anaceratagallia ribauti* (Ossiannilsson), *Emelyanoviana mollicula* (Boheman), *Errastunus ocellaris* (Fallen), *Macrosteles viridigriseus* (Edwards), *Macrosteles laevis* Ribaut, *Mocuellus collinus* (Boheman), *Neoaliturus fenestratus* (Herrich-Schaeffer) in *Psammotettix alienus* (Dahlb.).

ABSTRACT

LEAF- AND PLANTHOPPERS COUGHT IN VINEYARDS OF SOUTHEASTERN SLOVENIA IN 2007 AND 2008

In the framework of the regular survey of grape yellows in 2007 and 2008 the occurrence of some leaf- and planthoppers (Auchenorrhyncha) in vineyards of SE Slovenia (Dolenjska, Bela Krajina and Posavje) was monitored as well. Special attention was paid to species, which are known as natural vectors of grape yellows. The species diversity was monitored separately on vine canopy and on the undergrowth vegetation. Samplings were performed in the period from July until September in both years. Samples were collected with an entomological net (catcher) and entomological aspirator. Specimens caught were stored in 96% ethanol and sent for identification to the Laboratory for entomology at Agricultural and forestry service Nova Gorica. Samples were taken from 5 localities in 2007 and 4 localities respectively in 2008, mostly from vineyards heavier diseased by grape yellows. Altogether 48 species were recognized; 31 in 2007 and additional 17 in 2008. The leafhopper *Scaphoideus titanus* Ball, known as the vector of Grapevine flavescence dorée phytoplasma (FD) was caught in 4 localities in both years. *Hyalesthes obsoletus* Signoret known as the main vector of Grapevine bois noir phytoplasma was also found in 3 localities. Some other species that could be considered as potential vectors of above-mentioned diseases were noted, among them: *Anaceratagallia ribauti* (Ossiannilsson), *Emelyanoviana mollicula* (Boheman), *Errastunus ocellaris* (Fallen), *Macrosteles viridigriseus* (Edwards), *Macrosteles laevis* Ribaut,

Mocuellus collinus (Boheman), *Neoaliturus fenestratus* (Herrich-Schaeffer) and *Psammotettix alienus* (Dahlb.).

Dinamika vnosa in odkrivanja tujerodnih škodljivih žuželk in pršic rastlin v Sloveniji

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Kronološka analiza vnosa in širjenja tujerodnih fitofagnih žuželk in pršic na ozemlje Slovenije kaže do sredine osemdesetih let prejšnjega stoletja razmeroma enakomerno dinamiko, v zadnjih dvajsetih letih pa skoraj eksponencialno povečevanje njihovega števila. Trend je predvsem posledica pospešene globalizacije trgovanja z rastlinami in rastlinskimi proizvodi na svetovni ravni, sprostitve tega trgovanja tudi v Sloveniji v osemdesetih letih in še posebej po osamosvojitvi ter prehodne geografske lege Slovenije. Deloma je ta trend povezan tudi z bolj sistematičnim spremljanjem zdravstvenega stanja rastlin v zadnjem obdobju in usposobljenostjo diagnostičnih laboratorijev za identifikacijo nekaterih skupin škodljivih organizmov rastlin. Zadnji inventar tujerodnih vrst žuželk in pršic, ki so bile doslej vnesene ali so se postopno razširile na ozemlje Slovenije, je bil napravljen v okviru evropskega projekta DAISIE (Delivering Alien Invasive Species Inventories for Europe) in upošteva vrste vnesene od sredine 18. stoletja dalje. Ta inventar obsega tudi več kot 130 vrst fitofagnih žuželk in pršic, ki jih štejemo med rastlinske škodljivce ali njihove proizvode. Več kot 50 % teh vrst je bilo vnesenih ali vsaj odkritih v zadnjih dveh desetletjih. Med temi izrazito prevladujejo enakokrilci (Hemiptera) – 76 vrst (56,7%), sledijo metulji (Lepidoptera) – 17 vrst (12,7%), hrošči (Coleoptera) – 15 vrst (11,2%), dvokrilci (Diptera) in resarji (Thysanoptera) – po 9 vrst (6,7%), kožokrilci (Hymenoptera) – 1 vrsta (0,7%) in pršice (Acari) – 4 vrste (3,0%). Med enakokrilci izrazito prevladujejo kaparji (Coccoidea) – 31 vrst (40,8%) in listne uši (Aphidoidea) – 26 vrst (34,2%). Največ tujerodnih fitofagnih žuželk izvira iz Azije – 44 vrst (32,8%) in Severne Amerike - 43 vrst (32,1%), sledita Afrika in Južna Amerika – po 12 vrst (9,0%), Avstralija in Nova Zelandija – 5 vrst (3,7%), ostalo so sredozemske, kozmopolitske in vrste neznanega izvora – skupaj 18 vrst (13,4%). V prispevku bo naveden celoten seznam tujerodnih fitofagnih vrst žuželk in pršic ugotovljenih na ozemlji Slovenije. Med temi je vsaj dva ducata takih, katerih pojavljanje v Sloveniji doslej še ni bilo javno publicirano.

ABSTRACT

Introduction dynamic and detecting of alien insect and mite pests of plants into Slovenia.

Chronological analysis of alien phytophagous insects and mites introduced or spread into Slovenia shows a quite stable dynamic till mid eighties of the last century, being increasing then rapidly in the last two decades. The rising globalisation of the world trades with plant material and plant products, the liberalisation of this trade in Slovenia after mid eighties, as well as the transitional geographical position of the country have played the most significant roll in an increasing spread of alien plant pests. The current situation presented here can partly be considered also as a result of an enhanced plant health survey and improved laboratory capabilities for identification of some groups of plant pests. The most recent list of alien insects and mites introduced or spread into Slovenia till now was made in the framework of the project DAISIE (Delivering Alien Invasive Species

Inventories for Europe). Species introduced since the mid of the 18th century up to now are considered. This list comprehends more than 130 species that can be considered as pests of plants or their products. More than 50 % of them have been discovered in the last two decades. The most numerous group are Hemiptera – 76 species (56,7%), followed by Lepidoptera – 17 species (12,7%), Coleoptera – 15 species (11,2%), Diptera and Thysanoptera – each with 9 species (6,7%), Hymenoptera – 1 species (0,7%) and mites (Acari) – 4 species (3,0%). Among Hemiptera scale insects (Coccoidea) – 31 species (40,8%) and aphids (Aphidoidea) - 26 vrst (34,2%) largely prevail. The major parts of alien plant pests originate from Asia – 44 species (32,8%) and North America - 43 species (32,1%), followed by Africa and South America with 12 species (9,0%) each, Australia and New Zealand – 5 species (3,7%). The remaining are Mediterranean or cosmopolitan species and species of uncertain origin – all together 18 species (13,4%). In the paper the comprehensive checklist of alien plant pest insects and mites up to now established in the territory of Slovenia will be presented. The occurrence in Slovenia of at least two dozens of these species has not been published yet properly.

Vibracijska komunikacija ameriškega škržatka *Scaphoideus titanus* (Hemiptera: Cicadellidae) prenašalca zlate trsne rumenice.

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Žuželke iz skupine Auchenorrhyncha (škržatki) so najpomembnejši prenašalci rastlinskih bolezni, ki jih povzročajo fitoplazme. Zlata trsna rumenica (Flavescence dorée) je ena najbolj nevarnih bolezni vinske trte in je uvrščena na II.A.II listo karantenskih škodljivih organizmov. Prenašalec te bolezni je ameriški škržatek vrste *Scaphoideus titanus*, ki izvira iz S Amerike in je bil v Evropi prvič najden v sredini prejšnjega stoletja. Ameriški škržatek je v Sloveniji splošno zastopan (Seljak, 1993) in leta 2005 so tudi pri nas ugotovili prvi primer okužbe z zlato trsno rumenico. Omejevanje okužbe z zlato trsno rumenico praviloma vključujejo tudi ukrepe za vzdrževanje nizke populacije ameriškega škržatka, ki predvidevajo obvezno uporabo insekticidov na celotnem širšem geografskem območju okužbe. Taki ukrepi niso v skladu z globalnim trendom zatiranja škodljivcev v vinogradništvu, katerega osnova je čim manjša uporaba kemičnih sredstev. Integrirana kontrola škodljivcev, naj bi temeljila na metodah, ki so usmerjene v preprečevanje in prekinitev parjenja. Take taktike običajno temeljijo na uporabi feromonskih pasti, vendar v primeru škržatkov tak pristop ni mogoč, saj ne proizvajajo kemičnih signalov in se v času parjenja sporazumevajo izključno z vibracijskimi signali, ki se prenašajo preko gostiteljskih rastlin (Čokl & Virant-Doberlet, 2003). Vibracijsko komunikacijo ameriškega škržatka na vinski trti smo raziskovali z laserskim vibrometrom (Mazzoni *et al*., 2009). Vrh akustične aktivnosti samcev ameriškega škržatka je bil v mraku, ko se le-ti selijo iz rastline na rastlino in iščejo samice. Stik med partnerjema se vzpostavi s pomočjo spontanega pozivnega napeva samca, na katerega se samica odzove. Odziv samice sproži

pri samcu oddajanje napeva dvorjenja ter iskanje samice in vibracijski signali samice hkrati omogočajo samcu, da jo na rastlini najde. Pomemben element vibracijske komunikacije ameriškega škržatka je močna tekmovalnost med samci, ki je izražena v obliki alternativnih taktik, kot so npr. motilni vibracijski signali, s katerimi rivalni samec prekine duet med samcem in samico. Vibracijski duet med samcem in samico je nujen, da samec lahko lokalizira samico in za uspešno parjenje, vendar je hkrati tudi izpostavljen rivalnim taktikam in ga rivalni samec z motilni signali z lahkoto prekine. Posledica teh prekinitev je zmanjšano število uspešnih parjenj.

ABSTRACT

Vibrational communication of the leafhopper *Scaphoideus titanus* (Hemiptera: Cicadellidae) vector of Flavescence dorée.

Insects from group Auchenorrhyncha are the most effective vectors of phytoplasma-associated plant diseases. The leafhopper *Scaphoideus titanus* Ball is the vector of Flavescence dorée (FD), one of the most damaging grapevine diseases in Europe. *S. titanus* is native to N America and its presence in Europe was first noticed in the 1950s. This species is widespread in Slovenia (Seljak, 1993) and for the first time in 2005 FD has also been recorded. Since FD is recognized as a quarantine disease, compulsory control measures include large-scale treatments of vineyards with insecticides. However, such approach is not in agreement with a current trend in pest control strategies that aim to reduce chemical input in viticulture. Sustainable management strategies for insect vectors should include methods that are targeted to disrupt such interactions as reproductive behaviour. Integrated pest management tactics usually rely on pheromone dispensers to disrupt mating behaviour of pest species however, up to now there is no evidence that chemical communication plays a role in reproductive behaviour of leafhoppers. Mate recognition and behaviour in Auchenorrhycha are mediated via vibrational signals transmitted through their host plants (Čokl & Virant-Doberlet, 2003). Vibrational signals of *S. titanus* were recorded from grapevine leaves with a laser vibrometer (e.g. Mazzoni *et al*., 2009). Signalling activity of single males changed throughout the day and the peak in activity was associated with twilight when 'call and fly' behaviour was observed. Pair formation began with spontaneous emission of male calling signals and female vibrational signals were emitted only in response to male signals. Female reply triggered the emission of male courtship phrase and searching for the female. A unique feature of vibrational communication in *S. titanus* is a well-developed intrasexual competition; males may use alternative tactics in the form of disturbance signals to disrupt an existing duet between male and female. While the male-female duet appears to be essential for successful localization of a female and copulation it is also vulnerable to, and easily disrupted by, alternative tactics. Disruptive signals significantly reduce the number of successful copulations.

Herbologija in varstvo rastlin pred pleveli

Nove plevelne vrste v Sloveniji – ocena dinamike prehoda iz ruderalnih v plevelne združbe njivskih površin in trajnih nasadov

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V prispevku je predstavljena dinamika prehajanja nekaterih novih (neofitnih) plevelnih vrst iz ruderalnih plevelnih združb v plevelne združbe njiv in trajnih nasadov Slovenije. Obravnavane so plevelne vrste iz naslednjih rodov: *Amaranthus, Acalifa, Ambrosia, Artemisia, Asclepias, Aster, Bidens, Chenopodium, Commelina, Conyza, Cyperus, Dittrichia, Echinochloa, Eleusine, Euphorbia, Iva, Nicandra, Senecio, Setaria, Sporobolus, Solanum, Panicum, Phalaris, Physalis, Paspalum, Phytollaca, Polygonum, Reynoutria, Sycious, Tagetes* in druge. Podane so ocene potencialne gospodarske škodljivosti obravnavanih vrst v bodočnosti.

ABSTRACT

New weed species in Slovenia – estimation of dynamics of transition from ruderal to field crop and perennial crop weed communities

The dynamics of transition of new (neophyte) weed species from ruderal to field crop and perennial crop weed communities of Slovenia is presented. Weed species included in the study are members of the following genera: *Amaranthus, Acalifa, Ambrosia, Artemisia, Asclepias, Aster, Bidens, Chenopodium, Commelina, Conyza, Cyperus, Dittrichia, Echinochloa, Eleusine, Euphorbia, Iva, Nicandra, Senecio, Setaria, Sporobolus, Solanum, Panicum, Phalaris, Physalis, Paspalum, Phytollaca, Polygonum, Reynoutria, Sycious, Tagetes* and others. Estimates about the potential future economic impacts of studied species are included.

Flaming: New Tool for Weed Control in Agronomic Crops

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There is an increased interest in organic production among farmers and industries in the United States. This interest is based on the increasing consumer demand for organic foods. Organic producers rank weeds as their number one problem, therefore field experiments were conducted during summers of 2007 and 2008 to determine a baseline information on crop and weed tolerance to broadcast flaming utilizing different rates of propane. The species evaluated were: maize (*Zea mays*), sorghum (*Sorghum halepense*), soybean (*Glycine max*), sunflower (*Helianthus annuus*), barnyardgrass (*Echinochloa crus-galli*), green foxtail (*Setaria viridis*), velvetleaf (*Abutilon theophrasti*) and redroot pigweed (*Amaranthus retroflexus*). The propane rates applied were 0, 12.1, 30.9, 49.7, 68.5 and 87.22 kg/ha. Species response to propane rates were described by log-logistic models. Overall response to flame varied depending on the species, growth stage and propane rate. Broadleaf weeds were more susceptible to flames than grasses. Field maize and sorghum were less susceptible, while soybean and sunflower were severely injured. Of all crops

tested, broadcast flaming has the most potential for use in field maize. However, more research is needed to evaluate flaming procedures (eg. positioning of the flame) in other grass-type crops, and various broadleaf crops.

ABSTRACT

Uporaba plamena - nova možnost zatiranja plevelov v sistemih ekološke pridelave

V ZDA opažamo porast zanimanja za uvajanje sistemov ekološkega pridelovanja tako s strani pridelovalcev, kot s strani predelovalne industrije. Porast temelji na podlagi povečanega povpraševanja potrošnikov po ekoloških pridelkih. Ekološki pridelovalci štejejo zatiranje plevelov, kot eno najpomembnejših težav pri pridelovanju, zato smo pričeli v letih 2007 in 2008 izvajati poljske poskuse za pridobivanje temeljnih informacij o tolerantnosti plevelov in gojenih rastlin na ožiganje pri tehnikah zatiranja plevel z uporabo usmerjenega plamena pri izgorevanju propana. Rastline pri katerih smo preučevali tolerantnost na ožiganje so bile: koruza (*Zea mays*), sirek (*Sorghum halepense*), soja (*Glycine max*), sončnica (*Helianthus annuus*), kostreba (*Echinochloa crus-galli*), muhvič (*Setaria viridis*), oslez (*Abutilon theophrasti*) and ščir (*Amaranthus retroflexus*). Preučili smo učinke porabe naslednjih odmerkov propana: 0; 12,1; 30,9; 49,7; 68,5 in 87,22 kg/ha. Odziv rastlin na ožiganje z različnimi odmerki propana je prikazan s pomočjo krivulj log-logističnih odzivnih funkcijskih modelov. Na splošno je bil odziv (stopnja poškodb) odvisen od interakcije med vrsto rastline, razvojnim stadijem in odmerkom propana. Širokolistni pleveli so bili bolj občutljivi za ožiganje, kot trave. Koruza in sirek sta bila manj občutljiva, kot soja in sončnica, ki sta zaradi izpostavljenosti plamenu utrpeli zelo močne poškodbe. Od vseh preučevanih poljščin so najboljši izgledi za uspešno uporabo plamena za zatiranje plevelov pri koruzi. Potrebne so še nadaljnje raziskave za prilagoditev optimalnih delovnih parametrov naprav za ožiganje s plamenom (npr. določitev ustrezne usmerjenosti plamena) za zatiranje plevelov prilagojeno različnim tipom poljščin.

Zatiranje plevela z ožiganjem

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V letu 2007 smo v Sloveniji porabili 1155,2 tone fitofarmacevtskih sredstev (FFS) za pridelavo kmetijskih pridelkov (vir: FURS, 2008). Glede na količino porabljenih FFS, je v slovenskem prostoru dobrodošla vsaka alternativa za varstvo rastlin pred boleznimi, škodljivci in pleveli. Naprava za ožiganje plevelov naj bi zmanjšala porabo herbicidov v poljedelstvu in s tem pripomogla k pridelavi kakovostnejše hrane. Dosedanje izkušnje pri delu z napravo potrjujejo smiselnost nadaljnjega dela na področju ožiganja plevelov.

ABSTRACT

Weed control with flaming

In 2007, 1155.2 tons of plant protection products (PPP) were used in Slovenia when growing the crops (source: FURS, 2008). Due to the extended usage of PPP, any alternative in the protection of plants against diseases, pests and weed would be welcome in Slovenia. A weed singeing device could reduce the use of herbicides in the agriculture

and thus help to produce food products of higher quality. Experience gained during the work with the above-mentioned device has demonstrated that further work in the field of weed singeing is eligible and welcome.

Herbicidi v prvoletnih nasadih hmelja in v ukoreniščih

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V poljskem poskusu smo proučevali pet herbicidov v različnih odmerkih in terminih uporabe v prvem letu po sajenju sadik hmelja - $CS_{A,}$ CS_B (*Humulus lupulus* L.) in fižola (*Phaseolus vulgaris* L.). V prvem letu po sajenju hmelja in v ukoreniščih je za zatiranje plevelov potrebno ogromno ročnega dela. Številni hmeljarji v prvoletne nasade hmelja sadijo tudi fižol. Želeli smo dobiti informacije, kako delujejo in vplivajo na rastlino hmelja in fižola nekateri pri nas registrirani herbicidi, katere že uporabljamo v poljedelstvu in vrtnarstvu. Poskus je bil zastavljen bločno, v treh ponovitvah. Poskus smo ocenili po štirih in po osmih tednih od škropljenja. Učinkovitost in fitotoksičnost herbicidov in njihovih kombinacij smo ocenjevali z vizualno procentualno metodo. V skupni oceni obravnavanja smo zajeli učinkovitost na zastopane plevelne vrste in morebitno fitotoksičnost za hmelj in fižol. Na podlagi Dobre prakse varstva rastlin in rezultatov opravljenega poskusa je po našem mnenju herbicid Stomp 400 SC, z aktivno snovjo pendimetalin, ustrezen za postopek razširitve registracije za zatiranje plevelov v prvem letu po zasaditvi hmeljišč in v ukoreniščih.

ABSTRACT

Herbicides in the first-year hop plants and in propagation nurseries

In the IHPS field experiment, five herbicides in different amounts and terms of use were investigated in the first year after hop - $CS_{A,}$ CS_B (*Humulus lupulus* L.) and bean (*Phaseolus vulgaris* L.) plantation. Vast quantum of manual work is required for weeds´ extermination in the first year after hop plantation and in propagation nurseries. Many hop growers plant bean in the first-year hop plants too. We wanted to get the information of that how some by us registered herbicides used in agriculture and horticulture act and influence on hop plant and bean. The experiment was blocked made, in three repetitions. The experiment was estimated after four and after eight weeks from spraying. We applied visual percentage method and estimated herbicides' efficacy and phytotoxicity and their combinations. In common treatment estimation the efficacy on possibly presented weeds and on eventuelly phytotoxicity for hop and bean were included. Our opinion is that on the basis of Good Plant Protection Practice and on the basis of the results of the experiment made the herbicide Stomp 400 SC with its active substance pendimetalin is, in our opinion, suitable for procedure of registration´ expansion for extermination of weeds in the first year after hop plants planting and in propagation nurseries.

Herbicide Tolerant Crops in USA: A decade later

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Herbicide tolerant crops (HTC) are a common part of the cropping systems in North America. Objective of this manuscript was to provide a brief overview of advantages and disadvantages with the widespread use of HTCs over the last 8-10 years. Examples of advantages include: (1) broadened spectrum of weeds controlled, (2) increased crop safety, (3) reduced risk of herbicide carryover, (4) price reduction for conventional herbicides, (5) new mode of action for triazine and ALS resistance management, and (6) crop management simplicity. Major disadvantages and concerns include: (1) performance and quality of yields, (2) single selection pressure and herbicide resistance, (3) shifts in weed species, (4) gene flow and gene escape, (5) contamination of organic crops which are becoming popular in developed world and (6) herbicide drift and non-target movement. We believe that it is easy to fall into a trap of overusing, for example, glyphosate when one glyphosate-tolerant crop is grown after another. Therefore, proper use of HTC technology, as a component of integrated weed management program, is the key to preserving the long-term benefits of this technology while avoiding many of the concerns about their use, or misuse.

ABSTRACT

Gensko spremenjene poljščine odporne na herbicide – stanje v ZDA desetletje po uvedbi v pridelavo

Pridelovanje gensko spremenjenih (GS) poljščin odpornih na herbicide je sestavni del pridelovalnih tehnologij na območju severne Amerike. Namen prispevka je predstaviti pregled koristi in težav, ki so povezane z gojenjem gensko spremenjenih poljščin v obdobju zadnjih 8 – 10 let. Osnovne koristi pridelave GS poljščin so: (1) razširitev spektra plevelnih vrst, ki jih je možno uspešno zatirati, (2) povečana selektivnost herbicidov za poljščine, (3) zmanjšanje težav z ostanki herbicidov v tleh v kolobarnem sistemu in zmanjšana kontaminacija tal z njihovimi ostanki, (4) zmanjšanje cen herbicidov, (5) lažje reševanje težav z odpornostjo pri plevelih odpornih na triazinske in ALS herbicide in (6) poenostavitev tehnike pridelovanja poljščin. Glavne težave in pomisleki v zvezi z uvajanjem GS poljščin so: (1) doseganje ustreznih standardov glede količine in kakovosti pridelkov, (2) povečan selekcijski pritisk glede odpornosti plevelov na herbicide na katere so odporne GS poljščine – začetki razvoja odpornosti, (3) spremembe v vrstni sestavi plevelnih populacij, (4, 5) genska kontaminacija sosednjih konvencionalnih in ekoloških posevkov, (6) pojavi drifta pri neselektivnih herbicidih. Izkušnje kažejo, da se lahko ujamemo v past pretirano pogoste uporabe herbicidov na katere so odporne GS poljščine, če te predstavljajo največji del kolobarnih členov. Zaradi tega je pri pridelovanju GS poljščin nujno izvajanje integriranih pristopov pri zatiranju plevelov. Implementacija le teh je ključ do dolgoročnega izkoriščanja koristi GS pridelovalne tehnologije in uspešnega izogibanja pojavu neželenih posledic prepogoste ali napačne rabe.

Preučevanje učinkovitosti herbicidov za zatiranje pelinolistne ambrozije (*Ambrosia artemisifolia* L.) v Sloveniji

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Pelinolistna ambrozija (*Ambrosia artemisifolia* L.), kot invazivna enoletna rastlinska vrsta, predstavlja v Evropi zaradi povzročanja inhalacijskih alergij eno najpomembnejših plevelnih vrst. V zadnjih letih se močno širi tudi v Sloveniji, kjer se iz nekmetijskih površin širi na njive z različnimi posevki kot so koruza, krompir, sladkorna in krmna pesa, vrtnine, krmne rastline ter žita. Z namenom preprečevanja širjenja ambrozije smo v letih med 2005 in 2008 v poljskih poskusih preučevali učinkovitost herbicidov, ki jih v Sloveniji uporabljamo za zatiranje plevelov v poljščinah, trajnih nasadih, strniščih ter na nekmetijskih zemljiščih. Na podlagi rezultatov je mogoče ugotoviti, da imamo v Sloveniji dovolj učinkovitih herbicidov, s katerimi lahko ob upoštevanju ter uporabi ostalih posrednih ter neposrednih nekemičnih ukrepov kot so ustrezen kolobar, obdelava tal ter oskrba gojenih rastlin, učinkovito zatiramo ter preprečujemo širjenje te plevelne vrste.

ABSTRACT

The investigation of herbicide efficacy on Common ragweed (*Ambrosia artemisifolia* L.) in Slovenia

Due to causing inhalation allergies, the common ragweed (*Ambrosia artemisifolia* L.), an invasive annual plant, is one of the most important weed species in Europe. It has been spreading very intensively in the last few years, also in Slovenia, from non-crop land to different crops such as maize, potatoes, sugar and fodder beet, vegetables, fodder plants and cereals. In order to investigate the efficacy of herbicides registered to control the weeds in different crops and non-crop land in Slovenia on this weed species, field trials were carried out from 2005 to 2008 in different crops and non-crop land. From the results it could be seen that in Slovenia there is a sufficient number of effective herbicides to control the common ragweed and to prevent its spreading. Especially, if all other recommended direct and indirect non-chemical techniques of field-crop production such as proper crop rotation, tillage system, and cultivation of plants causing decrease of the number of weed seeds are used.

Preverjanje učinkovitosti herbicidov za zatiranje žitne stoklase (*Bromus secalinus* L.)

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V poljskem poskusu smo preučevali biotično učinkovitost delovanja herbicidov na plevel žitno stoklaso (*Bromus secalinus* L.). Tri dni po setvi ječmena jeseni smo na poskusne parcelice ročno posejali seme stoklase (300 semen m^{-2}) in ga z grabljami zadelali v tla na globino 2 cm. Aplikacijo herbicidov na podlagi izoproturona, diflufenikana, prosulfokarba, triasulfurona, pinoksadena in propoksikarbazona smo izvedli v treh različnih terminih z nahrbtno škropilnico za izvajanje poskusov pri porabi vode 350 l ha^{-1}. Najvišja biotična učinkovitost 99,2 % je bila ugotovljena pri herbicidu na podlagi propoksikarbazona in se je statistično značilno razlikovala od drugih herbicidov.

ABSTRACT

Testing of herbicide efficacy for rye brome grass (*Bromus secalinus* L.) control

A field trial was carried out to evaluate the biological efficacy of herbicides for control of rye brome grass (*Bromus secalinus* L.). Three days after autumn sowing of barley, rye brome seeds (300 seeds m^{-2}) were seeded onto trial plots by hand and incorporated into soil by rake to depth of 2 cm. Herbicides based on isoproturon, diflufenican, prosulfocarb, triasulfuron, pinoxaden and propoxycarbazone were applied at three different periods by knapsack sprayer adapted for trial plot spraying and delivering 350 l ha^{-1} of spray. The highest biological efficacy was achieved by the application of herbicide based on propoxycarbazone and was statistically significantly higher of all other tested herbicides.

Rezultati preizkušanja herbicidov proti plevelom v soji

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V letu 2007 smo v enoletnem poljskem poskusu preizkušali delovanje herbicidov proti plevelom v navadni soji (*Glycine max* (L.) MERR.). V poskusu je bilo uporabljenih devet različnih herbicidov v različnih kombinacijah. Uporabljeni so bili Stomp 330 EC (pendimetalin), Dual Gold 960 EC (S-metolaklor), Sencor WG 70 (metribuzin), Afalon (linuron), Harmony 75 WG (tifensulfuron-metil), Focus ultra (cikloksidim), Basagran 600 (bentazon), Plateen WG 41,5 (metribuzin + flufenacet) in Fusilade forte (fluazifop-p-butil). Pokrovnost plevelov v kontroli – neškropljeno je znašala 94,5%, v najvišjem deležu pa je bil, na neškropljenih poskusnih parcelicah, zastopan plevel navadna kostreba – *Echinochloa crus-galli* (90,0%), ostali pleveli pa so bili zastopani v 1 – 4% deležu. Najvišjo učinkovitost je pokazala kombinacija herbicidov Basagran 600 + Dual Gold 960 EC (96,5%), visoko učinkovitost pa sta še tudi pokazali kombinaciji Plateen WG 41,5 + Basagran 600 (93,9 %) in Sencor + Dual Gold 960 EC (93,0%). Na nobeni od poskusnih parcelic ni bilo mogoče opaziti fitotoksičnosti.

ABSTRACT

Results of herbicide testing against weeds in soya bean

In year 2007, we are in the one-year experiment testing the efficiency of herbicides against weeds in the soya bean (*Glycine max* (L.) Merr.). The experiment has been used nine different herbicides in various combinations. The herbicides were Stomp 330 EC (pendimethalin), Dual Gold 960 EC (S-metolachlor), Sencor WG 70 (metribuzin), Afalon (linuron), Harmony 75 WG (thifensulfuron-methyl), Ultra Focus (cikloksidim) Basagran 600 (bentazone) Plateen WG 41.5 (metribuzin + flufenacet) and Fusilade forte (fluazifop-p-butyl). Coverage of weeds in control – non treatment was 94.5%, the highest proportion on the non-treatment experimental plots, was represented with weed Barnyardgrass – *Echinochloa crus-galli* (90.0%), other weeds were represented in the 1 - 4% share. The maximum efficiency has shown a combination of herbicides Basagran 600 + Dual Gold 960 EC (96.5%), also high efficiency has shown a combination of Plateen WG 41.5 + Basagran 600 (93.9%) and Sencor + Dual Gold 960 EC (93.0%). On any trial plot has not been observed phytotoxicity.

Možnosti za kemično zatiranje plevelov v posevkih maka (*Papaver somniferum*)

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V enoletnem poljskem poskusu smo preučevali možnost zatiranja plevelov v posevkih maka (*Papaver somniferum*). Uporabili smo 9 herbicidov na podlagi prosulfokarba, klomazona, petoksamida, S- metolaklora, pendimetalina, izoksaflutola, bromoksinil oktaonata, mezotriona in fluazifop-p-butila. Ugotavljali smo biotično učinkovitost in fitotoksičnost uporabljenih herbicidov. Kot ustrezne herbicide za zatiranje plevelov v maku predlagamo uporabo herbicidov na podlagi prosulfokarba, klomazona, petoksamida, S-metolaklora, mezotriona in fluazifop-p-butila. Herbicida na podlagi izoksaflutola in bromoksinila sta povzročila srednje močno fitotoksičnost na rastlinah maka. Herbicid z aktivno snovjo pendimetalin ne ustreza za uporabo v maku.

ABSTRACT

Possibilities for chemical weed control in oil-seed poppy (*Papaver somniferum)* fields

A field experiment was conducted to evaluate herbicides in order to find suitable ones for the control of weeds in oil-seed poppy (*Papaver somniferum*) in Slovenia. Nine herbicides based on prosulfocarb, clomazone, petoxamide, S-metolachlor, pendimethalin, izoxaflutol, bromoxinil oktaonat, mesotrione and fluazifop-p-butil were evaluated in terms of efficacy to control weeds and phytotoxicity for oil-seed poppy plants. The herbicides based on prosulfocarb, clomazone, petoxamide, S-metolachlor, mesotrione and fluazifop-p-butil could be recommended for the use in oil-seed poppy. Herbicides based on izoxaflutol and bromoxinil were moderately phytotoxic to oil-seed poppy. Herbicide pendimethalin can not be recommended for the control of weeds in oil-seed poppy.

Usmerjeno zatiranje plevelov v koruzi s herbicidom Akris®

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Nekaj zadnjih let zatiranje plevelov v koruzi takoj po setvi s talnimi herbicidi v Sloveniji, v mnogih primerih, ni bilo dovolj učinkovito. Vzrok za to je pomanjkanje vlage v tleh v času, ko je uporaba talnih herbicidov priporočljiva. Akris je herbicid sestavljen iz dveh aktivnih snovi: terbutilazina in dimetenamid-P-a. Sinergističen učinek obeh zagotavlja uspešno zatiranje semenskih širokolistnih in ozkolistnih plevelov v koruzi pred vznikom in zgodaj po njem. V kombinaciji s foliarnimi herbicidi ga je mogoče uporabiti tudi v fazi, ko imajo pleveli 4 liste.

ABSTRACT

Oriented application with herbicide Akris® in maize

Efficacy of maize soil herbicides was in Slovenia last years poor. Dry soil in application time is reason for poor efficacy. Maize herbicide Akris is combination of two a.s. Terbutylazine and Dimethenamid-P. Synergistic effect assure very good broadleaf and grass weeds control in pre and early posteemergence application. In tankmix, with foliar herbicides, can use Akris till 4 leafs weeds stage too.

Varstvo sadnega drevja

Analiza zastopanosti posameznih skupin fitofarmacevtskih sredstev v škropilnih programih varstva jablanovih nasadov v letih 2007 in 2008

Gustav MATIS

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Letos je minilo že osemnajst let od začetka organizirane integrirane ali okolju prijazne pridelave jabolk v Sloveniji. Ta način pridelave je brez dvoma veliko pripomogel k ohranjanju ekosistema v trajnih nasadih. K temu je prav gotovo precej prispevala selektivna in oportuna uporaba FFS. V prispevku želimo prikazati zastopanost posameznih skupin FFS v 26 oz. 30 škropilnih programih. Skupna površina nasadov, ki smo jih zajeli v analizo ali preverjanje je znašala v prvem 780 in v drugem letu 900 ha. Poleg številčnosti uporabe FFS smo pozornost posvetili odstopanjem glede števila dovoljenih uporab za posamezne skupine-navedene v tehnoloških navodilih. Ugotavljamo, da je velika večina tržnih pridelovalcev jabolk upoštevala predpisane omejitve in tako prispevala k trajnostni uporabi določenih pripravkov za zatiranje jablanovega škrlupa in jabolčnega zavijača, ki zahtevata daleč največ škropljenj.

ABSTRACT

Analysis of representation of individual groups of plant protection products in spraying programmes for protection of apple orchards in years 2007 and 2008

As of this year, eighteen years have passed since the beginning of the organised integrated or environmentally friendly production of apples in Slovenia. This method of production has undoubtedly contributed significantly to the preservation of the ecosystem in permanent crops. The selective and opportune use of plant protection products has surely contributed a great deal thereto. In this article we wish to demonstrate the representation of individual groups of plant protection products in 26 or 30 spray programmes. The total area of orchards included in this analysis or evaluation amounted to 780 ha in the first year and 900 ha in the second year. In addition to the amount of the plant protection products used, we paid attention to derogations regarding the number of authorised uses for individual groups, laid down in technological instructions. We have established that a large number of market apple producers have followed prescribed limitations and thereby contributed to the sustainable use of certain preparations used for the control of apple scab and apple borer, which by far require the most spraying.

Strategija zatiranja jabolčnega zavijača (*Cydia pomonella*) v razmerah naraščajoče odpornosti

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Jabolčni zavijač je najbolj znan in razširjen škodljivec jabolk. Škoda, ki jo povzroča iz leta v leto niha, doseže pa lahko tudi 20 do 50 % črvivih plodov, izjemoma pa tudi več. V tehnoloških navodilih za integrirano pridelavo sadja za leto 2008 je med drugim tudi zapisano: "cilj pri zatiranju jabolčnega zavijača je da izvedemo največ štiri neposredne

uporabe insekticidov. V zadnjem obdobju v številnih nasadih z zelo velikimi populacijami metuljčkov in z delno odpornostjo na nekatere insekticide takšen pristop ne zagotavlja popolnega varstva, kljub temu pa ne smemo preveč lahkomiselno povečevati števila škropljenj". Prenekateri sadjar (tehnolog) in svetovalec se sprašuje kako doseči ta cilj. Rezultati analize 26 škropilnih programov varstva jablan iz leta 2007, ki so bili uporabljeni na 780 ha kažejo, da je bilo proti jabolčnemu zavijaču v povprečju opravljenih 6 tretiranj z insekticidi (največ 8). Na osnovi izkušenj in opravljenih poskusov v zadnjih letih želimo opozoriti na razpoložljive možnosti učinkovitega zatiranja ob doslednem upoštevanju antirezistentne strategije.

ABSTRACT

Strategy to combat the apple borer (*Cydia pomonella*) in conditions of increased resistance

The apple borer is the most common and well-known apple pest. The damage it causes varies every year, but it can reach as much as 20 to 50% of grubby fruits, and sometimes even more. The technological instructions for the integrated production of fruits for the year 2008 also lay down the following: "the objective of the apple borer control is to perform four direct uses of insecticides at most. In the last period, in numerous orchards, with large populations of butterflies and partial resistance to some insecticides, this approach does not ensure a perfect protection, however in spite of that, we may not increase the number of sprays too carelessly." Many fruit producers (technologists) are wondering how to reach this objective. Analysis of the 26 spray programmes for the apple trees protection in 2007 as used in 780 ha show that on average, as few as 6 insecticide treatments and as many as 8 were carried out against the apple borer. Based on experiences and tests performed in the last years, we would like to point out the available options for effective control, while consistently following the anti-resistance strategy.

Spremljanje sezonske dinamike orehove muhe (*Rhagoletis completa* Cresson) v letu 2008 z rumenimi lepljivimi ploščami in rezultati preizkušanja insekticidov

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V poskusu zatiranja orehove muhe, izvedenem na sortah 'Novosadski kasni' in 'Franquette' smo uporabili insekticide Perfekthion, Calypso in GF 120. V kontroli - neškropljeno je bil delež v celoti napadenih plodov 45,9% ('Novosadski kasni') oziroma 45,6% ('Franquette'). Med preizkušenimi insekticidi smo na sorti 'Franquette' ugotovili 35,7% plodov s popolnoma poškodovano lupino pri insekticidu Perfekthion, pri insekticidu Calypso 32,1 % in pri insekticidu GF 120 33,7%. Na sorti 'Novosadski kasni' je imelo pri insekticidu Perfekthion 38,6% plodov popolnoma poškodovano lupino, pri insekticidu Calypso 32,2% in pri insekticidu GF 120 42,9%. V letu 2008 smo z rumenimi lepljivimi ploščami spremljali let orehove muhe v orehovih nasadih Maribor in Razvanje. Let imaga na lokaciji Maribor z dvema vrhoma leta (31.7. in 8.9.) se je pričel v ob koncu julija in končal v začetku druge dekade septembra, na lokaciji Razvanje pa se je pričel v

sredini druge dekade julija in končal v začetku druge dekade septembra. Vrh leta je bil 31.7. in 14.8.

ABSTRACT

Seasonal dynamics of walnut husk fly (*Rhagoletis completa* Cresson) monitored with yellow sticky plates and results of insecticide testing against walnut husk fly

In the examination we tested efficiency of insectidices Perfektion, Calypso and GF 120 against walnut husk fly in a year 2008. Trial was done on cultivars 'Novosadski kasni' and 'Franquette'. On the non treatment control, the percentage of completely infested nuts was 45.9% ('Novosadski kasni') and 45.6% ('Franquette') respectively. In 'Franquette', the percentage of completely infested nuts was 35.7 after spraying with Perfekthion, 32.6% after using Calypso, and 33.8% when GF 120 was used. In 'Novosadski kasni', there were 38.6% of completely infested nuts (Perfekthion), 32.2 % (Calypso), and 42.9 % (GF 120). With yellow sticky plates we monitoring the seasonal dynamics of walnut husk fly on the locations Maribor and Razvanje. The adults were present between middle of July and middle of September on both locations. Two peaks of population were presented, the first one at 31st of July, and the second at 8th of September (Maribor) and 14th of August (Razvanje).

Bellis – izkušnje uporabe iz prakse

Aleš GROBIN

METROB d.o.o.

Skladiščne bolezni jablan in hrušk so povzročitelj gospodarsko pomembnih izgub pridelka v hladilnicah. Za zmanjšanje teh izgub so slovenski sadjarji pred letom 2007 med ostalim lahko uporabljali tudi fitofarmacevtske pripravke z aktivno snovjo tolifluanid. Bistvena prednost tovrstnih pripravkov je bila kratka karenca. Po prenehanju dovoljenja za njihovo uporabo v Sloveniji nismo imeli ustreznega nadomestila. Vrzel je v letu 2007 nadomestil nov pripravek s kombinacijo aktivnih snovi piraklostrobin in boskalid, Bellis. Pripravek se uporablja za zaključna tretiranja jablan in hrušk. Dovoljenje za uporabo v Sloveniji je bilo zaradi vrzeli na tržišču in potrebah po nadomestitvi predhodnih izdano zelo hitro. Izkušnje z uporabo pripravka so imeli le sadjarji v Italiji. Ob uvedbi pripravka na trg je bila zato izkazana izrazita potreba po potrditvi proizvajalčevih praktičnih izkušenj v slovenski praksi. V letu 2007 smo zato izvedli obsežno testiranje pripravka Bellis v podjetju Evrosad d.o.o. Poskus je zajemal 18 ha sadovnjakov in tri, pri nas gospodarsko najpomembnejše kultivarje jabolk, jonagold, zlati delišes in idared. Izvedeni sta bili dve tretiranji z odmerkom 0,8 kg/ha ob koncu rastne dobe. Jabolka kontrolne variante so bila tretirana v istih terminih s pripravkom na osnovi učinkovine kaptan. Vsa jabolka so bila skladiščena v istih skladiščnih razmerah, ločeno po sortah, v več hladilnih komorah z uporabo Smart Fresh. Izvrednotenje poskusa smo izvedli teden dni po odpiranju komor konec meseca aprila in junija. Ocenjenih je bilo po 400 plodov vsakega obravnavanja. Ocena je vsebovala delež gospodarsko najpomembnejših skladiščnih bolezni na plodovih. Ugotovili smo pozitiven doprinos tretiranja z Bellisom v primerjavi s kontrolo. Pozitiven vpliv tretiranja opravičuje finančna vlaganja v varstvo jabolk s pripravkom Bellis.

ABSTRACT

Bellis – practical experiences of use

Storage diseases of apples and pears are the cause of economically important losses of the yield in cold stores. In order to minimise these losses before the year 2007, Slovenian fruit producers were able to, among others, use plant protection preparations containing the active substance tolylfluanid. The essential advantage of these preparations was a short withdrawal period. However, after the authorisation for their use was revoked, there was no appropriate substitute. The gap that had been left in 2007 was filled by a new preparation, Bellis, containing a combination of the active substances pyraclostrobin and boscalyd. This preparation is used for the end treatment of apples and pears. Authorisation for use in Slovenia was issued very quickly, not only because of the market gap but also because of the need to replace the previous products. Only fruit producers in Italy had had experience with the use of this preparation. Therefore, when the preparation was introduced on the market there was a distinctive need to confirm producer's practical experiences in Slovenian practice. Therefore, extensive testing of the Bellis preparation was carried out in 2007 in the company Evrosad d.o.o. The experiment included 18 ha of the orchards, and included three of Slovenia's most important apple cultivars, Jonagold, Golden Delicious and Idared. Two treatments with a dosage of 0.8 kg/ha were carried out at the end of the growing season. Apples of the control variant were treated in the same periods with a preparation based on the active substance captan. All apples were stored under the same conditions, separated by variety in several cold chambers, with the use of Smart Fresh. We evaluated the experiment one week after the opening of the chambers, at the end of May and June. 400 fruits of each treatment were evaluated. The assessment included a portion of the most economically significant storage diseases of fruits. We have established a positive contribution of Bellis treatment compared to the control. The positive influence of the treatment justifies financial investments in the apple tree protection using the Bellis preparation.

Varstvo vinske trte

Rezultati preizkušanja insekticidov proti ameriškemu škržatku v letu 2008

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V letu 2008 smo v vinogradu sorte ´laški rizling´ preizkušali delovanje insekticidov na ameriškega škržatka, *Scaphoideus titanus* Ball. Preizkušali smo insekticide Steward (Indoksakarb) in Reldan 22 EC (Klorpirifos-metil) v različnih terminih in kombinacijah. Populacijo ameriškega škržata smo spremljali z rumenimi lepljivimi ploščami tipa Trece – Pherocon AM 22 x 18 cm. Rezultati so pokazali, da škropljenje v danem terminu ni statistično značilno zmanjšalo populacije ameriškega škržata.

ABSTRACT

RESULTS OF INSECTICIDES TESTING AGAINST LEAFHOPPER *Scaphoideus titanus Ball* IN THE YEAR 2008

In 2008 we tested insecticides against leafhopper *Scaphoideus titanus Ball*. The trial was done in the vineyard of the variety ´Italian Riesling´. We tested insecticides Steward (indoxacarb) and Reldan 22 EC (Chlorpyrifos-methyl) in different periods and combinations. We track the population of *Scaphoideus titanus Ball* with yellow sticky plates of type Trece - Pherocon AM 22 x 18 cm. Results showed, that spraying in a given period has not statistically significantly reduced the population of leafhopper.

Pergado – biotične lastnosti in delovanje na peronosporo vinske trte (*Plasmopara viticola*)

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Mandipropamid je nov fungicid, ki ga je razvila družba Syngenta in je namenjen varstvu rastlin pred patogeni iz družine Oomycetes. Pergado, ki je pripravek na osnovi mandipropamida in folpeta se priporoča v preventivnih programih varstva pred peronosporo vinske trte (*Plasmopara viticola*). Mandipropamid je izredno učinkovit pri preprečevanju kalitve spor poleg tega pa deluje tudi kot inhibitor rasti micelija in sporulacije. Po foliarni aplikaciji se velik del mandipropamida vnese v voščene plasti rastlinskih tkiv. Iz depozita na listni površini in iz voščenih plasti se aktivna snov postopoma globinsko prenaša v rastlinsko tkivo, kar zagotavlja zanesljivo translaminarno delovanje in zmerno kurativno delovanje v začetku okužbe. Mandipropamid je varen pred izpiranjem z dežjem, čim se obloga na površju rastline posuši. Biotične ter fizikalno kemične lastnosti zagotavljajo stalno odlično varovanje grozdja in listov tudi v neugodnih vremenskih razmerah. Je izredno učinkovit v nizkih hektarskih odmerkih, ki znašajo od 100 – 150 gramov aktivne snovi na hektar ali 10 – 15 g a.s./100 L vode. Aktivno snov odlikuje tudi visoka selektivnost do gojenih rastlin. Nenazadnje pa ima mandipropamid izredno ugoden toksikološki profil na področju humane toksikologije in toksikologije okolja ter živali. Pripravki kot so Revus, Revus MZ ter Pergado so tržna imena formulacij čistega mandipropamida ali pa kombinacij z dodano kontaktno komponento.

ABSTRACT

Pergado - biological properties and performance against downy mildew on grapes

Mandipropamid is a new fungicide developed by Syngenta for the control of Oomycete pathogens. Mandipropamid is recommended as preventive treatment for the control of downy mildew (*Plasmopara viticola*) in grapes. It is highly effective in preventing spore germination. It also inhibits mycelial growth and sporulation. Following application a significant proportion of the active ingredient binds rapidly to the wax layer of plant surfaces. Mandipropamid is highly rainfast as soon as the spray deposit has dried. From the surface deposit and the material adsorbed to the epicuticular wax small amounts of active ingredient migrate progressively into the plant tissue. Due to the high intrinsic activity the amount taken up into the plant tissue is sufficient to provide good translaminar activity and curative disease control during the incubation period. These biological and physico-chemical properties explain the consistently excellent disease control observed on leaves and bunches also under adverse weather conditions. Mandipropamid is highly effective at low application rates of 100-150 g a.i./ha or 10-15 g a.i./100 litres spray solution. The compound is characterized by excellent crop safety. It also has a very favourable profile with regard to human safety and safety to wildlife and the environment.

Pinus DuPont: Talendo® - nov standard v varstvu vinske trte

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Prokvinazid (DPX-KQ926; Talendo®) je nova aktivna snov podjetja DuPont, ki pripada novi skupini fungicidov - kvinazolinoni. Fitofarmacevtsko sredstvo Talendo® z edinstvenim načinom delovanja dobro deluje proti pepelovki/oidiju (*Uncinula necator*) na vinski trti za pridelovanje vinskih in namiznih sort grozdja. V prispevku so predstavljene glavne fizikalne, kemijske in toksikološke značilnosti sredstva ter rezultati biotičnih preizkušanj (65) s sredstvom Talendo® proti pepelovki/oidiju na vinski trti, ki so bili izvedeni v Italiji in drugih delih Evrope. Prokvinazid je aktivna snov s preventivnim načinom delovanja, zato je zatiranje potrebno pred okužbo vinske trte s pepelovko/oidijem. Rezultati kažejo, da ima aktivna snov podaljšano delovanje in učinkovito zatira pepelovko/oidij takoj po kalitvi spor, saj zavira njihovo kaljenje in tvorbo apresorija. Priporočen odmerek je 50 g a.s./ha. Delovanje aktivne snovi prokvinazid je alternativa obstoječim načinom delovanja aktivnih snovi proti pepelovki/oidiju (*Uncinula necator*) na vinski trti. Čeprav nimamo podatkov, da pripada skupini fitofarmacevtskih sredstev pri katerih obstaja možnost pojava navzkrižne rezistence, so na voljo smernice za antirezistentno strategijo.

ABSTRACT

Pinus DuPont: Talendo® - the new standard in powdery mildew control

Proquinazid (DPX-KQ926; Talendo®) is new active molecule, which belongs to new chemical group of fungicides - Quinazolinone, patented by DuPont. Plant protection product Talendo® has a strong biological activity for the control of powdery mildew (*Uncinula necator*) on grapes. This paper introduces the product main physical, chemical and toxicological properties and provides a summary of the results from field trials (65), against grape powdery mildew on vine and table grapes, which were carried out in Italy and other parts of Europe. Proquinazid is active substance with preventive action, therefore applications should start before grape powdery mildew infections occur. Results indicate that it has long lasting activity and is effective immediately after spore germination of grape powdery mildew by inhibiting spore germination and appresorium formation. The recommended dose rate is 50 g a.i./ha. Activity of proquinazid is alternative to fungicidal modes of action available to control powdery mildew (*Uncinula necator*) on grapes. Although there is no evidence that it belongs to any of the known "cross resistance groups", resistance management guidance is provided.

Zagotavljanje trajnostne rabe fitofarmacevtskih sredstev za zatiranje pepelovke vinske trte *(Uncinula necator)*

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Ohranjanje in širjenje vrst sta osnovni biotični zakonitosti narave. V procesu intenziviranja pridelave hrane, potrebne zaradi zmanjšanja razpoložljivih pridelovalnih zemljišč in večanju človeške populacije ter zahtev po znižanju pridelovalnih stroškov, mora pridelovalec pridelati večje količine kvalitetnih pridelkov. Z optimiranjem rastnih razmer gojenim rastlinam se izboljšujejo tudi razmere za razmnoževanje patogenih organizmov. Tudi ob upoštevanju vseh agrotehničnih ukrepov intenzivna pridelava ni mogoča brez uporabe fitofarmacevtskih sredstev (FFS). Pepelovko vinske trte ali oidija (*Uncinula necator*) uvrščamo v družino Erysiphaceae, ki vsebuje celo vrsto zelo pomembnih gliv, znanih ektoparazitov številnih gojenih rastlin. Pepelovka ali oidij, kot jo nekateri imenujejo po nespolnem stadiju glive povzročiteljice (*Oidium tuckeri*) je v naših razmerah druga najpomembnejša glivična bolezen vinske trte, na Primorskem pa pogosto najpomembnejša. Poznavanje razvoja glive je osnova za njeno zatiranje. Glivica se v ugodnih razmerah zelo hitro razmnožuje in lahko ima v rastni sezoni več" generacij". Nevarnost pojava rezistence na FFS je zato velika. Povečana je zlasti takrat, ko pridelovalec ne upošteva, ponavadi zaradi neznanja, navzkrižne rezistence med aktivnimi snovmi (AS) in jih uporablja mimo FRAC pravil. Pogosto se dogaja, da v škropilnem programu menjuje pripravke znotraj skupine v kateri so AS z navzkrižno rezistenco. Program varstva vinske trte pred oidijem podjetja BASF SE temelji na antirezistentni strategiji rabe FFS. V programu so FFS s štirimi AS iz različnih skupin po FRAC-u. To so Kumulus DF (žveplo), Cabrio Top (strobilurin), Vivando (benzofenon) in Collis (karboksianilid). Predstavljen je program zatiranja oidija s temi sredstvi v cilju optimalnega varstva in sprejemljivih stroškov.

ABSTRACT

Provinding sustainable use of plant protection products to combat grapevine powdery mildew (*Uncinula necator)*

The preservation of and spreading of species are basic biological rules. In the process of intensifying food production, required because of reduced available production areas, increased human population, and also demands to lower production costs, growers must produce greater quantities of quality products. However, with the optimisation of growth conditions of cultivated plants, the reproduction conditions of pathogenic organisms improve as well. Even when considering all available geotechnical measures, such intensive production is impossible without the use of plant protection products. Grapevine powdery mildew (*Uncinula necator*) is placed in the family of Erysiphaceae, which contains a whole variety of very important fungi, known ectoparasites of numerous cultivated plants. Grapevine powdery mildew (*Uncinula necator*) is the second most significant fungus disease of grapevines in our region or growing conditions, whereas in Primorska, it is often the most significant one. Knowledge of the fungus's biology is the basis for its control. The fungus can reproduce very quickly under favourable conditions and can have more "generations" in a growing season. Therefore, the danger to develop resistance against plant protection products is great. It is particularly high when the producer, mostly because of the lack of knowledge, does not consider the cross-resistance between active substances, and uses them without following the FRAC rules. It often occurs that, in their spray programme, producers change preparations within a group also containing active substances with the cross-resistance. The protection programme of BASF SE against grapevine powdery mildew is based on the anti-resistant strategy of the use of plant protection products. Included in the programme are plant protection products with four active substances of different groups under the FRAC. These are Kumulus DF (sulphur), Cabrio Top (strobylurin), Vivando (benzophenone) and Collis (carboxyanylid). The programme to combat powdery mildew with these means is presented, with the objective of optimal protection and acceptable costs.

Varstvo vinske trte z najnovejšimi pripravki družbe Bayer CropScience (Nativo, Verita Profiler)

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Peronospora vinske trte (*Plasmopara viticola*) in oidij vinske trte (*Uncinula necator*) povzročata vinogradnikom največje preglavice pri pridelavi grozdja. V letu 2008 je zaradi velike količine padavin v aprilu, maju in juniju največji problem povzročala peronospora, v juliju in začetku avgusta pa tudi oidij. Podjetje Bayer CropScience je v letu 2008 svoji že tako široki paleti pripravkov za varstvo vinske trte dodalo še dva pripravka, Verita Profiler in Nativo WG75. Verita Profiler vsebuje ob dobro znanem in preverjenem Al-fosetil-u še novo aktivno snov fluopikolid. Fluopikolid spada v novo kemično skupino. Zatira večino škodljivih gliv iz podrazreda Oomycetes Fluopikolid ne kaže navzkrižne rezistence z ostalimi fungicidi in zatira glive, ki so odporne na fenilamide, strobilurine in pripravke na osnovi dimetomorfa. Ima popolnoma nov način delovanja, kar je dobrodošlo orožje v antirezistenčni strategiji zatiranja peronospore vinske trte. Nativo WG75 je nov pripravek za varstvo pred oidijem vinske trte. Pripravek vsebuje dve aktivni snovi tebukonazol in trifloksistrobin. Kombinacija triazolne in strobilurinske komponente je edinstvena na tržišču. Ob odličnem kurativnem in eradikativnem delovanju ima tudi najdaljše preventivno delovanje in predstavlja popolno varstvo vinske trte pred oidijem.

ABSTRACT

Control of main vine deseases with Bayer CropScience's products (Nativo, Verita Profiler)

Downy mildew (*Plasmopara viticola*) and powdery mildew (*Uncinula necator*) are the most common and problematic diseases in our vineyards. In 2008 due to high precipitations in April, May and June Downy mildew was present in nearly every vineyard in Slovenija. In July and first half of August there were also severe infections with powdery mildew. Bayer CropScience has enlarged the portfolio with two new products Verita Profiler and Nativo WG75 in 2008. Verita Profiler is composed of Al-fosetil and fluopicolid. Fluopicolid belongs to a new chemical class of fungicides and is highly effective on a broad spectrum of oomycetes. This compound does not show a cross resistance to other commercial oomycete fungicides and control fungi resistant to phenylamides, strobilurines and dimethomorph. This suggests that fluopicolide has a new mode of action which is a highly welcome solution in antiresistant strategy. Nativo WG75 is a new product against powdery mildew in grapes. The product is a combination of Tebukonazol and Trifloxistrobyn, a combination of a triazol and a strobiluryn that is unique on our market. It combines an excellent curative and eradicative, with an extremly long preventive efficacy.

Splošna sekcija

Prikaz in analize izrednih vremenskih pojavov na območju JV Slovenije z uporabo tehnologije GIS

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Uničujoči vremenski pojavi postajajo v kmetijstvu vedno večji problem. Toča predstavlja poleg uničenja pridelka posredno nevarnost tudi zaradi fizičnih poškodb na rastlinah v trajnih nasadih. Nastale rane so potencialno vstopno mesto nekaterim karantenskim in gospodarsko pomembnim škodljivim organizmom. V službi za varstvo rastlin na KGZS – Zavodu Novo mesto se na območju JV Slovenije od leta 2003 dalje sistematično dokumentira posledice in oblike izrednih vremenskih pojavov (npr. toča). Pri beleženju dogodkov se obravnava čas, lokacija, obseg in intenzivnost vremenskih pojavov (trajanje in debelina zrn toče). V obdobju od 2003 do 2008 smo dokumentirali 179 lokacij s pojavi toče. Za prikaz in analize podatkov v prostoru ter kartografski prikaz smo uporabili programski paket ArcGIS Desktop 9.2 (ESRI). Način zbiranja podatkov je vezan na zabeležke opazovalcev, ki zaznajo dejansko obliko pojava in jo tudi foto – dokumentirajo. Opazovanja pokrivajo ruralno in urbano območje, v večjem delu z gozdovi poraslega območja pa je spremljanje pomanjkljivo. Zanesljivost beleženja dogodkov bi se lahko povečalo z uporabo meritev ARSO in preverjanjem informacij. V tem primeru bi prostorski podatki lahko služili kot podpora pri izdelavi ocen tveganja za določene škodljive organizme (npr. bakterijo *Erwinia amylovora*, hroščke iz skupine *Scolytidae,*…).

ABSTRACT

Tracking extreme weather events in SE Slovenia region using GIS

Devastating weather events are becoming bigger and bigger problem in agriculture. In addition to damaged crops, hail represents also indirect threat of physical injuries to perennial grown plants. Injuries are potential entry point for some quarantine and economically important harmful organisms. Plant protection service in KGZS – Zavod Novo mesto systematically documents consequences and type of extreme weather events (like hail) since 2003. When collecting data, time, location, area and intensity of weather events (duration and hail diameter) are being measured. In the period from 2003 to 2008, we documented 179 localities with hail events. For spatial tracking and map elaboration, we used software package ArcGIS Desktop 9.2 (ESRI). Data gathering is involving observers with their notes of event type and photo documentation. Observations are applied in rural and urban areas, while the forested areas are covered deficiently. Validated event observations could be provided using ARSO measurements and evaluation of gathered data. In that case spatial data could be used as support for pest risk assessments for several harmful organisms (like bacteria *Erwinia amylovora*, beatles from *Scolytidae* group,…).

Aplikacija FSI-Pregled kot podpora delu fitosanitarnega inšpektorja v okviru celovitega info sistema zdravstvenega varstva rastlin

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V okviru Fitosanitarne inšpekcije je bila leta 1994 izdelana posebna aplikacija, imenovana CK, ki je bila prilagojena zlasti uvoznim in izvoznim nadzornim postopkom. Z letom 1996 se je fitosanitarna inšpekcija začela pripravljati na vstop v Evropsko unijo in s tem na uveljavljanje sistema rastlinskega potnega lista na notranjem skupnem trgu Evropske unije. V naslednjih letih je bila vse bolj očitna potreba po prenovi obstoječe računalniške aplikacije. Leta 2005 je tako fitosanitarna inšpekcija začela uporabljati novo aplikacijo FSI-Pregled. Nova aplikacija omogoča vodenje zadev v skladu s predpisi o pisarniškem poslovanju državnih organov, vnašanje zbranih podatkov o opravljenih pregledih, delo z GIS orodji, pripravo in tiskanje zapisnikov, odločb in certifikatov, izdajanje računov za plačilo pristojbin, omogoča elektronsko komunikacijo z laboratoriji in pripravo ter izpis obvestil o zadržanju pošiljk (notifikacije). Aplikacija nudi zbiranje in urejanje podatkov o izvoznih in uvoznih pošiljkah (vključno s fitofarmacevtskimi sredstvi), pregledih lesenega pakirnega materiala, obveznih fitosanitarnih pregledih pri zavezancih iz Fito/Seme Registra, pregledih v okviru posebnih nadzorov in inšpekcijskem spremljanju zdravstvenega stanja rastlin. Fitosanitarni inšpektorji v aplikacijo beležijo tudi odrejene ukrepe, razloge ukrepov ter število rastlin z odrejenimi ukrepi ter podatke o prekrškovnih postopkih. Za vsak zdravstveni pregled vnašajo tudi podatke o lokaciji pregleda (z določitvijo x,y koordinat), vrsti pregledanih rastlin, izvoru rastlin, jemanju vzorcev in analiznih izvidih ter o ugotovljenih škodljivih organizmih.

ABSTRACT

Computer application (FSI - Pregled) – support to the work of a fitosanitary inspector in the context of a complete plant health information system

In 1994, a special computer application named CK was created for internal use of the Phytosanitary Inspectorate. It was adapted for import and export inspection procedures. In 1996, the Phytosanitary Inspectorate started its preparation for joining the EU which involved also introduction of the plant passport system at the internal EU market. In the following years it had become clear that renovation of the existing computer application would be necessary. In 2005, the Phytosanitary Inspectorate began to use its new application named FSI- Pregled. The new application provides that inspection procedures are conduced according to the legislation on administrative procedures in public administration. It provides input of data on inspections, work with GIS (Geographic Information System), preparation and printing of records, decisions, certificates and invoices. Furtheron, it provides electronic communication with laboratories, preparation and printing of notifications, collection and editing of data on import and export consignments (including plant protection products), wood packing material checks, obligatory phytosanitary checks of producers, surveys and inspection monitoring. Phytosanitary inspectors record also the measures taken and the reasons thereof, the number of plants, and data on violation procedures. For each plant health check, inspectors collect data on the location of inspection (identifying geographic coordinates), plant species, and origin of the plants, analysis report, and data on the pests determined.

Posterji

Problems of aphid control in apple orchards in 2007

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Reduction of insect susceptibility to insecticides is typically the reason for application failure, especially of insecticides from organophosphate, carbamate and pyrethroid groups, while other reasons are rarely mentioned. Therefore, investigations have been directed to testing effectiveness of similar preparations (from different manufacturers), their mixtures and those exerting mechanical action (mineral oils), in the control of *Aphis* sp. on apples. In 2007, trials were established in apple orchards (Begeč, Krčedin and Bačka Palanka) using a standard method (OEPP 1/21, 1997). Preparations on the basis of chlorpyrifos, chlorpyrifos + cypermethrin and mineral oils were applied in conventional doses. Effectiveness and significance of differences among average values were calculated by Henderson and Tilton formula (ANOVA). Efficacy of the tested preparations differed subject to the applied quantities and application conditions. In the locations of Begeč, Krčedin and Bačka Palanka, the preparations on the basis of chlorpyrifos and chlorpyrifos + cypermethrin showed lower efficacy (47% - 85.9%) after one, two and three days, and so did mineral oils (16.5% - 66.4%). Five and six days after application, chlorpyrifos and mixtures showed the efficacy from 11.7% to 84.2% and mineral oils from zero to 73.2%. Those counts were made in June and July, under conditions of high temperature (max. 36-42°C). In the counts performed in September (Bačka Palanka), the same insecticides revealed high efficacy (88.1% - 97.5%) three to seven days after treatment, most likely due to lower average daily temperatures (max. 28 °C). The causes for the observed efficacy of insecticides in the control of aphids in apple orchards could be attributed to specific agroecological conditions, i.e., extremely high temperatures, and possibly to poor adaptation of the pesticide formulations for high temperatures or the presence of other related aphid species, among which *A. spiraecola* Patch. was detected in 2008.

ABSTRACT

Smanjenje osetljivosti insekata prema insekticidima često je razlog neuspeha primene istih, pogotovo onih iz grupe organofosfata, karbamata i piretroida, dok se ostali razlozi ređe navode. Otuda ispitivanja su usmerena u pravcu provere efikasnosti paralelnih preparata (različiti proizvođači), mešavina i onih sa mehaničkim delovanjem (mineralna ulja), za *Aphis sp.* na jabuci. U zasadima jabuke (Begeč, Krčedin i Bačka Palanka) tokom 2007. godine izvedeni su ogledi po standardnoj OEPP (PP 1/21, 1997) metodi. Primenjeni su preparati na bazi hlorpirifosa, hlorpirifos+cipermetrin i mineralnih ulja u količinama za praktičnu primenu. Po Henderson i Tilton-u određena je efikasnost kao i značajnost razlika za prosečnu brojnost vaši (ANOVA). Efikasnost ispitivanih preparata se razlikovala zavisno od količina i uslova primene. Preparati na bazi hlorpirofosa i hlorpirifos+cipermetrin u lokalitetu Begeč, Krčedin i Bačka Palanka ispoljili su nižu efikasnost (47%-85,9%) posle jedan, dva, odnosno tri dana, takođe i mineralna ulja (16.5%-66,4%). Posle pet odnosno, šest dana od primene hlorpirofos i mešavine su ostvarile efikasnost 11,7-84,2%, a mineralna ulja od izostanka efekta do 73,2%. Ova ispitivanja su izvedena tokom juna i jula, pri visokim temperaturama (max. 36-42 ^{o}C). Ogledi su ponovljeni i tokom septembra (Bačka Palanka), kada su isti insekticidi ispoljili visoku efikasnost (88,1%-97,5%) posle tri i sedam dana od primene (97,2-99,3%), pri nižim srednje dnevnim temperaturama (max. 28 ^{o}C). Uzroci ostvarene efikasnosti insekticida za lisne vaši na jabuci moguće je tražiti u specifičnim agroekološkim uslovama,

neuobičajeno visokim temperaturama, možda u neprilagođenosti formulacija za visoke temperature ili u prisustvu i drugih srodnih vrsta vaši među kojima je tokom 2008, godine detektovana i *A. spiraecola* Patch.

Slovenski izvleček ni bil predložen!

Dinamika listnih uši na lubenicah (*Citrullus lanatus* Thunb.), gojenih na prekritih in na golih tleh

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Znano je, da lubenice napadajo številne vrste uši. V hrvaški vrtnarski praksi se pri gojenju lubenic na prostem običajno priporoča prekrivanje tal z zastiranjem, od zastirk pa se najpogosteje uporablja polietilenska (PE) črna folija. Tip in barva folije lahko vplivata na številčnost populacije uši na rastlinah. Cilj naše raziskave je bil ugotoviti, kako PE črna folija v primerjavi z golimi tlemi in tlemi, prekritimi s senom, vpliva na razširjenost uši na lubenicah. Tako smo z ugotavljanjem številčnega stanja uši želeli prilagoditi tehnologijo gojenja lubenic v boju proti tem škodljivcem. Poljski poskus, ki je bil leta 2008 zasnovan po metodi naključnih blokov v treh ponovitvah, je bil postavljen v okolici Pulja v primorskem delu Hrvaške. Uši smo s preštevanjem na rumenih kovinskih pasteh ugotavljali vsak teden. Od 19. maja do trenutka, ko so listi lubenic prekrili tla, smo opravili šest preštevanj. Med posameznimi datumi smo ugotovili značilno razliko med številom uši na ploščah, ki je bila posledica njihove populacijske dinamike na rastlinah. Število uši v dveh preštevanjih v drugi polovici maja je bilo znatno večje od števila uši naštetih v juniju. Največji nalet uši je bil ugotovljen 26. maja. Njihova razširjenost pa se je značilno zmanjšala do 9. junija. Način zastiranja tal ni statistično značilno vplival na razširjenost uši. Poudariti pa je treba, da je na vrhuncu zastopanosti uši senena zastirka privabila 13 % (26. maja) oz. 18 % (2. junija) več uši, kot smo jih našteli v obravnavanjih na golih leh.

ABSTRACT

Aphid population dynamics in mulched watermelon (*Citrullus lanatus* Thunb.) or grown on bare soil

A number of aphid species have been recorded as watermelon crops feeders. Mulching is a common practice in field grown watermelon crops in Croatia. The most often used cover is the black polyethylene (PE) mulch. Type and color of mulch material may influence aphid populations in the crops. The aim of this study was to compare the effect of PE black mulch with bare soil and hay cover against aphid number. In order to create management strategy in watermelon, flight dynamics of aphid population was recorded. In 2008, the field experiment was set up as a randomized block design in three replications at Pula in Mediterranean region of Croatia. Winged aphids were collected weekly using yellow water metal traps. There were six sampling dates starting from 19 May until mulch was covered by plant canopy. We found significant difference in aphid number among the sampling dates as a result of their population dynamics on watermelon. The catches of

two assessments in the second half of May were more numerous than during assessments in June. The flight maximum was recorded on 26 May and the population density significantly decreased from June 9. There was not much effect of mulch on aphid number. However, at the peak of aphid population hay cover attracted 13% (26 May) and 18% (2 June) more aphids compared to bare soil.

Molekularna identifikacija pravih listnih uši (Sternorrhyncha: Aphidoidea)

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Morfološka identifikacija pravih listnih uši se je na Kmetijskem inštitutu Slovenije začela s spremljanjem naleta sive breskove uši *Myzus persicae* L., ki je glavna prenašalka virusnih obolenj krompirja. Razvoj molekularnih tehnik nudi možnost tudi genetske identifikacije, ki je nadgradnja morfološki identifikaciji. Morfološki identifikacijski ključi so na voljo le za določevanje krilatih in nekrilatih oblik pravih listnih uši, medtem ko je z molekularnimi pristopom poleg odraslih uši mogoče identificirati tudi nižje razvojne stadije. Poleg tega obstaja znotraj vrst nemalokrat tudi morfološka variabilnost, ki identifikacijo otežuje. Zaradi navedenega smo v zadnjem letu več osebkov pravih listnih uši (Aphididae) tudi genetsko identificirali. Pri identifikaciji smo se osredotočili na več kot 700 bp dolgo regijo gena za citokrom oksidazo I (COI) v mitohondrijski DNK. Iz literaturnih podatkov smo ugotovili, da je regija dovolj variabilna, da identifikacijo omogoča. Poleg tega smo v genetskih bazah ugotovili, da je veliko vnosov sekvenc za omenjeno regijo. Za identifikacijo smo uporabili metodo sekvenciranja, s katero je mogoče najti razlike znotraj nukleotidnega zaporedja. Sekvencirali smo 32 listnih uši iz 10-tih rodov družine Aphididae. Ugotovili smo relativno visoko stopnjo polimorfizma med vrstami (6 - 13%) znotraj vrst pa je bila vrednost manjša (0 - 1.5%). Z analizo smo potrdili vseh 16 vrst listnih uši in da je regija COI primerna za razločevanje določenih vrst listnih uši. Kot temeljna metoda določevanja ostaja morfološka identifikacija, ker je molekularna identifikacija relativno dolgotrajna ter draga in je zato primerna le v primerih, ko potrebujemo potrditev morfološke identifikacije ali imamo osebke, ki jih z morfološkimi identifikacijskimi ključi težje določimo.

ABSTRACT

Molecular identification of aphids (Sternorrhyncha: Aphidoidea)

Morphologic species identification of aphids at Agricultural Institute of Slovenia started with monitoring of peach-aphid, which is the main agent of virus transmission in potato. With the development of molecular techniques the genetic identification is possible, too. Morphologic identification is possible only if you have adult alate or apterous aphids, but with molecular analysis the identification of other stages of aphids is also possible. Beside this, morphological identification is often very difficult because of morphological variability. Therefore, in the last year, some aphid species were identified also genetically. For the identification, a 700 bp long region for cytochrome oxidase I (COI) in mitochondrial DNA was used. From the scientific literature it was estimated that this region was variable enough for species identification. In GenBank databases it was found out that there was a lot of data for sequence comparison. For identification, the sequence analysis was used because it shows all the differences between specimens and species. 32 aphid samples

belonging to 10 races were sequenced. Relatively high variability between species (6 – 13%) was found; within species the variability was only 0 – 1,5%. On that basis, all 16 analysed aphid species were confirmed. The results showed that COI region was polymorphic enough for some species identification. Nevertheless, morphologic identification still remains the basis for the identification, because genetic identification is very time consuming and expensive and, therefore, it is appropriate only in cases when species confirmation is needed or when there are specimens which are hard to identify.

The scale insects (Hemiptera: Coccoidea) of imported fruits in Croatia

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Scale insects (Coccoidea) enjoy perennial plants and can devastate nut and fruit trees, greenhouse plants, forest vegetation, woody ornamentals and house plants. They thrive on nearly all parts of host plants, sometimes settle under bark, and cause a variety of plant deformities. They disperse passively with the aid of wind, water, soil, humans and domestic and wild animals. Global trade has been a major factor in their spread worldwide. The main pathway of scale's worldwide spread is import of plant material and fresh fruits.
Inspection on scale insects of imported fresh fruits in supermarkets in Croatia were carried out over a 3 year period (2006 – 2008) by visual inspections of potentially infested fruit with the help of a magnifying lens of 10x magnification, collecting of host plant material infested with scale insects (fruits) in plastic bags, labelling each sample with collection data, observation of field characteristics of collected specimens under the dissecting stereo microscope, slide mounting, microscopic identification on the basis of morphological characteristics of adult females according to relevant keys and marking the localities of finding according to UTM system (Horvat *et al*., 2003). Inspected samples of fresh fruit were imported from Argentina, Brazil, Chile, China, Greece, Israel, South Africa, South America, Costa Rica, Mexico and Spain. The most frequent host plants belong to the family Rutaceae. Inspections have resulted in 18 identified scale species, namely from family Diaspididae: *Abgrallaspis cyanophylli* (Signoret, 1869); *Aonidiella aurantii* (Maskell, 1879); *Aonidiella comperei* McKenzie, 1937; *Chrysomphalus aonidum* (Linnaeus, 1758); *Diaspis boisduvalii* Signoret, 1869; *Hemiberlesia lataniae* (Signoret, 1869); *Lepidosaphes beckii* (Newman, 1869); *Lepidosaphes gloverii* (Packard, 1869); *Melanaspis bromiliae* (Leonardi, 1899); *Parlatoria cinerea* Hadden in Doane & Hadden, 1909, *Parlatoria oleae* (Colveé, 1880); *Parlatoria pergandii* Comstock, 1881; *Parlatoria ziziphi*, (Lucas, 1853); *Pinnaspis aspidistrae* (Signoret, 1869); *Pseudaonidia trilobitiformis* (Green, 1896); *Selenaspidus articulatus* (Morgan, 1889) and from family Pseudococcidae: *Dysmicoccus brevipes* (Cockerell, 1893) and *Pseudococcus comstocki* (Kuwana, 1902). Species *A. cyanophylli, A. comperei, D. boisduvalii, D. brevipes, M. bromiliae, P. cinerea, P. pergandii, P. trilobitiformis* and *S. articulatus* are newly recorded species in Croatia.

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Whitefly species (Hemiptera: Aleyrodidae) recorded on imported ornamental plants in Croatia from 2005 to 2008

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During the last decade worldwide trade in plants has increased enormously. Because of increased import of different ornamentals in the last years, possibility of interception of new whitefly species has increased too. That was the main reason of inspections of imported ornamental plants in the nurseries and greenhouses carried out over a 4 year period (2005 – 2008). It was collected 152 leaf samples. Whiteflies were collected using the visual survey of host plant leaves on presence of their puparia or pupal cases. All collected whiteflies in leaf samples were identified to the species level. Inspections carried out on consignments originating from 5 European countries, mostly from The Netherlands, and also from Japan, have resulted in 9 identified whitefly species: *Aleuroclava hikosanensis* Takahashi, 1938, *Aleuroclava jasmini* Takahashi, 1932, *Aleurothrixus floccosus* Maskell, 1896, *Aleyrodes elevatus* Silvestri, 1934, *Bemisia afer* Priesner & Hosny, 1934, *Bemisia tabaci* Gennadius, 1889, *Dialeurodes citri* Ashmead, 1885, *Massilieurodes chittendeni* Laing, 1928 and *Trialeurodes vaporariorum* Westwood, 1856. The species which has the highest frequency distribution of frequency was *T. vaporariorum.* It was present in the most of collected leaf samples. The next most frequent species was *B. tabaci,* the species recently introduced to Croatia. Species *A. elevatus* and *D. citri* are already well established in the nature in coastal part of Croatia. Species *B. afer* is an indigenous species widespread throughout the country. Species *A. floccosus* is currently present only on limited area of Croatian Middle Adriatic region. Species *A. hikosanensis*, *A. jasmini* and *M. chittendeni* are newly recorded species for Croatia. These are all non European whitefly species. Only the species *M. chittendeni*, which probably originates in northern Asia is distributed in some European countries. Their possibility of naturalization in Croatia is not known. For this reason, a Pest Risk Analysis for these pests is strongly suggested.

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Control of olive fruit fly - *Bactrocera oleae* G. (Diptera, Tephritidae) by mass trapping and bait sprays methods in Dalmatia

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Olive fruit fly is the most important olive pest that causes direct fruit loss and has negative influence to olive oil quality. Traditionally, supression methods have been based on cover spraying using environmentally not friendly insecticides. Other, more selective methods, first of all "attract and kill" and mass-trapping have been developed as ecologically better alternative. Bait spray method was investigated using Success bait. Mass-trapping method was investigated using Eco-trap. The trials were conducted in the area of southern Dalmatia, near city of Ston. The selected orchards were planted mainly with domestic

cultivars Oblica and Bjelica. Trials were set on four olive orchards, bait spray plot, mass trapping plot, coverspray plot and control plot. Data were collected in weekly intervals and were analysed as adults captures on traps for monitoring which were set in all experimental plots and fruit infestation. The data were analysed using ARM, Duncan's test. Efficacy researches results show no difference in comparation with cover spraying. Results confirmed high efficacy of both improoved methods.

Slovenski izvleček ni bil predložen!

Control of olive moth – *Prays oleae* B. (Lepidoptera, Hyponomeutidae) fruit generation by insecticidal cover sprays

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Olive moth is one of the most important olive pests, specially it's second generation that causes direct fruit loss. Such dropped fruits don't have any commercial value. Supression is based on chemical treatments, mostly with large spectrum insecticides. Their repeated use over years often disorders natural balance in olive orchards, which brings problems with different secondary pests and diseases, first of all scales and sooty mould. For this reason, researches with some new insecticides with different mode of action were carried out in order to measure their efficacy against olive moth's fruit generation. Active ingredients used in trials include most insecticide gropus: neonicotinoids (tiakloprid), naturalites (spinosad), synthetic pyretroids (gama-cyhalothrin) and insect growth regulators (teflubenzuron). Most effective insecticide used in this trials were teflubenzuron and spinosad. Experiments were set in the area of Central Dalmatia, fifty kilometars west from city of Split, near village Marina. Experimental plot used was olive orchard planted with domestic cultivar Oblica. Observation of insecticide efficassy were made by collecting of fruits before fruit drop and counting of fruit infestation. The data were analysed using ARM, Duncan's test.

Slovenski izvleček ni bil predložen!

Širjenje in populacijska gostota koruznega hrošča *Diabrotica virgifera virgifera* LeConte v Sloveniji in njegov vpliv na kmetijsko prakso v obdobju 2003-2008

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Koruzni hrošč (*Diabrotica virgifera virgifera* LeConte) je eden glavnih škodljivcev koruze. V Sloveniji smo ga prvič zasledili leta 2003 na vzhodu ob meji z Madžarsko in Hrvaško ter na zahodu ob meji z Italijo. Opazne so velike razlike med širjenjem in naraščanjem populacije med pridelovalnimi območji koruze na vzhodu in zahodu države.

Razlike so pogojene z gostoto koruznih polj in deležem koruze v kolobarju. Na intenzivnost naraščanja populacije koruznega hrošča in njegovo širjenje vpliva obseg pridelave koruze in populacijska gostota škodljivca v obmejnih območjih sosednjih držav. Razširjenost in številčnost koruznega hrošča je bila na zahodu do vključno 2007 na približno enaki ravni kot v letu 2003. V vzhodnem delu države se je hrošč širil neprimerno hitreje kot na zahodu, naraščala pa je tudi njegova številčnost. Kljub temu, da lahko naraščanje populacije koruznega hrošča in intenzivnost njegovega širjenja v celoti označimo kot zmerno, je bilo do leta 2006 le to bolj zmerno kot v letih 2007 in 2008, ki sta bili za razvoj koruznega hrošča ugodnejši. V zadnjih dveh letih se je hrošč močno razširil, kar se je odrazilo tudi na povprečnem ulovu odraslih osebkov na PAL feromonskih vabah, ki je v letu 2008 znašal 195 osebkov na feromonsko vabo. Analiza širjenja in številčnosti ulova koruznega hrošča kaže, da so na širjenje koruznega hrošča močno vplivala tudi prometna sredstva. V razmejenih območjih smo kot rezultat vpeljave zadrževalnih ukrepov ugotovili občutno zmanjšanje pridelave koruze v monokulturi. Spremenjen vzorec kmetijske prakse pridelovanja koruze smo potrdili z analizami z GIS orodji na območjih, ki so bila razmejena do leta 2006. Analiza je ob koncu leta 2007 pokazala, da se je na vzhodnem delu države delež koruze v monokulturi na območju, ki je bilo razmejeno v letu 2004 zmanjšal z 18% na 2% in na razmejenem območju iz leta 2005 z 28% na 5%. Na razmejenem območju iz leta 2004 na zahodnem delu države, se je delež pridelave koruze kot monokulture zmanjšal s 34% v letu 2003 na le 3% v letu 2007. Navedeni podatki kažejo, da so slovenski kmetje sledili zakonodajnim predpisom in so izbrali kolobar kot najpomembnejši ukrep za preprečevanje širjenja koruznega hrošča in nastanka gospodarske škode.

ABSTRACT

The spread and population density of *Diabrotica virgifera virgifera* LeConte and its impact on agricultural practice in Slovenia during the period 2003-2008

The western corn rootworm (WCR, *Diabrotica virgifera virgifera* LeConte) is one of the most important maize pests which was introduced to Slovenia in 2003 by natural spread from both, from Hungary and Croatia on the East and from Italy on the West. Different patterns of spread and population growth of the WCR have been observed in maize growing areas, depending on the density of maize fields in the area and the frequency of maize in the crop rotation. In the period 2003 to 2008, the spread and population growth of WCR were observed to be different between western and eastern part of Slovenia due to differences in population pressure from neighbouring areas and the portion of maize in the area. In the West, the distribution and prevalence of WCR until the end of 2007 has remained approximately unchanged since the first year of introduction while in the East, both the spread and the population growth have become more progressive. However, both parameters showed only moderate progress up to 2006 while in 2007 and 2008, conditions became more favourable for WCR development and spread. The spread was extended significantly, so there were on average 195 imagos captured per PAL pheromone trap per year since the WCR was introduced for the first time into the area 5 years ago. Distribution data show that the WCR spread was influenced by the transport as well. As a consequence of the implementation of area-wide containment measures in a delimited area considerable decrease of monoculture maize growth was recorded. This altered pattern of agricultural practice was confirmed by GIS analysis in areas that were demarcated in 2004, 2005 and 2006. The analysis of the situation in 2007 showed that in the demarcated areas in the East, the portion of area under monocultural maize cultivation decreased from 18% to 2% and from 28 to 5% in demarcated areas of 2004 and 2005, respectively. In the demarcated area established in 2004 in the West, the portion of monocultural maize significantly decreased in 2007 to only 3%, compared with 34% in

2003. Obviously, Slovenian farmers have followed the legislation to a great extent and adopted crop rotation as the main WCR control measure.

The past, the present and the future of the Western Corn Rootworm in Hungary

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The first individuals of the Western Corn Rootworm (*Diabrotica virgifera virgifera* LeConte, 1868) were found by Dr. Franja Bača the entomologist of the Corn Research Institute of Zimony in 1992 in a cornfield near Belgrade airport. The Hungarian common insect pest of the corn increased with this species in 1995. This insect pest spread very quickly in Hungary. At first it appeared in the south part of the country in Csongrád and Békés counties, then its spreading was very quick, northwards, utilized the configuration of the terrain and the prevailing wind. The adults were found in Somogy, Tolna, Fejér, Pest, Nógrád, Komárom, Hajdú, Szolnok counties in 1999. The species cause economic damage in the Hungarian cornfields. The level of the damage influenced by the weather (mainly the amount of the rainfall) and the used protection technology. In Hungary in the agricultural practice farmers apply the agricultural engineering and chemical protection against the Western Corn Rootworm. A third in Hungary just theoretical protection method: cultivation of the tolerant or resistant corn hybrids. The reason this just the theoretical protection is that we haven't got similar hybrids in the country. Our task to know this species ecological claim, think this knowledge over and work out effective, based on prediction protection strategy against this insect pest.

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Povezava med pojavom navadne pršice (*Tetranychus urticae* Koch) na krizantemah *Chrysanthemum* 'Veria Dark' in 'Cassablanca White' in vsebnostjo fenolov in pigmentov v listih

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Navadna pršica (*Tetranychus urticae* Koch) spada med pomembne škodljivce na okrasnih rastlinah. Povezavo med pojavom navadne pršice na dveh sortah krizantem *Chrysanthemum* 'Veria dark' in 'Cassablanca White' in vsebnostjo fenolov in pigmentov v listih, smo raziskovali v letih 2003 in 2004, v rastlinjakih na Laboratorijskem polju in v laboratorijih Biotehniške fakultete, Oddelka za agronomijo (Ljubljana). Tehnologijo gojenja krizantem smo izvajali v skladu s priporočili stroke in na podlagi lastnih opazovanj. Namakali smo jih kapljično in poplavno. Fenole in pigmente v listih krizantem smo analizirali s pomočjo HPLC po metodah avtorjev Scalberta in sod. (1988) in

Pfeifhoferja (1989). Ugotovili smo, da na naselitev navadne pršice vplivajo gojitveni dejavniki. Prevelike količine vode v substratu neugodno vplivajo na kondicijo krizantem. V obeh sortah smo določili fenole miricetin, naringerin, kavino kislino in klorogensko kislino. Vsebnost klorogenske kisline narašča s starostjo krizantem, kar pripomore k večji odpornosti rastlin na navadno pršico. Navadna pršica ni bistveno vplivala na spremembe v vsebnosti pigmentov v listih obeh sort krizantem, ker se ni namnožila in ni delovala škodljivo na rastline. Spremembe v vsebnosti klorofilov pripisujemo neugodnim gojitvenim dejavnikom (preveliki količini vode v substratu).

ABSTRACT

Connection between two spotted spider mite (*Tetranychus urticae* Koch) on Chrysanthemum *Chrysanthemum* 'Veria Dark' in 'Cassablanca White' and phenolics compounds and pigments in its leafs

Twospotted spider mite (*Tetranychus urticae* Koch) is one of the main pests on ornamental plants. The research of phenolics and pigments in leaves and their influence on the colonisation of twospotted spider mite on chrysanthemum *Chrysanthemum* 'Veria Dark' and 'Cassablanca White' was carried out in 2003 and 2004 in greenhouses of the Biotechnical Faculty and in laboratories of the Department of Agronomy (Ljubljana). The technology of chrysanthemum growing was carried out according to professional recommendations and our own observations. Drop irrigation and flood irrigation were used. Phenolics and pigments were analysed with the use of HPLC according to the methods by Scalbert et al. (1988) and Pfeifhofer (1989). We found out that colonization of twospotted spider mite depends on growing factors. Excess of water in the substrate have negative effect on chrysanthemums condition. In both varieties we identified phenolics miricetin, naringerin, caffeic acid and chlorogenic acid. Chlorogenic acid level increases with the age of chrysanthemums, which contributes to a higher resistance of the plants against twospotted spider mite. The twospotted spider mite did not have any considerable effect on changes in pigments levels in the leaves of both varieties, as it did not multiply and therefore had no harmful effect on plants. Changes in chlorophylls levels are therefore attributed to unfavourable growing factors (excess of water in the substrate)..

Vrednotenje repelentnih lastnosti izbranih rastlinskih izvlečkov z novo računalniško aplikacijo

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Poleti 2008 smo s pomočjo zunanjega sodelavca razvili računalniški program, ki zapisuje premike objekta v nekem prostoru. Prostor, ki ga ima testirani organizem na voljo, je razdeljen v 5 aren, in sicer v osrednjo in na štiri stranske, znotraj katerih so izbrani rastlinski izvlečki, ki so naneseni na liste. Premiki organizma se zapisujejo časovno in glede na koordinate arene/prostora. Premiki se tudi grafično izrisujejo na sliko arene v obliki sledi/črte. Čas zadrževanja je izražen v odstotkih. S programom smo želeli ugotoviti repelentne ali insekticidne lastnosti rastlinskih snovi (etanolni ekstrakt vinske rutice [*Ruta graveolens*], α+β-tujon, kafra) na koloradskega hrošča. Iz sledi, ki so jih naredili osebki (ličinke ali odrasli hrošči), lahko povzamemo, da je najbolj repelentno deloval ekstrakt

rutice, saj so se osebki najmanj časa zadrževali v bližini lista, ki je bil pomočen v to snov. V povprečju so se osebki koloradskega hrošča najdlje zadrževali na kontrolnem listu.

ABSTRACT

Evaluation of repelent properties of some plant extracts using new computer application

In summer 2007 software application was developed with the aim to monitor all changes in motion of the test organisms. Observation area is divided in 5 regions, one central (include wet tampon, on which test organism is placed) and 4 off side (which include plants treated with single extract). Movement changes in time and coordinate of experimental bug is written down. On picture, red line represents the movement of test organisms; staying time in separate arena is expressed in percentage. With this program we wanted to establish insecticidal or repellent property of selected plant components (ethanol extract of common rue [*Ruta graveolens*], α+β-thujone and camphor) on Colorado potato beetle. From pest tracks it can be concluded that the most repellent substance for adult and larvae of Colorado potato beetle was common rue. In majority of time the presence of pests were on control eggplant leaf.

Preučevanje odpornosti koloradskega hrošča (*Leptinotarsa decemlineata* Say) v Sloveniji na izbrane insekticide

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Zatiranje z insekticidi je že dolgo najpomembnejši način varstva krompirja pred koloradskim hroščem (*Leptinotarsa decemlneata* Say). Ta je v območjih z intenzivnim kmetovanjem razvil odpornost proti vsem skupinam sintetičnih insekticidov. V raziskavi, ki je potekala med leti 2006 in 2008 smo ugotavljali občutljivost slovenskih populacij koloradskega hrošča na insekticid lambda-cihalotrin (sintetični piretroid), klorpirifos (organofosforni ester) in imidakloprid (neonikotinoid). V skladu z izbrano metodo (IRAC 7 – Insecticide Resistance Action Comitee) smo žuželke v različnih razvojnih stadijih izpostavljali različnim koncentracijam insekticidov (0 % - 800 % priporočenega odmerka) in ugotavljali njihovo smrtnost v laboratorijskih razmerah. Za različne populacije in razvojne stadije koloradskega hrošča smo izračunali koncentracije aktivnih snovi, pri katerih dosežemo 50 oz. 95 % smrtnost škodljivca (LD_{50} in LD_{95}). Visoke vrednosti LD_{95} smo največkrat ugotovili pri insekticidu lambdacihalotrin, razlike v občutljivosti populacij koloradskega hrošča smo ugotovili tudi pri insekticidu klorpirifos, medtem ko je bila učinkovitost neonikotinskega insekticida imidakloprid povsod zelo visoka, tudi pri zelo nizkih koncentracijah.

ABSTRACT

Research on resistance of Colorado potato beetle (*Leptinotarsa decemlineata* Say) in Slovenia to selected insecticides

Insecticide spraying has been the most important way of control of the Colorado potato beetle (CPB) for many years. The insect became resistant against all groups of synthetic insecticides used for his control in the regions with intensive agriculture. During the years 2006 to 2008 the sensitivity of Slovenian CPB populations to lambda-cyhalothrin (pyrethroid), chlorpyrifos (organophosphate) and imidacloprid (neonicotinoid) was investigated. According to selected methodology (IRAC no.7 – Insecticide Resistance Action Committee), different growing stages of CPB were exposed to different concentrations of selected insecticides (0 % - 800 % of field used concentrations) in laboratory conditions. The mortality of insects and the LD_{50} and LD_{95} values were calculated for different populations at different growing stages of CPB. In most cases high LD_{95} values were calculated for lambda-cyhalothrin and in some cases also for chlorpirifos. The efficacy of imidacloprid was high in all cases even at very low concentrations.

Širok spekter gostiteljskih rastlin sadnega listnega duplinarja (*Leucoptera malifoliella* [O. Costa])

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Sadni listni duplinar *Leucoptera malifoliella* [O. Costa] iz družine zankastih listnih zavrtačev (fam. Lyonetiidae) je polifagna vrsta gospodarskega škodljivca, ki ima v nasadih jablane na območju JV Slovenije velik pomen. Gosenice pod povrhnico lista koncentrično izjedajo tkivo v obliki rovov in s tem zmanjšujejo asimilacijsko površino. Ob močnem napadu lahko povzročijo prezgodnjo defoliacijo napadenih listov gostiteljske rastline. V širši regiji sta bili do nedavnega kot gostiteljski rastlini znani jablana in hruška ter v manjši meri tudi češnja, kutina, glog, in breza. Zadnja leta so se znamenja napada na območju JV Slovenije začela pojavljati tudi na drugih rastlinah. V letih 2007 in 2008 smo opravili vzorčenje različnih vrst gostiteljskih rastlin in napade dokumentirali. Poškodbe in mesta napadov smo pregledali in prvo določanje povzročiteljev napadov opravili v stadiju gosenice. Zaradi lažjega določanja taksonomske pripadnosti smo na delih napadenih rastlin v insektariju vzgajali povzročitelje napadov do stadija odraslega osebka. Ugotovljeno je bilo, da vrsta *Leucoptera malifoliella* [O. Costa] na območju JV Slovenije poleg jablane napada tudi hruško (pojav množičnejših napadov v letu 2007), breskev, marelico, češnjo, višnjo, azijsko hruško ter paradižnik. Pri določanju povzročiteljev izvrtin so obstajale možne zamenjave z drugimi listnimi zavrtači, oz. okužbo z glivo *Alternaria sp*. Na napadenem paradižniku.

ABSTRACT

Wide range of host plants of Pear leaf blister moth (*Leucoptera malifoliella* [O. Costa])

Pear leaf blister moth *Leucoptera malifoliella* [O. Costa] from the Lyonetiidae family is a polyphagous pest species of great economic importance in apple orchards in SE Slovenija. Larvae mine leaf tissue under epidermis in concentric shape and reduce

assimilation area. Under heavy attack, host plant can prematurely defoliate by dropping infested leaves. In the wider region were until recently known host plants apple and pear, with cherry, quince, hawthorn and birch in minor part. In recent years, the symptoms of infestation were appearing in SE Slovenia also on other plant species. In 2007 and 2008 different host plants were sampled and documented. Mines and localities of attack were inspected and first identification of pests was performed in the larva stage. Due to easier identification of taxonomic status, creators of the mines were bred in insectarium on parts of host plants until the adult stage. It was confirmed that besides apple, species *Leucoptera malifoliella* [O. Costa] attacks in SE Slovenia also pear (major infestation in 2007), peach, apricot, cherry, sour cherry, nashi and tomato. When identifying creator of the mines, there were possible replacements to be made with other leaf miners or infection with fungus *Alternaria sp*. On attacked tomato..

Varovanje kmetijskih zemljišč pred škodo po divjadi z elektroograjami

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Uporaba elektroograj za potrebe nadzorovane paše domačih živali je že dolgo znana kot poceni in učinkovit pripomoček za kmetovanje na travnatem svetu. V Sloveniji je premalo izkoriščena možnost njene uporabe za oviranje dostopa divjadi ter velikim zverem na kmetijska zemljišča in preprečevanje škod na gojenih rastlinah in na rejnih živalih. Ker je vse več prijav škodnih primerov tako na posevkih s kmetijskimi rastlinami (koruza, vrtnine, travinje), kot tudi napadov na domače živali (ovce, koze, osli), bo treba poiskati rešitev v učinkovitejšem varovanju z elektroograjami. Zaradi specifičnosti slovenskega prostora (visok delež gozda, območja s težjimi razmerami za kmetovanje, večanje številčnost divjadi), ki narekuje težje razmere za pridelavo hrane in krme za domače živali, je nujna uporaba tehničnih sredstev kot so različne vrste elektroograj. Posebnost te oblike tehničnih sredstev pri odvračanju divjadi in posledično preprečevanja škode na kmetijskih rastlinah je v tem, da deluje kot psihološka ovira. Čeprav se jih pri varovanju gojenih rastlin na kmetijskih zemljiščih zaradi očitkov, da so le-te drage in prezahtevne za vzdrževanje, premalo uporablja, menimo, da sta očitka neupravičena.V prispevku bodo predstavljene osnovne zahteve, ki morajo biti izpolnjene za učinkovito delovanje katerekoli vrste elektroograj. Poleg tega bodo predstavljene tudi zahteve pri ograjevanju za namene odvračanja divjadi od kmetijskih zemljišč, kjer uspevajo gojene rastline. Poseben poudarek bo na postavitvi in vzdrževanju elektroograj za potrebe odvračanja divjega prašiča od njiv in travnikov. Osnovna zahteva pri učinkoviti elektroograji za potrebe varovanja posevkov poljščin je ta, da mora biti prilagojena vrsti živali, ki ji želimo preprečiti dostop na zemljišče. Poleg tega mora biti primerna za premeščanje in hitro postavitev na območju, kjer se bo pokazala potreba po varovanju poljščin in njena prisotnost naj bi bila čim manj moteča za druge uporabnike prostora.

ABSTRACT

Protection of agricultural land from big game damage with electric fencing

The use of electric fences for the necessity of controlled grazing of domestic animals is well known as an inexpensive and effective way of grassland farming. In Slovenia, the possibility of their use in hindering access to big game and large carnivores to agricultural land with the aim of preventing the damage to cultivated plants and livestock is not enough exploited. Because more and more damage on crops such as maize, vegetable and grass sward as also attacks on domestic animals (sheep, goats, donkeys) is reported, it is urgent to seek for solution in effective protection with electric fencing. Due to specificity of Slovenian territory (large portion of forests, less favoured areas, increase in wildlife population) which dictates harder conditions in food and feed production for livestock, it is necessarily to employ technical means as different designs of electric fence are. Special characteristic of this form of technical means when trying to divert big game and consequently prevent damage on agricultural plants, is that it acts as a physiological barrier. Although in protecting crops on agricultural land this means is used very too scarce due to recriminations that it is too expensive to erect and exacting for maintenance as well, be belive these two recrimations are inexcusable. In a paper basic requirements which have to be fulfilled for adequate functioning of any kind of electric fence will be presented. Furthermore requirements in fencing for the purpose to exclude big game from agricultural land on which plants are cultivated will be laid out. Special attention will be given on how to erect and maintain wild boar proof electric fence. Principal demand when looking for effectiveness of electric fence in controling field crops is its adaptivennes to the animal for which we want to inhibit the entrance to the land. Beside previous it has to be convenient for relocation and fast set up in the area, where the need for protection of crops is. And the last but not the least important, its presence should be as less obstructed as possible for other beneficiaries of the countryside.

Preučevanje fungicidnega delovanja štirih naravnih snovi na paradižnikovo plesen (*Phytophthora infestans*) na dveh hibridih determinantnega paradižnika

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V letu 2008 smo na Laboratorijskem polju Biotehniške fakultete v Ljubljani izvedli poljski poskus v katerem smo preizkušali delovanje štirih naravnih snovi in en priporočen fungicid pri omejevanju in zatiranju krompirjeve ali paradižnikove plesni (*Phytophthora infestans*) na paradižniku. V poskusu smo uporabili 2 sorti paradižnika: Pik ripe (Petoseed) in Sun chaser (Petoseed). Naravne snovi, ki smo jih uporabili so bile carvacrol, asaronaldehid, cimetova kislina in borneol. Med obravnavanji z naravnimi snovmi ni bilo velike razlike pri okužbi paradižnika s paradižnikovo plesnijo in tudi pri številu in masi plodov se niso bistveno razlikovala. Ob prvem ocenjevanju se je pokazalo, da se okužba stopnjuje s časom ocenjevanja. Sorta paradižnika S. chaser se je pokazala za nekoliko bolj odporno o sorte P. ripe. Najmanj okužene so bile rastline paradižnika, ki smo jih škropili s priporočenim fungicidom Polyram DF, sledijo pa rastline škropljene s carvacrolom in asaronaldehidom, nato borneolom ter cimetovo kislino in najbolj okužene rastline so bile tiste, ki so ostale netretirane.

ABSTRACT

Research on fungicidal activity of four natural substances against tomato late blight (*Phytophthora infestans*) in two hybrids of determinant tomato

In 2008 the field experiment at the Experimental Field at the Biotechnical Faculty of Ljubljana was carried out to investigate the effect of four natural substances and one fungicide reducing and suppressing tomato late blight (*Phytophthora infestans*) on two tomato cultivars: Pik ripe (Petoseed) and Sun chaser (Petoseed). As natural substances we used carvacrol, asaronaldehyde, cinnamic acid and borneol. Among treatments there was just a slight difference in effectiveness against tomato late blight infection, number and mass of tomatos. Cultivar S. chaser was more resistant against pathogen then P. ripe. Less infected were plants treated with fungicide Polyram DF, then follows treatments with carvacrol and asaronaldehyde, borneol and cinnamic acid. Most infected was the control, where plants weren't treated.

Aktivnost encimov fenilpropanoidne poti, kot odziv tkiva na okužbo z jablanovim škrlupom (*Venturia inaequalis* [Cooke] G. Wint.)

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Poskus smo izvedli na plodovih sorte 'Zlati delišes', ki smo jih obrali v tehnološki zrelosti (15. September). Želeli smo ugotoviti kako okužba z jablanovim škrlupom vpliva na delovanje encimov in vsebnost posameznih fenolov v treh različnih delih jablanove kožice. Kožico plodov smo ločili na pego, tkivo v okolici pege (1-2 mm) in zdravo kožico. Tako smo analizirali delovanje naslednjih encimov: fenilalanin amonijak-liaze, halkon sintaze/halkon izomeraze, flavanon-3-hidroksilaze, flavonol sintaze (FLS), flavonoid-7-glukoziltransferaze (GTP). Znano je da okužba z glivo *Venturia inequalis* spremeni metabolizem nastajanja fenolov v pegi, okolici pege in zdravi kožici. Pokazalo se je, da je imelo tkivo pege v primerjavi z zdravim tkivom in tkivom okoli pege višjo encimsko aktivnost za vse encime, razen za encim flavonoid-7-glikoziltransferazo, ki je imel nižjo aktivnost v pegi. GTP uravnava tvorbo floridzina, kar nakazuje da se je floretin v pegi pretvori v floridzin, ki smo ga v pegi določili v večjih količinah. Pri vsebnosti fenolov smo ugotovili, da je tkivo pege v primerjavi z zdravim tkivom vsebovalo 3,4 krat več hidroksicimetnih kislin, 1,1 krat več dihidrohalkonov in 1,4 krat več flavan-3-olov. Zdravo tkivo pa je v primerjavi z tkivom pege vsebovalo 1,6 krat več flavonolov. Kljub temu, da je bila višja aktivnost FLS-a v pegi, pa je bilo njegovih produktov v pegi najmanj. Zato predvidevamo, da so se produkti transportirali v okolico pege in tam tvorili bariero ali pa se porabili v nadaljnjem encimatskem procesu. Iz dobljenih rezultatov sklepamo, da fenoli sodelujejo v obrambnem mehanizmu jablan proti jablanovem škrlupu. Encimska aktivnost fenilpropanoidne poti je v okuženem tkivu bistveno višja kot v zdravem tkivu.

ABSTRACT

Enzyme activity of phenylpropanoid pathway as a tissue response to infection with apple scab (*Venturia inaequalis* [Cooke] G. Wint.)

The study was performed on apple fruits of cv. 'Golden delicious', the samples of fruits were taken in technological maturity (15th of September 2008). The aim of the study was

to evaluate how the infection with apple scab influences the enzyme activity and the content of different phenolic compounds in different part of the peel. The apples peel was separated into scab spot, tissue around the scab spot (1-2mm) and healthy peel. We established the activity of following enzymes: phenylalanine ammonia-lyase, chalchone synthase/chalcon isomerase, flavanone 3-hydroxylase, flavonol synthase (FLS) and flavonoid 7-glucosyltransferase (GTP). Infection with the *Venturia inequalis* fungus enhanced the metabolism of phenolics in the scab spot, around spot and healthy peel. Tissue of the scab spot showed in comparison to the healthy tissue and the tissue around spot a higher enzyme activity for all tasted enzymes, except for flavonoid 7-glucosyltrasferase, which has lower activity in the scab spot. GTP is important for formation of phloridzin, which may suggest that in spot all of the phloretin was converted in phloridzin, which is present in higher quantities in the spot. At analyzing the concentration of phenolics compounds we established that scab spot showed in comparison to the healthy peel up to 3.4 times more hydroxycinnamic acids, up to 1.1 times more dihydrochalcones and up to 1.4 times more flavan-3-ols. Healthy peel showed in comparison to scab spot up to 1.6 times more flavonols. Despite of the fact that a high activity for FLS was noted in the scab spot, the amount of products of this enzyme in the spot was the lowest. Therefore we assume that the products of this enzyme are transported into the surrounding tissue around infection and create a barrier or are used up in following enzymatic processes. From the achieved results we can conclude that

phenolics are part of the defense mechanism of the plant to the infection with apple scab. Enzyme activity of the phenylpropanoid pathways was the infected tissue much higher compared to the healthy one.

Prve brezviroidne rastline hmelja (*Humulus lupulus* L.) v Sloveniji

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Na Inštitutu za hmeljarstvo in pivovarstvo Slovenije smo z namenom zagotovitve kakovostnega in neokuženega sadilnega materiala, začeli z eliminacijo hmeljevega latentnega viroida (HLVd) in vzgojo prvih brezviroidnih matičnih rastlin. Raziskave so pokazale, da okužba s HLVd vpliva na zmanjšanje količine pridelka, kar je posledica slabšega razvoja storžkov, obenem pa ima tudi vpliv na zmanjšanje vsebnosti alfa kislin v pridelanem hmelju. V Sloveniji je bila potrjena vsesplošna razširjenost hmeljevega latentnega viroida (HLVd) v matičnih rastlinah, tkivnih kulturah, brezvirusnih sadikah in pridelovalnih nasadih hmelja, čemur je v največji meri pripomoglo vegetativno razmnoževanje okuženih rastlin. Pri vzgoji novih sort se HLVd v procesu križanja izloči po naravni poti, saj se le redko prenaša preko semena, v primeru starih sort, pa je bilo potrebno izvesti eliminacijo HLVd s kulturo meristemov. Iz mladih poganjkov matičnih rastlin smo v aseptičnih razmerah izolirali meristeme in jih kultivirali *in vitro* na MS gojišču, ki je vsebovalo 2 mg/l BAP in 20 g/ saharoze. Regenerirane rastline smo v stadiju 2 razvitih nodijev prestavili na gojišče za ukoreninjenje (0,2 mg/l IBA) in jih nato vsake 4

do 6 tednov prenesli na sveže gojišče, do starosti 3-4 mesecev v odvisnosti od sorte. Uspešnost regeneracije izoliranih meristemov apikalnih in lateralnih poganjkov hmelja se je gibala med 18 in 60 odstotki v odvisnosti od sorte. Po približno 4 mesecih smo rastline testirali na HLVd z RT-PCR metodo. Z zdravimi rastlinami smo nadaljevali postopek aklimatizacije na *in vivo* razmere in jih nato vključili kot brezviroidne matične rastline v proizvodnjo certificiranega sadilnega materiala hmelja.

ABSTRACT

First viroid-free hop plants (*Humulus lupulus* L.) in Slovenia

The Slovenian Institute for Hop Research and Brewing has started the elimination of hop latent viroid (HLVd) and has obtained the first viroid-free mother plants. Establishing healthy plant material is clearly an essential prerequisite to get high and quality yield. Studies have revealed that HLVd is capable of causing moderate to severe yield loss in terms of cone yields and alpha-acid content. HLVd is widespread in Slovenian hops and has been detected in mother plants, tissue cultures, virus-free planting material and in commercial hop gardens, which is a result of vegetative propagation of infected plants. HLVd could be eliminated naturally by breeding of new hop varieties, because it is rarely transmitted by the seeds. For HLVd elimination from old hop varieties, meristem culture technique has been used. The production of healthy plant material was performed by excising meristems from newly emerged sprouts of mother plants under aseptic conditions. The meristem tips were cultivated *in vitro* on a MS medium with 2 mg/l BAP and 20 g/l sucrose. When on the regenerated plants 2 internodes were developed, they were transferred to a MS growth medium with 0.2 mg/l IBA and every 4 to 6 weeks of culture were transferred into a fresh growth medium. *In vitro* regeneration ability varied between 18 and 60 % depended on the variety. After approximately 4 months, successfully regenerated hop plants were tested for the presence of HLVd by the RT-PCR method. Healthy hop plants, free of HLVd, were acclimatized to *in vivo* conditions and are used as a mother plants for further propagation of certified hop plant material.

Preživetje in infektivnost PepMV v vodnem okolju

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Virus mozaika pepina (PepMV) uvrščamo v družino Flexiviridae in rod Potex virusov. Prvič je bil opisan na rastlinah pepina (*Solanum muricatu*) iz Peruja, zdaj pa je razširjen po vsem svetu in povzroča resne težave predvsem pri gojenju paradižnika v rastlinjakih. Virus je zelo lahko mehansko prenosljiv, njegov specifični prenašalec ni znan in raven prenosa s semeni je nizka, zato smo ugotavljali njegovo preživetje in infektivnost v vodnem negostiteljskem okolju. Dva različka virusa smo namnožili ločeno v propagacijski rastlini *Datura stramonium*. Liste smo homogenizirali v vodi in inkubirali pri 25 °C. Vsak teden smo analizirali inokulum. Tako evropski kot čile 2 različek PepMV sta ostala infektivna vse do treh tednov po inkubaciji v vodi. Preživetje in infektivnost virusa smo spremljali preko inokulacije testnih rastlin *Datura stramonium* in spremljanja pojava simptomov ter s

hitrim testom za detekcijo PepMV (Lateral flow) in RT-PCR v realnem času v enem koraku. Razmeroma dolgo preživetje in infektivnost virusa v vodnem negostiteljeskem okolju opozarja na vodo, kot potencialen vir okužbe s PepMV.

ABSTRACT

Survival and infectivity of PepMV in aqueous environment

Pepino mosaic virus (PepMV) belongs to genus potexvirus within the family Flexiviridae and was first described in pepino plants (*Solanum muricatum)* in Peru. It is highly mechanically transmitted and has spread throughout the world causing serious problems for glasshouse tomato production. Since a specific insect vector for PepMV transmission is not yet identified and the rate of seed transmission is very low, the survival and infectivity of the virus in an aqueous non-host environment was determined. Two PepMV strains, European and Chile 2, were separately propagated in *Datura stramonium* plants. Then leaves were homogenized in water and incubated at 25 °C. Every week part of the inoculum was tested. Both strains remained infective after being in water for up to 3 weeks. Virus infection was monitored by weekly inoculation of *Datura stramonium* test plants and observation of symptoms development together wit PepMV lateral flow test and single step real time RT-PCR. Relatively long virus survival and infectivity in an aqueous non-host environment call for attention to water as a source of infection with PepMV.

Težave z bakterijo *Pseudomonas syringae* pv. *Syringae* pri pridelavi sadilnega materiala pečkatega sadja

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Bolezni, ki jih povzroča bakterija *Pseudomonas syringae* pv. *Syringae,* so v naravi precej pogoste, občasno pa se pojavljajo z močneje izraženimi bolezenskimi znamenji posebno na različnih sadnih vrstah. Bakterija je po Zakonu o semenskem materialu kmetijskih rastlin in podzakonskih aktih uvrščena na seznam škodljivih organizmov in bolezni, ki lahko vplivajo na kakovost pridelanih sadik. Sadike, ki se tržijo morajo izpolnjevati zahteve, da so proste škodljivih organizmov in na njih ne smejo imeti vizualnih znamenj okužbe. Fitosanitarna inšpekcija je v okviru rednega nadzora pridelave sadilnega materiala v sadjarstvu z vizualnimi pregledi opazila, da se v zadnjem času vse pogosteje pojavljajo bolezenska znamenja okužbe tudi na sadilnem materialu pečkatega sadja. Za potrditev okužbe so bili odvzeti številni vzorci. Laboratorijske analize so potrdile navzočnost te bakterije na sadikah jablane, zlasti sorte Braeburn. V prispevku so prikazana najpogosteje opažena bolezenska znamenja na sadikah jablane in ukrepi v drevesnici za preprečevanje nadaljnjega širjenja okužbe omenjene bakterije.

ABSTRACT

Problems with bacterial canker (*Pseudomonas syringae* pv*. Syringae*) in production of pome fruit propagating material

Diseases caused by the bacterium *Pseudomonas syringae* pv. *Syringae* are quite common in the nature. Sometimes they appear with well expressed symptoms, especially on various fruit trees. According to the Law of seed material of agricultural crops and the other regulative, this bacterium is listed as a harmful organism which can impact the quality of produced plants. Plants in trade have to be free from this harmful organism and free from visible symptoms. During regular inspections of propagating material in fruit nurseries phytosanitary inspection noticed that recently signs of this disease have been appearing more frequently on propagating material of pome fruits as well. To confirm the presence of *Pseudomonas syringae* pv. *Syringae* as the potential causal agent of mentioned symptoms many samples have been taken. Laboratory tests confirmed its presence in plants of apple trees, most frequently in those of the cultivar Braeburn. In the paper the most distinctive symptom expressions of diseased apple plants and the phytosanitary measures undertaken to prevent the spread of this disease will be presented.

Sistematično ugotavljanje okužb hruševega ožiga na Kmetijskem inštitutu Slovenije v letih 1998-2008

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Hrušev ožig je najnevarnejša bolezen pečkarjev in nekaterih okrasnih rastlin iz družine rožnic. Največjo škodo povzroča v jablanovih in hruševih nasadih ter v drevesnicah. Povzroča jo bakterija *Erwinia amylovora* (Burrill) Winslow *tal*. Bolezen se je do leta 1996 pojavila v vseh sosednjih državah, kar je spodbudilo slovenske strokovne službe s področja varstva rastlin, da so v letu 1998 omogočile Kmetijskemu inštitutu Slovenije organizacijo sistematičnega nadzora. Z raziskavo smo želeli preveriti zastopanost bolezni v Sloveniji. Program sistematičnega nadzora obsega preglede gostiteljskih rastlin na izbranih lokacijah po vsej državi. V prvem letu smo pregledali 256 točk v zadnjih letih pa se je to število podvojilo. Vsakoletni nadzor obsega preglede v dveh časovnih terminih. Prvo najdbo hruševega ožiga smo v okviru posebnega nadzora odkrili leta 2001 v Naklem na Gorenjskem. V letu 2003 smo odkrili žarišče novih okužb v Škofji Loki od koder se je bolezen v tem letu razširila po širši okolici. V prispevku je prikazana dinamika spremljanja bolezni in rezultati sistematičnega nadzora v posameznih letih.

ABSTRACT

Systematic determination of the presence of fire blight at Agricultural Institute of Slovenia in the years 1998-2008

Fire blight is the most fatal disease of stone fruit and some ornamental plants of the family Rosaceae. It causes the most severe damage mainly in apple and pear plantations and in nurseries. The disease is caused by the bacterium *Erwinia amylovora* (Burrill) Winslow *et al*. By 1996 the disease appeared in all the neighbouring countries, which stimulated the Slovene plant protection professional service to enable the Agricultural Institute of Slovenia to organise a special surveillance in 1998. The investigation was used to check the presence of the disease in Slovenia. The systematic surveillance program comprises the inspection of host plants on chosen locations throughout the country. In the first year, 256 checkpoints were inspected and the number was doubled in the last few years. The annual surveillance includes inspections on two dates. The fire blight was found for the

first time in frame of special surveillance at Naklo, Gorenjska, in 2001. In 2003 the focus zone of new infections was found in Škofja Loka and from there the disease was spread in the broader area in the same year. The current paper presents the dynamics of disease monitoring and the results of systematic surveillance in individual years.

Pojav bakterijskega oljčnega raka (*Pseudomonas savastanoi*) v severozahodnem delu istrskega polotoka

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Oljčni rak, ki ga povzroča patogena bakterija *Pseudomonas savastanoi* je znan že iz časov starega Rima. Danes je razširjen praktično v vseh območjih, kjer raste oljka in je najpomembejša bolezen na tej rastlini. Bakterija pospešuje rast rastlinskega tkiva in nekontrolirano delitev celic iz katerih se razvijejo novotvorbe, njihovo množenje in rast povzroča propad vej in korenin, kar ima za posledico nižji pridelek. Olje z okuženih rastlin pa ima slabšo kvaliteto. Bakterija prodre v rastlinsko tkivo skozi odprte rane, ki ostanejo od obrezovanja ali od pobiranja pridelka in skozi rane, ki jih naredi toča ali močan veter. V naši raziskavi, ki smo jo opravili v letu 2008, smo želeli ugotoviti vzroke, ki vplivajo na pojav in razširjanje te bolezni v okolici Poreča (severozahodna Istra, Hrvaška). Območje raziskovanja je skupaj obsegalo 140 ha oljčnih nasadov, ki so bili postavljeni na petih med seboj ločenih lokacijah s podobnimi ekološkimi in mikroklimatskimi razmerami. V poskus sta bili vključeni 2 sorti: Leccino in Picholine. Okužbe na oljkah, ki smo jih ugotavljali vizualno s pregledovanjem zgornjih delov dreves, smo prikazali v številčni skali. Intenzivnost okužbe z oljčnim rakom se je med lokacijami razlikovala. Sorta Leccino se je pokazala kot bolj občutljiva v primerjavi s sorto Picholine. Dobljeni rezultati bodo uporabljeni v strategiji boja proti tej bolezni.

ABSTRACT

The occurrence of olive knot disease caused by *Pseudomonas savastanoi* in the northwest region of Istrian peninsula

Olive knot, a disease caused by pathogenic bacteria *Pseudomonas savastanoi* is known from the ancient Roman times. Nowadays it is spread in almost all olive production areas and represents the main disease in olive groves. The bacteria stimulates tissue proliferation and abnormal cell division from which tumour formations are formed. With disease development, tumours grow and their number increase which can lead to branch and shoots decline and lower yields. The oil from olives on contaminated olive trees has lower quality. The bacteria penetrates the olive through open wounds from cutting or harvesting as well as through wound caused by hail and strong winds. Considering the incidence of disease occurrence in surroundings of Poreč (northwest Istria, Croatia) during the 2008 our aim was to quantify the presence of olive knot appearance and set possible reasons which have influenced its presence and spreading. The researched area had 140 ha of olive trees in which there were 5 separate research locations with similar ecological and microclimatic circumstances planted with Leccino and Picholine varieties. Frequency and degree of contamination were defined by visual examination of olive's

upper parts, and results were shown numerically (on scale). Intensity infestation of olive knot was different on various locations. Variety Leccino showed less susceptibility to infection of bacteria compared to Picholine. Gained results can be used in strategies for decreasing damages caused by this disease.

Ranljivost tal za izpiranje izbranih herbicidov v koruzi v Apaški dolini – ocenjena z modelom PELMO

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Apaško polje spada v enega izmed bolj ranljivih območij v Sloveniji, kjer je izpiranje fitofarmacevtskih sredstev v podzemne vode zaradi specifičnih hidroloških in pedoloških lastnosti lahko večje. Izpiranje izbranih herbicidov (terbutilazina in S-metolaklora) v podzemne vode je v veliki meri povezano s pretežno kmetijsko dejavnostjo in zatiranjem plevela pri koruzi, ki je med najbolj zastopanimi poljščinami območja. Intenzivna uporaba pripravkov z aktivno snovjo atrazin v preteklosti, je najverjetnejši razlog, da se atrazin in njegovi metaboliti še vedno pojavljajo v podzemni vodi. Na podlagi že obstoječe pedološke karte v merilu 1:25.000, aeroposnetkov in terenskega dela (sondiranje in 18 izkopanih pedoloških profilov) smo izdelali pedološko karto v merilu 1:5.000. Na območju smo določili tri glavne talne tipe in sicer obrečna tla, hipoglej in psevdoglej. Analitske podatke talnih profilov smo skupaj s klimatskimi podatki tega območja uporabili v modelu PELMO 3.2.2., ki simulira vertikalno gibanje fitofarmacevtskih sredstev v tleh. Izpiranje atrazina, terbutilazina in S-metolaklora smo testirali za obdobje zadnjih 10 let in uporabili meteorološke podatke postaje Murska Sobota. Z modelom smo ovrednotili vplive lastnosti tal, različnih odmerkov izbranih herbicidov in zaporednih aplikacij na izpiranje aktivnih snovi na vseh 18 talnih profilih. Prostorske pedološke podatke Apaškega polja smo skupaj s povprečnimi vrednostmi izpiranja herbicidov po posameznih pedokartografskih enotah uporabili za izdelavo kart ranljivosti tal za izbrane aktivne snovi v programu ArcGIS 9.2.

ABSTRACT

Soil vulnerability to selected herbicide leaching in maize fields of Apace Valley – using PELMO model

Apače Valley has specific hydrological and pedological characteristics and is therefore one of the most vulnerable areas in Slovenia concerning pesticide leaching. Agriculture activity and oppresion of weed in maize, which is one of the main cultures grown in this area, represents the main reason for terbuthylazine and S-metolachlor leaching to groundwater. Intensive use of herbicides with atrazine as active ingredient in the past is the most probable reason that atrazine and its metabolites still occurs in the groundwater.
Detailed soil map of Apače Valley has been made in the scale of 1:5.000 using existing soil map in the scale of 1:25.000, aerofoto of Apace Valley and additional field work (soil probing and 18 pedological profiles). Fluvisol, hypogley and pseudogley are the main soil types determined in this area. Analytical data of soil profiles and climate data of the

investigated area were used in Pelmo 3.2.2 which is one dimensional simulation model, simulating the vertical movement of pesticides in soil. Leaching of selected active substances was tested for the period of last 10 years, using data from meteorological station Murska Sobota. The effects of soil properties, different herbicide rates as well as successive applications on selected pesticides leaching in all 18 profiles were evaluated. Spatial soil type data and average values of herbicide leaching for each soil mapping unit were used to produce soil vulnerability maps for all three herbicides in ArcGis 9.2 programe.

Fitotoksičnost različnih herbicidov na domač genski material koruze in njihova učinkovitost

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Poleg učinkovitega delovanja herbicidov z različnimi aktivnimi snovmi je zelo pomembno, da ne povzročajo fitotoksičnosti na gojenih rastlinah, v katerih jih uporabljamo. Fitotoksičnost herbicida in posamezne aktivne snovi na določeno gojeno rastlino preverijo že proizvajalci sami pred registracijo herbicida, vendar v žlahtnjenju rastlin uporabljamo različen genski material, pogosto še posebej občutljive homozigotne linije in smo zato zelo omejeni v varstvu pred pleveli. Namen raziskave je preučiti fitotoksičnost herbicidov na domač genski material koruze ter učinkovitost delovanja herbicidov z različnimi aktivnimi snovmi. V poljski poskus je bilo v letu 2008 vključenih 53 linij in 53 populacij koruze iz genske banke na Biotehniški fakulteti v Ljubljani ter 19 standardov/hibridov z Opisne sortne liste za koruzo R Slovenije. Uporabili smo 6 herbicidov z različnimi aktivnimi snovmi in sicer: H1 (izoksaflutol 75%), H2 (mezotrion 3,75%, S-metolaklor 37,5%, terbutilazin 12,5%), H3 (foramsulfuron 3%, jodosulfuron-metil natrij 1%), H4 (nikosulfuron 4%), H5 (glufosinat-amonijeva sol 15%) in H6 (glifosat v obliki izopropilamin soli 48 %). Odmerek vsakega herbicida smo uporabili v dveh variantah, 1) v priporočenem – registriranem odmerku ter 2) v podvojenem odmerku. Že na osnovi preliminarnih rezultatov smo ugotovili različno učinkovitost zatiranja plevelov glede na aktivne substance herbicidov ter veliko genetsko variabilnost domačega genskega materiala koruze glede fitotoksičnosti, ki se je izražala predvsem v različnih klorozah. Nekateri genotipi nakazujejo tudi delno tolerantnost na neselektivna herbicida glufosinat-amonij in glifosat, kar bo potrebno z nadaljnjimi raziskavami še potrditi.

ABSTRACT

Phytotoxicity of some herbicides to domestic maize gene material and their efficacy

It is very important that beside good efficacy herbicides with different active substances show also no phytotoxicity to cultivated plants. This characteristic is primarily checked before registration of certain herbicide, but in plant breeding we often operate with very sensitive breeding material, like homozygote lines and therefore we are very limited in weed management. The main objective of this research is to investigate phytotoxicity of some herbicides to domestic maize gene material and their efficacy. In the field trial, conducted in 2008, the 53 maize inbreds and 53 maize populations obtained from gene bank of Biotechnical faculty in Ljubljana and 19 hybrids as standard, were included. For

weed management we used 6 herbicides with different substances: H1 (isoxaflutole 3 %), H2 (S-metolachlor 37,5 %, terbutilazine 12,5 %, mesotrione 3,75), H3 (foramsulfuron 3%, iodosulfuron-methyl-sodium 1%), H4 (nicosulfuron 4 %), H5 (glufosinate-ammonium 15%) and H6 (glyphosate 48 %). For application 2 variants were used: 1st) registered dose and 2nd) double dose of each herbicide. Already preliminary tests showed different activity on present weeds and quite genetic variability of domestic maize gene material regarding to phytotoxicity which was shown in different necrosis. Some of genotypes showed certain tolerance also to non-selective herbicides glufosinate-ammonium and glyphosate, which needs to be confirmed in further investigations.

Plant invaders, as artificial and natural hosts of economically important viruses

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Out of 2400 plant species of the Hungarian flora 71 ones are considered as invasive alien species. Most plant invaders are dangerous to ecological balance of biotic communities, nature conservation areas, to our rare and protected plant species and biological diversity. They can cause human health problems (e.g. pollen allergy of *Ambrosia artemisiifolia* and *Iva xanthiifolia*) and considerably reduce crop yields. Their indirect harmful effect as alternative hosts of plant pests and pathogens may also be also important. In this study we investigated the role of some invasive species (*Abutilon theophrasti, Ambrosia artemisiifolia, Asclepias syriaca, Cyperus esculentus, Phytolacca americana, Solidago gigantea*) in the epidemiology of plant viruses. Natural virus infestations have been monitored for more years. Mechanical inoculations and vector transmission studies were also carried out. Even in the last year, a lot of new weed-virus relations have been identified. At low percent (1-2 %) of the collected symptomless samples of *A. artemisiifolia, Cucumber mosaic virus* (CMV) and *Tomato spotted wilt virus* were detected. *A. syriaca* and *C. esculentus* as natural hosts of four viruses and *Barley stripe mosaic virus* became known, respectively. *Melandrium yellow fleck virus* and RS strain of CMV infested *P. americana* under glasshouse condition during mechanical inoculations. Neither virological surveys under field conditions nor inoculations in the glasshouse did not show *A. theophrasti* as host of plant viruses. Chlorotic ringspot symptoms on *S. gigantea* leaves suggested the presence of virus(es), which were not yet identified. This work was supported by courtesy of Hungarian National Research Found (OTKA No. T049093).

Slovenski izvleček ni bil predložen!

Ugotovljeni novi škodljivi organizmi pri premeščanju rastlin iz držav članic Evropske unije ali med pridelavo v Sloveniji v letu 2008

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Fitosanitarna inšpekcija izvaja redni zdravstveni nadzor rastlin, rastlinskih proizvodov in nadzorovanih predmetov, ki so prepoznani kot prenašalci nevarnih škodljivih organizmov in so uvrščeni v sezname Direktive Sveta 2000/29/EC ali v odločbe Evropske Komisije o nujnih ukrepih. V času zdravstvenih pregledov nadzorovanih rastlin fitosanitarni inšpektorji preverjajo tudi druge rastline, ki bi lahko bile gostiteljice novih škodljivih organizmov, na primer iz opozorilnega seznama ("Alert list") Evropske in mediteranske organizacije za varstvo rastlin (EPPO). Nadzor poteka na mestih, kjer se te rastline, rastlinski proizvodi ali nadzorovani predmeti premeščajo, pridelujejo, predelujejo, skladiščijo, prodajajo ali drugače uporabljajo, kot tudi v prostorih kupcev in pri vnosu iz tretjih držav, izvozu ter tranzitu. V okviru rednega zdravstvenega nadzora rastlin so bili v letu 2008 prvič v Sloveniji ugotovljeni nekateri škodljivi organizmi rastlin, ki so uvrščeni na seznam II.A Direktive Sveta 2000/29/EC in seznam A2 EPPO (*Paysandisia archon* Burmeister) ali na EPPO seznam škodljivih organizmov A1/A2 (*Fusarium foetens* Schroers *tal*.) oziroma so bili v času najdbe na EPPO "Alert list" (*Plasmopara obducens* J. Schröt. In *Cylindrocladium buxicola* Henricot). Tujerodni vrsti kaparjev – *Aspidiotus destructor* Sign. In *Chrysomphalus aonidum* L. ter bakterija *Curtobacterium flaccumfaciens* pv. *Poinsettiae* (Starr & Pirone) so bili prvič potrjeni na ozemlju Slovenije, niso pa uvrščeni na nobenega od navedenih seznamov.

ABSTRACT

New pests detected on plants moved from Member States of the European Union or during the production in Slovenia in 2008

The Phytosanitary inspection service carries out regular inspections of plants, plant products and other objects, which can transmit harmful organisms and are listed in annexes of Council Directive 2000/29/EC or in European Commission decisions on emergency measures. During plant health checks of regulated plants, phytosanitary inspectors control also other plants that can be host of new pests, which are listed in the Alert list of the European and Mediterranean Plant Protection Organisation (EPPO). Inspection is carried out at places where these plants are moved, produced, processed, stored, sold or otherwise used, as well as in the premises of buyers and during introduction from third countries, export and transit. In the framework of regular inspection of plants some pests were detected for the first time in Slovenia in 2008. Some of them are listed in Annex II.A of Council Directive 2000/29/EC and on the List A2 of EPPO (*Paysandisia archon* Burmeister) or are listed only on the EPPO list of quarantine pests A1/A2 (*Fusarium foetens* Schroers *et al*.) or they were at the time of finding listed on the EPPO Alert list (*Plasmopara obducens* J. Schröt. And *Cylindrocladium buxicola* Henricot). Alien species of scale insects – *Aspidiotus destructor* Sign., *Chrysomphalus aonidum* L. and bacteria *Curtobacterium flaccumfaciens* pv. *Poinsettiae* Starr & Pirone were found for the first time on the Slovene territory and are not listed on any of the above mentioned lists.

Analiza gospodarnosti konvencionalnega in ekološkega gojenja solate (*Lactuca sativa* L.) v različnih agroekoloških razmerah

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V vrtnarski pridelavi je konvencionalno gojenje vrtnin še vedno najbolj razširjeno. Za ta način pridelave so značilni velika poraba kemičnih sredstev, velik pridelek in majhni stroški na enoto površine. Po drugi strani pa tako lahko pride do povečanja onesnaženosti okolja in preobremenitve hrane z ostanki fitofarmacevtskih sredstev. V zadnjih dvajsetih letih postaja glavna tema političnih, socialnih in ekonomskih gibanj naravi prijazna pridelava, ki ima za cilj ohranjanje narave ob upoštevanju socialnih in kulturnih danosti. Takšne težnje so najmočnejše predvsem v razvitih državah (države EU, ZDA), kjer vse bolj narašča povpraševanje po ekološko pridelanih svežih in predelanih vrtninah. Zaradi specifičnih naravnih in gospodarskih razmer ima Hrvaška ugodne prostorske in klimatske možnosti za ekološko pridelavo vrtnin, še posebno na območjih, in teh je na pretek, kjer doslej niso bila uporabljena kemična sredstva. Cilj naše raziskave je bil primerjati gospodarsko uspešnost gojenja solate v konvencionalnem in ekološkem načinu pridelave v celinskem in sredozemskem delu Republike Hrvaške. V letih 2002 in 2003 je bil poskus postavljen na družinskih kmetijah v okolici Pulja (sredozemsko območje) in v okolici kraja Otočac (celinsko območje). Dobljeni rezultati kažejo na to, da ima gojenje solate v ekološki pridelavi za posledico manjši pridelek, kar je še bolj izrazito v celinskem podnebju. Da bi bila pridelava solate iz takega načina gojenja ekonomsko opravičljiva, je treba zanjo doseči višjo prodajno ceno v primerjavi s solato iz konvencionalne pridelave. Iz istega razloga bi morala biti tudi prodajna cena ekološko pridelane solate na celinskem območju višja kot cena solate, pridelane ob morju.

ABSTRACT

The economical analysis of conventional and integrated crop management of lettuce (*Lactuca sativa* L.) growing in different agroecological conditions

The most representative method of cultivating crops in the vegetable productions is the conventional system, which is characteristic for the high use of chemical substances, high yield and low cost per unit of land. But consequently this system of production can cause the increase of pollution in the area and high level of pesticide residues in food. In the last twenty years the main theme of political, social and economic movement has been sustainable management, which goal is nature preservation considering its social as well as cultural characteristics. Such trends are becoming representative mainly in the developed countries of the EU and the USA, where the demand for fresh as well as processed organically grown garden crops has been increasing. Due to specific natural and economic conditions Croatia boasts advantageous spacial and climatic conditioins for growing vegetable crops according to the integrated crop system especially in the areas – (a lot of land is available), where chemical substances have not yet been used. The aim of our study was to compare the economic performance of growing lettuce in the conventional and integrated crop management of production in the mainland and the Mediterranian part of Croatia. In the years 2002 and 2003 the experiment was carried out

on family farms in the vicinity of Pulj (the Mediterranian area) and in the vicinity of Otočac (the mainland area). The obtained results show that the cultivation of lettuce in the integrated crop management in lower yields, which is even more apparent in continental climate. In order to justify the integrated crop management of lettuce economically, it is essential to achieve a higher sales price in comparison with the lettuce cultivated according to the conventional system. For that reason, the sales price of integrated grown lettuce in the mainland should be higher than in the Mediterranean.

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