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Društvo za varstvo rastlin Slovenije
Plant Protection Society of Slovenia

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KAZALO

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Dejavnosti EPPO, povezane s pojavljanjem novih bolezni in njihovih povzročiteljev

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Medvladna evropska in sredozemska organizacija za varstvo rastlin (EPPO) je bila ustanovljena leta 1951. Trenutno je vanjo včlanjenih 50 držav. Med poslanstvi organizacije je preprečitev vstopa in širjenja povzročiteljev bolezni, ki predstavljajo tveganje za kmetijstvo in gozdarstvo. Od sedemdesetih let prejšnjega stoletja dalje EPPO članicam posreduje seznama A1 in A2 s povzročitelji bolezni, ki jih je potrebno nadzorovati. EPPO posreduje tudi fitosanitarne ukrepe, ki jih je potrebno izvesti, da se vnos in širjenje povzročiteljev preprečita. Ukrepi pa ne zadoščajo vedno. Človekovo delovanje, še posebej trgovanje z rastlinami ter njihovimi produkti, je eden od glavnih vzrokov pojava novih bolezenskih povzročiteljev. Njihov vnos na nova območja ima lahko resne gospodarske in okoljske posledice, kar se je že pokazalo ob številnih vnosih v Evropo. Da bi se tveganja pojava novih bolezenskih povzročiteljev lotili usklajeno, je EPPO oblikoval shemo analize tveganja za nove povzročitelje (PRA). Shema bo predstavljena v prispevku. Ob pojavu novih povzročiteljev je zelo pomembno, da so o tem zelo hitro obveščene službe za varstvo rastlin, saj le tako lahko na svojih območjih organizirajo inšpekcijske službe in ustrezne pregledovalne programe. Od 1998 EPPO na svoji spletni strani objavlja opozorilni seznam s podatki o pojavljanju bolezenskih povzročiteljev. Nekateri od njih so lahko kasneje vključeni v PRA in se zanje predlaga nadzor kot za karantenski organizem. Kadar je karantenski status primeren za določenega povzročitelja, se zanj običajno oblikujejo standardi EPPO, ki vključujejo navodila za diagnostiko, uničenje in omejitvene programe.

ABSTRACT

EPPO activities on emerging pests and diseases

The European and Mediterranean Plant Protection Organization (EPPO) is an intergovernmental organization, which was created in 1951. It currently has 50 member countries and one of its missions is to prevent the entry and spread of pests presenting a risk to agriculture and forestry. Since the 1970s, EPPO has made recommendations to its members on which pests should be regulated (EPPO A1 and A2 Lists) and on phytosanitary measures which should be implemented to avoid their introduction and spread. However, these existing measures can be challenged by the emergence of new pests and diseases. Human activities and in particular the commercial trade of plants and plant products is perceived as playing a major role in the emergence of new pests. The introduction of pests into new areas can have serious economic and environmental impact, and this will be illustrated with several examples of recent introductions into Europe. In order to assess in a harmonized way the risks that are associated with emerging pests, EPPO has elaborated a Pest Risk Analysis (PRA) scheme which will be presented. When new pests are emerging, it is also quite important to provide early warning to Plant Protection Services so that they can put in place import inspections and surveillance programmes on their territory. Since 1998, EPPO has set up an Alert List on its website to provide data on these emerging pests. Some of them may later be submitted to a PRA and eventually be recommended for regulation as quarantine pests. When a quarantine status is felt appropriate for an emerging pest, EPPO Standards can also be developed to provide guidance on diagnostics, eradication and containment programmes.

Pojav novih bakterijskih bolezni sadnega drevja in nekaterih drugih rastlin, ki so ali lahko postanejo grožnja za južno Evropo: epidemiologija, tveganje, preprečevanje in upravljanje ob prvem pojavu

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Bakterijske bolezni sadnega drevja težko nadzorujemo tako kemično kot tudi biotično. Zaradi tega za njihov nadzor večinoma uporabljamo le preventivne ukrepe. Taki ukrepi so higiena zdravega sadilnega materiala, dobra praksa gojenja in izogibanje sajenja na območjih, kjer je tveganje za okužbo veliko. Dodatno težavo predstavlja enostaven prenos bakterij s specifičnimi žuželčjimi prenašalci, površinskimi vodami, sadilnim materialom in okuženim orodjem. Najpomembnejša dejavnika tveganja za vnos bakterijskih bolezni v južno Evropo sta uvoz okuženega sadilnega materiala in okuženi prenašalci. V tem prispevku bodo izpostavljeni epidemiologija, upravljanje in glavna tveganja treh novih bakterijskih bolezni, ki se približuje južni Evropi, skupaj z njihovimi povzročitelji in prenašalci. Podrobno bodo predstavljeni ožigi listov vinske trte, sadnega in okrasnega drevja, ki jih povzroča *Xylella fastidiosa*. Njena možna, a še ne potrjena prenašalca v Evropi in Sredozemlju sta *Cicadella viridis* in *Philaenus spumarius*. Predstavljena bo bolezen huanglongbin ali zelenenje citrusov, ki jo povzroča proti vročini tolerantna bakterija '*Candidatus' Liberobacter asiaticus* in na vročino občutljiva '*Candidatus' L. africanus*. Obe obliki bakterije sta skupaj s prenašalcema, bolšicama (Psyllidae) *Diaphorina citri* in *Trioza erytreae*, zastopani na Arabskem polotoku. V zdajšnjem času so znana poročila o pojavljanju bolezni huanglongbin iz Irana, Malija, Etiopije in Somalije. *T.erytreae* je že razširjena na nekaterih otokih v Atlantskem oceanu. V prispevku bo predstavljen tudi rak citrusov, ki ga povzroča *Xanthomonas axonopodis* pv. *citri*. Njegova najnevarnejša oblika je zastopana v Iraku, Iranu, Omanu, Somaliji, Združenih arabskih emiratih, Savdski Arabiji, Jemnu in na Reunionu. Predstavljeni bodo izbruhi in/ali tveganja ter morebitna znamenja, ki kažejo na možne izbruhe nekaterih drugih patogenih bakterij: *Acidovorax citrulli*, ki povzroča bakterijsko lisavost na plodovih buč, z nedavnimi izbruhi v Grčiji, na Madžarskem, Izraelu in Italiji; *Pantoea ananatis* na koruzi in čebuli; *P. stewartii* subsp. *stewartii* na koruzi; *Pseudomonas syringae* pv. a*ctinidiae* na kiviju; *Xanthomonas arboricola* pv. *pruni* na koščičarjih, z nedavnimi izbruhi v Švici in na Nizozemskem na lovorikovcu; '*Candidatus' Phytoplasma phoeniculum*, ki je uničila na tisoče mandljevih dreves v Libanonu. Ker so izogib začetnemu tveganju in ukrepi, ki pojavu sledijo, podobni za vse naštete patogene, bodo poudarjeni pri bakteriji *Xylella fastidiosa*. V prispevku bodo predstavljena tudi razmišljanja o učinkovitosti karantenskega nadzora rastlinskih patogenih bakterij.

ABSTRACT

Emerging bacterial diseases of fruit trees and some other crops, that are or may become a threat for Southern Europe: notes on epidemiology, risks, prevention and management on first occurrence

Bacterial diseases of fruit trees are difficult to control (both chemically and biologically), mostly only by preventive measures such as hygiene, healthy planting material, good cultural practices and avoidance of risk planting sites. Moreover bacteria may easily spread by (surface) water, planting material and contaminated implements/machines and

by a-specific or specific insect vectors. Most important risk factors for the introduction of bacterial diseases into southern Europe are imported infected planting material and (infected) insect vectors. In this contribution the epidemiology, management and main risks of three emerging bacterial diseases approaching southern Europe, their causal organisms and vectors will be highlighted, especially 1) Leaf scorch and leaf scald diseases of grape and diverse fruit and ornamental trees, caused by *Xylella fastidiosa*. For this pathogen, although not yet confirmed from Europe or the Mediterranean basin, local possible vectors such as *Cicadella viridis* and *Philaenus spumarius* occur. In less detail 2) Citrus huanglongbin or Citrus greening, caused by the heat tolerant *'Candidatus' Liberobacter asiaticus* and and heat sensitive *'Candidatus' L. africanus* (both forms and respective psyllid vectors *Diaphorina citri* and *Trioza erytreae* are present on the Arabian peninsula, with recent reports of huanglongbin occurring in Iran, Mali, Ethiopia and Somalia and *T.erytreae* already present on some Atlantic Ocean Islands) and 3) Citrus canker, caused by *Xanthomonas axonopodis* pv. *citri*, the so-called Asiatic, most severe form, is present in Irak, Iran, Oman, Somalia UAE, Saudi-Arabia, Yemen and Reunion. Outbreaks and/or risk and possible emerging character of some other bacterial pathogens: *Acidovorax citrulli*, causing bacterial fruit blotch of cucurbits, with recent outbreaks in Greece, Hungary, Israel and Italy, *Pantoea ananatis* on maize and onion, *P. stewartii* subsp. *stewartii* on maize, *Pseudomonas syringae* pv. *actinidiae* on kiwifruit, *Xanthomonas arboricola* pv. *pruni* on stone fruits, with recent outbreaks in Switzerland and in the Netherlands (on *Prunus laurocerasus* - cherry-laurel), *'Candidatus' Phytoplasma phoeniculum* on almond, destroying thousands of trees in Lebanon. Since initial risk avoiding and management measures following an introduction are more or less similar for the above mentioned pathogens, they will be highlighted for *Xylella fastidiosa*. Some considerations on the (effectiveness of) quarantine regulations for plant pathogenic bacteria will also be presented.

New tools to assess the environmental impact of plant protection products

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Much progress has been done over the last few years in assessing the environmental fate of plant protection products, in particular with respect to modelling. Reliable pesticide fate models originating from research can now be implemented in decision-support tools to support pesticide registration and to manage the environmental risks posed by plant protection products once they are used in the field. The FOOTPRINT project, funded by the European Commission between 2006 and 2009, contributed significantly to improving the assessment of the risks of contamination of water resources by i) developing a methodology which can be deployed for any farm or territory in Europe; ii) compiling databases for soil and pesticide properties; and, iii) encapsulating databases and results of pesticide fate models in software tools. The FOOTPRINT catchment tool FOOT-CRS was tested in the Apače Valley, a catchment to the north east of Slovenia. The FOOTPRINT methodology has since been adapted to allow detailed risk assessments to be undertaken at all scales: field, farm, catchment, region, country, registration zones or the whole of the EU. The latest system allows users to assess the risks of pesticides impacting on surface water and groundwater through the internet. User-friendly web interfaces enable users to specify the identity of products of interest, their application date and rate, and the spatial extent of the territory for evaluation. The relevant pesticide fate modelling is undertaken on a supercomputer fully dedicated to assessing the environmental fate of plant protection

products and results are provided in various formats: statistics, probability distribution, risk indicators and maps. These new decision support tools can be used to support national registration of plant protection products, and national implementations of the Water Framework Directive and the Directive on the Sustainable Use of Pesticides.

ABSTRACT

Nova orodja za ocenjevanje vplivov fitofarmacevtskih sredstev na okolje

Ocenjevanje okoljskih vplivov fitofarmacevtskih sredstev (FFS) se je v zadnjih nekaj letih hitro razvijalo, posebno na področju modeliranja. Zanesljive modele za ocenjevanje usode FFS, ki so rezultat znanstveno raziskovalnega dela, lahko sedaj nadgradimo v "decision-support" orodja, ki so v pomoč pri odločanju v registracijskih postopkih in pri upravljanju okoljskih tveganj po uporabi FFS na polju. Projekt FOOTPRINT, ki ga je financirala Evropska komisija v letih 2006-2009, je pomembno prispeval k izboljšavam pri ocenjevanju tveganj onesnaževanja vodnih virov z i) razvojem metodologije, ki se lahko uporablja na vsaki kmetiji ali ozemlju v Evropi; ii) zbiranjem enotnih podatkovnih baz tal in lastnosti FFS; ter, iii) zadrževanjem podatkovnih baz in rezultatov modeliranja usode FFS v samih programskih orodjih. FOOTPRINTova orodja so bila testirana v Apaški dolini, povodju v severovzhodni Sloveniji. FOOTPRINTova metodologija se razvija še naprej v smeri omogočanja izdelave natančnih ocen tveganja v vseh velikostnih območjih: polje, kmetija, povodje, regija, država, registracijska območja, ali celotna EU. Zadnji sitem sistem omogoča uporabniku izdelavo ocene tveganja FFS za površinske in podzemne vode prek spletne aplikacije. Uporabniku prijazni spletni portal omogoča uporabnikom specifikacijo FFS, določitev njihovega odmerka in časa nanosa, ter prostorski obseg ozemlja za ocenjevanje. Ustrezno modeliranje usode FFS poteka na superračunalniku, ki je v celoti namenjen ocenjevanju usode FFS, rezultati pa so na voljo v različnih zapisih: osnovna statistika, verjetnostne porazdelitve, kazalci tveganja in karte.

Referati na okrogli mizi

Vpliv novih rastlinskih bolezni in škodljivcev na pridelavo ter naravo v Sloveniji

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Preventivni fitosanitarni ukrepi so prvi element trajnostne pridelave, če jih konsistentno izvajamo. Kljub temu, da je za škodljive organizme (ŠO), ki so na seznamih prilog direktive 2000/29/ES, znano tveganje za zdravje rastlin v EU, se v sedanjem sistemu dogajajo stalni vnosi ŠO z območij navzočnosti zaradi sledenja cilju, da ne bi preveč motili trgovanja z rastlinami in rastlinskimi proizvodi. Tako zapostavljanje zdravja rastlin posledično v ruralnem in naravnem okolju le delno zagotavlja prehransko varnost in konkurenčnost kmetijstva oziroma varovanje naravnega okolja. Morda bo po reviziji sistem zdravstvenega varstva rastlin v EU bolje sledil splošnim ciljem, kot so: varovanje zdravja rastlin skozi trajnostno pridelavo; zagotavljanje konkurenčnosti proizvajalcev; zagotavljanje prehranske varnosti; varovanje naravnega okolja (gozdovi, javni in zasebni parki, pokrajina in biodiverziteta). Posebni cilji fitosanitarne zakonodaje so namreč: varstvo pred ŠO, ki se še ne pojavljajo v EU; obvladovanje ŠO, ki še niso splošno razširjeni, a so tako škodljivi, da je potrebno preprečevati njihov vnos in širjenje; zagotavljanje dostopnosti in uporabe zdravega sadilnega materiala na začetku pridelovalne verige; obvladovanje širjenja ŠO preko premeščanja rastlin ali rastlinskih proizvodov. Z naraščajočo trgovino nastajajo dnevno nova tveganja, ki bi jih morali prepoznati, preden pride do izbruhov v EU. Pogosto na razpolago nimamo niti EU analiz tveganja zaradi škodljivih organizmov niti analiz tveganja za širjenje ali analiz stroškov-učinkov, da bi se na njihovi podlagi laže odločali. Te analize ali zgolj ocene so narejene po potrebi na nacionalni ravni. V prispevku bo predstavljena analiza stroškov in učinkov za fitosanitarno ukrepanje, vključno z obveznim nadzorom ŠO s karantenskih seznamov in laboratorijsko oziroma znanstveno podporo, v boju proti nekaterim pomembnim ŠO v Sloveniji.

ABSTRACT

An influence of newly occurred pests and diseases to production and nature in Slovenia

Preventive phytosanitary measures are the first element of sustainable production if they are implemented in consistent manner. Despite fact, that harmful organisms (HOs), listed in annexes of directive 2000/29/EC, pose known threat to the Community plant health, present regime allows for continuous introductions from risky areas aiming not to disturb trade in plants and plant products. Such setting a side of plant health in rural and natural environment only partly ensures food security and competitiveness of agriculture or safeguarding the natural environment. Hopefully review of the plant health system in EU will meet better general objectives like: Contributing to plant health protection through sustainable production; Ensuring competitiveness of producers; Ensuring food security; Safeguarding the natural environment (forests, public and private green, landscape, biodiversity). Specific objectives of phytosanitary legislation are: Providing protection against HOs that so far do not occur in the EU, Controlling HOs of still limited distribution which are so harmful that strict control on further spread is needed; Ensuring the availability and use of healthy plant material at the beginning of the plant production chain; Controlling the spread of HOs through movement of host plants/plant products. With increased trade unknown risks arise daily, which should be identified before outbreaks occur in EU. Neither EU pest risk analysis nor spread-risk and cost-benefit analysis are

available for better decision making. All these are done mainly at national level at the occasion of necessity. Phytosanitary actions including mandatory surveillance of listed HO and laboratory or scientific support against some important HOs in Slovenia will be analysed in respect of cost-benefit.

Zlata trsna rumenica – potencialna grožnja slovenskemu vinogradništvu

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Bolezen vinske trte – zlata trsna rumenica (FD) se je prvič pojavila v poznih petdesetih letih prejšnjega stoletja v Franciji, kjer je prizadela veliko območje in povzročila veliko izgubo pridelka. Ta neozdravljiva bolezen povzroči propad rastlin nekaj let po okužbi. Bolezen se v zadnjih letih hitro razširja v druge evropske države v značilnem vzorcu epidemije. V Sloveniji se občasno pojavlja od leta 2005. V letu 2010 se je močno razširila v Dolenjski vinorodni deželi, zabeležili pa smo tudi izbruh v okolici Izole. Zlato trsno rumenico povzroča majhna bakterija fitoplazma FD. Fitoplazma FD se širi z okuženim rastlinskim sadilnim materialom in z žuželkami. Edini potrjen žuželčji prenašalec v naravi je ameriški škržatek *Scaphoideus titanus*, ki fitoplazmo prenaša s hranjenjem na okuženih rastlinah. Fitoplazma FD ima tudi druge potencialne naravne gostitelje, kot sta navadni srobot (*Clematis vitalba*) in črna jelša (*Alnus glutinosa*) in prenašalce kot je vzhodnjaški škržatek (*Orientus ishidae*). Raziskave molekulske raznovrstnosti izolatov fitoplazme FD v različnih gostiteljih in prenašalcih nakazujejo veliko raznolikost te fitoplazme in odkrivajo možne poti prenosa in širjenja.

ABSTRACT

Flavescence dorée – a potential threat to the Slovenian viticulture

The grape vine disease Flavescence dorée (FD) has occurred for the first time in late 50s in France, where it affected large areas of vineyards and caused significant yield losses. This incurable disease causes death of the infected plants in few years after the infection. Disease incidence is rising rapidly in other European countries in recent years, showing a clear epidemic pattern. It has been recorded sporadically in Slovenian vineyards since 2005. However, it has reached significant spread in Dolenjska region in 2010. In addition, its outbreak was recorded in a vineyard near Izola. Flavescence dorée is caused by a small bacterium - FD phytoplasma. FD phytoplasma may spread through infected planting material or an insect. The only confirmed vector in nature is a leafhopper *Scaphoideus titanus*, transporting the phytoplasma as it moves between vines to feed. FD phytoplasma has also other potential natural host, e.g. clematis (*Clematis vitalba*) and black alder (*Alnus glutinosa*), as well as new potential vectors, e.g. an leafhopper *Orientus ishidae.* The studies of molecular diversity of FD phytoplasma strains in various hosts and potential vectors have revealed their great diversity and potential pathways for their spread.

Analiza vnosa in odkrivanja tujerodnih fitofagnih žuželk in pršic v Slovenijo

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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 se njihovo število skoraj eksponencialno povečuje. 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. K večjemu številu odkritih vrst prispeva tudi bolj sistematično spremljanje zdravstvenega stanja rastlin v zadnjem obdobju in usposobljenost diagnostičnih laboratorijev za identifikacijo nekaterih težjih skupin škodljivih organizmov rastlin. Inventar tujerodnih vrst žuželk in pršic, ki so bile doslej vnesene ali so se postopno razširile na ozemlje Slovenije, obsega tudi vsaj 155 vrst fitofagnih žuželk in pršic, od katerih so mnoge pomembni škodljivci rastlin ali njihovih proizvodov. Skoraj 60 % teh vrst je bilo vnesenih ali vsaj odkritih v zadnjih dveh desetletjih, 38 % v zadnjih desetih letih. Med temi izrazito prevladujejo enakokrilci (Hemiptera) – 90 vrst (58,1%), sledijo metulji (Lepidoptera) in hrošči (Coleoptera) – s po 20 vrstami (12,9%), dvokrilci (Diptera) – 10 vrst (6,5%), resarji (Thysanoptera) – 7 vrst (4,5%), kožekrilci (Hymenoptera) – 1 vrsta (0,6%) in pršice (Acari) – 4 vrste (2,6%). Med enakokrilci izrazito prevladujejo kaparji (Coccoidea) – 37 vrst (41,1%) in prave uši (Aphidoidea) – 32 vrst (35,6%). Med deležem posameznih taksonomskih skupin in njihovim pomenom za kmetijstvo, gozdarstvo in okolje ni nobene korelacije. Ta je, ne glede na njegovo taksonomsko pripadnost, odvisen predvsem od napadalnosti posamezne vrste in gospodarskim oz. okoljskim pomenom gostiteljske(ih) rastlin(e). Največ tujerodnih fitofagnih žuželk izvira iz Azije – 54 vrst (34,8%) in Severne Amerike - 46 vrst (29,7%), sledi Afrika – 16 vrst (10,3%), Južna in Srednja Amerika –13 vrst (8,4%), Avstralija in Nova Zelandija – 5 vrst (3,2%), ostalo so sredozemske, kozmopolitske in vrste neznanega porekla – skupaj 21 vrst (13,5%).

ABSTRACT

Analysis of introduction and detecting of alien phytophagous insects and mites 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 exponentially in the last two decades. The rising globalisation and liberalisation of the world trade with plant material in plant products are the main cause for such the situation. For Slovenia the liberalisation of this trade in mid seventies and latter and the transitional geographical position of the country have played the most significant roll in spread of alien plant pests. The current situation presented here is partly also the result of an enhanced plant health survey in the latest period and improved laboratory capabilities for identification of taxonomically more critical groups of plant pests. The current list of alien insects and mites introduced or spread into Slovenia since the mid of the 19th century until now comprehends also more than 155 species that can be considered as important pests of plants or their products. Almost 60 % of them were discovered in the last two decades, 38 % in the last 10 years. The most numerous group

are Hemiptera – 90 species (58,1%), followed by Lepidoptera and Coleoptera – each with 20 species (12,9%), Diptera – 10 species (6,5%), Thysanoptera – 7 species (4,5%), Hymenoptera – 1 species (0,6%) and mites (Acari) – 4 species (2,6%). Among Hemiptera scale insects (Coccoidea) – 37 species (41,1%) and aphids (Aphidoidea) - 32 vrst (35,6%) largely prevail. No correlations between number of species from different taxonomic groups and their economic, environmental or social impact have been observed. This is usually determined by the pest aggressiveness associated with the economic and environmental importance of its host plant(s) and their susceptibility. The major parts of alien plant pests originate from Asia – 54 species (34,8%) and North America - 46 species (29,7%). Follow Africa with 16 (10,3%), South America with 13 species (8,4%) and Australia and New Zeeland with 5 species (3,7%). The remaining are Mediterranean, cosmopolitan species and species of uncertain origin – all together 21 species (13,5%).

Neobiota – nekaj novega, a nam ni všeč!

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Ljudje imamo običajno radi nove stvari, če to niso ravno spremembe v okolju. Te nam niso pri srcu, tudi ko gre za nove vrste, ki prihajajo k nam od daleč in se tu agresivno razbohotijo. Poimenovali smo jih invazivke, vse bolj pa se za njih uporablja tudi izraz »neobiota«. Ne motijo nas vrste kot take, njihova oblika ali barva, ki so, resnici na ljubo, pogosto prav eksotični in prijetni za oko. Motijo nas novi odnosi, ki jih s prihodom vzpostavijo v ekosistemih, moti nas nov red, ki ga vsilijo v okolju. In kaj je s tem redom tako zelo narobe, da nam ni všeč? V ekologiji že dolgo razlikujemo med vrstami, ki so se razvile v domačem kraju, to so avtohtone ali domorodne vrste in tistimi, ki so na neko območje prišle naknadno – alohtone ali tujerodne vrste. Razmejitev med obojimi je zato dokaj jasna, a le na papirju. Ko skušamo definicijo s papirja prenesti v življenje, smo pogosto v zadregi, kar je običajno za človekov način dojemanja narave in življenja. Naravo si namreč predstavljamo kot omaro z velikim številom predalov, v katere pospravljamo posamezne vrste, pojme, procese. Vedno znova in znova pa naletimo na probleme, ko bi morali vrsto, pojem ali proces pospraviti v dva ali še več predalov hkrati, kar seveda ne gre, ali celo nekam v ozek prostor med dva predala. Takšna je pač prava narava. In tako je tudi pri predalčkanju domorodnih in tujerodnih vrst. Sta krompir in koruza v Evropi domorodna ali tujerodna? Kje so ptice selivke domorodne in kje tujerodne? Ko temu razvrščanju narave dodamo še invazivke - alohtone vrste z močnim negativnim vplivom na okolje, je zmešnjava popolna. Vse samo zato, ker si tako zelo želimo, da bi vse lahko pospravili v veliko omaro s predali!

ABSTRACT

Neobiota – something new, but we don't like it!

People usually love new things, unless they mean changes in the environment. That is something new we dislike – even if this is new species coming from fare away and spreading aggressively around the place we live. We gave those species a name, an invasive species, every more often we call them also “neobiota”. It is not their shape or color that we dislike, which can be very exotic and pleasant to view, to be honest. It is new interaction in the ecosystems that disturb us when they arrived, new order they create in

the environment. And what is so wrong with new order that we dislike it? Distinction between introduced species, living outside their native distributional range and indigenous species, living in their native environment is not new for ecologists. For that reason it is very easy to deal with, at least on the paper. But when we try to apply both terms in practice, we often find the task a mission impossible. The problem is in our way of looking on nature and life itself. Namely, we like to imagine nature as a big closet with many drawers, each holding one species, one ecological concept or process. But every so often we bump against the problem when we realize, that we should put a particular species, concept or process into two or even more drawers, what is impossible of course, or even in narrow space in between the drawers. That's what truth nature is alike. And the same is when we try to store in the drawers introduced and indigenous species. Are potato and corn introduced or indigenous species in Europe? In which country are migrating birds introduced species and in which they are indigenous? When we add invasive species to this concept of classification of nature – indigenous species with adverse affect on ecosystems, the mess is complete. Only because we are pushing so hard to store everything into the big closet with drawers!

Varstvo sadnega drevja

Spremljanje pojava jabolčnega zavijača (*Cydia pomonella* L.) na območju Celjske regije od leta 2004 do 2010 in strategija zatiranja

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Spremljanje in napoved pojava ter razvoja škodljivih organizmov v sadjarstvu temelji na spremljanju in vrednotenju tako biotičnih kot abiotičnih dejavnikov in deluje v okviru Opazovalno napovedovalne službe Slovenije, ki je organizirana v petih regijskih centrih. Jabolčni zavijač je gospodarsko najpomembnejši stalni škodljivec jablan, ki lahko povzroči veliko zmanjšuje pridelka in zato ga je potrebno zatirati. Dinamiko razvoja jabolčnega zavijača spremljamo s pomočjo biotehničnih pripomočkov, vrednotenja meteoroloških spremenljivk in opazovanj v naravi. Omenjene metode spremljanja nam omogočajo dokaj natančno določitev optimalnega časa zatiranja jabolčnega zavijača. Ta pristop je edina pot k zmanjševanju ostankov fitofarmacevtskih sredstev v samih pridelkih kot tudi v tleh in okolju. V članku je podrobnejše predstavljen način spremljanja in strategija zatiranja Jabolčnega zavijača na območju Celjske regije

ABSTRACT

Monitoring of codling moth (*Cydia pomonella* L.) in Celje region in years 2004 to 2010 and strategy of combating

Monitoring and forecasting about occurrence and development of harmful organisms in fruit growing is based on evaluation of biotic and abiotic factors and take an active part in Observation and forecasting service of Slovenia, which is organized in five regional centers. Codling moth, the most serious pest permanent pest of apple orchards, can cause high yield losses, so it needs to be suppressed. Development of codling moth is observed using biotechnical tools, evaluation of meteorological data and field observations. These modes of monitoring help us to predict the need and optimal time for control of codling moth in apple orchards. By means of a good forecasting system this is the only way to reduce the use of plant protection products (PPP) and also to reduce the accumulation of PPP in fruits, soil and environment. In this article the modes of codling moth monitoring in Celje region is presented and strategy of combating.

Primerjava učinkovitosti dveh sistemov zatiranja jabolčnega zavijača (*Cydia pomonella* L.) z uporabo metode zbeganja (Exosex CM, RAK 3)

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V poljskem poskusu, izvedenem v rastni dobi 2010 v 25 hektarskem nasadu jablan, smo izvedli primerjavo dveh alternativnih metod za zatiranje jabolčnega zavijača (*Cydia pomonella* L.), ki temeljita na uporabi feromona kodlemon (E,E 8,10-dodekadien-1-ol). Na drevesa na polovici parcelic poskusnega nasada smo izobesili dispenzorje sistema Exosex CM (Exosect LTD) in pri drugi polovici parcelic dispenzorje za izvedbo standardne metode zbeganja RAK 3 (BASF). Dvakrat v sezoni smo ugotavljali delež

plodov, začrvivljenih od gosenic jabolčnega zavijača na drevesih 6 sort jablan, ki so rasla na 48 podparcelicah, razpršenih znotraj 25 ha kompleksa jablan. Z uporabo metode Exosex CM smo dosegli primerljivo stopnjo učinkovitosti zatiranja jabolčnega zavijača kot pri uporabi dispenzorjev RAK 3. Ugotovljen delež črvivih plodov pri parcelicah, varovanih z eno ali drugo metodo, se ni statistično razlikoval.

ABSTRACT

Comparison of two systems of mating disruption (Exosex CM vs. RAK 3) for control of codling moth (*Cydia pomonella* L.)

Two methods of codling moth (*Cydia pomonella* L.) pheromone mating disruption based on the use of codlemone (E,E 8,10-dodekadien-1-ol) were compared in 2010 in a 25-ha apple plantation. Half of plots of the plantation were treated with Exosex CM (Exosect LTD) dispensers, and another half with RAK 3 dispensers (BASF). The percentage of fruits attacked by codling moth caterpillars was determined twice a season on trees of 6 apple cultivars, which were a part of 48 sub-plots scattered inside the experimental plantation. The Exosex auto-confusion method provided comparable level of codling moth control in comparison to traditional method with use of RAK 3 dispensers. No statistical differences in percentage of attacked fruits were observed.

Zmanjšanje populacije jabolčnega zavijača *(Cydia pomonella)* **z uporabo entomopatogenih ogorčic v nasadu jablan**

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Za zmanjšanje močnih populacij jabolčnega zavijača sadjarji že vrsto let v Evropi in drugod zelo uspešno uporabljajo metodo zbeganja ali konfuzije, ki jo dopolnjujejo še z uporabo sredstev na podlagi virusa granuloze. V zadnjem času so ponekod v ta namen začeli uporabljati tudi entomopatogene ogorčice iz rodu ***Steinernema***, ki jih že dalj časa uspešno uporabljajo za zatiranje talnih škodljivcev. Od vrste ***Steinernema feltiae***, ki smo jo tudi mi uporabili v poljskem poskusu proti diapavzalnim gosenicam jabolčnega zavijača, lahko pričakujemo 70 do 90% smrtnost in posledično zmanjšanje črvivosti jabolk od prvega rodu za okrog 40 do 70%. Prvi poljski (demonstracijski) poskus v Sloveniji smo zasnovali v jeseni v letu 2008 v nasadu KZ Selnica ob Dravi na sorti elstar, ki sodi med najboljše gostiteljske sorte za jabolčnega zavijača. S poskusom smo v naslednjem letu nadaljevali. Z natančnim pregledom plodov ob koncu doraščanja gosenic prvega in drugega rodu smo ugotavljali razlike v odstotkih črvivosti plodov na tretirani in netretirani parceli ali 'kontroli', ki predstavlja standardno pridelavo jabolk. V prispevku želimo predstaviti oz. pokazati dobljene rezultate dveh let.

ABSTRACT

Decreasing the population of the apple borer *(Cydia pomonella)* by the use of the entomopathogenic nematodes in the apple orchard

For diminishing strong populations of apple borer, the fruit growers in Europe and elsewhere have used the confusion method very successfully for many years, supplemented by the use of means based on the granulosis virus. For this purpose, in some countries, they recently started to use the entomopathogenic nematodes of the genus *Steinernema*, which have been used successfully for the control of the ground pests, for a long time now. From the species *Steinernema feltiae*, which we used in our field test against the diapausal caterpillars of the apple borer, we can expect 70 to 90% mortality and consequently decrease of wormy apples of the first genus for around 40 to 70%. The first field (demonstrative) test in Slovenia was designed in autumn 2008 in the orchard KZ Selnica by the Drava River on the elstar variety, which is one of the best host varieties for the apple borer. We continued the test in the following year. With precise inspection of fruits by the end of the growth period of caterpillars of the first and the second genus, we established the differences in the percentage of wormy fruits on the treated and on the untreated or control parcel, which represents the standard production of apples. In this paper, we would like to present and demonstrate the results obtained in two years.

Spremljanje sezonske dinamike orehove muhe (*Rhagoletis completa* Cresson) V SV Sloveniji

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V letu 2008 smo s pomočjo rumenih lepljivih plošč spremljali let orehove muhe v nasadih oreha Maribor (Vrbanski plato) in Razvanje, v letih 2009 in 2010 pa na več lokacijah SV Slovenije (Razvanje, Hajdina, Pekre, Nebova, Gančani, Laznica, Maribor, Maribor – Vrbanski plato). Let imaga na lokaciji Maribor se je v letu 2008 pričel ob koncu julija in končal v začetku druge dekade septembra, na lokaciji Razvanje pa v sredini druge dekade meseca julija in končal v začetku druge dekade meseca septembra. V letu 2009 in 2010 se je let na vseh spremljanih lokacijah pričel v zadnji dekadi meseca julija, končal pa v drugi oz. tretji dekadi meseca septembra.

ABSTRACT

Seasonal dynamics of walnut husk fly (*Rhagoletis completa* Cresson) monitored with yellow sticky plates in NE part of Slovenia

With yellow sticky plates we monitoring the seasonal dynamics of walnut husk fly on the locations Maribor and Razvanje in year 2008 and in the years 2009 and 2010 on locations: Razvanje, Hajdina, Pekre, Nebova, Gančani, Laznica, Maribor, Maribor – Vrbanski plato. In the year 2008 the adults were present between middle of July and middle of September on both locations. In the years 2009 and 2010 the adults were present between last decade of July and middle of September.

Pilot project of medfly – *Ceratitis capitata* Wied. (Diptera, Tephritidae) suppression by sterile insect technique in the Neretva river valley of Croatia

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The Neretva river valley is divided with a part in the Republic of Croatia and a part in Bosnia and Herzegovina. It has been noted that highest damage caused by medfly – *Ceratitis capitata* Wied. (Diptera, Tephritidae) is along the border area and can cause up to 30% damage on mandarines. The Croatian Government strongly supports the project since the medfly became a serious pest in the valley. Interest from the Croatian Government to integrate the sterile insect technique (SIT) on an area-wide basis as an alternative for insecticide-based medfly control in consultation with the Joint FAO/IAEA Division determined that Neretva river valley could be a good location to apply this environmentally friendly pest control method as a part of an integrated pest management system. The Neretva valley is the largest citrus production area in Croatia. The Neretva river valley is a relatively isolated ecosystem (similar to that of the Hex River Valley in South Africa where IAEA had supported activities of medfly control by using SIT). This provides a good probability of success for a future project since such relative isolation by mountains would limit the movement of wild medfly adults into the valley. A national project involving the Neretva valley as a pilot project for southern Europe is feasible in view that it represents an ecosystem at the northern edge of medfly distribution. A pilot area of 650 ha of mandarine was selected as pilot area where sterile males are released since April 2010. The flies were produced in BioFly Israel, and were shipped directly to the Croatian airport Split, twice a week. A total of 70 shipments will be delivered to Croatia during 2010, as a part of FAO/IAEA RER 5014 TCP. The Croatian Government built an emergency facility with capacity of 20 mil flies/week in the city of Opuzen in Neretva river valley, which is fully equipped for recapture, packing and pre-release operation and quality control. Results shows significant efficacy of the SIT control method, when fruits of figs, apricots and mandarins were checked to be infested by medfly larvae and when female captures in control traps in pilot and infested areas were checked. The Neretva valley includes over 80% of the Croatian national citrus production, valued at USD 13 million of exported mandarine fruit per year, mostly to EU. The medfly control by integrating SIT technique would economically benefit all local stakeholders including growers and the public at large in view more access to fresh fruits. This program will benefit from the support of the local authorities as well as of the growers and exporters.

Slovenski izvleček ni bil predložen.

Vpliv vremenskih razmer na dinamiko populacije oljčne muhe (*Bactrocera oleae* Gmelin)

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Razvojni krog razmnoževanja in ekologija oljčne muhe (*Bactrocera oleae* Gmelin) sta veliki meri odvisna od fenološkega razvojnega stadija oljke in lokalnih podnebnih razmer. Kljub temu, da je pojav oljčne muhe odvisen od vremenskih razmer in je le-ta gospodarsko najpomembnejša škodljivka oljk v Sredozemlju, je vpliv podnebnih razmer na dinamiko pojava oljčne muhe v slovenski Istri razmeroma slabo raziskan. Zaradi pomanjkljivega znanja o vplivu vremenskih razmer na pojav oljčne muhe smo na območju slovenske Istre v letih 2005, 2006, 2007, 2008 in 2009 s pomočjo rumenih lepljivih plošč opremljenih s feromonsko vabo izvedli monitoring oljčne muhe. Na podlagi rezultatov monitoringa in spremljanja abiotskih dejavnikov okolja (temperatura, padavine, relativna zračna vlažnost) smo naredili sistematično analizo pojava oljčne muhe v odvisnosti od vremenskih podatkov. Rezultati raziskave so pokazali, da vremenske razmere pomembno vplivajo na velikost populacije oljčne muhe v slovenski Istri, čeprav klimatski dejavniki nimajo direktnega vpliva na dinamiko leta samčkov oljčne muhe.

ABSTRACT

Effects of weather condition on population dynamics of the olive fly (*Bactrocera oleae* Gmelin)

The life cycle and ecology of the olive fly (*Bactrocera oleae* Gmelin) is linked to the seasonal development of olive trees and to local climate condition. Despite the fact that olive fruit fly activity depend on weather condition and it's the Mediterranean's the most important pest of olives, the effects of climatic condition on population dynamics of the olive fly is relatively poorly known. Because of this lack of information, annual monitoring of the population dynamics of the olive fly was conducted in Slovene Istria by using yellow plastic strip covered with non-drying adhesive and pheromone trap in 2005, 2006, 2007, 2008 and 2009, and factors including temperature, rainfall and relative humidity with respects to the population fluctuation were analyzed systematically. The results showed that meteorological conditions have significant effect on population abundance of olive fly in Slovene Istria, despit the fact that climatic conditions had little direct influence on population dynamic of adult males of olive fly.

Vpliv črne protitočne mreže na razvoj rdeče sadne pršice in plenilskih pršic na jablani

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V intenzivnem pridelovanju sadja – jabolk, se protitočne mreže vse bolj uveljavljajo. Raziskave so se v zadnjih letih osredotočile predvsem na fizikalne lastnosti različnih protitočnih mrež, na odziv sadnih rastlin, na različne stopnje senčenja, tehnične rešitve in le v manjši meri na fiziološke odzive rastlin, klimatske razmere pod mrežo in zunaj nje, še manj pa na spremembe v razvoju populacij škodljivih in koristnih organizmov. V poskusnem nasadu sadjarskega centra Maribor smo na treh sortah (Fuji, Gala, Braeburn) pod mrežo in zunaj nje, spremljali razvoj populacije rdeče sadne pršice (*Panonychus ulmi*) in zastopanost predatorskih pršic (Phytoseiidae) v treh zaporednih letih. Štetje gibljivih stadijev smo izvajali 2-3 krat, izvajali smo tudi štetje zimskih jajčec rdeče sadne pršice v zgodnjem pomladanskem času pred rezjo. Štetja gibljivih stadijev rdeče sadne pršice so pokazala rezultate, ki se razlikujejo od pričakovanih, saj se pod črno protitočno mrežo rdeča sadna pršica ne razvija bolje kot izven nje. Med obravnavanji ni bilo razlike, pokazala se je le večja občutljivost rdeče sadne pršice pri sorti Braeburn. V opazovanem obdobju so predatorske pršice zadostno nadzorovale razvoj populacije rdeče sadne pršice, saj smo v treh letih spremljanja škodljivih organizmov uporabili akaricid le enkrat. Uporabili smo Envidor SC 240 (spirodiklofen) in sicer v letu 2010. Ugotovili smo, da se rdeča sadna pršica v nasadu pod črno protitočno mrežo razvijajo tako, da je številčnost populacije večinoma nižja v nasadu pokritem s črno protitočno mrežo.

ABSTRACT

Influence of black countercurrent network on development red fruit mites and predatory mites in apple orchards

In intensive fruit growing, especially with apples, the hail nets are more and more included. In recent years the researches have been focused especially on the physical characteristics of hail nets, on the response of fruit plants, on the different levels of shading, on the technical solutions but not as much on the physiological responses of plants or climatological changes under and outside the hail nets. There has been almost no focus on the development of the harmful and friendly organism population. At the experimental station of Sadjarski center Maribor we have been monitoring the development of red spider mite (*Panonychus ulmi*) and the presence of predatory mites (Phytoseidae) on three varieties (Fuji, Gala, Braeburn) during a three year period. We have counted moving stages 2 to 3 times and we have also been counting winter eggs of the red spider mite in the early spring time before the pruning. The results were different than expected because the red spider mite did not develop better under the hail net in comparison to the development outside the hail net. There was no difference between the treatments, there was only a noticeable sensitivity of the red spider mite by Braeburn variety. During the research period predatory mites have been sufficiently controlling the development of the red spider mite because we have used acaricid in the three years of monitoring the harmful organisms only once. In 2010 we used Envidor SC 240 (spirodiclofen). The research has shown that under the black hail net the red spider mite develops in a way that the number of the population is lower in comparison to the orchard outside the black hail net.

Glive iz rodu *Colletotrichum*, povzročiteljice antraknoze na sadnem drevju in jagodičju v sloveniji

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Glive iz rodu *Colletotrichum* sodijo med gospodarsko najpomembnejše škodljive organizme na kmetijskih rastlinah, pa tudi na okrasnem drevju ter grmičevju. Zmožnost, da povzročijo latentno okužbo jih uvršča tudi med pomembne povzročiteljice skladiščnih bolezni. Bolezenska znamenja, ki jih povzročajo, imenujemo antraknoze in se kažejo kot uleknjene, bolj ali manj okrogle temne pege, na katerih se razvijejo trosišča (acervuli) in oranžni skupki trosov. Za razumevanje etiologije bolezni, ki jih povzročajo glive iz rodu *Colletotrichum,* je pomembna zanesljiva identifikacija vrste povzročiteljev, pa tudi prepoznavanje populacij znotraj posameznih vrst. Standardne metode za identifikacijo vrst rodu *Colletotrichum* temeljijo na morfoloških karakteristikah kot so barva kolonije, velikost in oblika konidijev, navzočnost set, hitrost priraščanja micelija pri različnih temperaturah in navzočnost spolnega stadija. Te metode ne zadoščajo za zanesljivo identifikacijo vrst zaradi velike variabilnosti in nestabilnosti morfoloških značilnosti pri obravnavanih glivah; dopolnjujejo jih paritveni testi na osnovi vegetativne kompatibilnosti in molekularne metode. S temi tehnikami so v populaciji glive *C. acutatum*, ki velja za najpomembnejšo povzročiteljico antraknoze na sadnem drevju in jagodičevju, identificirali osem molekularnih skupin (A1 do A8) in tri od njih opisali kot samostojne vrste: *C. simmondsii, C. fioriniae* in *C. acutatum* sensu stricto. V raziskavi antraknoze na sadnem drevju in jagodičju smo se osredotočili na bolezni, ki jih glive iz rodu *Colletotrichum* povzročajo na treh izbranih sadnih vrstah: domačem orehu, ameriški borovnici in jagodnjaku. V letih 2008 - 2010 smo zbrali 86 vzorcev pri katerih smo analizirali navzočnost gliv iz rodu *Colletotrichum.* Z morfološkimi in molekularnimi metodami smo ugotovili, da sedem izolatov pripada vrsti *C. simmondsii,* 26 izolatov vrsti *C. fioriniae,* 53 izolatov pa še neopisani molekularni skupini A4.

ABSTRACT

Species of *Colletotrichum* causing anthracnose of fruit trees and small fruit in Slovenia

Species belonging to the genus *Colletotrichum* cause economically important diseases on agricultural plants and ornamental trees and shrubs. Their ability to cause latent infections classifies them also as important agents of storage diseases. Symptoms of the diseases, referred to as anthracnose, include dark brown, round, depressed lesions on which acervuli and orange masses of spores are abundantly produced. Reliable pathogen identification and definition of genetic population structure are very important for understanding the etiology of the diseases caused by members of the genus *Colletotrichum*. Identification of *Colletotrichum* species was traditionally based on morphological and cultural characters such as colony colour and growth rate, size and shape of conidia, presence of setae, occurrence of peritecia. These characteristics were too variable und unstable for reliable species identification and were supplemented with

vegetative compatibility tests and molecular methods. Based on molecular characters, eight molecular groups (A1 to A8) were identified within the population of *C. acutatum,* the major causative agent of antracnose on fruit tress and small fruits. Three molecular groups were subsequently described as separate species: *C. simmondsii, C. fioriniaea* and *C. acutatum* sensu stricto. The research on anthracnose of fruit trees and small fruits in Slovenia was focused on *Colletotrichum* induced diseases of European walnut, high-bush blueberries and strawberries. 86 samples of anthracnose were collected in the years 2008 – 2010. *Colletotrichum* sp. were isolated and identified using morphological and molecular methods. Seven isolates were identified as *C. simmondsii,* 26 isolates as *C. fioriniae,* while 53 isolates belonged to yet undescribed molecular group A4.

Vpliv uporabe natrijevega bikarbonata, sredstva za zatiranje jablanovega škrlupa, na kakovost plodov jablane

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Študije v zadnjih letih ugotavljajo učinek natrijevega bikarbonata (NaBK), kot fungicidnega sredstva, ki preprečuje okužbo z jablanovim škrlupom. V predhodnih študijah so preučevali uporabo NaBK na kalitev askospor in na podaljševanje kličnega mešička glive *Venturia inaequalis* [(Cooke) G. Wint.]. Namen naše raziskave pa je bil spremljanje možnega vpliva NaBK na akumulacijo sladkorjev in organskih kislin, kot tudi posameznih in skupnih fenolov v tehnološko zrelih plodovih jablane. Raziskava je bila opravljena na plodovih jablane sorte 'Zlati delišes', katere plodovi so bili pobrani ob tehnološki zrelosti 23. septembra 2010. V poskus smo vključili tri različna obravnavanja: drevesa škropljena z vodo, drevesa škropljena z fungicidom in drevesa škropljena z 1% raztopino NaBK. Uporaba NaBK je pokazala zmanjšanje simptomov okužbe tako na plodovih, kot listih. Parametri kakovosti plodov (masa in trdota) so bili boljši pri NaBK in fungicidnem obravnavanju glede na kontrolno obravnavanje. Plodovi tretirani z NaBK so vsebovali manj skupnih fenolov, flavonolov in flavan-3-olov kot kontrolna drevesa. Plodovi, ki so bili tretirani z NaBK so vsebovali višje vsebnosti sladkorjev kot kontrolna drevesa. Rezultati raziskave kažejo, da parametri kakovosti plodov dajejo primerljive rezultate kot fungicidno obravnavanje z nižjo obremenitvijo z pesticidnimi ostanki za okolje. Smiselno bi bilo razmisliti o uporabi NaBK kot možnega sredstva za zatiranje jablanovega škrlupa.

ABSTRACT

Influence of sodium bicarbonate, an anti-apple scab agent, on quality parameters of apple fruits

Experimental studies in the past years recommend the use of sodium bicarbonate (SBC) as a fungicidal agent in prevention and control of apple scab disease. Generally, the research aim of previous studies was investigating the effects of SBC on spore germination and germ tub elongation of *Venturia inaequalis* [(Cooke) G. Wint.] fungus. However, this study monitors the accumulation of sugars and organic acids as well as individual and total phenolic compounds in technologically mature apple fruit as affected by the use of SBC against *Venturia inaequalis.* The study was performed on apple fruits of cv. 'Golden delicious', the samples of fruits were picked in technological maturity on 23rd

of September 2010. Three different treatments were established: water-treated control, fungicide treated and 1% SBC solution. The use of SBC demonstrated a reduction in the disease symptoms on apple fruits and leaves. The fruit quality parameters (mass and fruit firmness) did not differ among treatments. On the other hand, fruits treated with SBC contained lower amounts of total phenolics, flavonols and flavan-3-ols compared to fruits from the control treatment. SBC treated fruits also contained higher amounts of sugars than fruits from the control treatment. We can conclude that fruit quality parameters show comparable results as fungicide treatment with a significantly decreased burden for the environment by pesticide residuals. It would be reasonable to consider the use of SBC as an effective treatment against apple scab.

Glive sajavosti in mušje pegavosti na površju jabolk- biotični in biokontrolni potencial

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Biotični nadzor postaja eden bolj obetavnih in presenetljivih načinov boja proti rastlinskim patogenom ali škodljivcem. V zadnjih 20. letih uporabljamo vrsto okolju prijaznih mehanizmov in z njimi skušamo zatirati rastlinske patogene. Biotični nadzor rastlinskih patogenov z uporabo mikrobnih agensov je okolju prijazna in obenem cenovno učinkovita komponenta integriranega programa obvladovanja bolezni. Raziskujemo antagonistični potencial gliv sajavosti in mušje pegavosti ter njihovo morebitno novo funkcijo kot biotično zatiralni agensi. V naravi jih zlahka najdemo na površini zrelih plodov jablane, prav tako pa tudi na listih, steblih in plodovih mnogih drugih rastlinskih vrst. So zelo raznolike in večinoma pripadajo klasifikaciji Capnodiales (Ascomycota). Mnogo novih vrst ali rodov je bilo identificiranih šele pred kratkim. V predstavitvi skušamo pojasniti, da utegnejo kolonije različnih gliv sajavosti in mušje pegavosti na površini jabolk ovirati druga drugo. Njihova interakcija se izrazi v demarkacijski črti ali coni inhibicije, znotraj katere se glive druge vrste ne morejo širiti. Rezultati testov dvojnih kultur kažejo antibiotični potencial številnih obravnavanih gliv za zatiranje različnih rastlinskih patogenov kot so *Fusarium graminearum s. l.* (povzročitelj fuzarioze klasov), *Venturia inaequalis* (povzročitelj jablanovega škrlupa), *Botrytis cinerea* (povzročitelj sive plesni na mnogih rastlinah*)* ter *Colletotrichum sp.* (povzročitelj antraknoze). V drugi seriji eksperimentov smo iz kolonij gliv ekstrahirali sekundarne metabolite, ki so v testu dvojnih kultur pomenljivo inhibirali nekatere ali vse testirane rastlinske patogene. Te ekstrakte smo dodali na mlade kolonije ali sveže konidije različnih glivnih patogenov in spremljali njihov učinek. Raziskava lahko vodi k odkritju novih biotično zatiralnih agensov ali novih biopesticidov.

ABTRACT

Sooty blotch and fly speck fungi on apple surfaces - biology and biocontrol potential

Biological control has become one of the promising and, at the same time, fascinating ways to combat plant diseases caused by plant pathogens or pests. Several systems

have emerged within the last 20 years, where plant pathogens could be controlled environmentally friendly by microbial agents. Biological control is also an important, cost effective component in integrated disease control programs. We explore the antagonistic potential of Sooty Blotch and Fly speck fungi (SBFS) and their possible role as novel biological control agents. SBFS fungi are encountered easily on the surface of maturing apple fruits, but they infest also other parts of plants such as leaves, stems and the fruits of other hosts. Sooty blotch fungi, most of them belonging to the Capnodiales (Ascomycota) are extremely diverse. Many new species or genera have been described just recently. In this presentation we illustrate that on apple fruits, the colonies of different SBFS fungi seem to interfere with each other. Their interaction can results into demarkation lines or inhibition zones, into which other species can not spread. The results from dual culture tests are shown that illustrate the antibiotic potential of a wide range of SBFS taxa against various plant pathogens such as *Fusarium graminearum*, causal agent of wheat head blight, *Venturia inaequalis*, causing apple scab, *Botrytis cinerea*, cause of grey mould disease on many plants, and *Colletotrichum* sp., causal agent of anthragnose. In a second set of experiments, secondary metabolites are extracted from the colonies of SBFS fungi, which significantly inhibited some or all of the tested plant pathogens in dual cultures tests. These extracts were added to the young colonies or fresh conidia of a range of plant pathogenic fungi and their effect on the plant pathogens is characterized. The research may lead to the discovery of novel biological control agents or novel biopesticides.

Peltaster sp., glive, ki povzročajo sajavost jabolk in njihova interakcija z rastlinskimi voski

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Sajavost jabolk povzročajo glive iz številnih rodov, ki jim je skupno to, da jih večino lahko uvrstimo v družino Capnodiales (Ascomycota). Škoda, ki jo povzročajo glive sajavosti je predvsem ekonomske narave, saj s svojo zastopanostjo povzročajo temno obarvanost jabolk, kar znižuje njihovo tržno vrednost, jabolk samih pa ne uničijo. Glive rodu *Peltaster*, kjer poznamo predvsem vrsto *P. frucicola*, povzročajo sajavost in so znane predvsem v ekološki pridelavi jabolk. V raziskavi smo proučevali biologijo doslej še neopisane vrste iz rodu *Peltaster*, ki smo jo izolirali s površja jabolk v Sloveniji. Poleg tega, da vrsta povzroča sajavost na površju jabolk v naravi, lahko razvije micelij, ki je enak sajavosti tudi na izoliranem jabolčnem vosku in drugih čistih voskih brez dodanih sladkorjev, kot so mikrokristalni vosek, parafin, beli vosek. Na površju jabolk in občasno tudi na čistih voskih, smo opazili piknotirije in spore. Proučevali smo diferencialno izražene proteine glive *Peltaster* sp. izolirane v Sloveniji, ki smo jo gojili v gojišču, v katerem so bili minerali in jojobino olje ali glukoza. Skupne izolirane proteine smo ločili z dvodimenzionalno elektroforezo, na kar smo diferencialno izražene proteine analizirali z LC-MS/MS. Predstavljeni so rezultati proteomskega eksperimenta, ki omogočajo vpogled v adaptacijo ekstremofilne glive *Peltaster* sp. na rast na rastlinskih voskih. Strategija

preživetja gliv sajavosti in njihova interakcija z rastlinskimi voski se v osnovi verjetno razlikuje od strategije preživetja drugih rastlinskih patogenih gliv, ki ne vstopajo v dolgotrajne interakcije z rastlinskim voskom, ki je vsaj deloma fungistatičen. Na podlagi opazovanja rasti glive *Peltaster* sp. izolirane v Slovenji, domnevamo, da je vrsta zmožna naseliti površje jabolk tudi v naravi.

ABSTRACT

The sooty blotch fungus *Peltaster* sp. and its interaction with plant waxes

Peltaster sp. causing Sooty blotch is well known to occur on organically produced apple fruits. It is not primarily plant pathogenic or fruit destructive but reduces the economical fruit value. Fungi from various genera mostly of the Capnodiales (Ascomycota) are the causal agents of this syndrome. *Peltaster fructicola* is an agent of sooty blotch on organically produced apple fruits. The biology of an undescribed species of the genus *Peltaster*, isolated from fruits in Slovenia, was studied. It forms mycelial sooty blotch not only on apple fruits but also on various other waxy substrata such as microcrystalline wax, paraffin and bleached beeswax not containing sugars/carbohydrates. At least rarely, we also encountered pycnothyrial fruiting bodies with conidia on the natural and artificial wax substrata. Therefore, we hypothesized that this *Peltaster* sp. is capable of colonizing the wax layer of apple fruits. We selected the liquid wax jojoba oil from the Middle American shrub *Simmondsia chinensis* suspended in water and a watery glucose medium to display differentially expressed proteins of *Peltaster* sp. in two-dimensional gel electrophoresis and analyze individual protein spots with LC-MS/MS. Growth patterns on natural and artificial wax substrata of *Peltaster* sp. and the results from proteonomic experiments are described identifying this species as an extremophilic fungus living in or on plant wax layers. The life strategy of sooty blotch fungi and their interaction with the wax substrata may fundamentally differ from the strategy of other plant pathogenic fungi that tend to largely avoid the partly fungistatic waxy cuticle.

Novosti v določanju bakterijske povzročiteljice hruševega ožiga v laboratoriju in na terenu

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Bakterijski hrušev ožig predstavlja grožnjo pridelavi jablan, hrušk in drugih gostiteljskih rastlin. Laboratorijska diagnostika povzročitelja, bakterije *Erwinia amylovora*, ima pomembno vlogo pri zgodnjem odkrivanju in obvladovanju bolezni, saj je hitro izločanje okuženih rastlin bistveno. V zadnjih letih je prišlo do razvoja novih metod in pristopov, tako za laboratorijsko okolje kot tudi za uporabo na terenu, uporabo različnih diagnostičnih metod v povezavi s prognostičnimi modeli ter razvoj novih orodij za epidemiološke raziskave. Z inovativno uporabo metod PCR v realnem času in hitrega serološkega testa v vzorcih cvetov jablan smo preverjali zastopanost *E. amylovora* v nasadih z različno zgodovino hruševega ožiga v Švici. Okužba cvetov je epidemiološko ena

najpomembnejših faz razvoja bolezni, saj se bakterije na cvetovih zelo hitro namnožijo, med cvetovi pa jih učinkovito širijo žuželke. Zaznavanja bakterije v fazi cvetenja in določanje njene koncentracije je uporabna informacija pri odločanju o ukrepih, posebej o uporabi, času in številčnosti aplikacije fitofarmacevtskih sredstev. V prispevku bomo predstavili izsledke naših raziskav in nekatere druge novosti v diagnostiki hruševega ožiga.

ABSTRACT

News in detection of bacterial causer of fire blight under laboratory and field conditions

Fire blight poses a threat to the production of apple, pear and other host plants of the causative agent, bacteria *Erwinia amylovora*. Its laboratory diagnosis plays an important role in early detection and management of the disease, as fast elimination of infected plants is crucial. In recent years there has been development of new methods and approaches, both for the laboratory environment as well as for the field use, employing different diagnostic methods, their integration with prognostic models and development of new tools for epidemiological research. We examined the presence of *E. amylovora* in orchards with different histories of fire blight in Switzerland, analyzing flowers before any visible symptoms, using real-time PCR and handy quick serological tests. Infection of flowers is one of the most important stages of the epidemiological development of the disease because the bacteria can rapidly propagate on flowers, and are successfully spread by bees and other insects. Detection of bacteria in the flowering phase and determination of their concentration is useful information when deciding on measures, specifically on the application, time and number of applications for plant protection. We present the results of our research and some other innovations in the diagnosis of fire blight.

Prve izkušnje z zatiranjem hruševega ožiga (*Erwinia amylovora* [Burrill] Winslow *et al*.) v nasadih jablane

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V letu 2010 smo preizkušali 6 različnih pripravkov za zatiranje hruševega ožiga (*Erwinia amylovora* [Burrill] Winslow *et al*.) v nasadu jablane sorte Gloster. Uporabljeni so bili Serenade WP, Blossom protect, Cuprablau Z, Kupro, Coptrel, Aliette flash in Regalis. Škropili smo dvakrat (28. 4. in 10. 5.) z nošenim pršilnikom Zupan ob porabi vode 700 L/ha. Učinkovitost delovanja (% Abott) smo ugotavljali 28. 5., tako da smo prešteli vse okužene cvetne šope na 3 sredinskih drevesih. Učinkovitosti delovanj so bile naslednje; Serenade, Kupro in Coptrel (75,0%), Cuprablau Z (50%), Aliette Flash (35%) in Regalis (0%).

ABSTRACT

Results of fungicides and leaf fertilizer testing against fire blight *Erwinia amylovora* [Burrill] Winslow *et al*.) in the apple orchard

In year 2010 were tested 6 different fungicides and leaf fertilizer for control of fire blight in apple orchard, variety was gloster. They have been used Serenade WP, Blossom protect, Cuprablau Z, Kupro, Coptrel, Aliette flash and Regalis. Two applications were done (28th of April and 10th of May) with Carried ventilator sprayer – Zupan with water amount 700 L per hectare. Efficiency (Abott in %) were evaluated on 28th of May by counted infected blossoms from the middle threes of each replication. Efficiency of Serenade, Kupro in Coptrel were 75.0%, Cuprablau Z (50%), Aliette Flash (35%) and Regalis (0%).

Rezultati preizkušanja učinkovitosti sredstev za zatiranje bakterije *Erwinia amylovora* Burrill v nasadu hrušk

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Izveden je bil poljski poskus v katerem smo preučevali biotično učinkovitost različnih formulacij bakrovih pripravkov (fungicidov in listnih gnojil) za zatiranje bakterije *Erwinia amylovora* Burill povzročiteljice bakterijskega ožiga hrušk. V času cvetenja smo 4 krat, vsakič v odmerku 300 g Cu++/ha, nanesli pripravke na podlagi Cu-Ca-oksiklorida, Cu-sulfata in spojin bakra vezanega v kompleksnih ali kelatnih oblikah z amino kislinami, peptidi, EDTA, sečnino, oktanojsko kislino in glukonsko kislino. Po cvetenju smo po standardnih metodah določili biotično učinkovitost pripravkov za preprečevanje cvetnih okužb in okužb poganjkov. Doseženo učinkovitost bakrovih pripravkov smo primerjali z učinkovitostjo pripravkov na podlagi kvasovke *Aureobasidium pullulans (AP)* in bakterije *Bacillus subtilis (BS)*. Najvišjo učinkovitost za zatiranje cvetnih okužb oz. okužb poganjkov smo ugotovili pri pripravkih na podlagi Cu-glukonata (57,7 % / 63,8 %), Cu-proteinskega kompleksa (50,7 % / 57,0 %) in Cu-Ca-oksiklorid-amino kompleksa (50,6 % / 53,7 %). Učinkovitost pripravka na podlagi AP je bila 43,7 % / 15,4 % in na podlagi BS 47,1 % / 10,8 %. Glede na rezultate našega poskusa imajo nove sistemično delujoče formulacije bakrovih pripravkov višjo učinkovitost od tradicionalnih formulacij bakrovih pripravkov in od mikrobno delujočih AP in BS pripravkov.

ABSTRACT

Evaluation of preparations for control of pear fire blight (*Erwinia amylovora* Burrill)

A field trial was carried out in order to determine the biological efficacy of several copper formulations (fungicides or foliar fertilizers) for pear (*Erwinia amylovora* Burill) fire blight control. Formulations based on copper calcium oxychloride, copper sulphate, and complexes or chelates of copper with amino acids, peptides, EDTA, urea, octanoic acid and gluconic acid were applied 4 times during blooming of pears at a rate of 300 g pure copper ions (Cu++) per hectare. Standard evaluations of efficacy of formulations for blossom and twig blight control were performed shortly after the end of blooming. The efficacy of copper formulations was compared to the efficacy of two biological preparations based on yeast *Aureobasidium pullulans* (AP) and bacterium *Bacillus subtilis* (BS). The highest control rate of blossom/twig blight was achieved by the application of systemic acting Cu-gluconate (57.7 % / 63.8 %), Cu-protein complex (50.7 % / 57.0 %) and Cu-Ca-oxychloride-amino complex (50.6 % / 53.7 %). The achieved efficacy of AP based product was 43.7 % / 15.4 % and of BS based product was 47.1 % / 10.8 %. New

systemic acting copper formulations have, according to our results, higher biological efficacy for pear blossom or twig blight control than traditional copper preparations or microbial AP and BS based preparations.

Nova spoznanja o lastnostih in obvladovanju šarke

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Šarka, ki jo povzroča virus *Plum pox potyvirus* (PPV), je gospodarsko najpomembnejše virusno obolenje koščičarjev, predvsem sliv, marelic in breskev. PPV je uvrščen med karantenske organizme na seznam I.A.2 direktive 2000/29/ES. Okužba s tem virusom lahko pri občutljivejših sortah povzroči popolno izgubo pridelka in popoln propad dreves, vpliva pa tudi na kakovost plodov. Šarka je razširjena v vseh pridelovalnih območjih Slovenije, njen pojav pa v Sloveniji redno spremljamo od leta 1988. Sistematični nadzor je usmerjen v zagotavljanje pridelave zdravega, s PPV neokuženega razmnoževalnega materiala koščičarjev. Uporaba novih raziskovalnih metod, širjenje okužb po svetu in interes držav za ohranjanje neokuženih območij so pospešili raziskave in prinesli nova spoznanja o povzročitelju te bolezni ter nove ideje o preprečevanju novih okužb in širjenja PPV. V prispevku bodo predstavljene nove ugotovitve o biotičnih in epidemioloških lastnostih PPV, kar nam bo v pomoč pri vključevanju v dogajanja v zvezi z obvladovanjem šarke na nivoju Evropske skupnosti na tak način, da bodo sprejeti ukrepi smiselni in bodo omogočali ohranjanje pridelave koščičastih sadnih vrst v Sloveniji in v drugih deželah, kjer je ta bolezen endemična.

ABSTRACT

New data about properties and containment of sharka

Sharka, caused by *Plum pox potyvirus* (PPV), is the most devastating viral disease of stone fruits, especially apricots, plums and peaches. PPV is a quarantine organism and is listed in Section 2 of Part A of Annex II to Directive 2000/29/EC. In susceptible varieties it can cause high yield losses and tree decline. The fruit quality is also affected. The disease is widely spread in Slovenia and its presence is monitored since 1988. The main goal of systematic survey in Slovenia is to ensure the production of healthy, PPV-free propagation material. The use of new research techniques, the spread of PPV in the world and the interest of certain countries to preserve non-infected areas brought new facts about PPV and new ideas about the prevention of its introduction and spreading. Research results about biological and epidemiological properties of PPV will be discussed in the presentation and the facts presented will help Slovene representatives to ensure that new measures against the spread of PPV in European Union will still allow the production of stone fruits also in Slovenia and other regions where sharka is endemic.

Varstvo vrtnin in okrasnih rastlin

Vrste iz rodu *Phytophthora* na okrasnih rastlinah v Sloveniji

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Vrste iz rodu *Phytophthora* (Stramenopiles, Oomycetes) parazitirajo širok krog gostiteljskih rastlin. Mednarodna trgovina z okrasnimi rastlinami omogoča vnos nedomorodnih vrst fitoftor. V Sloveniji je o razširjenosti fitoftor malo podatkov. Zanimanje zanje se je povečalo po letu 2003 z vzpostavitvijo nadzora nad karantensko vrsto *Ph. ramorum*, ki se razširja predvsem z okrasnimi rastlinami, kot so vresovke (Ericaceae) in druge vendar ob širjenju v okolje lahko ogrozi mnoge samonikle ali sajene lesnate rastline. Med leti 2003 in 2009 je bilo na sadikah lesnatih okrasnih rastlin v vsebnikih na prodajnih mestih, v drevesnicah ter na stalnih rastiščih odvzetih 790 vzorcev za analizo. Največ preiskav je bilo na vresovkah. Določanje vrst je potekalo z izolacijo iz obolelih rastlinskih delov na semiselektivno gojišče in ugotavljanjem morfoloških značilnosti organizma ter s sekveniranjem predelov znotrajprepisne vmesniške regije (ITS) ribosomske DNA in primerjavo sekvenc s pomočjo BLAST algoritma s sekvencami v javno dostopnih bazah podatkov. Poleg vrste *Ph. ramorum*, ki je bila potrjena na 89 vzorcih, je bilo ugotovljenih še več kot 10 drugih vrst fitoftor. Nekatere so pomembni patogeni kmetijskih in samoniklih rastlin. Pri slečih (*Rhododendron* spp.) je bila raznolikost vrst največja. Po izolaciji iz različnih delov rastlin so bile ugotovljene vrste: *Ph. ramorum*, *Ph. plurivora*, *Ph. cactorum*, *Ph. syringae*, *Ph. cambivora*, *Ph. cinnamomi*, *Ph. hedraiandra in Ph. citrophthora.* Na brogovitah (*Viburnum* spp.) so bile določene vrste *P. ramorum, P. cactorum, P. hedraiandra, P. cryptogea in P. citrophthora.* Slednja je bila izolirana tudi iz listov lipovke *(Syringa vulgaris).* Na pušpanu (*Buxus sempervirens)* in sivki *(Lavandula angustifolia*) je bila določena še vrsta *Ph. nicotianae,* na enem vzorcu magnolije (*Magnolia* sp.) *Ph. pseudosyringae* in na kalmiji (*Kalmia latifolia*) hibrid *Ph. cactorum x Ph. hedraiandra*. Največkrat izolirana vrsta je bila *Ph. plurivora, ki se je* pojavljala na več gostiteljih.

ABSTRACT

Phytophthora species on ornamental plants in Slovenia

Species of the genus *Phytophthora* (Stramenopiles, Oomycetes) are pathogens of a wide range of ornamental plants. The international trade with ornamental plants resulted into the introduction and transfer of *Phytophthora* species into new areas. Data about their distribution in Slovenia are scarce. More attention has been paid to *Phytophthora* species after quarantine pathogen *Ph. ramorum* was surveyed starting in 2003. This organism is introduced mainly with ornamental plants such as *Rhododendron* spp. (Ericaceae) and can endanger naturally grown or planted woody plants in case it spreads in the environment. Woody ornamental plants were monitored in garden centres where plants are kept in containers, in nurseries, and in parks and gardens. We collected 790 samples for analysis during the years 2003–2009. Most samples were taken from ericaceous hosts. Pathogens were isolated from symptomatic plant parts on semi-selective medium. For species identification morphological characteristics of isolates were evaluated and sequences of the internal transcribed spacer regions of the ribosomal RNA gene cluster were generated. The DNA sequences were compared with the data in publicly available databases through BLAST searches. Beside *Ph. ramorum*, which was present in 89 samples, more than 10 other *Phytophthora* species were detected. Some of them are known to be important pathogens of cultivated or native plants. *Rhododendron* spp. were

hosts of *Ph. ramorum*, *Ph. plurivora*, *Ph. cactorum*, *Ph. syringae*, *Ph. cambivora*, *Ph. cinnamomi, Ph. hedraiandra* and *Ph. citrophthora. Viburnum* spp. were hosts of *Ph. ramorum, Ph. cactorum, Ph. hedraiandra, Ph. cryptogea and Ph. citrophthora. Phytophthora citrophthora* was also isolated from *Syringa vulgaris. Phytophthora nicotianae* was detected on *Buxus sempervirens* and *Lavandula angustifolia.* There was a single sample of *Magnolia* sp. infected by *Ph. pseudosyringae*. On *Kalmia latifolia* the hybrid *Ph. cactorum x Ph. hedraiandra* was found*. Phytophthora plurivora* was most often isolated and from various hosts.

Bakterijske bolezni okrasnih rastlin

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Pogosti povzročitelji bakterijskih bolezni na okrasnih rastlinah so bakterije iz rodov *Xanthomonas* in *Pseudomonas*, ki povzročajo značilne madeže na listih in s tem zmanjšujejo vrednost rastlin. Veliko gospodarsko škodo lahko povzročajo tudi povzročiteljice mehkih gnilob iz rodov *Erwinia* in *Dickeya.* Za bakterijske bolezni rastlin ni učinkovitega kemijskega varstva, zato je njihova določitev in identifikacija še posebej pomembna. V preteklih letih smo na Nacionalnem inštitutu za biologijo zastopanost bakterij testirali predvsem na vzorcih pelargonij, krizantem in božičnih zvezd, redkeje tudi na vzorcih orhidej, bršljana, lovorikovca, mačeh in nageljnov. Z uporabo kombinacij različnih laboratorijskih diagnostičnih metod smo največkrat v pelargonijah potrdili bakterijo *Xanthomonas campestris* pv. *pelargonii,* pri krizantemah pa bakterijo povzročiteljic mehkih gnilob iz rodu *Erwinia.* Pri vzorcih božičnih zvezd smo v letu 2009 prvič v Sloveniji laboratorijsko potrdili bakterijo *Xanthomonas axonopodis* pv. *poinsettiicola*. Zaradi pogostejšega pojavljanja v zadnjih letih, občasnega povzročanja velike škode in analize tveganja (PRA), je bakterija uvrščena na seznam A2 organizacije EPPO. Bakterijo smo izolirali iz madežev na listih božičnih zvezd. Bakterijsko DNA čiste kulture značilnih kolonij smo identificirali z analizo DNA zaporedja gena gyrB in analizo prstnih odtisov DNA bakterij s testom BOX-PCR. Patogenost bakterije smo potrdili s testom patogenosti na božičnih zvezdah. V prispevku bomo predstavili pomen in pojavljanje bakterijskih povzročiteljev bolezni okrasnih rastlin po svetu in pri nas.

ABSTRACT

Bacterial diseases of ornamental plants

One of the most common bacterial pathogens of ornamental plants come from genera *Xanthomonas* and *Pseudomonas* which cause typical spots on leaves and thereby reduce the value of plants. Bacteria from genera *Erwinia* and *Dickeya* cause soft rot on plants which can also lead to severe economic losses. Since there is no effective chemical protection for bacterial diseases of plants, their determination and identification is particular important. In recent years we have tested at the National Institute of Biology several different species of ornamental plants, for the presence of bacterial pathogens. Most commonly tested were pelargoniums, chrysanthemums and poinsettias. We have also received samples of orchids, ivy, Cherry laurel, pansies and carnations. By using combinations of different laboratory diagnostic methods we have confirmed the presence

of the bacterium *Xanthomonas campestris* pv. *pelargonii* in pelargoniums and the presence of soft-rot bacteria from the genus *Erwinia* in chrysanthemums. In 2009 we have confirmed in our laboratory the presence of *Xanthomonas axonopodis* pv. *poinsettiicola* in poinsettia plants in Slovenia for the first time. Because of the frequent occurrence and sometimes extensive damage to the plants, as well as Pest Risk Analysis (PRA), the bacterium *X. axonopodis* pv. *poinsettiicola* is listed on the A2 list of EPPO organization. *X. axonopodis* pv. *poinsettiicola* were isolated from spots on the leaves of the poinsettia. Bacterial DNA of pure cultures of typical colonies was identified by DNA sequence analysis of the gyrB gene and analysis of DNA fingerprints of bacteria with the BOX-PCR. Pathogenicity of the bacteria was confirmed by the pathogenicity test on poinsettias and reisolation of bacteria. In this paper we will outline the importance and emergence of bacterial pathogens of ornamental plants around the world and our country.

Pospiviroidi na okrasnih rastlinah v Sloveniji

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V rod *Pospiviroid* je uvrščenih devet viroidov. Značilni predstavnik je *Potato spindle tuber viroid* (PSTVd), ki povzroča bolezen vretenatost krompirjevih gomoljev. Uvrščen je med karantenske organizme na seznam I.A.1 direktive 2000/29/ES, saj lahko že v letu, ko okuži krompir ali paradižnik, povzroči izgubo polovice pridelka. Paradižnik okužujejo tudi *Citrus exocortis viroid* (CEVd), *Columnea latent viroid* (CLVd), *Mexican papita viroid* (MPVd), *Tomato apical stunt viroid* (TASVd), *Tomato chlorotic dwarf viroid* (TCDVd) in *Tomato planta macho viroid* (TPMVd) in lahko povzročajo podobna znamenja in izgube kot PSTVd. Razen tega povzročajo posamezni viroidi iz rodu *Pospiviroid* okužbe tudi pri drugih pomembnih kmetijskih rastlinah. Okužbe z viroidi so lahko tudi latentne ali mile, posebno na nekaterih gostiteljskih rastlinah. Takšne okužbe so nevarne, ker jih ne opazimo, okužbe pa se lahko prenesejo na bolj občutljive rastline. Viroidi se namreč prenašajo tudi z dotiki, delovnim orodjem in stroji. V letu 2006 so na Nizozemskem prvič v svetu potrdili zastopanost PSTVd na okrasnih rastlinah iz rodov *Brugmansia* in *Solanum*, v naslednjih letih pa so bile okužbe s tem viroidom odkrite še na drugih okrasnih rastlinah. V vseh primerih so bile okužbe latentne. Komisija Evropskih skupnosti je zato predpisala tudi raziskavo o zastopanosti ali stalni nezastopanosti PSTVd v državah članicah. V Sloveniji smo od konca leta 2006 pa do konca leta 2010 opravili 398 analiz različnih okrasnih gostiteljskih rastlin, krompirja, paradižnika in paprike. Skupno je bilo s PSTVd okuženih 97 vzorcev, njegovo zastopanost smo potrdili pri *Brugmanisa suaveolens, Solanum jasminoides, S. rantonnetti, S. muricatum* in *Petunia* spp. V letu 2010 smo v Sloveniji na okrasnih rastlinah prvič potrdili tudi zastopanost drugih viroidov in sicer CEVd na *S. jasminoides* in TCDVd na *Petunia* spp. O okužbah s CEVd na *S. jasminoides* so pred tem poročali že Nizozemci in Avstrijci, o okužbah s TCDVd na petunijah pa Nizozemci in Angleži.

ABSTRACT

***Pospiviroids* on ornamental plants in Slovenia**

Potato spindle tuber viroid (PSTVd) is the type species of genus *Pospiviroid*, which includes 9 different viroids. PSTVd is a quarantine organism and is listed in Section 1 of Part A of Annex I to Directive 2000/29/EC. It can cause a 50% yield reduction of potato and tomato already in the year of infection. *Citrus exocortis viroid* (CEVd), *Columnea latent viroid* (CLVd), *Mexican papita viroid* (MPVd), *Tomato apical stunt viroid* (TASVd), *Tomato chlorotic dwarf viroid* (TCDVd) and *Tomato planta macho viroid* (TPMVd) also infect tomato and can cause similar symptoms and damages as PSTVd. Additionally, several pospiviroids can cause severe damages on other important agricultural crops. On the other hand a lot of infections, especially on certain hosts, are latent or mild and therefore not detected and can present danger for transmission of infection to susceptible crops. Viroids are easily mechanically transmitted also by hands, tools and machinery. In 2006 PSTVd was discovered on new ornamental hosts *Brugmansia* spp. and *Solanum jasminoides* in the Netherlands. In the following years other new PSTVd hosts were identified. All infections of new ornamental hosts were symptomless. The commission of the European Communities therefore prescribed surveys for the presence or continued absence of PSTVd. In Slovenia 398 samples taken from ornamental species, potato, tomato and sweet pepper were tested from the end of 2006. The infection with PSTVd was confirmed in 97 samples. Infection was detected on *Brugmanisa suaveolens, Solanum jasminoides*, *S. rantonnetti, S. muricatum* and *Petunia* spp. In 2010 CEVd was detected on one sample of *S. jasminoides* and TCDVd on 4 samples of *Petunia* spp. for the first time in Slovenia. Infection of *S. jasminoides* with CEVd was already reported by Dutch and Austrian researchers. Infection of TCDVd on petunias was reported from The Netherlands and United Kingdom.

Biologija in določanje virusa mozaika pepina (PepMV)

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Virus mozaika pepina (PepMV) ogroža pridelavo paradižnika povsod po svetu. Do sedaj je bilo izoliranih nekaj različnih PepMV variant-različkov, ki otežujejo diagnostiko virusa, temelječo na molekularnih metodah. Razvili smo nov kvantitativni RT-PCR v realnem času za določanje trenutno znanih različkov PepMV. Test smo analizirali na Evropski, Ch2 in US1 različek. Enokoračni RT-qPCR je bil za dva do tri velikostna razreda bolj občutljiv od ELISA testa, kar smo preizkusili na vzorcih listov. Evropski-Peru, Ch2, in US1 različke smo uspešno ločili. Specifičnost testa, njegova kvantitativna narava in njegova občutljivost test uvrščajo kot primernega za različne epidemiološke študije in za ugotavljanje rezistence rastlin na virus PepMV. Test je zelo ustrezen tudi za vzorce, kjer pričakujemo nizko količino virusa, kot so latentne okužbe ali namakalne vode, zaradi možnosti določanja več genomskih tarč hkrati. Metodo smo že uporabili v študijah prenosa virusa prek semena, ki so bile opravljene v okviru evropskega projekta PEPEIRA (6OP), katerega rezultati bodo prav tako predstavljeni v prispevku.

ABSTRACT

Biology and detection of PepMV

Pepino mosaic virus (PepMV) is threatening tomato industry worldwide. Several distinct PepMV strains have been identified so far, complicating the molecular diagnostic of the

virus. New reverse transcription real time quantitative PCR (RT-qPCR) assays for the detection of the, at present circulating, PepMV strains were developed. The performance of the assays was evaluated on European, Ch2 and US1 PepMV strains. One-step RT-qPCR detected three and two orders of magnitude more sensitively than ELISA, PepMV European strain particles diluted in healthy tomato sap and tap water, respectively. The following strain combinations, European-Peru, Ch2, and US1, were successfully distinguished within the tested isolates. The strain specificity and the quantitative nature of the method, makes it good candidate for epidemiological studies as well as studies evaluating the plant resistance to virus strains. At the same time, the disposability of more than one gene target for the detection of PepMV RNA, will increase the reliability of the virus detection in samples with low expected virus concentration, such as, latent infections, or irrigation waters. The method was used in experiments in which seed transmission of PepMV was studied in the frame of the European FP6 project PEPEIRA, whose outcomes will be introduced in the contribution.

Nov nevaren škodljivec za Evropo – ogorčica koreninskih šišk *Meloidogyne ethiopica*

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V letu 2004 smo v Sloveniji poročali o najdbi tropske vrste ogorčic koreninskih šišk *Meloidogyne ethiopica* Whitehead. Ta najdba je bila tudi prva najdba vrste *M. ethiopica* v Evropi. Iz Brazilije in Čila poročajo o veliki gospodarski škodi, ki jo ta vrsta povzroča na vinski trti, kiviju in raznih poljščinah. Ogorčice *M. ethiopica* so polifagni škodljivci in parazitirajo na več kot 80 lesnih in zelnatih gostiteljskih vrstah, ki pripadajo tako dvokaličnicam in enokaličnicam. Vrsto *M. ethiopica* uvrščamo med izredno nevarne škodljivce kmetijskih rastlin, zato smo želeli ugotoviti, ali lahko ta tropska škodljiva vrsta preživi v naših podnebnih razmerah. V poskusu na dveh lokacijah smo ovrednotili vpliv celinskega in submediteranskega podnebja v Sloveniji na preživetje *M. ethiopica*. Rezultati so pokazali, da ogorčice vrste *M. ethiopica* lahko preživijo tako v submediteranskih kot tudi celinskih rastnih razmerah na polju kljub temu, da se je temperatura v tleh večkrat spustila pod ledišče. Opravili smo tudi raziskave, v katerih smo določili gostiteljski status rastlinam, ki so pomembne za naše kmetijstvo.

ABSTRACT

New emerging plant pest in Europe – root knot nematode *Meloidogyne ethiopica*

Meloidogyne ethiopica Whitehead is a tropical root knot nematode species which has been found in Slovenia in 2004. This was the first report of this species in Europe. *Meloidogyne ethiopica* is causing serious crop damage and economic losses on grapevine, kiwi and other crops in Brazil and Chile. It is polyphagous pest which can parasitize at least 80 different woody and herbaceous host plant species belonging to dicotyledons as well as monocotyledons. *Meloidogyne ethiopica* is serious plant pest species therefore a question was posed about the ability of such tropical pest to survive open field climate conditions in Europe. Outdoor experiment of *M. ethiopica* survival was set up at two locations with continental and sub-Mediterranean climate conditions. Our results showed that *M.*

ethiopica survived open field conditions in continental and sub-Mediterranean climates and also retained its infection ability despite several instances of temperatures falling below freezing level. Additionally, host status of several vegetable crops that are important for agricultural production in Slovenia was determined.

Privabilni posevki kot metoda zmanjševanja škodljivosti kapusovih stenic (*Eurydema* spp.) in kapusovih bolhačev (*Phyllotreta* spp.) na belem zelju – primerjava rezultatov med letoma 2009 in 2010

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V letih 2009 in 2010 smo izvedli poljski poskus, kjer smo preučili uporabo treh privabilnih posevkov (oljna redkev, krmna ogrščica, bela gorjušica) kot metodo varstva zelja pred kapusovimi stenicami (*Eurydema* spp.) in kapusovimi bolhači (*Phyllotreta* spp.). Bločni poskus je potekal na njivi na Gorenjskem. Poškodbe škodljivcev na dveh kultivarjih zelja, Hinova in Tucana ter na privabilnih posevkih smo ocenjevali v 10-dnevnih intervalih. S statistično analizo podatkov smo ugotovili, da je krmna ogrščica najbolj učinkovit privabilni posevek za kapusove stenice, medtem ko so kapusovi bolhači v drugem letu poskusa pokazali največ preference do oljne redkve kot privabilnega posevka. Intenzivnost poškodb kapusovih bolhačev na zelju je zelo močno izražena že v začetku rastne sezone, medtem ko intenzivnost poškodb kapusovih stenic začne naraščati v drugi polovici rastne dobe. Za poškodbe stenic je bil veliko bolj dovzeten hibrid Hinova. Vrsta privabilnega posevka je vplivala na povprečni pridelek posamezne sorte zelja. Višji pridelek glav smo ugotovili pri poznejšem hibridu Hinova.

ABSTRACT

Trap cropping as a method for plant protection against stink bugs (*Eurydema* spp.) and flea beetles (*Phyllotreta* spp.) on white cabbage – results of two years experiment

During the years 2009 and 2010, a field experiment at the Gorenjska area was carried out to determine the effect of three trap crops (oil radish, oil rape, and white mustard) as a plant protection method against stink bugs (*Eurydema* spp.) and flea beetles (*Phyllotreta* spp.) attack on cabbage. Experiment in Zgornja Lipnica was designed as randomized complete block with four treatments, each replicated 4 times. The damage of stink bugs and flea beetles were estimated in 10-day intervals, considering main cash crop and trapcrops. Based on statistical analysis we can conclude, that oil rape was the most effective trap crop considering stink bugs, trought all the years of experiment. Flea beetles shown specific preference to oil radish as a trap crop in year 2010, meanwhile they did not show specific preference to any of trap crop tested in the year 2009. The damage caused by stink bugs on cabbage started to increase in the middle of growing season. On the other hand damage caused by flea beetles started to increase at the end of May. The damage caused by stink bugs was higher on hybrid Hinova. Variety of specific trap crop had influenced of average yield of specific hybrid of cabbage. Considering average yield hybrid Hinova was estimated as more productive.

Paradižnikov molj (*Tuta absoluta* Povolny) - izsledki posebnega nadzora v Sloveniji v letu 2010

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Paradižnikov molj (*Tuta absoluta* Povolny) se je v Evropi kot škodljivec prvič pojavil v letu 2006. Najprej je bil ugotovljen na sadikah paradižnika v vzhodnem delu Španije, po letu 2008 tudi v Italiji. Ob nadaljnjem širjenju je bil v letu 2009 ugotovljen v Franciji, v Bolgariji, na Cipru, v Grčiji, na Malti, na jugu Portugalske, v Švici, na Nizozemskem, na Danskem in na jugovzhodu Anglije. Najden je bil tudi v nekaterih državah severne Afrike. V letu 2009 je bil škodljivec prvič ugotovljen v zavarovanih prostorih tudi v Sloveniji. Paradižnikov molj ima izredno visok reprodukcijski potencial in lahko povzroči velike škode na sadikah, rastlinah in plodovih (predvsem paradižnika) in na drugih potencialnih gostiteljih iz družine razhudnikovk. Kot tak, predstavlja resno grožnjo pridelovalcem paradižnika v Sloveniji. S posebnim nadzorom v letu 2010, smo želeli ugotoviti njegovo dejansko zastopanost in razširjenost v Sloveniji tako, da smo načrtno spremljali škodljivca na feromonskih vabah in rumenih lepljivih ploščah. Ugotavljali smo čas, dinamiko pojavljanja, število generacij v zaprtih prostorih in eventualno na prostem ter proučevali bionomijo in možnosti za zatiranje oz. omejevanje škodljivca. V prispevku so predstavljeni izsledki posebnega nadzora v letu 2010, ki so kot taki osnova za vpeljavo akcijskega načrta ukrepov.

ABSTRACT

Tomato leaf miner (*Tuta absoluta* Povolny) - results of its special surveillance in Slovenia in year 2010

Tomato leaf miner (*Tuta absoluta* Povolny) was appeared in Europe like pest for first time in 2006 on plants for planting of tomato in Eastern part of Spain. In 2008 it was found also in Italy. During further spreading in 2009 it was introduced in France, Bulgaria, Cyprus, Greece, Malta, South part of Portugal, Switzerland, Netherlands, Denmark and in South eastern part of England. It was found also in some Northern States of Africa. In 2009 its presence was confirmed for the first time in greenhouses in Slovenia as well. Tomato leaf miner has extremely high reproductive potential and could cause great injuries on plants and fruits (especially on tomato), but also on several other plant species from botanical family Solanaceae. Tomato leaf miner represents serious threat for all producers of young plants and fruits of tomato in Slovenia. With specific survey in 2010 we obtained information on its presence and distribution in Slovenia by attractant trapping with yellow sticky and pheromone traps. During specific survey the dynamics of its appearance, number of generations per year in greenhouses and eventually on open area has been ascertained. Some study of bionomy and possibilities of its suppression were done.

Results of specific survey of Tomato leaf miner in Slovenia in year 2010 are presented in the article.

Možnosti uporabe biotičnih agensov v rastlinjakih za varstvo rastlin pred paradižnikovim moljem (*Tuta absoluta* Povolny)

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Biotično varstvo kot način varstva pred škodljivimi organizmi je v Sloveniji že uveden v prakso, za kar uporabljamo mednarodne standarde za fitosanitarne predpise (FAO – ISPM) in standarde Evropske in mediteranske organizacije za varstvo rastlin (EPPO). V Sloveniji je v veljavi Pravilnik o biotičnem varstvu rastlin (Uradni list RS, št. 45/06), ki natančneje opredeljuje možnosti vnosa biotičnih agensov. Paradižnikov molj je vrsta, ki je bila še pred kratkim v Sloveniji neznana. V zadnjem času pa v rastlinjakih, zlasti pri pridelavi paradižnika (*Lycopersicon esculentum* Mill.), že povzroča izdatno škodo. Biotično varstvo sicer še ni docela raziskano. Med fitosanitarnimi ukrepi, ki so mogoči pri nadzoru tega škodljivca, se v tujini že uspešno uporabljajo biotični agensi, ki se vnesejo na lokacijo pridelave. Ugotovljeno je bilo, da lahko nekateri parazitoidi jajčec, kot npr. *Trichogramma pertiosum* Riley, *Trichogramma achaeae* Nagaraja in Nagarkatti in *Tricogramma brassicae* (Bezdenko) ter plenilske stenice *Macrolophus pygmaeus* Rambur, *Macrolophus caliginosus* (Wagner), *Podisus negrispinus* (Dallas), *Nesidiocoris tenuis* (Reuter) in *Nabis pseudoferus* Remane, uspešno zmanjšajo populacijo paradižnikovega molja. V Sloveniji sta domorodni vrsti plenilca *Macrolophus melanotoma* (Costa) in *Aphidoletes aphidimyza* (Rondani) ter parazitoid *Aphidius ervi* (Haliday). Domorodna vrsta je tudi ogorčica *Steinernema carpocapsae* (Filipjev). Z vzpostavitvijo nadzorovanega ciljnega vnosa v zavarovane prostore in drugimi predpisanimi ukrepi, kot npr. množično lovljenje na feromonske vabe, bi zmanjšali številčnost škodljivca, kar bi ob upoštevanju njegovega velikega populacijskega potenciala uspešno omejilo njegovo nadaljnje širjenje. Glede na biologijo škodljivca je pričakovati, da v Sloveniji vrsta na prostem, razen izjem, ne prezimi.

ABSTRACT

Possibilities for the use of biological control agents against tomato leaf miner (*Tuta absoluta* Povolny) in the greenhouses

In Slovenia, biological control as the method of protection against harmful organisms has already been introduced into practice and is subject to international standards for phytosanitary regulations (FAO – ISPM) and standards of the European and Mediterranean Plant Protection Organisation (EPPO). Rules on Biological control (Official Gazette of the Republic of Slovenia, No. 45/06) are in force in Slovenia which specify the possibilities for the introduction of biological control agents. Tomato Leaf Miner is a species which has only recently been known in Slovenia. However, it has already caused great damage in greenhouses, in particular in the production of tomato (*Lycopersicon esculentum* Mill.). Biological control has not been sufficiently examined yet. Among

phytosanitary measures which may be used in the control of this harmful organism, some foreign countries have already been successful in using biological control agents which are to be applied on the production site. It has been established that some egg parasitoids, such as *Trichogramma pertiosum* Riley, *Trichogramma achaeae* Nagaraja and Nagarkatti, and *Tricogramma brassicae* (Bezdenko), and pirate bugs *Macrolophus pygmaeus* Rambur, *Macrolophus caliginosus* (Wagner), *Podisus negrispinus* (Dallas), *Nesidiocoris tenuis* (Reuter) and *Nabis pseudoferus* Remane may successfully decrease the Tomato Leaf Miner population. In Slovenia, autochthonous species of the predator are *Macrolophus melanotoma* (Costa) and *Aphidoletes aphidimyza* (Rondani), and parasitoid *Aphidius ervi* (Haliday). Another autochthonous species is the nematode *Steinernema carpocapsae* (Filipjev). Establishment of a controlled targeted introduction in protected places and other mandatory measures such as mass trapping by pheromone traps would surely contribute to the decreased number of the harmful organism which would, by considering the harmful organism's great population potential, limit its further spread. Regarding the biology of the harmful organism, the species is, save for some exceptions, expected not to survive outdoor overwintering.

Varstvo vinske trte

Učinkovitost nekaterih novejših FFS, namenjenih za zatiranje oidija vinske trte (*Erysiphe necator* Schwein)

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Oidij (*Erysiphe necator* Schwein), uvrščamo med najpomembnejše bolezni vinske trte, ki velikokrat zmanjša tako količino kot kakovost pridelanega grozdja. Za uspešno zdravstveno varstvo grozdja, je zato potrebno spremljati učinkovitost aktivnih snovi in pripravkov, ki so registrirani za zatiranje oidija vinske trte. Z namenom ugotavljanja učinkovitosti nekaterih aktivnih snovi proti oidiju, sta bila opravljena dva poskusa v letih 2008 in 2009. Poskusa sta bila izvedena po EPPO standardih (enajst postopkov s štirimi ponovitvami). Vanje smo vključili novejše pripravke, registrirane v ta namen s sledečimi aktivnimi snovmi: meptildinokap, meptildinokap + miklobutanil, tetrakonazol, kvinoksifen + miklobutanil, piraklostrobin + metiram, boskalid, prokvinazid, tebukonazol + trifloksistrobin, azoksistrobin + folpet, močljivo žveplo in praktični škropilni program. V obeh letih, še posebej pa v letu 2009, je bil infekcijski pritisk oidija vinske trte zelo močan, kar daje veliko kredibilnost poskusu. V prispevku so prikazani rezultati obeh škropilnih poskusov proti oidiju vinske trte in učinkovitosti uporabljenih aktivnih snovi.

ABSTRACT

Efficacy of some relatively new plant protection products registered for oppression powdery mildew (*Erysiphe necator* Schwein) on grapevine

The powdery mildew (*Erysiphe necator* Schwein) could be classified in the group of most important diseases of grapevine, which could decreased quality and quantity of yield. The observing and testing the efficiency of different active substances and plant protection products is necessary to assure effectively protection of grapes. With these purpose two trials with testing of different active substances against powdery mildew in years 2008 and 2009 by EPPO standards were done. Relatively new active substances, as follows: meptildinocap, meptildinocap + myclobutanil, tetraconazol, quinoxifen + myclobutanil, pyraclostrobin + metyram, boscalid, proquinazid, tebuconazol + trifloxystrobin, azoxystrobin + folpet, wettable sulphur and practical spraying program were included in these trials. In both years, but especially in year 2009 the infection pressure of powdery mildew was very strong what gave our trials high credibility. In article, some results and efficacy of tested plant protection products in both spraying trials were shown.

Sočasno določanje fitoplazem in virusov na simptomatičnih vzorcih vinske trte

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Okužbe vinske trte z virusi zvijanja listov vinske trte (GLRaV) ali s trsnimi rumenicami pomembno vplivajo na gojenje vinske trte. Pri virusih velja to predvsem za GLRaV-1 in -3 in trsne rumenice, zlata trsna rumenica (*Flavescence doree*) pa je tudi na seznamu karantenskih škodljivih organizmov. Bolezenska znamenja GLRaV in trsnih rumenic so precej podobna. Teoretično je tipična bolezenska znamenja možno ločiti med seboj, v praksi pa je ločevanje težje ali celo nemogoče. Na okuženih trsih znamenja mnogokrat niso tipična, ker nanje poleg patogena vplivajo tako zunanji dejavniki, kot tudi stanje rastline. Poleg tega so problematične tudi mešane okužbe, ko so lahko bolezenska znamenja enega ali več zastopanih patogenov prikrita. V letih 2007 in 2008 smo v okviru CRP projekta (V4-0313) analizirali 53 vzorcev na zastopanost GLRaV in fitoplazem in popisali bolezenska znamenja z namenom ugotoviti, ali lahko okužbe z GLRaV in s trsnimi rumenicami v naših rastnih razmerah z dovolj veliko zanesljivostjo vizualno ločimo. Pri nekaj vzorcih z bolezenskimi znamenji tipičnimi za fitoplazme, npr. sektorsko rdečenje in neenakomerna olesenelost poganjkov, nismo potrdili okužbe s fitoplazmami. Tudi pri določenih vzorcih z bolezenskimi znamenji GLRaV zastopanosti obeh iskanih virusov nismo potrdili. Iz rezultatov opravljenih analiz lahko povzamemo, da samo na osnovi opazovanja bolezenskih znamenj na rastlinah ne moremo sklepati, kdo je njihov povzročitelj, fitoplazma, virus ali morda oba. Za potrditev okužbe s posameznim patogenom je potrebna laboratorijska identifikacija.

ABSTRACT

Detection of viruses and phytoplasma on symptomatic grapevine samples

Grapevine leafroll-associated virus (GLRaV) infections and infections with phytoplasma greatly influence the grapevine production, especially GLRaV-1, GLRaV-3 and phytoplasma. Typical symptoms induced by these pathogens are different but when they are not typical it is very difficult to differentiate between them. The appearance of symptoms is influenced by pathogen, host plant and environmental factors. In mixed infections the symptoms can be more complex and the presence of one or more pathogens can be masked. In frame of CRP project 53 grapevine samples were visually inspected and analysed for the presence of GLRaV-1, GLRaV-3 and phytoplasma to establish the possibility to differentiate between virus and phytoplasma infection on the basis of visual inspection. In some samples with typical phytoplasma-like symptoms (e.g. sectorial yellowing or reddening, incomplete lignifications of shoots) the phytoplasma infection was not confirmed. Similarly the GLRaV infection was not confirmed in some samples with typical virus-like symptoms. The results of the study show that only on the basis of visual inspection it is not possible to conclude what is the cause of the disease – virus or phytoplasma infection. Laboratory identification is needed for infection confirmation.

Poskus prenosa virusov zvijanja listov vinske trte (GLRaV) z velikim trtnim kaparjem (*Neopulvinaria innumerabilis*)

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Veliki trtni kapar (*Neopulvinaria innumerabilis*) se v vinogradih na Primorskem redno pojavlja že od sredine osemdesetih let. V zadnjih letih ponekod opažamo povečan pojav kaparja, ki lahko že sam po sebi na vinski trti povzroča številne težave. Škodo povzroča s sesanjem rastlinskih sokov, zato močno napadeni šparoni odženejo kratke poganjke z malo ali nič pridelka. Če je napad zelo močan, lahko trs propade. Ličinke med rastjo izločajo obilno medeno roso, ki privablja številne, tudi škodljive, žuželke. Na njej se lahko razvije tudi sajavost, ki zmanjša asimilacijo listov in s tem vpliva na slabšo kakovost grozdja. Poleg tega je veliki trtni kapar znan tudi kot prenašalec virusov zvijanja listov vinske trte 1 in 3 (GLRaV-1, GLRaV-3), ki sta oba gospodarsko pomembna in vključena tudi v certifikacijsko shemo za pridelavo zdravega sadilnega materiala vinske trte. Oba virusa sta razširjena v rodnih vinogradih v Sloveniji, zato povečanje populacij in razširjenost kaparja lahko pospešita razširjanje virusov v vinogradih, kar lahko povzroči veliko gospodarsko škodo, tako zaradi virusov, kot tudi zaradi samega kaparja. V vinogradu v Škocjanu na Primorskem smo štiri leta zapored spremljali širjenje GLRaV-1 in -3 na 100 izbranih trsih, ki smo jih na zastopanost obeh virusov testirali enkrat letno. Rezultati analize so pokazali, da se virusa v vinogradu širita, kar kaže na možno vlogo velikega trtnega kaparja pri prenosu GLRaV. Vsebnost obeh virusov smo potrdili tudi v samih kaparjih. Na podlagi teh rezultatov smo dve leti zapored opravili tudi poskuse, s katerimi smo dokazali, da populacija velikega trtnega kaparja, prisotna v preučevanem vinogradu, uspešno prenaša izbrani izolat GLRaV-1, ki je ravno tako zastopan v tem vinogradu.

ABSTRACT

Transmission of Grapevine leafroll-associated virus 1 (GLRaV-1) by scale insect *Neopulvinaria innumerabilis*

Cottony maple scale (*Neopulvinaria innumerabilis*) is a regular pest in Primorska vineyards since middle 80's. Serious outbreaks were observed in last years. The pest itself can cause serious problems on grapevine by feeding on plants. Heavily infested branches develop short shoots with very little or no fruits and the plants can die. During development nymphs excrete large amounts of honeydew which is a good medium for mold growth. The assimilation and fruit quality is reduced. Cottony maple scale is known to transmit Grapevine leafroll-associated virus-1 (GLRaV-1) and -3 (GLRaV-3). Both viruses are present in production vineyards in Slovenia. Mass outbreaks of the vector and their spread can also spread the viruses which could produce a lot of damage in grapevine production. Virus (GLRaV-1 and GLRaV-3) spread was monitored on 100 grapevine plants in vineyard in Škocjan in Primorska region for four years. The plants were also infested by cottony maple scale. The results of the study show that both viruses are spreading in the vineyard. Based on these results possible role of soft scales in virus spread was further studied. The presence of both viruses in cottony maple scale was confirmed by RT-PCR. Transmission tests with natural population of cottony maple scale showed that local population of insect can successfully transmit GLRaV-1 isolate from the same location.

Preučevanje bionomije ameriškega škržatka (*Scaphoideus titanus* Ball)

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Ameriški škržatek (*Scaphoideus titanus* Ball) je glavni naravni prenašalec zlate trsne rumenice, bolezni vinske trte, ki jo povzroča karantenska fitoplazma Grapevine Flavescence dorée (FD). Eden izmed osnovnih fitosanitarnih ukrepov za preprečevanje širjenja in zatiranja FD je uspešno varstvo proti ameriškemu škržatku, za kar je potrebno natančno poznavanje njegove bionomije. Bionomijo ameriškega škržatka smo spremljali in proučevali v nadzorovanih razmerah in na prostem. V nadzorovanih razmerah v rastni komori smo spremljali izleganje ličink ameriškega škržatka na dvoletnih rozgah vinske trte nabranih v treh vinorodnih deželah Slovenije. Pri temperaturi 23 °C, 70 % relativni zračni vlagi ter 15 urni dolžini dneva, je bila dolžina izleganja ličink ameriškega škržatka več kot 50 dni. Najdaljši razvoj so imele ličinke stadija L2 in sicer v povprečju 11 dni. Razvoj ameriškega škržatka smo v vinogradih na območju šmarsko - virštanjskega vinorodnega okoliša spremljali vizualno s pregledi listov vinske trte ter s pomočjo rumenih lepljivih plošč. Rezultati raziskave bodo v pomoč pri pripravi strategije zatiranja ameriškega škržatka.

ABSTRACT

The study on bionomics of American leafhopper (*Scaphoideus titanus* Ball)

Scaphoideus titanus Ball is a leafhopper natural vector of the phytoplasma that causes “flavescence dorée” (FD), the most important vector grapevine yellow diseases. One of the main phytosanitary measures to prevent the spread and control of FD is successful protection against the American leafhopper. For this measure is needed knowledge of bionomy. Bionomic characteristics of American leafhopper were monitored and studied in growing chamber and in vineyards. Under growing chamber conditions were assessment the hatching of American leafhopper larvae on the biennial shoots of grapevine which were collected in three different vineyard regions of Slovenia. At temperature 23 °C, 70 % relative humidity and 15-hour day length, American leafhopper larvae hatched more that 50 days. The maximum development had second larvae stage (L2), in average of 11 days. American leafhopper development was also monitored in vineyards in the area Šmarsko - Virštanj region by visual inspection of vine leaves and using yellow sticky traps. Results of the research will assist in the American leafhopper control strategies.

Fitoplazemska povzročiteljica zlate trsne rumenice: molekulska raznovrstnost slovenskih izolatov, potencialni gostitelji in prenašalci

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Fitoplazma FDp (Flavescence doreé), ki na vinski trti povzroča zlato trsno rumenico je uvrščena v filogenetsko podskupino brestovih rumenic 16SrV. Podobnost med različnimi podskupinami filogenetske skupine je zelo velika, njihovo pojavljanje v različnih gostiteljskih rastlinah in žuželčjih prenašalcih pa neraziskano. Poznavanje teh odnosov je ključno za razumevanje epidemiologije in pravilno načrtovanje ukrepov zatiranja FDp. Ugotovili smo, da se na območju Slovenije za gotovo pojavljata dva tipa FDp, ki ju lahko uvrstimo v podskupini 2 in 3. Sevi v podskupini FD2 po sedaj analiziranih vzorcih vinske trte prevladujejo, kar je v skladu s pojavljanjem teh sevov drugje v Evropi. Približno tretjina diagnosticiranih sevov pripada skupini FD3. Izključno s sevom FD3 je bilo okuženih veliko rastlin navadnega srobota (*Clematis vitalba*), ki so imeli, ali pa tudi ne, izražena bolezenska znamenja. Glede na identičnost sevov FD3 v srobotu in vinski trti, bi bil srobot lahko možen naravni izvor tega seva. Pokazali smo že, da sta s sevi FD v Sloveniji okužena tudi edini znani prenašalec te fitoplazme ameriški škržatek (*Scaphoideus titanus*) in vzhodnjaški škržatek (*Orientus ishidae*). Vloga slednjega v epidemiologiji FD je povsem neznana. Fitoplazmo, podobno FD, smo našli tudi na rastlinah črne (*Alnus glutinosa*) in sive jelše (*A. incana*). Molekulska karakterizacija fitoplazem na jelšah je v teku.

ABSTRACT

Flavescence dorée: molecular diversity of Slovenian isolates, other potential hosts and vectors

Phytoplasma FD, which belongs to the elm yellows or 16Sr-V group, is an etiological agent of the most important grapevine yellows disease Flavescence doreé. Different subgroups of this phylogenetic group are strikingly similar. Although their occurrence in different host plants and insect vectors is still unexplored, the knowledge of these relationships is crucial for understanding the epidemiology and proper planning of phytosanitary measures. Up to now two different FD isolates, FD2 and FD3, have been identified in Slovenian grapevines. According to the analyzed samples, FD2 strains prevail, which is in line with the emergence of these strains elsewhere in Europe. About one third of strains belongs to the group FD3. Exclusively with FD3 strain were infected tested clematis (*Clematis vitalba*) plants either with or without the symptoms. FD3 isolates in clematis were the same as that present in the vines, indicating that clematis could be a possible natural origin of this strain. Phytoplasma FD was also found in the leafhopper *Scaphoideus titanus*, which has been known as the only natural vector of this phytoplasma. The phytoplasma FD was also detected in the mosaic leafhopper *Orientus ishidae,* which role in epidemiology of FD is currently not known. Phytoplasmas-like FDs were also found in alder species *Alnus glutinosa* and *A. incana*. Their molecular characterization is under current investigation.

Ugotavljanje navzočnosti trsnih rumenic v žariščih v Sloveniji

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V letu 2005 je bila v Sloveniji prvič potrjena zlata trsna rumenica (povzročitelj Grapevine flavescence dorée phytoplasma – FD), na Koprskem. Do leta 2010 je bila FD potrjena v vseh vinorodnih deželah Slovenije. Največ žarišč (območje s polmerom do 1 km okoli točke potrditve FD) je v vinorodni deželi Posavje, v Dolenjskem vinorodnem okolišu, kjer je tudi najvišji delež trsov z znamenji trsnih rumenic. Fitosanitarni inšpektorji so v žariščih okužbe izvajali vizualne preglede vinogradov in na podlagi teh odrejali odstranitev trsov z znamenji trsnih rumenic. V prispevku so predstavljeni rezultati nadzora v letih 2006 do 2010.

ABSTRACT

Inspection on presence of grapevine yellows in foci in Slovenia

Grapevine flavescence dorée phytoplasma (FD) was confirmed for the first time in Slovenia in 2005 near Koper. By 2010 the presence of FD was confirmed in all of Slovenia's wine regions. Most of the foci (area within a 1 km radius around the point of confirmed FD) were in the Dolenjska district of the Posavje wine region. This is also where the highest percentage of plants showing symptoms of grapevine yellows was confirmed. Phytosanitary inspectors visually inspected all vineyards in the focus areas on presence of grapevine yellows and ordered the removal of all plants on which symptoms were identified. The paper presents the results of the inspections carried out in the period 2006 - 2010.

Varnostni pasovi površinskih voda in vinogradništvo: omejitve in rešitve na primeru trsnih rumenic

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Predpisi, ki urejajo vinogradništvo z vidika uporabe fitofarmacevtskih sredstev (FFS), tvorijo kompleksno področje, saj je pri uporabi FFS potrebno dosledno spoštovati več zakonov: Zakon o fitofarmacevtskih sredstvih, Zakon o vodah, Zakon o kemikalijah, Zakon o varstvu okolja, Zakon o ohranjanju narave in tudi njihove podzakonske predpise ter akte sprejete na občinskem nivoju. Na drugi strani pa Zakon o zdravstvenem varstvu rastlin predpisuje obvezne ukrepe proti karantenskim škodljivim organizmom na vseh območjih, kjer se pojavljajo. Tako Pravilnik o ukrepih za preprečevanje širjenja in zatiranje zlate trsne rumenice, ki je bil sprejet v letu 2009, predpisuje zatiranje ameriškega škržatka na razmejenih območjih, v matičnih vinogradih, matičnjakih in trsnicah, natančnejši ukrepi pa so določeni z načrtom obvladovanja trsnih rumenic (www.furs.si). Zakon o vodah na obrežnih zemljiščih površinskih voda omejuje rabo FFS glede na red oziroma kategorijo vodotoka, medtem ko so lahko omejitve v nekaterih primerih dodatno postavljene z registracijsko odločbo za posamezno FFS. Problematiko lahko osvetli uporaba geografskih informacijskih sistemov na področju varstva rastlin, ki omogoča prostorske analize

različnih tematskih in topografskih podatkov, kar zagotavlja kvantitativno in kvalitativno ovrednotenje načrtovanih ukrepov rabe FFS v občutljivih območjih površinskih voda. V prispevku so predstavljeni rezultati prostorske analize različnih varnostnih pasov površinskih voda in razmejenih območij trsnih rumenic, možni vidiki ter tehnični ukrepi za reševanje problematike varstva rastlin oziroma zagotavljanja nemotene pridelave vinske trte in grozdja na eni strani in varovanja vodnih virov na drugi strani.

ABSTRACT

Surface waters buffer zones and viticulture: limitations and solutions in case of Grapevine yellows disease

The legislation governing grape production in terms of the use of plant protection products (PPP) is a complex area since the use of PPP is regulated by several laws: Plant Protection Products Act, Waters Act, Chemicals Act, Environmental Protection Act, Nature Conservation Act and their sub-law regulations as well as the acts adopted at the municipal level. On the other hand Plant Health Act requires mandatory measures against quarantine harmful organisms on regulated area, where they occur. Regulation on measures against the spread of grapevine yellows disease, which was adopted in 2009, provides for control of American leafhopper in demarcated areas in the vineyards, nurseries and mother plants, more detailed measures are set by the official action plan for grapevine yellows (www.furs.si). Restrictions on the use of PPP in buffer zones of surface waters is set according to provisions of the Waters Act, and in some cases can be further extended by the registration decision for each PPP. The use of geographic information systems in the field of plant protection allows spatial analysis of the various thematic and topographic data, which gives a more detailed insight into the problems of pesticide use in sensitive buffer zones of surface waters. The results of the intercrossing of different layers of surface waters buffer zones and demarcated areas of grapevine yellows, the possible aspects and technical measures to address the problem of ensuring the smooth plant protection/production of grapevines and grapes on one side and on the other hand, protection of water resources are presented in the paper.

Varstvo poljščin

Rezultati preizkušanja fungicidov za zatiranje plesni bučnic (*Pseudoperonospora cubensis*) na oljnih bučah v sezoni 2010

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V pridelovalni sezoni 2010 smo na območju vzhodne Slovenije v posevkih oljnih buč odkrili glivo, ki povzroča plesen bučnic (*Pseudoperonospora cubensis*). V poljskem poskusu smo preverili učinkovitost delovanja nekaterih fungicidov na osnovi Al-fosetila, azoksistrobina, mandiopropamida, propineba in dveh kombinacij aktivnih snovi mankozeb + metalaksil in mandiopropamid + mankozeb za zatiranje omenjene glive. Ugotavljali smo tudi vpliv zatiranja te bolezni na pridelek plodov in svežih semen bučnic. V kontrolni parcelici je znašal delež okužene listne površine 17,34%. Pri vizualnem ocenjevanju učinkovitosti delovanja pripravkov ni bilo ugotovljene statistično značilne razlike v delovanju med uporabljenimi pripravki (79,8 - 89,5%). V obravnavanjih, kjer smo uporabili mandiopropamid + mankozeb, azoksistrobin, mankozeb + metalaksil in mandiopropamid smo dosegli statistično značilno višje pridelke svežih semen bučnic (0,16 - 0,17 kg/m^2) v primerjavi z obravnavanjem, kjer nismo uporabili fungicida (0,13 kg/m^2). Na osnovi izvedenega poskusa lahko trdimo, da je ob močnejšem napadu glive *Pseudoperonospora cubensis* v posevkih oljnih buč uporaba fungicidov smiselna in ekonomsko upravičena.

ABSTRACT

Results of testing the efficacy of fungicides to control oil pumpkin downy mildew (*Pseudoperonospora cubensis*) in season 2010

In the 2010 growing season in the oil pumpkin fields of eastern Slovenia the severe infestation with fungus that causes mildew of pumpkins (*Pseudoperonospora cubensis*) was observed. In the field experiment, we tested the efficacy of several fungicides to control the disease. Fungicides on the basis of fosetyl Al, azoxystrobin, mandiopropamida, propineb and two combinations of active substance mancozeb + metalaxyl and mancozeb + mandiopropamid were applied at full labeled rates. We also determined the effect of disease control on the yield of pumpkin seeds. In control plots the average infestation rate of leaf tissue was 17.34 %. Visual asessment of disease infestation rate and calculations of fungicide efficacy have shown, that there were no statistically significant differences between tested fungicides which provided 79.8 to 89.5% disease control rate. On plots treated with mandiopropamid + mancozeb, azoxystrobin, mancozeb + metalaxyl and mandiopropamid significantly higher yields of fresh pumpkin seeds (from 0.16 to 0.17 kg/m^2) were determined in comparison to the control plots (0.13 kg/m^2), which were not treated with fungicides. Based on the experiment carried out it can be conclude that application of fungicides in seasons with the disease severity like in season 2010 is economically feasible.

Obvladovanje izbruhov cerkosporne in sive pegavosti hmelja

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V zadnjih 5 letih smo v Sloveniji opazili povečan pojav okužb hmelja s cerkosporno pegavostjo (*Cercospora cantuariensis*) in sivo pegavostjo hmelja (*Phoma exigua*), ki so na nekaterih območjih povzročile tudi do 20 % izgubo pridelka. V okviru raziskovalnega projekta Ciljnega raziskovalnega programa (CRP): »Konkurenčnost Slovenije 2006-2013« smo kot odgovor izbruhom do sedaj slabo proučenim novim boleznim opravili obsežen pregled pojava obeh povzročiteljic v proizvodnih in naravnih habitatih hmelja Slovenije. Z umetnimi okužbami smo za obe vrsti gliv določili patogenost in agresivnost ter testirali odpornost slovenskih sort. Določili smo najprimernejše fungicide za preprečevanje s pomočjo »*in vitro*« in »*in planta*« testiranja ter proučili njihove medsebojne interakcije. Proučili smo osnovne epidemiološke značilnosti in na osnovi vseh ugotovitev izdelali integrirano strategijo preprečevanja in obvladovanja bolezni.

ABSTRACT

Outbreaks management of cercospora and phoma leaf spot on hops

In Slovenia in the last 5 years increased infection occurrence of cercospora (*Cercospora cantuariensis*) and phoma (*Phoma exigua*) leaf spots on hop have been observed, which in some areas have caused up to 20 % of crop loss. In the frame of research project of Target research program »Slovenian Competitiveness 2006-2013« as an answer to the outbreaks of these new and not well studied diseases extensive monitoring for causing fungi in production and natural hop habitats of Slovenia was performed. By using artificial infections pathogenicity and aggressiveness was determined for both fungi and resistance of hop varieties was tested. Fungicides efficacy was evaluated by »*in vitro*« and »*in planta*« testing with further determination of fungicidal interactions. Disease epidemiological characters were studied and based on all findings detailed integrated management strategy was developed for controlling of these diseases.

Laboratorijsko preizkušanje insekticidnega delovanja diatomejske zemlje, prahu prave sivke in njivske preslice na fižolarja (*Acanthoscelides obtectus* [Say], Coleoptera, Bruchidae)

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V laboratorijskih razmerah smo preučevali vpliv treh različnih naravnih snovi na smrtnost odraslih osebkov fižolarja (*Acanthoscelides obtectus).* Ugotovljali smo insekticidno učinkovitost diatomejske zemlje (pripravek SilicoSec), njivske preslice (*Equisetum arvense*) in prave sivke (*Lavandula angustifolia*). Zrnje fižola smo tretirali s pripravki v

obliki prahu v petih različnih koncentracijah (100, 300, 500, 900 in 1200 ppm). Insekticidno delovanje smo preučevali pri šestih različnih vrednostih temperature (10, 15, 20, 25, 30 in 35 °C) in dveh vrednostih relativne zračne vlage (55 in 75%). Smrtnost imagov smo ugotavljali 1., 2., 4., 7., 14. in 21. dan po nastavitvi poskusa. Rezultati generalne statistične analize rezultatov poskusa kažejo, da smo signifikantno največjo smrtnost odraslih osebkov ugotovili pri uporabi diatomejske zemlje, pri 35 °C, 55 % relativni zračni vlagi in koncentraciji preučevanih snovi 900 in 1200 ppm. V prispevku bodo natančno prikazane interakcije med različnimi dejavniki v poskusu in podani predlogi za uporabo najučinkovitejše snovi v kmetijski praksi.

ABSTRACT

Testing the insecticidal activity of diatomaceous earth, and dusts of lavender and field horsetail against bean weevil (*Acanthoscelides obtectus* [Say], Coleoptera, Bruchidae) under laboratory conditions

Laboratory experiment was carried out to evaluate the impact of three different natural substances on the mortality of bean weevil (*Acanthoscelides obtectus*) adults. We tested the insecticidal properties of diatomaceous earth (commercial formulation SilicoSec), field horsetail (*Equisetum arvense*) and lavender (*Lavandula angustifolia*). Natural substances in a form of dust were mixed with bean seeds in five different dose rates (100, 300, 500, 900, and 1200 ppm). Insecticidal efficacy was tested at six different temperatures (10, 15, 20, 25, 30, and 35 °C) and two relative humidity (RH) levels (55, and 75 %). Mortality of adults was evaluated first, second, fourth, seventh, fourteenth and twenty-first day after exposure. Statistical analysis of pooled results showed significantly the highest mortality of bean weevil adults exposed to diatomaceous earth. The highest mortality of the pest was confirmed at 35 °C, 55 % of relative humidity level, and at concentrations of 900 and 1200 ppm. Interactions between different factors of experiment will be presented, and suggestions for the practical use of the most effective substance will be given.

Kompatibilnost štirih ras entomopatogenih ogorčic (Rhabditida) in 15 fungicidnih pripravkov v laboratorijskih razmerah

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V laboratorijskem poskusu smo preučili kompatibilnost štirih ras entomopatogenih ogorčic (Rhabditida) vrst *Steinernema feltiae, S. carpocapsae* in *Heterorhabditis downesi* s 15 izbranimi kemičnimi fungicidi. Vpliv direktnega izpostavljenja infektivnih ličink fungicidom smo preverjali po 24, 48 in 72 urah v petrijevkah pri 15, 20 in 25 ºC. V našem poskusu smo ugotovili kompatibilnost vrste *S. feltiae* s pripravkom Quadris (a.s. azoxystrobin), medtem ko smo do podobne ugotovitve pri vrsti *S. carpocapsae* (rasa C67) prišli z vsemi fungicidi, z izjemo pripravkov Falcon (a.i. tebukonazol in spiroksamin), Dithane (a.i. mancozeb), Sabithane (a.i. dinokap) in Ridomil (a.i. bakreni oksiklorid in metalaksil-M). Pri ogorčici *H. downesi* (rasa 3173) smo ugotovili signifikantno najvišjo smrtnost infektivnih ličink pri mešanju s pripravkom Falcon (a.i. tebukonazol in spiroksamin).

ABSTRACT

Compatibility of four entomopathogenic strains (Rhabditida) to 15 fungicides under laboratory conditions

In the laboratory experiment we tested the compatibility of four strains of entomopathogenic nematodes *Steinernema feltiae, S. carpocapsae* and *Heterorhabditis downesi* to 15 chemical fungicides. The effect of direct IJs exposure to fungicides for 24, 48 and 72 hours was tested in Petri dish experiment at 15, 20 and 25 ºC. Our experiment showed the compatibility of *S. feltiae* with fungicide Quadris (a.i. azoxystrobin), on the other hand we concluded the compatibility of *S. carpocapsae* (strain C67) with all fungicides tested in the experiment, without the exception Falcon (a.i. tebukonazol and spiroksamin), Dithane (a.i. mancozeb), Sabithane (a.i. dinokap) and Ridomil (a.i. copper oxichlorid and metalaksyl-M). With EPN species *H. downesi* (strain 3173) we found the significantly highest mortality of infective juveniles with fungicide Falcon (a.i. tebukonazol and spiroksamin).

Primerjava rojenja poljskega majskega hrošča (*Melolontha melolontha* L.) pred uporabo mikoinsekticida Melocont-Pilzgerste® in po njej

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V raziskavi smo s svetlobnimi vabami spremljali let poljskega majskega hrošča pred aplikacijo mikoinsekticida Melocont-Pilzgerste®(2007) in naslednji let po triletni aplikaciji (2007-2009) v letu 2010. V obeh letih smo od 20. aprila do 10. junija v kraju Zadlog dnevno spremljali ulov odraslih hroščev. Leta 2010 je skupni ulov hroščev dosegel le 42 % tistega v letu 2007. Začetek rojenja je odvisen predvsem od temperature, kasneje pa je intenzivnost odvisna tudi od padavin. Krivulja leta ima v obeh letih tri vrhove, med katerimi je eden zelo izrazit. V zadnjem obdobju rojenja med ulovljenimi hrošči prevladujejo samice, v absolutni kulminaciji je delež samcev nekoliko večji. Po uporabi mikoinsekticida Melocont-Pilzgerste® se je v treh letih populacija odraslih hroščev poljskega majskega hrošča močno zmanjšala.

ABSTRACT

Comparison of common cockchafer (*Melolontha melolontha* L.) swarming before and after mycoinsecticide Melocont-Pilzgerste® application

In our investigation the flight of common cockchafer was monitored using light traps in 2007, the year before using the mycoinsecticide Melocont-Pilzgerste®, and in 2010, the year after its 3-year application (2007-2009). In these two years, in Zadlog, from 20 April till 10 June traps were checked daily and captured beetles were counted. In 2010 altogether catch reached just 42 % of the catch in 2007. The start of swarming mainly depends on the temperature and later the intensity of flight can be also affected by the rainfall. The flight curve shows three peaks in both years; among which one is very distinctive. In the period of absolute culmination of swarming the number of males

prevailed over the females and only at the end of flight period there were more female beetles caught in the light traps. After the 3-year application of the mycoinsecticide Melocont-Pilzgerste® the adult population of *Melolontha melolontha* beetles was strongly reduced.

Molekulska raznolikost encimov za razgradnjo celične stene pri rastlinsko parazitskih ogorčicah iz rodu *Globodera*

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Ob napadu gostiteljskih rastlin morajo rastlinsko parazitske ogorčice predreti rastlinsko celično steno. Da bi razgradile kompleksno strukturo pektina in celuloznih vlaken skozi bodalo v rastlino vbrizgajo izločke obžrelnih žlez. Obžrelne žleze izločajo mešanico litičnih encimov, tudi takšnih za razgradnjo celične stene. Encime za razgradnjo rastlinske celične stene so v zadnjem desetletju pri mnogih ogorčicah prepoznali kot parazitski dejavnik, malo pa je znanega o njihovi raznolikosti in evoluciji. V naši študiji proučujemo raznolikost encimov za razgradnjo rastlinske celične stene, pektat liaz in ekspanzinov, v rodu *Globodera*. Molekulsko raznolikost genov *pel*1, *pel*2, *exp*B2 in *exp*B3 ter njihovih pripadajočih proteinov smo ovrednotili pri 32 populacijah *G. rostochiensis*, *G. pallida*, *'G. mexicana'* in *G. tabacum*, da bi poiskali morebitno povezavo med njihovo raznolikostjo in patotipi krompirjevih ogorčic. Primerjava genov in encimov za razgradnjo rastlinske celične stene pri vrstah rodu *Globodera* daje nov vpogled v evolucijo parazitskih dejavnikov pri rastlinsko parazitskih ogorčicah. V nizu preko 400 DNA zaporedij smo določili vrstno specifična mesta in mesta, ki ločijo med krompirjevimi in tobakovimi ogorčicami in ki so obetavna za razvoj novih diagnostičnih metod. Opažena raznolikost ni v povezavi niti s patotipi krompirjevih ogorčic niti s podvrstami tobakovih ogorčic. Filogenetska drevesa razkrivajo topologijo, ki se razlikuje od splošno sprejete vrstne topologije v tem rodu, saj so si zaporedja *G. rostochiensis* in *G. pallida* med seboj bolj podobna kot z zaporedji *G. tabacum*. Opazili smo zanimivo povezavo med naborom gostiteljskih rastlin in strukturo parazitskega dejavnika *pel*2. Analiza ekspanzinov je pokazala obstoj genske družine. Primerjava gena *exp*B2 v krompirjevih ogorčicah je razkrila, da intronov pri beli krompirjevi ogorčici *G. pallida* ni.

ABSTRACT

Molecular variability of plant cell wall degrading enzymes in the *Globodera* plant-parasitic nematodes

When plant-parasitic nematodes invade their host, they need to overcome the plant's cell wall. In order to degrade this complex structure of pectin and cellulose fibres, plant-parasitic nematodes produce a mixture of lytic enzymes in their oesophageal glands and secrete them through the stylet into the plant. While the studies performed in the last decade identified different cell wall degrading enzymes as parasitism factors in different species of plant-parasitic nematodes, there is little information on variability and evolution of these genes. We are assessing molecular variability of cell wall degrading enzymes,

the pectate lyases and expansins, in the genus *Globodera*. Molecular variability of the genes *pel*1, *pel*2, *exp*B2 and *exp*B3 and the predicted proteins was evaluated in 32 populations of *G. rostochiensis, G. pallida, 'G. mexicana'* and *G. tabacum* in order to investigate if a link can be found between this variability and the pathotyping scheme of potato cyst nematodes (PCN). Comparison of the *Globodera* genes and enzymes for the plant cell wall degradation gives insight into the evolution of these parasitism factors in plant-parasitic nematodes. Species-specific sites, potentially applicable for identification, and sites distinguishing potato cyst nematodes from tobacco cyst nematodes, were identified in dataset of over 400 DNA sequences. The observed polymorphism does not correlate either to the pathotypes proposed in potato cyst nematodes or the subspecies described in tobacco cyst nematodes. The phylogenetic trees reveal a topology different from the admitted species topology as *G. rostochiensis* and *G. pallida* sequences are more similar to each other than to *G. tabacum*. An interesting link between host range and structure of *pel*2 is observed. Analysis of expansins showed existence of a gene family. A comparison of the *exp*B2 gene in PCN revealed lack of the introns in *G. pallida.*

Izkušnje z zatiranjem plevelov v oljni ogrščici (*Brassica napus* L.)

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V letu 2009 smo, v enoletnem poskusu, proučevali delovanje herbicidov proti plevelom v oljni ogrščici (*Brassica napus* L.). V poskusu smo preizkušali osem različnih herbicidov v 10 različnih obravnavanjih. Uporabljeni so bili Butisan – S (metazaklor), Centium 36 CS (klomazon), Nimbus SC (metazaklor + klomazon), Effigo (klopiralid + pikloram), Teridox 500 EC (dimetaklor), Brasan (dimetaklor + klomazon), Fuego (metazaklor) in Successor 600 (petoksamid). Opravili smo dvoje ocenjevanj (prvo – septembra, drugo – aprila v naslednjem letu), analizo stopnje skupne povprečne učinkovitosti herbicidov, fitotoksičnost herbicidov ter pokrovnost parcelic s pleveli. Manjšo učinkovitost sta pokazali obravnavanji 2 (Centium 36 CS – 78,4%) in 4 (Effigo – 72,5%), vsa ostala obravnavanja pa so bila zelo učinkovita (med 98,4 in 99,6%). Pri nobenem preizkušanem herbicidu oz. kombinaciji herbicidov, nismo opazili znamenj fitotoksičnosti na rastlinah oljne ogrščice.

ABSTRACT

Results of testing herbicides against weeds in oilseed rape (*Brassica napus* L.)

In one-year experiment in 2009, we have studied the efficiency of herbicides against weeds in oilseed rape (*Brassica napus L.*). Eight different herbicides (Butisan-S – metazachlor, Centium 36 CS – clomazone, Nimbus SC – metazachlor + clomazone, Effigo – clopyralid + picloram, Teridox 500 EC – dimethachlor, Brasan – dimethachlor + clomazone, Fuego – metazachlor and Successor 600 – pethoxamid) were in 10 different combinations tested. In the experiment were done two evaluations (first in September and second in April the following year), analysis of the level the total average efficiency of herbicides, phytotoxicity of herbicides on rape plants and level of cover on plots with weeds. The lowest efficiency have shown a variants 2 (Centium 36 CS – 78,4%) and 4 (Effigo – 72,5%), all other variants were very high effective (between 98,4 and 99,6%).

None of the tested herbicide or combination of herbicides caused any visible symptoms of phytotoxicity on the rape plants.

Spremljanje vpliva različnih rokov uporabe herbicidov na zapleveljenost in pridelek ozimnih žit v letih med 1992 in 2010

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V prispevku so prikazani rezultati 27 mikro in makro poskusov s herbicidi v ozimnih žitih v različnih agroklimatskih območjih Slovenije v letih od 1992 do 2010, kjer smo ugotavljali učinkovitost herbicidov ter pridelke pri različnih rokih njihove uporabe. Primerjali smo pridelke žita pri zgodnji in pozni jesenski, zgodnji pomladanski in pozni pomladanski uporabi herbicidov. Primerjali smo samo pridelke herbicidnih kombinacij, s katerimi smo dosegli več kot 95 % skupno učinkovitost pri zatiranju plevela. Iz rezultatov je razvidno, da smo pri zgodnji jesenski ter pozni jesenski uporabi herbicidov praviloma dosegli najboljšo učinkovitost, kot tudi najvišje pridelke. Kljub temu je v naših pridelovalnih razmerah težko v naprej opravičiti jesensko oziroma pomladansko uporabo herbicidov v ozimnem žitu, saj je le ta odvisna od številnih dejavnikov, med katerimi so še posebej pomembni čas setve in vremenske razmere v jesenskem času, ob teh pa še priprava tal in gnojenje, vrsta plevela in njegova gostota.

ABSTRACT

The comparison of different herbicide application time on weed control and yield of winter cereals between 1992 and 2010

The results of 27 micro and macro herbicide trials in winter cereals in different agroclimatic regions of Slovenia conducted between 1992 and 2010 are presented where herbicide efficacy and yield due to different application time (early and late autumn and early and late spring application time) were evaluated. Only herbicide combinations with more than 95 % of efficacy were included in yield comparison. From the results it can be concluded that early and late autumn application gave the best herbicide efficacy as well as highest yields. Nevertheless it is very hard to foresee the justified application time due to many factors which influence the herbicide efficacy and yield in winter cereals, among them especially sowing date and the following weather conditions in the autumn, as well as soil and seedbed preparation, fertilisation, the type of weed species and their density.

Rast in razvoj pelinolistne ambrozije (*Ambrosia artemisiifolia* L.) pri različnih ravneh dušika in vode

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Pelinolistna ambrozija (*Ambrosia artemisifolia* L.), kot invazivna enoletna rastlinska vrsta, predstavlja v Evropi zaradi izgub pridelkov in povzročanja inhalacijskih alergij pri ljudeh, eno najpomembnejših plevelnih vrst. Z namenom proučevanja vpliva različnih ravni dušika in vode na rast in razvoj pelinolistne ambrozije smo v letu 2010 postavili lončni poskus v rastlinjaku. Zasnova poskusa je bila faktorska, s štirimi ponovitvami. Preučevani faktorji sta bili dve ravni vode (50 % in 100 % vodne kapacitete v loncu) in tri ravni dušika (1, 5, 10 g N/m^2). Za potrebe meritev rastnih in fizioloških parametrov pelinolistne ambrozije, smo opravili štiri destruktivne žetve rastlin v razvojnih fazah V4 (4-listi), V10, V14 in polno cvetenje. Relativna vsebnost vode (RWC) in vsebnost vode sta bili statistično značilno nižji v obravnavanjih z nižjo ravnijo vsebnosti vode (P<0,001). Odziv pelinolistne ambrozije na različne ravni dušika in vode se je v različnih stadijih rasti razlikoval. Na splošno smo statistično značilne razlike v rastnih parametrih ugotovili od faze V14 naprej. V tej fazi je višja raven vode vplivala na višje mase svežih listov in stebel, suhe mase le-teh pa niso bile statistično značilno višje (P<0,005). V fazi polnega cvetenja smo za svežo maso listov in stebel, suho maso listov in stebel na rastlino ugotovili statistično značilne interakcije med vplivom dušika in vode (P<0,005). Tudi relativna rast (RGR) je bila pri višji ravni vode od faze V14 naprej statistično značilno višja (P<0,005), vpliva dušika pa nismo ugotovili. Pri absolutni rasti (AGR) je bil v fazi V14 ugotovljen statistično značilen vpliv dušika in vode (P<0,005), pri polnem cvetenju pa vpliv njune interakcije (P<0,005). Naša raziskava je potrdila in ovrednotila vplive dušika in vode na rast in razvoj pelinolistne ambrozije v posameznih razvojnih fazah, brez kompeticije s strani obstoječe vegetacije.

ABSTRACT

Growth and development of common ragweed (*Ambrosia artemisiifolia* L.) under different nitrogen and water levels

Common ragweed (*Ambrosia artemisiifolia* L.) is an invasive weed species, which causes serious public health problems and substantial yield losses in crops. To determine effect of nitrogen and water on growth and development of common ragweeed a greenhouse pot experiment was conductet in 2010. Experiment was established as a factorial design with four replications. Factors were two watering levels (50 % and 100 % pot water-holding capacity) and three randomized nitrogen levels (1, 5, 10 g N/m^2). Four harwests were conducted troughout the life cycle to determine common ragweed growth parameters in growth stages V4 (4 leaf), V10, V14 and full flowering. Relative water content (RWC) and water content in the lower watering level were significantly lower (P<0.001). Common ragweed response to water and nitrogen varied among levels and stages. In general statistically significant effects of water and nitrogen levels on growth parameters were shown from stage V14 onwards. In V14 stage plants with higher water levels had a significantly higher fresh matter of leaves and stems, higher relative growth rates (RGR), however dry matter of leaves and stems were not significantly higher (P<0.005). Interactions between nitrogen and water levels were statistically significant for all studied growth parameters (P<0.005) in full flowering stage, except for relative growth rate (RGR), where only effect of higher water level was statistically significant (P<0.005). Absolute growth rate (AGR) was significantly higher from V14 stage onwards, where main effects of water and nitrogen levels were observed (P<0.005). Our research determined influence of water and nitrogen on growth and development of common ragweed at least when plants are not exposed to the competition from neighbouring plants.

Vpliv kompeticije na vegetativni in reprodukcijski razvoj pelinolistne ambrozije (*Ambrosia artemisiifolia* L.).

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Pelinolistna ambrozija je invazivna plevelna vrsta, ki povzroča škodo na kmetijskih površinah in hkrati zaradi produkcije velikih količin peloda ena glavnih povzročiteljic alergijskih obolenj pri ljudeh. Z namenom proučevanja vpliva kompeticije smo v letu 2010 postavili lončni poskus v rastlinjaku. Zasnova poskusa je bila faktorska, s štirimi ponovitvami. Preučevane faktorje so predstavljale tri kompeticijske ravni; brez kompeticije (ena rastlina ambrozije v loncu), srednja (ena ambrozija ena trava) in visoka (ena ambrozija pet trav). Za potrebe meritev rastnih parametrov pelinolistne ambrozije, smo opravili štiri destruktivne žetve rastlin v razvojnih fazah V4 (4-listi), V10, V14 in polno cvetenje. Statistično značilen učinek kompeticije smo ugotovili od faze V10 naprej. Višina rastlin, sveža masa listov in stebel ter suha masa listov in stebel na rastlino je bila v obravnavanjih s srednjo in visoko stopnjo kompeticije statistično značilno nižja (P<0,001). V polnem cvetenju je bila suha masa na rastlino pri srednji kompeticiji 43 % nižja, pri visoki pa kar 82 % nižja. Učinek kompeticije je bil statistično značilen tudi pri sveži, suhi masi in številu socvetij na rastlino (P<0,001). Suha masa socvetij se je znižala z 1,1 g (brez kompeticije) na 0,96 g in 0,2 g pri srednji in visoki kompeticiji. Število socvetij se je zmanjšalo s 13,7 pri obravnavanjih brez kompeticije na 10,7 in 5,1 pri srednji in visoki stopnji kompeticije. Na podlagi izsledkov naše raziskave lahko sklepamo, da je pelinolistna ambrozija slab kompetitor in se je sposobna širiti le v okoljih s pogostimi motnjami in redko vegetacijo.

ABSTRACT

Influence of competition on vegetative and reproductive development of common ragweed (*Ambrosia artemisiifolia* L.).

Common ragweed is an invasive weed species in various cropping sistems and a major allergenic plant due pollen production, capable of causing severe health problems. To determine the effect of competition on growth and development of common ragweeed, a greenhouse pot experiment was conducted in 2010. Italian ryegrass (*Lolium multiflorum* Lam.) was selected as a competitor. Experiment was established as a factorial design with four replications. Factors were three ragweed competiton levels with no competition (one ragweed plant in the pot), medium competition level (one ragweed and one grass) and high competition level (one ragweed and five grasses). Four harvests were conducted troughout the life cycle to determine common ragweed growth parameters in growth stages V4 (4 leaf), V10, V14 and full flowering. Competition effect significantly influenced common ragweed growth from V10 growth stage onwards. Plant height, fresh matter of leaves and stems, dry matter of leaves and stems per plant were statistically significant lower in medium and higher competition levels (P<0.001). In full flowering stage total dry matter per plant decreased by 43 % in medium and by 82 % in high competititon level. Fresh, dry matter and number of inflorescences per plant were also significantly influenced by competition levels (P<0.001). Dry matter of inflorescences decreased from 1.1 g (no competition), to 0.96 g (medium competiton level) and 0.2 g (high competition

level). Number of inflorescences was reduced from 13.7 (no competition), to 10.7 and 5.1 in medium and higher competition levels respectively. Based on our results, common ragweed growth and development is strongly influenced by the competition level. Being poor competitor suggests, that common ragweed is only capable of spreading in disturbed environments with sparse vegetation.

Izvajanja ukrepov za zatiranje škodljivih rastlin iz rodu *Ambrosia* v letu 2010

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V prispevku so predstavljeni metode in rezultati nadzora implementacije nove zakonodaje o nadzoru škodljivih rastlin iz rodu *Ambrosia.* V maju 2010 je bil spremenjen Zakon o zdravstvenem varstvu rastlin, ki je uvedel možnost za ukrepanje zaradi škodljivih rastlin, kot so pelinolistna ambrozija (*Ambrosia artemisiifolia*) in druge neofitne vrste iz rodu *Ambrosia*. Posebni ukrepi so bili določeni z odredbo ministra o ukrepih za zatiranje škodljivih rastlin iz rodu *Ambrosia*, ki je začela veljati v začetku avgusta 2010. Fitosanitarna inšpekcija je obravnavala 125 prijav o sumu ali ugotovljeni navzočnosti ambrozije oziroma o neizvajanju ukrepov, ki so predpisani z odredbo. Največ prijav je bilo v Prekmurju, na Štajerskem in na Dolenjskem. Ambrozija je bila potrjena na 151 lokacijah, na 72 prijavljenih lokacijah pa se je izkazalo, da ne gre za ambrozijo.

ABSTRACT

Implementation of measures to suppress the harmful plants of genus *Ambrosia* in 2010

The paper presents the methods and results of supervision on the implementation of new legislation on harmful plants of genus *Ambrosia.* In May 2010 the Plant Health Act was amended, providing the basis for measures on harmful plants as for *Ambrosia artemisiifolia* L. and other neophyte plants of genus *Ambrosia*. Specific measures were taken in line with the Decree on the measures for suppression of the harmful plants of genus in force from early August 2010*.* The Phytosanitary Inspection dealt with the 125 reports of suspicion or findings of *Ambrosia* and with the reports of failures to carry out measures, which are regulated in the Decree. Most reports were from Prekmurje, Štajerska and Dolenjska regions. *Ambrosia* was confirmed on 151 locations; on the other hand on 72 locations phytosanitary inspectors did not confirm that plants belonged to the genus *Ambrosia*.

Varstvo goznega drevja in drugih lesnatih rastlin

e-Varstvo gozdov Slovenije: Portal

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e-Varstvo gozdov Slovenije (eVGS) je elektronski informacijski sistem za varstvo gozdov v Sloveniji. Podoben je sistemu Fito-Info, to je Slovenskemu informacijskemu sistemu za varstvo rastlin, le da je eVGS specializiran za področje varstva gozdov. Sistem eVGS je sestavljen iz dveh enot. Prvo enoto predstavlja podatkovna zbirka in drugo portal. Podatkovna zbirka eVGS predstavlja osrednje skladišče podatkov varstva gozdov v Sloveniji. Dostop do zbirke je omejen. Namen portala eVGS je, da posreduje znanja o varstvu gozdov, da spodbuja komunikacijo na temo varstva gozdov, da predstavlja pripomoček pri delu gozdarjev, da sporoča javnosti aktualna dogajanja na področju varstva gozdov. Vsebine portala eVGS so: priročnik za določevanje vzrokov poškodb drevja, elektronska revija Novice iz varstva gozdov, izobraževalno gradivo, slovar strokovnih pojmov, letna poročila iz varstva gozdov, arhiv poročil in elaboratov poročevalske, prognostično-diagnostične službe za gozdove (PDP), predpisi povezani z varstvom gozdov, aktualni dogodki na področju varstva gozdov, posebni nadzori škodljivih organizmov povezani z gozdarstvom, javno dostopni podatki iz zbirke eVGS. Uporabniki sistema eVGS so v prvi vrsti gozdarji na Zavodu za gozdove Slovenije (ZGS) in vsi uporabniki PDP službe, katero vodi Gozdarski inštitut Slovenije. Pri razvoju sistema eVGS upoštevamo naslednja načela in usmeritve: je enostaven za uporabo, prijazen do uporabnika, sistem je koristen pripomoček na vseh ravneh ZGS, ni podvajanja vnosov istih podatkov, omogoča sledljivost in kontrolo zapisov ter je vir znanja. S sistemom eVGS se bo delo gozdarjev na področju varstva gozdov poenostavilo, delo bo preglednejše, potekalo bo hitreje in rezultati bodo kakovostnejši. Informacijski sistem za varstvo gozdov predstavlja osnovo za izdelavo prognoz v varstvu gozdov v Sloveniji. Portal eVGS bo dvignil raven obveščenosti in ozaveščenost javnosti na področju varstva gozdov.

ABSTRACT

e-Forest protection of Slovenia: Portal

e-Forest protection of Slovenia (eVGS) is an electronic information system for forest protection in Slovenia. It is similar to the system Fito-Info, i.e. Slovenian information system for plant protection; however, eVGS is specialized for the field of forest protection. The system eVGS has two units: database and portal. The eVGS database is central data warehouse for forest protection in Slovenia. Access to the database is restricted. Purpose of the eVGS portal is to mediate knowledge about forest protection, to encourage communication in the field of forest protection, to be a tool for forester's everyday work, to inform public about events in the field of forest protection. The contents of eVGS portal is: manual for determining causes of tree damages, electronic journal News from forest protection, educational material, glossary, forest protection yearly reports, archive of reports and expert's detailed report of Reporting, prognostic-diagnostic service for forests (PDP), forest protection legislation, current events in the field of forest protection, special surveys of harmful organisms related with forestry, publicly available data from eVGS database. The eVGS users are foresters from Slovenian Forestry Service (ZGS) and all users of PDP service, which is managed by Slovenian Forestry Institute. Development of eVGS system considers following principles and directives: it is easy to use, it is user friendly, it is helpful tool at every level of ZGS, there is no duplicate data input, it enables traceability and control of records, and it is the source of knowledge. The EVG system will

simplify the work of foresters in the field of forest protection; work will be more transparent, faster and results will be of better quality. With the information system of forest protection in Slovenia, fundamentals for prognosis in forest protection in Slovenia will be established. The eVGS portal will raise the level of public awareness in the field of forest protection.

Kako ohraniti zdravje gozda?

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Sistem zdravstvenega varstva gozdov v Sloveniji ne zagotavlja preprečevanje vnosa, odkrivanja in zatiranja novih, invazivnih organizmov, ki lahko destabilizirajo gozd ali ogrozijo obstoj katere koli drevesne vrste. Tudi sistem varstva rastlin v Evropi ima vrsto pomanjkljivosti, ki omogočajo neprekinjen vnos teh organizmov iz drugih kontinentov s trgovino, transportom in turizmom. Z uvozom sadik s substratom vnašamo številne organizme, o katerih ne vemo dovolj in nekateri še niti niso opisani. Tudi endofitne glive v živih rastlinah so lahko nevarni latentni patogeni. Predvidena prenova sistema evropskega zdravstvenega varstva rastlin bi lahko povečala sposobnost odkrivanja in izkoreninjanja nevarnih organizmov, vendar ne bo preprečila vnosa; njihovo odkrivanje in izkoreninjanje bo zagotovo v številnih primerih neuspešno. Edini ukrep, ki lahko prekine prenos teh organizmov med kontinenti je popolna prepoved prenosa tal (rastline s koreninami, koreninsko grudo in substrat) in prepoved prenosa živih rastlin (ali njihovih delov, vključno s cvetjem). Vsi rastlinski produkti (ne-živi deli rastlin) morajo biti obdelani z metodami, ki zagotavljajo uničenje vseh organizmov v njih. Dovoljen naj bo samo prenos ustrezno razkuženih semen in čistih tkivnih kultur rastlin. Opustijo naj se seznami škodljivih organizmov, ker so nepopolni in ne vključujejo neznanih škodljivih organizmov. Ocene tveganja ne zagotavljajo ustrezne podlage za ukrepanje, ker so prepozne, saj so narejene po ugotovitvi škodljivosti novega organizma. Pri medkontinentalnem prevozu ljudi in v turizmu naj se razvijejo in uvedejo tehnike uničevanja škodljivih organizmov, ki bodo preprečevale prenos škodljivih organizmov na prtljagi in ljudeh. Razviti in uvesti je potrebno vrsto ukrepov, ki bodo prekinili tudi prenos škodljivih organizmov v okviru Evrope. Za dosego tega je potrebno spremeniti temeljna načela Svetovne trgovinske organizacije o svobodni trgovini in previdnostni ukrepi naj postanejo osnovno vodilo. Ozaveščanje družbe o možnih posledicah ne-uvajanja in neizvajanja predlaganih ukrepov je najpomembnejša naloga vseh fitosanitarnih strokovnjakov v sedanjem času.

ABSTRACT

How to preserve forest health?

The forestry phytosanitary system in Slovenia does not assure successful prevention, detection and eradication of new, invasive harmful organisms which can destabilize forests or threaten the existence of tree species. European phytosanitary system has numerous deficiencies, which enable constant inflow of these organisms through trade, transport and tourism. From other continents saplings and trees with soil are imported and along with them innumerable organisms, which are insufficiently known and some are even not described. Some endophytic fungi in living plants are also dangerous latent

pathogens. Anticipated renovation of European phytosanitary system could increase capability for detection and eradication of harmful organisms but it will not prevent their introduction. Detection and eradication will fail in many cases. The only measure that can stop the transfer of these organisms among continents is total ban on the transport of live plants (and their parts, including flowers) and on the transfer of soil (plants with roots, root balls and associated soil). Plant products in trade (non living parts of plants) should be treated to kill all organisms in them. Only disinfected seeds and plant tissue cultures could be transported. Lists of harmful organisms should be abandoned because they are incomplete and do not contain unknown harmful organisms. Pest Risk Analyses are not suitable basis for adequate measures since they are produced after assessing the damages from newly introduced organisms. In intercontinental transport of people and tourism the methods of pest eradication should be developed which prevent their transfer on luggage and passengers. Variety of measures to prevent transfer of pests within Europe should be developed and implemented. For achieving all of these goals the basic agreements on free trade among World Trade organization members have to be changed and precautionary measures should be used as a new paradigm. To inform the society on possible consequences of non realization of proposed measures is at present the utmost important activity of all phytosanitary experts.

Nenavadne vremenske razmere kot sprožilci patogenih aktivnosti endofitnih gliv na primeru vrste *Botryosphaeria dothidea*

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Nenavadne vremenske razmere postajajo čedalje pogostejše. Ekstremne suše in visoke temperature so leta 2003 prizadele Evropo. V Sloveniji je bilo v letu 1997 na Krasu opaženo nenavadno odmiranje črnega gabra (*Ostrya carpinifolia*), ki je bilo najbolj izrazito leta 2003. Nenavadna podrobnost tega pojava je v tem, da je bila prizadeta drevesna vrsta, ki je veljala za odporno proti boleznim in sušnem stresu. Kot povzročiteljica odmiranja je bila določena gliva *Botryosphaeria dothidea*, do tedaj neznana kot patogen omenjene drevesne vrste. Izolirali smo jo tudi iz asimptomatskih črnih gabrov in drugih drevesnih vrst, vendar je najobsežnejše poškodbe pri nas povzročila na črnem gabru. *B. dothidea* je pogosta tudi kot saprofitna gliva na številnih odmrlih lesnatih rastlinah. Vpogled v populacijsko raznolikost in patogenost izolatov omenjene glive je razkril heterogeno strukturo, ki nakazuje, da je pojav bolezni črnih gabrov povezan s samoniklo populacijo glive *B. dothidea* in ne z vnosom patogenega seva na prizadeto območje. Omenjena vrsta je navadno zastopana kot endofit v tkivih različnih drevesnih vrst v Evropi (npr. *Fraxinus excelsior*, *Ostrya* sp., *Platanus* spp., *Populus nigra*, *P. tremula*, *Prunus* sp., *Vitis vinifera*, *Quercus rubra*, *Q. robur*, *Q. suber*, *Q. ilex*). Glivo *B. dothidea* uvrščamo v družino Botryosphaeriaceae, katere člani so običajno endofiti, vendar so zabeleženi tudi kot patogeni, še posebej v povezavi s sušnim stresom, mehanskimi poškodbami, zmrzaljo, saditvijo dreves na neprimernih lokacijah ter biotskimi poškodbami. V primeru bolezni črnih gabrov so najverjetneje dolgotrajne nenavadne vremenske razmere (suša, visoke temperature) sprožile patogene aktivnosti sicer endofitne populacije *B. dothidea*. Ostaja pa nepojasnjeno, zakaj se je bolezen pojavila v tako velikem obsegu predvsem na tej, sicer izredno odporni drevesni vrsti.

ABSTRACT

Unusual weather conditions as triggers of pathogenic activities of endophytic fungi – *Botryosphaeria dothidea* as an example

Unusual weather conditions are lately becoming a usual phenomenon. In Europe, the most recent extreme conditions occurred in 2003, when severe drought and higher temperatures were recorded. An unusual dieback of *Ostrya carpinifolia* had been reported in Slovenia from 1997, but the severity of damages and mortality was the most alarming in 2003. Curious detail about this disease occurrence is that the affected tree species is known to be resistant to various diseases and drought. The fungus *Botryosphaeria dothidea*, which to that time was not known as a pathogen of *O. carpinifolia,* was identified as a causative agent of the dieback. This species was isolated also from symptomless *O. carpinifolia* trees and from other tree species, but nevertheless, disease symptoms were widely distributed only on *O. carpinifolia*. Species *B. dothidea* is recognized also as a saprophyte on numerous dead woody plants. An insight into population diversity and pathogenicity of isolated *B. dothidea* revealed a heterogeneous structure, which suggests that *O. carpinifolia* dieback was associated with a native population of *B. dothidea* and not with a recently introduced pathogenic strain. This fungal species usually lives in tissues of woody plants as an endophyte and is common on various trees in Europe (eg. *Fraxinus excelsior*, *Ostrya* sp., *Platanus* spp., *Populus nigra*, *P. tremula*, *Prunus* sp., *Vitis vinifera*, *Quercus rubra*, *Q. robur*, *Q. suber*, *Q. ilex*). The fungus *B. dothidea* belongs to Botryosphaeriaceae family, whose members are usually endophytes but with known pathogenic effect connected to drought stress, physical damage, frost, planting species on inappropriate areas and damages by biotic factors. In the case of *O. carpinifolia*, the endophytic population of *B. dothidea* was most likely triggered by continuous extreme weather conditions (drought, high temperatures) into pathogenic activity. But it remains controversial, why just this highly resistant tree species was affected in such extent.

Jesenov ožig po svetu in pri nas

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Močno sušenje in odmiranje jesenov se je sredi devetdesetih let prejšnjega stoletja najprej pojavilo v Litvi in na Poljskem. Bolezen, ki smo jo pri nas poimenovali jesenov ožig, se je začela hitro širiti. Različni simptomi, kot so sušenje in prezgodnje odpadanje listja, nekroze listov, listnih pecljev in skorje, odmiranje poganjkov ter rakave rane na vejah in deblih, se tako danes pojavljajo v večjem delu Vzhodne, Srednje in Severne Evrope. V Sloveniji so bili simptomi bolezni prvič opaženi jeseni 2006 v SV delu države, v naslednjih letih pa se je sušenje in odmiranje jesenov razširilo na vso državo. Leta 2006 je bila ugotovljeno, da je povzročiteljica bolezni do takrat še neopisana gliva *Chalara fraxinea*. Dve leti kasneje je bil odkrit tudi teleomorf glive. Sprva so domnevali, da pripada že dolgo znani saprofitski glivi *Hymenoscyphus albidus*, pred kratkim pa so s pomočjo molekularnih metod ugotovili, da gre pravzaprav za novo vrsto *H. pseudoalbidus*. Postavljenih je več hipotez o izvoru glive oziroma pojavu bolezni, ki pa jih je potrebno še podrobno proučiti. Gliva je bila izolirana iz nekrotičnih tkiv več vrst jesenov (*Fraxinus* spp.). Bolezen najbolj ogroža veliki jesen (*F. excelsior*) in ozkolistni jesen (*F. angustifolia*), medtem ko simptomov bolezni na malem jesenu (*F. ornus*) še nismo odkrili. Ogrožena so drevesa vseh

starosti, mortaliteta je velika predvsem med drevesi mlajših razvojnih faz, glivi pa ustrezajo predvsem vlažna rastišča. Preživetje populacij občutljivih vrst jesenov v prihodnosti je resno ogroženo. Kljub vsemu pa upanje za jesene vseeno obstaja. Kaže se v individualni odpornosti posameznih osebkov.

ABSTRACT

Ash dieback around the world and in Slovenia

Massive ash dieback was first observed in the middle of 1990s in Lithuania and Poland. Disease spread quite fast and now different symptoms like wilting and premature shedding of leaves, necroses of leaf, leaf stalks and bark, top and shoot dieback and cankers of branches and stems, are reported from most of East, North and Central Europe. In autumn 2006 were first symptoms of disease discovered also in north-eastern part of Slovenia. In next years disease spread all over the country. Newly described fungus *Chalara fraxinea* was identified as causal agent of disease in 2006. Two years later telemorph of fungus was found. It was at first identified as long known saprophytic fungus *Hymenoscyphus albidus*, but recent molecular researches showed that teleomorph really belongs to new species *H. pseudoalbidus*. There are few different hypotheses about origin of fungus and appearance of disease that still need to be studied. Fungus was isolated from necrotic tissues of different ash species (*Fraxinus* spp.). Common ash (*F. excelsior*) and narrow-leaved ash (*F. angustifolia*) are the most susceptible species, while no symptoms have yet been observed on flowering ash (*F. ornus*). Endangered are trees of all ages, mortality is common amongst saplings and young trees. Disease is especially severe in humid places. European populations of susceptible ash species are seriously threatened. Anyway, because of resistance of individual trees hope for ashes still exists.

Razvoj akustičnih metod za detekcijo ličink kozličkov in rilčkarjev v drevesih in lesnem materialu

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V sklopu evropskega projekta Q-detect, ki poteka znotraj 7. okvirnega programa EU, Oddelek za Entomologijo Nacinalnega inštituta za biologijo sodeluje v delovni skupini, ki se ukvarja z razvojem akustičnih metod za detekcijo karantenskih škodljivcev. Seznam tarčnih škodljivih organizmov vključuje hrošče iz družin Cerambycidae (kozlički) in Rhynchophoridae (rilčkarji). Med domorodnimi vrstami so za varstvo rastlin pomembni zlasti kozlički iz rodu *Monochamus*, ker so vektorji karantenske borove ogorčice. Kozlički niso prav dobri letalci, zlasti večje vrste. Ker ima večina vrst dveletno generacijo, so ličinke dolgo skrite v deblih ali lesu. Tako lahko na dolge razdalje potujejo s pošiljkami rastlin in rastlinskih proizvodov, to je sadik, lesa in lesenega pakirnega materiala, ne da bi jih opazili. Tako se v Evropo vse pogosteje tihotapita tujerodni vrsti: azijski kozliček in kitajski kozliček. Obe vrsti sta prepoznani kot nevarna škodljivca, ki lahko napadata številne lesnate rastline, predvsem v urbanem okolju ter nasadih sadnega drevja. Karantenski predstavnik družine Rynchophoridae pa je palmov rilčkar, ki napada različne vrste palm ter povzroča njihovo odmiranje. Larve omenjenih hroščev je težko odkriti, saj se prikrito v sadikah in lesnem materialu lahko prenašajo jajčeca, ličinke in bube. Ponavadi

na napadenem lesnem materialu oz. na drevesih odkrijemo šele izhodno odprtino odraslih osebkov, ko se je napad že razširil na sosednja drevesa; oz. v primeru palmovega rilčkarja odkrijemo infestacijo šele, ko je drevo že močno prizadeto in rešitev največkrat ni več možna. Zaradi velike ekonomske škode, ki jo povzročajo našteti organizmi, obstaja potreba po razvoju hitrejših, enostavnejših in zanesljivejših metod zgodnjega odkrivanja infestacije. Na oddelku za entomologijo razvijamo metodo zgodnje detekcije na osnovi drobnih vibracij, ki jih povzroča prehranjevanje larv v okuženem lesu. Za zaznavanje teh vibracij uporabljamo laserski vibrometer, ki omogoča nekontaktno zaznavanje signalov zelo nizkih intenzivnosti. Predstavili bomo preliminarne rezultate naših raziskav.

ABSTRACT

Development of acoustic methods for early detection of the wood-boring beetle larvae in wood

Inside the Q-detect project, which is being carried out in the scope of the 7th Framework programme of the EU, the Department of Entomology at the Institute of Biology in Ljubljana, Slovenia, is participating in a work package that is developing acoustic detection methods for quarantine pests. The list of target species include the wood-boring beetles of the families Cerambycidae (longhorn beetles) and Curculionidae (weevils). Among the autochthonous Slovenian species, the longhorn beetles of the genus *Monochamus* are the most important for plant protection, because they are vectors of the pine wilt disease. Longhorn beetles are not particularly good flyers, especially the larger species. Due to the two-year generation cycle in most species, the larvae remain hidden in the wood for a relatively long time. This way they can travel long distances in plant consignments, shipments of wood and wood packaging material, without being noticed. This is how two invasive species have been introduced to Europe: the citrus longhorn beetle and the asian longhorn beetle. Both species are recognized as serious pests of a range of trees and shrubs. The target quarantine species of the Curculionidae family is the red palm weevil, which attacs various palm trees, causing their decline. The listed species are difficult to detect while in the plant tissue, as they are hidden and transported in the form of eggs, various larval stages and pupae. Usually the emergence holes of adult beetles are detected once the infestation has spread to neighboring trees, or, in the case of the red pal weevil, the infestation is detected when the palm tree is already too weakened to be saved. Due to great economic losses caused by the listed organisms, there is a need for simpler, quicker and more reliable methods for early detection. At the Dept. of Entomology, we are developing a method for early detection based on the tiny vibrations caused by the feeding larvae. We are using the laser vibrometer as a non-contact recording tool for detection of low-intensity signals. The preliminary results of our research will be presented.

Novosti na področju parazitoidov škodljivih žuželk v Sloveniji

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V prispevku predstavljamo nekatere novosti na področju raziskovanja parazitoidnih vrst škodljivih organizmov na območju Slovenije. Med najpomembnejšimi škodljivci, ki so se

v zadnjih letih naselili v Sloveniji štejemo tudi kostanjevo šiškarico (*Dryocosmus kuriphilus* Yasumatsu (Hymenoptera; Cynipidae)), ki povzroča veliko škodo na gojenih in samoniklih kostanjih v Severno Primorski regiji. V letu 2010 je iz starih šišk kostanjeve šiškarice izletelo šest vrst domorodnih parazitoidov. Poleg tega smo nabrali tudi nekaj vzorcev bub oljčnega molja (*Prays oleae* (Bernard) (Lepidoptera, Yponomeutidae)), ki ga v naših oljčnikih vse pogosteje opisujejo kot pomembnega škodljivca oljk. Iz vzorcev sta izleteli dve vrsti parazitoidnoh osic, *Ageniaspis fuscicollis* in *Elasmus steffani*. Predstavljeni bodo tudi rezultati identifikacije parazitoidov listnih uši in nekaterih drugih škodljivih žuželk.

ABSTRACT

New findings about parasitoids of pest insects in Slovenia

Some new records of insect parasitoids in Slovenia are presented in present article. Chestnut gall wasp (*Dryocosmus kuriphilus* Yasumatsu (Hymenoptera; Cynipidae)) is one of the most important pests of cultivated and wild-growing chestnuts, that has been recently imported and established in Slovenia in North Primorska region. In 2010 six species of native parasitoids flew out of gall of this cynipid. Also some pupae of the olive moth (*Prays oleae* (Bernard) (Lepidoptera, Yponomeutidae)), important pest in Slovenian olive orchards, were collected. Two species of parasitoids were recorded, *Ageniaspis fuscicollis* and *Elasmus steffani*. Identification results of aphid parasitoids and parasitoids of other pest insects are also presented in the paper.

Obvladovanje palmovega rilčkarja - *Rhynchophorus ferrugineus* (Oliver) in palmovega vrtača - *Paysandisia archon* Burmeister v Sloveniji

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Palmov rilčkar - *Rhynchophorus ferrugineus* (Oliver) [Coleoptera: Dryophthoridae] in palmov vrtač - *Paysandisia archon* Burmeister [Lepidoptera: Castniidae] sta novi tujerodni žuželki zaneseni v Evropo in resno ogrožata naravno in kulturno dediščino palmovih sestojev v Sredozemlju. Čeprav palme za Slovenijo nimajo izrazito velikega kulturnega in krajinskega pomena, se od leta 2008 dalje izvaja posebni nadzor obeh škodljivcev v Slovenski Istri z namenom zgodnjega odkrivanja napadenih palm in priprave akcijskega načrta za njuno obvladovanje. V Sloveniji je bil palmov rilčkar prvič najden poleti 2009 v Portorožu, kamor je bil očitno zanesen z napadenimi odraslimi kanarskimi datljevci že nekaj let poprej. Od takrat je bilo v Slovenski Istri ugotovljenih 8 palmovih dreves, ki so bila tudi odstranjena in ustrezno uničena. Prve palme napadene s palmovim vrtačem so bile ugotovljene v Izoli jeseni 2008 in nato na istem mestu še spomladi 2009. vrste *Trachycarpus fortunei*. Tudi v tem primeru je šlo za uvožena odrasla drevesa palme *Trachycarpus fortunei*. Palmov vrtač napada mnoge vrste palm, med najbolj ogrožene vrste, ki uspevajo v Slovenski Istri so *Trachycarpus fortunei, Washingtonia robusta , Chamaerops humilis* in *Phoenix canariensis*. Ker sta obe vrsti karantenska škodljiva organizma, se na napadenem območju izvajajo ustrezni fitosanitarni ukrepi za njuno izkoreninjenje in omejitev nadaljnjega širjenja. Fitosanitarni ukrepi za obvladovanje

palmovega rilčkarja so bili v EU sprejeti leta 2007 ter dopolnjeni leta 2010. Izkoreninjenje je uspešno le v primeru zgodnjega odkrivanja napada in ob takojšnjem izvajanju predpisanih kurativnih in preventivnih ukrepov. V okviru posebnega nadzora v l. 2010 novih napadenih palm nismo našli.

ABSTRACT

Control of red palm weevil - *Rhynchophorus ferrugineus* (Oliver) and palm borer - *Paysandisia archon* Burmeister in Slovenia

Red palm weevil - *Rhynchophorus ferrugineus* (Oliver) [Coleoptera: Dryophthoridae] and palm borer - *Paysandisia archon* Burmeister [Lepidoptera: Castniidae] are two alien insects introduced into Europe, which seriously threat natural and cultural palm heritage all over the Mediterranean basin. Although in Slovenia palms do not represent a natural and cultural heritage of particular value, since 2008 official survey of both pests has been carried out in the littoral region of Slovenia with the aim of early detection of infestations and providing a suitable action plan for their control. First finding of red palm weevil was detected in Slovenia in Portorož in summer 2009. Obviously it was introduced some years earlier with infested large trees of *Phoenix canariensis*. Since then eight infested palm trees have been confirmed, which were consequently removed and destroyed. First palm trees infested by the palm borer were found in Izola in autumn 2008 and then at the same place again in spring 2009. The source of infestation was *Trachycarpus fortunei* palm trees introduced from another EU country. Among the palms growing in the littoral Slovenia *Trachycarpus fortunei, Washingtonia robusta, Chamaerops humilis* and *Phoenix canariensis* are the most endangered. As both pests are quarantine harmful organisms, appropriate phytosanitary measures have been carried out in the demarcated area in order to eradicate the pests and prevent their further spread. Phytosanitary measures against the red palm weevil in the EU were adopted in 2007 and improved in 2010. Eradication is successful only in case of early detection of the infestation, followed by immediate eradication and preventive actions. No new palm trees infested by red palm weevil or palm borer were found during the official survey in 2010.

Kitajski kozliček (*Anoplophora chinensis*) – nov škodljivec drevesnih vrst

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Kitajski kozliček - *Anoplophora chinensis* (Coleoptera: Cerambycidae) je nevaren škodljivec številnih lesnatih rastlin in v EU spada med karantenske škodljive organizme. Razširjen je v nekaterih državah Daljnega vzhoda, v Evropo pa so ga v preteklih letih večkrat zanesli s sadikami javorja in bonsaji predvsem s Kitajske in Japonske. Škodljivec je razširjen v Italiji v pokrajini Lombardija, kjer ga ni več mogoče izkoreniniti; najden je bil tudi na več lokacijah na Nizozemskem, v Angliji in Nemčiji. Škodo povzročajo predvsem ličinke, ki vrtajo rove v spodnji del debla in korenine, zaradi česar drevesa slabijo in lahko propadejo. Škodljivca so doslej v EU našli le v urbanem okolju. Od tam se lahko razširi v sadovnjake in v gozdove, kjer lahko povzroči veliko gospodarsko škodo. Zaradi nevarnosti, ki jo škodljivec predstavlja za EU, je bila leta 2008 sprejeta odločba Evropske komisije 2008/840/ES o nujnih ukrepih za preprečevanje vnosa in širjenja

kitajskega kozlička, ki za najpogostejše gostiteljske rastline določa posebni nadzor škodljivca, ukrepe v primeru najdbe ter zahteve za uvoz in premeščanje. V letu 2010 je bil zaradi številnih najdb začasno prepovedan uvoz rastlin javorja s Kitajske v EU. V Sloveniji v skladu s to odločbo od leta 2008 dalje izvajamo posebni nadzor na mestih z največjim tveganjem za vnos škodljivca, da bi morebitne napadene rastline odkrili čim bolj zgodaj in preprečili širjenje tega nevarnega škodljivca. Doslej kitajski kozliček v Sloveniji ni bil najden.

ABSTRACT

Citrus longhorne beetle (*Anoplophora chinensis*) – a new pest of tree species

Citrus longhorn beetle *Anoplophora chinensis* (Coleoptera: Cerambycidae) is an EU quarantine pest and a dangerous pest of numerous woody hosts. It is spread in several Far Eastern countries and has been introduced into the Europe for several times from China and Japan with acer plants and bonsai plants. Now the pest is spread in Lombardy, Italy, where it cannot be eradicated anymore. It was found on several locations in the Netherlands, United Kingdom and Germany. The damage is caused mostly by larvae which make tunnels under the bark and in the wood in the lower part of the trunk and in the roots. The infested trees weaken and may be killed. Until now, the pest has been found only in the urban area in the EU. From there, it can be spread into orchards and forests where it can cause serious economic damage. Because of the risk that the pest represents for the EU, the Commission Decision 2008/840/EC on emergency measures to prevent the introduction and spread of citrus longhorn beetle was adopted in 2008. The decision provides for the requirements for import and movement in respect of the most common host plants. In 2010, due to numerous findings of citrus longhorn beetle, temporary ban on import of acer plants from China into the EU was adopted. In compliance with this decision, in Slovenia an official survey is carried out at places where there is the biggest risk of introduction of the pest, with the aim to discover the attacked plants as soon as possible and prevent its spread. Until now, citrus longhorn beetle has not been found in Slovenia.

Fitofarmacevtska sredstva in okolje

Ocenjevanje tveganja in upravljanje s fitofarmacevtskimi sredstvi v okolju – model Apaške doline

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Uporaba fitofarmacevtskih sredstev (FFS) in njihovi potencialni negativni učinki na okolje so dandanes zelo odmevni. Vendar si zadostne pridelave kmetijskih rastlin ne moremo predstavljati brez njihove uporabe, zato je potrebno več pozornosti nameniti obvladovanju oziroma nadzoru njihove rabe s stališča možnih usod teh sredstev v konkretnih kmetijsko-okoljskih situacijah. Apaško polje spada med bolj ranljiva območja v Sloveniji, kjer je izpiranje FFS v podtalnico zaradi specifičnih hidroloških in pedoloških lastnosti lahko večje. V okviru projekta CRP-V3-0548 smo pridobili kakovostne vhodne podatke o naravnih danostih (talne lastnosti, pokrajinske značilnosti, podnebne razmere) in kmetijskih tehnologijah na območju, ter izdelali ocene tveganja uporabe izbranih FFS z različnimi pristopi. Primerjali smo uporabo deterministčnih simulacijskih modelov PELMO in PEARL ter testirali nova orodja, razvita v okviru EU projekta FOOTPRINT. Le ta so namenjena trem različnim končnim skupinam uporabnikov: kmetom in svetovalni službi na ravni kmetije (FOOT-FS), upravljalcem voda na ravni povodij (vodozbirnih območij) (FOOT-CRS) in ustvarjalcem politik na državni in/ali EU ravni (FOOT-NES). Pomembna inovativnost FOOTPRINTovega pristopa je možnost upoštevanja širokega spektra kombinacij (kmetijsko-okoljskih scenarijev) in že vgrajena baza rezultatov modeliranja (»look up« tabela), ki na ta način omogoča končnemu uporabniku hitro pot do rezultata (v nekaj minutah, namesto v nekaj urah ali dneh). Potencialne negativne vplive izbranega programa varstva rastlin je na ta način moč predvideti v naprej in rabo FFS prilagoditi danemu okolju.

ABSTRACT

Pesticide risk assessment and management in the environment – model of Apače Valley

The use of pesticides and their potentially negative effects on the environment are today widely acclaimed. However, it is difficult to imagine sufficient food production without thier use, hence more attention has to be payed to managing or controlling their use in terms of the possible fates of these products in specific agro-environmental situations. Apače Valley is one of the most vulnerable areas in Slovenia, where pesticide groundwater leaching may be higher due to the specific hydrological and soil properties. In the frame of the CRP-V3-0548 project, high-quality input data were aquired on natural conditions (soil properties, landscape characteristics and climatic conditions), and on agricultural technologies, furthermore risk assessment of selected pesticides were assessed with different approaches. We compared the use of deterministic simulation models PELMO and PEARL, and tested new tools developed within the EU project FOOTPRINT. FOOTPRINT tools were developed for the three different user groups: farmers and

advisory service at the farm level (FOOT-FS), water managers at the level of catchments (FOOT-CRS) and policy makers at national and/or EU level (FOOT- NES). An important innovation of FOOTPRINT approach is the possibility of a wide range of combinations (agro-environmental scenarios) which can be considered and already incorporated base of modelling results (»look up« table), which allows end users quick answers (in minutes instead of hours or days). Thus, potential negative impacts of selected pesticide program can be foreseen in advance and the pesticide usage adjusted accordingly to a given environment.

Spremljanje onesnaženosti kmetijskih zemljišč na vodovarstvenih območjih v Mestni občini Ljubljana med leti 2005 in 2010

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V prispevku so prikazani rezultati spremljanja ostankov fitofarmacevtskih sredstev (FFS) v kmetijskih tleh na območju vodovarstvenega območja Mestne občine Ljubljana (VVO MOL) ter vodovarstvenega območja Brest (VVO Brest) v obdobju 2005-2010. V raziskavo je bilo v šestih letih vključeno 111 kmetijskih zemljišč na VVO MOL ter 32 kmetijskih zemljišč na VVO Brest. Vzorce tal smo vsako leto odvzeli pomladi pred začetkom rasti (pred uporabo FFS) ter jeseni po spravilu pridelkov. Vzorčenje tal smo opravili na njivah s prevladujočim poljskim kolobarjem ter na njivah s prevladujočim vrtnim kolobarjem. Na vsaki parceli smo vzorčili tla iz globine 0-30 cm zgodaj spomladi (marec) pred uporabo fitofarmacevtskih sredstev (FFS) ter jeseni po spravilu pridelkov (oktober). Vzorce smo analizirali na ostanke FFS (acetoklor, alaklor, atrazin, bentazon, bromacil, cianazin, desetil-atrazin, desetil-terbutilazin, desizopropil-atrazin, diflufenikan, dimetenamid, flufenacet, foramsulfuron, imidakloprid, izoproturon, jodosulfuron, klortoluron, linuron, mesotrion, metalaksil, metamitron, metazaklor, metolaklor, metosulam, metribuzin, pendimetalin, piridat, prometrin, prosulfokarb, rimsulfuron, simazin, terbutilazin, terbutrin, tifensulfuron-metil, triasulfuron) ter na težko kovino, baker, ki se uporablja tudi kot FFS. Iz rezultatov lahko ugotovimo, da kmetje na VVO MOL ter Brest v veliki večini upoštevajo zakonodajo s področja uporabe FFS in varstva okolja ter uporabljajo FFS v skladu z dobro kmetijsko prakso varstva rastlin. Po pričakovanju smo z zelo redkimi izjemami ugotovili le aktivne snovi, ki so dovoljene v Sloveniji na splošno kot tudi pri uporabi preučevanih gojenih rastlin. Manj razveseljivo je dejstvo, da smo ostanke FFS v sicer zelo redkih primerih ugotovili tudi na VVO I, kjer je uporaba FFS na podlagi zakonov prepovedana.

ABSTRACT

The investigation of agricultural soil pollution in groundwater protection areas of Ljubljana Municipality by plant protection products from 2005 to 2010

The results of plant protection products (PPP) monitoring in agricultural soils in the groundwater protection areas of the Ljubljana Municipality (VVO MOL) and in the area of the waterwork Brest (VVO Brest) on Iški vršaj are presented for the period of 2005 to 2010. The six years research was performed on 111 locations on VVO MOL and 32 locations on VVO Brest. Soil samples were taken from locations with the prevailing field

crops and from locations with the prevailing vegetable land use. On each location, the soil samples were taken from 0-30 cm depth in the early spring (March) before plant protection products (PPP) were applied, and in the autumn after harvest (October). In soil samples the residues of PPP (acetochlor, alachlor, atrazine, bentazone, bromacil, cyanazine, desethylatrazine, desethylterbuthylazine, desisopropylatrazine, diflufenican, dimethenamid, flufenacet, foramsulfuron, imidacloprid, isoproturon, iodosulfuron, chlorotoluron, linuron, mesotrione, metalaxyl, metamitron, metazachlor, metolachlor, metosulam, metribuzin, pendimethalin, pyridate, prometryn, prosulfocarb, rimsulfuron, simazine, terbuthylazine, terbutryn, thifensulfuronmethyl and triasulfuron). The residues of PPP were analysed in both periods of sampling. From the results it could be seen that farmers are using PPP due to legislation, in accordance to good agricultural practice and integrated pest management. As expected, we only found very few samples with residues of PPP, for which it could be indicated that PPP were not used properly and due to legislation. More unpleasant is the fact that we found few soil samples containing residues of PPP in the most restricted groundwater areas, where the use of all PPP is prohibited.

Vpliv različnih parametrov škropljenja na zmanjševanje zanašanja in kakovost nanosa fitofarmacevtskih sredstev pri varstvu hmelja

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Nanašanje fitofarmacevtskih sredstev (FFS) v hmeljiščih je zaradi specifičnosti nasada med zahtevnejšimi opravili pri pridelavi hmelja. Hmeljišče je gost in visok nasad, zato kljub veliki količini porabljene vode ter zmogljivimi pršilniki velikokrat ne moremo zagotoviti enakomernosti nanosa FFS. Poleg zagotavljanja kakovostnega nanosa so iz okoljskega vidika pomembna prizadevanja v smeri omejevanja zanašanja FFS izven območja tretiranja. V zadnjem času se pri uporabi določenih FFS vse bolj soočamo z velikimi varnostnimi razdaljami do voda I. in II. reda, veliko težav nastaja tudi v bližini urbanih naselij, kjer nepravilna politika na področju prostorsko ureditvenih planov ne upošteva in predvideva varovalnih pasov za trajne nasade, kar omejuje dosedanji obseg pridelave hmelja. Na obvladovanje pojavov zanašanja »drifta« pri pršenju hmeljišč lahko v veliki meri vplivamo z uporabo šob za zmanjševanje zanašanja kakor tudi primernih tehnik nanašanja ob bregovih rek in mejnih parcelah. V prispevku so predstavljeni preliminarni rezultati vpliva klasičnih šob proizvajalca Albuz tip ATR pri porabi vode 1000 in 2400 l/ha v primerjavi z šobami za zmanjševanje zanašanja proizvajalca Agrotop tip TD pri porabi vode 1000, 1500 in 2400 l/ha na zmanjševanje zanašanja ter kakovost nanosa FFS. Prav tako smo na osnovi različnih parametrov škropljenja spremljali biotično učinkovitost uporabljenih FFS pri zatiranju pomembnejših bolezni in škodljivcev hmelja.

ABSTRACT

Effect of different spraying parameters on drift reduction and the quality of plant protection products application to hop

Applying of plant protection products (PPP) in hop gardens is because of specificity of plantation one of the most demanding tasks in the hop production. Hop garden is a dense and high plantation so despite of using a large amount of water and powerful sprayer is difficult to achieve uniform application of PPP. In addition to providing high-quality deposit

importance is focused also to environmental point in the direction drift limitation of PPP outside the area of treatment. Recently, the use of certain pesticides is increasingly faced with large safety distances from I. and II. class surface waters. Many problems are occurring also in vicinity of urban settlements where incorrect policy of place arrangement comply and provide buffer zones for permanent crops, limiting the scope of the current hop production. Drift reduction of the hop gardens spraying can be largely influenced by the use of nozzles to reduce drift as well as appropriate techniques for application on the banks of rivers and border plots. In paper are introduced preliminary results of influence of classical nozzles producer Albuz type ATR at consumption of water 1000 and 2400 l/ha in comparison to nozzles for reducing of skidding producer Agrotop type TD at consumption of water 1000, in 1500 and 2400 l/ha on reducing of skidding and quality of deposit of PPP. In addition, biological efficacy of used PPP to control important pest and diseases of hop was monitored.

Spremljanje vpliva kmetijsko-pridelovalnih območij na pojavljanje ostankov fitofarmacevtskih sredstev v cvetnem prahu in njihov vpliv na razvoj družin kranjske čebele (*Apis mellifera carnica*)

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Fitofarmacevtska sredstva (FFS), ki se uporabljajo v kmetijstvu in kontaminirajo cvetni prah kmetijskih rastlin in rastlin, ki rastejo v okolici, potencialno negativno vplivajo na razvoj in zdravstveno stanje čebeljih družin. Zaradi povečanih zimskih izgub čebeljih družin v preteklem obdobju in zaradi posameznih zastrupitev čebel, predvsem v letu 2008, smo v letu 2009 začeli z raziskavo spremljanja kmetijskih dejavnikov, ki bi lahko vplivali na zdravstveno stanje in razvoj čebeljih družin. V okviru raziskave spremljamo ostanke FFS v zbranem cvetnem prahu in razvoj 90 čebeljih družin postavljenih v enakih skupinah na 30 lokacijah. Lokacije obravnavamo glede na tip kmetijske pridelave: a) intenzivne poljedelske lokacije (10 lokacij); b) intenzivne vinogradne lokacije (4 lokacije); c) intenzivne sadne lokacije (6 lokacij) in d) lokacije z ekstenzivno kmetijsko pridelavo (10 lokacij). Z uporabo GC/MS in LC/MS/MS smo v letu 2009 analizirali 50 vzorcev cvetnega prahu na vsebnost 880 kemijskih spojin, v letu 2010 pa 52 vzorcev cvetnega prahu na vsebnost 713 kemijskih spojin. V letu 2009 smo ostanke FFS v cvetnem prahu ugotovili na 11 lokacijah (37 %), v letu 2010 pa na 5 (17 %). V letu 2009 smo ugotovili 16 različnih kemijskih spojin, v letu 2010 pa le treh. Koncentracije ugotovljenih kemijskih spojin so bile v območju od 0,011 mg/kg do 76 mg/kg. Največ različnih kemijskih spojin smo ugotovili na intenzivnih sadnih lokacijah (10) ter na intenzivnih vinogradnih lokacijah (9). Glavnina ugotovljenih kemijskih spojin je pripadala skupini fungicidov (69 %). Aktivne spojine iz skupine insekticidov (klorpirifos–etil, metoksifenozid in tiakloprid) so bile ugotovljene na šestih preiskovanih lokacijah. Ostanki FFS v cvetnem prahu niso vplivali na moč čebeljih družin, napadenost z varojami (*Varoa destructor*), zastopanost spor *Nosema* spp. in okuženost z virusi (ABPV, SBV, DWV, BQCV).

ABSTRACT

The influence of different agricultural production areas on the level of pesticide residues in the pollen and its influence on development of Carniolan honeybee (*Apis mellifera carnica*)

Pesticides used in agriculture could contaminate pollen of agricultural plants and plants growing nearby. Contaminated pollen has potentially negative influence on development of honeybee colonies. Due to high winter losses of honeybee colonies in past years as well as due to some cases of local poisoning of the colonies, an investigation aimed to monitor agricultural factors, which could affect development and honeybee health, was started in 2009. Pollen samples were collected and development of 90 honeybee (*Apis mellifera carnica*) colonies were monitored. Colonies were situated on 30 locations, grouped by main agricultural production practice: a) intensive field production (10 locations); b) intensive viticulture production (4 locations); c) intensive fruit growing location (6 locations); d) extensive agricultural production (10 locations). By the means of GC/MS and LC/MS/MS 50 pollen samples were analyzed on 880 chemicals in year 2009 and 52 samples on 713 chemicals in year 2010. In 2009 residues were found in pollen samples from 11 locations (37 %) and in year 2010 in samples from 5 locations (17 %). All together 16 different residues in pollen were found in 2009 and only 3 in 2010. Residues found in the pollen samples ranged from 0.011 mg/kg to 76 mg/kg. The highest number of residues was found in pollen from the intensive fruit growing locations (10) and from the intensive viticulture areas (9). Residues that were found were mostly fungicides (69 %). Insecticide residues (chlorpyriphos-ethyl, methoxifenocide and thiacloprid) were found in the pollen samples from 6 locations. Residues in the pollen did not influence the development of the honeybee colonies or infestation rate of *Varoa destructor* mite species, *Nosema* spp. or viruses (ABPV, SBV, DWV, BQCV).

Učinek herbicidov in fungicidov na rast micelija entomopatogene glive *Beauveria bassiana* (Bals.) Vuill.

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V laboratoriju smo *in vitro* preučevali učinek metribuzina (Sencor WG 70), flurokloridona (Racer 25-EC), fluazinama (Shirlan 500 SC) in propineba (Antracol) na rast micelija entomopatogene glive *B. bassiana*. Glivo smo gojili na PDA gojišču z dodatkom posameznih fitofarmacevtskih sredstev v različnih koncentracijah (100, 75, 50, 25 in 0 % poljskega odmerka) pri 15 in 25 °C. Metribuzin pri vseh koncentracijah signifikantno zavira rast micelija, flurokloridon ga popolnoma zavre pri 100, 75 in 50 % koncentraciji, šibka rast je opazna šele pri 25 % poljski koncentraciji. Fungicida fluazinam in propineb prav tako fungistatično delujeta na glivo, vendar je učinek nekoliko manjši kot pri herbicidih. Inhibicija rasti micelija je v korelaciji s količino herbicida oziroma fungicida v gojišču. Temperatura vpliva na prirast micelija, ne pa tudi na samo inhibicijo.

ABSTRACT

Effect of selected herbicides and fungicides on mycelial growth of entomopathogenic fungus *Beauveria bassiana*

In the laboratory test the effect of two herbicides; metribuzin (Sencor WG 70) and fluorochloridone (Racer 25-EC), and two fungicides; fluazinam (Shirlan 500 SC) and propineb (Antracol), on the mycelial growth of *Beauveria bassiana* was evaluated *in vitro*. The fungus was cultured on PDA medium where pesticides at different concentrations (100, 75, 50, 25 and 0% of normal field application rate) were added at two temperatures, 15 and 25 °C. All concentrations of herbicide metribuzin significantly inhibited the mycelial growth, meanwhile fluorochloridone caused total growth inhibition at concentrations 100, 75 and 50 %, and only at 25 % of normal field rate a slight mycelial growth was detected. The fungicides, fluazinam and propineb, have less fungistatic effect on *B. bassiana* than selected herbicides. Inhibition of the mycelial growth was positively correlated with herbicide and fungicide concentration in the growth medium. The temperature can affect the mycelial growth, but it does not affect the inhibition by the pesticides.

Agrometeorološki informacijski sistem: temelj prilagajanja podnebnim spremembam

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Predvidene podnebne spremembe se bodo zaradi spremenjenih temperaturnih in vodnih režimov odrazile v spremembi pogostnosti in intenzivnosti napadov ter spremenjeni biologiji bolezni in škodljivcev. Vplivale bodo na ustalitev novih škodljivih organizmov in tako ogrožale pridelavo hrane in krme ter obstoj določenih rastlin v našem okolju. V smeri prilagajanja tem spremembam, je potrebno ugotoviti trende in določiti ustrezne ukrepe. Pri varstvu rastlin je zlasti pomembno spremljanje meteoroloških in biotičnih dejavnikov. Agrometeorološki sistem Ministrstva za kmetijstvo gozdarstvo in prehrano deluje v okviru Fitosanitarnega informacijskega sistema od leta 2004 dalje, njegovi zametki pa segajo v leto 1994 z uvedbo prvih avtomatskih agrometeoroloških postaj ADCON Telemetry v slovenski prostor. Vedno večja dostopnost razpoložljivih informacijskih tehnologij (programiranje, meritve, modeli, telekomunikacije, splet, GIS), je omogočila natančnejše spremljanje pojava škodljivih organizmov v realnem času in napovedi pojava in širjenja bolezni in škodljivcev v rastlinski pridelavi. Tako so meritve, modeli, napovedi in obveščanje postali tudi osnovni del agrometeorološkega informacijskega sistema. Pravilno vzpostavljen agrometeorološki sistem mora vsebovati: vse elemente informacijskega sistema, vsebinsko strokovno podporo, hkrati pa mora ustrezati standardom na področju kakovosti podatkov. V prispevku so predstavljene novosti, izzivi in potrebe obstoječega Agrometeorološkega informacijskega sistema.

ABSTRACT

»Agrometeorological Information System: starting point of adjustment to the climate changes«

Expected climate changes will be - due to changes in temperature and water regimes - reflected in the change in frequency, intensity of attacks and in changed biology of pests and diseases. The establishment of new harmful organisms will be enabled and production of food and feed as well as existence of certain plants will be endangered. In line of adjustment to the climate changes, trends should be ascertained and adequate measures defined. Monitoring of meteorological and biotic data is a very important part in plant protection. Therefore an Agrometeorological Information System of the Ministry of Agriculture, Forestry and Food has been operating under the Phytosanitary Information System since 2004. Its origin dates back to 1994 with the introduction of the first automatic agrometeorological stations of ADCON Telemetry in Slovenian territory. An increasing accessibility of available information technology (software, measurement, modelling, telecommunications, internet, GIS), has enabled more accurate pest monitoring in real time and forecasting the occurrence and spread of pests and diseases in plant production. Thus, measurements, models, forecasts and information dissemination has become an essential part of the agrometeorological information system. If properly set up, the agrometeorological system must include: all the elements of an information system, technical expertise, in the same time meet the data quality requirements. New challenges and needs of existing Agrometeorological Information System are presented in the paper.

Desetletne izkušnje pri izvajanju usposabljanj za izvajalce ukrepov varstva rastlin in prodajalce fitofarmacevtskih sredstev

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Usposabljanje s področja fitomedicine je postalo v letu 2002 zakonsko obvezno za izvajalce ukrepov varstva rastlin in prodajalce fitofarmacevtskih sredstev. Na Kmetijsko gozdarskem zavodu v Novi Gorici že od leta 2001 organiziramo in izvajamo tovrstna usposabljanja. V desetih letih smo izvedli 95 osnovnih usposabljanj za izvajalcev ukrepov varstva rastlin in izdali 5968 potrdil o pridobitvi znanja iz fitomedicine. Izvedli smo tudi 3 osnovna izobraževanja za prodajalce fitofarmacevtskih sredstev, katerih se je udeležilo 57 kandidatov. V prispevku bo podana podrobna analiza izvedenih usposabljanj, predstavljena bo starostna, spolna in izobrazbena struktura udeležencev. Predstavljen bo tudi pregled veljavne zakonodaje s področja usposabljanj iz fitomedicine ter spremembe v zakonodaji, ki so imele pomemben vpliv na potek usposabljanja.

ABSTRACT

Ten years experiences in implementation of training for operators of plant protection and sellers of plant protection products

Training in the field of phytomedicine became legally mandatory in 2002 for operators of plant protection and sellers of plant protection products. Since 2001, Agriculture and forestry service Nova Gorica has organised such trainings for operators of plant protection and sellers of plant protection products. Within ten years, 95 basic trainings for operators of plant protection were organised and 5968 certificates were issued. During this period 3 basic trainings for sellers of plant protection products were carried out, which was

attended by 57 candidates. The paper will discussed realization of the trainings and presents the age, sex and educational structure of the participants. An overview of valid legislation and changes in legislation which have had an important impact on training course will be also presented.

GIZ fitofarmacija

Directive 2009/128/EC on the sustainable use of pesticides and its implementation

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Europe and the world are facing today key challenges that are undoubtedly impacting agriculture and its stakeholders. A growing global population, limited natural resources such as agricultural land, the risk of crop failure caused by unfavourable climate conditions but also less available plant protection solutions are putting agriculture under pressure to meet increasing demand for food, feed, and natural resources. For agriculture to remain sustainable, it is essential to achieve the critical balance between enhancing productivity and environmental protection. In the above context, Member States will have to implement the Directive and find the most suitable means to achieve the sustainable use of pesticides while ensuring sustainable and competitive agriculture. As stated in the title itself, the Directive establishes a Framework for Community action to achieve the sustainable use of pesticides and comprises legal requirements and provisions to be implemented at national level. One of the main efforts for Member States will surely be the constitution of a National Action Plan to further reduce risks and impacts of pesticide usage and enhance the implementation of the principles of Integrated Pest Management as well as the respective training of all professional users to ensure sustainable use. During the implementation phase, it will be important that the National Action Plans and each envisaged measure take into consideration environmental, social and economic factors in a balanced way to ensure sustainable agricultural production. The implementation must also reflect the vast diversity in agriculture, climate and the need for resistant management.

ABSTRACT

Direktiva 2009/128/EC o trajnostni rabi pesticidov in njena implementacija

Evropa in svet se soočata s ključnimi izzivi, ki nedvomno vplivajo tudi na kmetijstvo in z njim povezane dejavnike. Rastoče svetovno prebivalstvo, omejeni naravni viri kot npr. omejena kmetijska zemljišča, tveganje zaradi zmanjšanja pridelkov kot posledica neprimerenih klimatskih sprememb, pa tudi zmanjšano število dostopnih rešitev za varstvo rastlin, soočajo kmetijstvo s pritiskom po večjih količinah hrane in krmil in naravnih virov. Da bi lahko kmetijstvo ostalo produktivno, je potrebno zagotoviti ravnotežje med povečano produktivnostjo in varovanjem okolja. Države članice EU bodo morale implementirati Direktivo na najbolj primeren način za doseganje trajnostne rabe pesticidov in doseganje trajnostnega in konkurenčnega kmetijstva. Kot navedeno v naslovu, Direktiva ponuja okvir za doseganje trajnostne rabe in jo je potrebno implementirati na nacionalni ravni. Največji izziv predstavlja priprava Nacionalnega akcijskega načrta s katerim bi dosegli nadaljnje zmanjševanje tveganja in uvedli principe Integriranega varstva rastlin ter obvezno izobraževanje profesionalnih uporabnikov. V obdobju implementacije je pomembno, da bodo Nacionalne akcijske načrte uravnotežili varovanje okolja s socialno ekonomskimi učinki kmetijstva in zagotovili trajnostno kmetovanje. Implementacija torej mora upoštevati obsežno raznolikost vplivov na kmetijstvo, klimatske razmere in omogočiti ustrezno ravnanje proti pojavom rezistence na bolezni in škodljivce.

Nacionalni akcijski načrt uporabe FFS v Sloveniji

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Direktiva 2009/128/ES o določitvi okvira za ukrepe Skupnosti za doseganje trajnostne rabe pesticidov določa, da morajo članice do 14.12.2012 predožiti Komisiji EU svoje nacionalne akcijske plane (NAP). NAP bodo vplivali na prihodnji način kmetovanja in posledično tudi na prihodek kmetij. Bistveni del NAP so kazalniki tveganja, ki bodo določeni skupno na nivoju EU, vsaka država pa lahko predpiše tudi svoje kazalnike tveganj. V referatu bodo predstavljene kritične točke uveljavljanja NAP v Sloveniji – področja, ki jih je potrebno popraviti in področja, ki jih bo potrebno šele uvesti.

ABSTRACT

National action plan for plant protection products use in Slovenia – SLOCPA (GI fitofarmacije) view

Directive 2009/128/ES which is establishing a framework for Community action to achieve the sustainable use of pesticides. By the 14th of December member states are obligate to prepare their National action plan (NAP), who will have an important influence of the way of farming and the income of farms. The core of the NAP are Harmonized Risk indicators, established on the EU level and also National risk indicators. The presentation will show the critical points by the introduction of NAP in Slovenia – areas where some adaptions to the Directive are needed and also areas, which have to be introduced.

Kmetijstvo na zavarovanih območjih Slovenije

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Kmetijstvo v Sloveniji je postavljeno pred nove izzive, ki jih predstavljajo nezadostna samooskrba, zmanjševanje obdelovalnih zemljišč, podnebne spremembe in naravovarstvene zahteve. Območij zavarovanih po klasifikaciji IUCN je pri nas 254.847 ha, kar je 12,57% površine Slovenije. Zaradi ohranjenih habitatov živalskih in rastlinskih vrst pomembnih za Evropo, je v Sloveniji okoli 719.727 ha ali 35.5% ozemlja vključeno v mrežo naravovarstvenih območij NATURA 2000, ki ima namen ohranjanja biotske raznovrstnosti. V prispevku bodo predstavljeni podatki o deležu kmetijskih zemljišč v uporabi na zavarovanih območjih v Sloveniji in sistem kmetijskih okoljskih plačil vezanih na zmanjševanje vpliva kmetovanja in NATURO 2000. Analizirane bodo zahteve podukrepov s stališča uporabe fitofarmacevtskih sredstev.

ABSTRACT

Farming on protected areas in Slovenia

Agriculture of Slovenia is faced with the challenges of low food self supply, reduction of arable land areas, climate change and natural protection measures. In Slovenia there is 254.847 ha, or 12,57% of areas protected in accordance with IUCN nomenclature. NATURA 2000 network, with aim of conserving biodiversity of European important endangered species and their habitats, encompasses 719.727 ha or 35.5% of total area of Slovenia. The data about the share of farmland in protected areas and the system of payments in Program of rural areas development (PRD) connected to environment protection, conservation and NATURA 2000 sites will be presented. Analysis of PRD requirements concerning use of plant protection preparations will be discussed.

Nova Skupna kmetijska politika (SKP): razvoj in pričakovanja

Vasja HAFNER

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Skupna kmetijska politika (SKP) se sooča s številnimi izzivi. Nekateri od njih so povsem novi, drugi nepredvideni, vsi pa zahtevajo od EU, da sprejme strateško odločitev za dolgoročno prihodnost svojega kmetijstva in podeželja. Za spoprijemanje z navedenimi izzivi mora biti SKP umeščena v trdne gospodarske politike in trajnostne javne finance, ki bodo prispevale k uresničevanju ciljev Unije. Namen reforme SKP je spodbujanje večje konkurenčnosti, učinkovite porabe davkoplačevalskih sredstev in doseganja ustreznih rezultatov javnih politik, ki jih pričakujejo evropski državljani v zvezi z varno preskrbo s hrano, okoljem, podnebnimi spremembami ter socialnim in teritorialnim ravnovesjem. V prispevku so predstavljeni nekateri pričakovani vplivi/scenariji SKP na slovensko kmetijstvo po letu 2013.

ABSTRACT

New Common Agricultural Policy (CAP): development and expectations

The Common Agricultural Policy (CAP) is confronted with a set of challenges, some unique in nature, some unforeseen, that invite the EU to make a strategic choice for the long-term future of its agriculture and rural areas. To be effective in addressing these challenges, the CAP needs to operate within the context of sound economic policies and sustainable public finances contributing to the achievement of the objectives of the Union. Reform of the CAP is intended to promote greater agriculture competitiveness, efficient use of taxpayer resources and effective public policy returns European citizens expect, with regard to food security, the environment, climate change and social and territorial balance. Article presents some expected impacts/scenarios of CAP on Slovenian agriculture beyond 2013.

Profesionalne storitve, ki jih nudi fitofarmacevtska industrija – primer Bayer

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Proizvajalci fitofarmacevtskih sredstev (FFS), imajo veliko znanja in so pomembni nosilci napredka na področju varstva rastlin. Z znanjem, ki ga imajo, lahko prispevajo tako na znanstveni ravni, saj vsako leto ogromno investirajo v raziskave in razvoj, pa tudi na aplikativni ravni, saj zaposlujejo veliko število agronomov, ki se ukvarjajo z vsakodnevnimi težavami, ki spremljajo pridelovalce. Bayer, kot vodilno inovativno podjetje na področju FFS, opravlja naslednje storitve, ki posledično vplivajo na napredek na področju varstva rastlin: (1) vsako leto pride iz laboratorijev podjetja Bayer v povprečju 7 novih aktivnih snovi, (2) Bayer lokalno opravi več kot 50 različnih poskusov na leto, (3) Bayer ima na ozemlju Slovenije več kot 100 predavanj na leto o varstvu rastlin, (4) Bayer ima specialista za tretiranje semen, ki tesno sodeluje s semenarskimi hišami, (5) Bayer pridelovalcem ponuja DON Cast sistem za napovedovanje pojava fuzarioz, (6) za zagotavljanje varne hrane Bayer v Sloveniji izvaja pilotske projekte Food Chain, (7) permanentno osveščanje javnosti o pravilni uporabi FFS.

ABSTRACT

Professional services in plant protection products industry – case Bayer

Plant protection products (PPP) producers, above all producers of original products, manage with immense base of knowledge and are important of progress. By holding such knowledge and investing in R&R substantial funds every year they significantly contribute on scientific as well as operational level by employing a large number of agronomists who meet with day-to-day problems of farmers. Bayer, being a leading innovative PPP producer, provides the following services: (1) in average 7 new active ingredients are developed every year in Bayer's laboratories, (2) every year Bayer locally executes over 50 field trials, (3) in Slovenia Bayer every year holds more then 100 lectures on plant protection, (4) Bayer's seed treatment specialist is regularly in close contact with the Seed treatment companies, (5) Bayer offers a service DON cast, a system to predict fusarium appearance, (6) to provide safe food Bayer in Slovenia every year performs Food Chain pilot projects, (7) Bayer is regularly informing public on proper use of PPPs.

Rezultati spremljanja ulova odraslih hroščkov pokalic v Sloveniji in na Hrvaškem

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V letih 2009 in 2010 smo s pomočjo feromonskih vab spremljali ulove petih vrst hroščev pokalic (*Agriotes*) v Sloveniji in na Hrvaškem. Lovili smo vrste, za katere je znano, da živijo na tem območju. Zanimivo pa je, da so se v zelo velikem številu ulovili hrošči žitne pokalice (***Agriotes ustulatus),*** za katere je značilen krajši razvojni krog. Za te se predvideva, da se lahko hitreje prerazmnožijo in posledično povzročijo večjo škodo kot vrste z daljšim razvojnim krogom. V prispevku so predstavljeni rezultati monitoringa in agrotehnični ukrepi za omejevanje škode.

ABSTRACT

Monitoring results of catches of click beetles in Slovenia and Croatia

In Slovenia and Croatia monitoring of five species of click beetles (Agriotes) was conducted in years 2009 and 2010. Five known different species living in this area were trapped using the method of pheromone. Results were surprising. Highest or second highest in number of trapped adults were *Agriotes ustulatus* which belong to group of *Agriotes* that have a short development cycle and tend to multiply very fast, causing substantial damage on crops. The article presents the results of monitoring and possible agrotechnical plant protection measures.

Po več letih uporabe feromona RAK3® lahko tudi pri nas razpolovimo uporabo insekticidov za zatiranje jabolčnega zavijača *(Cydia pomonella)*

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Znano je, da so sadjarji v nekaterih deželah v zadnjih dvajsetih letih z razširitvijo metode zbeganja ali konfuzije in dopolnilno uporabo sredstev na podlagi virusa granuloze občutno zmanjšali uporabo klasičnih insekticidov. Na ta način so zagotovili antirezistentno strategijo pri uporabi FFS in optimalno zatiranje jabolčnega zavijača. V Sloveniji smo začeli preverjati in uvajati metodo zbeganja pozneje kot drugod v Evropi. V letu 1999 in 2000 smo prvič uporabili feromon RAK3® v 6 ha velikem nasadu jablan FK Maribor na Pohorskem dvoru. Uporaba feromona se je le težko uveljavljala, saj pri nas za razliko od drugih držav uporaba ni dodatno subvencionirana. V zadnjih petih letih se je uporaba feromona RAK3® ustalila. Bolj ali manj stalno se jih uporablja le v 5 % jablanovih nasadov. V prispevku želimo prikazati rezultate uspešnega zatiranja jabolčnega zavijača v nasadu podjetja Sadjarstvo Mirosan d.d., kjer so 6 let zaporedoma uporabljali metodo zbeganja in v letu 2010 uporabo sintetičnih insekticidov zmanjšali za polovico.

ABSTRACT

After years of using the RAK3® dispenser we can halve the use of insecticides for the control of the apple borer *(Cydia pomonella)* also in Slovenia

As we know, the fruit growers of some countries have significantly decreased the use of classical insecticides in the last ten or twenty years by the expansion of the confusion method and supplementary use of means based on the granulosis virus. This way, they provided an antiresistant strategy in the use of the plant protection products and optimal control of the apple borer. In Slovenia, we started to test and introduce the confusion method much later than the rest of the Europe. In 1999 and 2000, we used the RAK3® dispensers for the first time in the 6-hectar apple orchard FK Maribor in Pohorski dvor. The use of dispensers was established with difficulty, because in Slovenia, unlike in other countries, the dispensers were not subsidised. In the last five years, the sale of RAK3® dispensers steadied down at the quantity for 5 % all apple orchards. In this paper, we would like to present results of the successful control of the apple borer in the orchard of

the Company Sadjarstvo Mirosan d.d., where they used the confusion method for 6 years in a row and decreased the use of synthetic insecticides for half in the year of 2010.

Pinus, BASF SE: nove možnosti za varstvo žit in koruze

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Slovenija ima naravne danosti za pridelavo večine poljščin, vendar se kmetje soočajo z velikimi težavami zaradi težke gospodarske situacije in splošnega poslabšanja ekonomskega položaja kmeta, kot tudi zaradi podnebnih sprememb in posledično nenavadnih vremenskih pojavov. Potrebne so določene spremembe s katerimi se bo položaj pridelovalcev izboljšal. V sodelovanju s podjetjem BASF SE predstavljamo nove možnosti za varstvo žit in koruze v sezoni 2011 - ARRAT® - selektivni kontaktno sistemični herbicid v obliki močljivih zrnc (WG) za zatiranje enoletnih in večletnih širikolistnih plevelov v ozimnih in jarih žitih (pšenici, ječmenu) ter v koruzi. ARRAT® odlikuje širok spekter delovanja, enostavna uporaba, nizek odmerek, hitro delovanje, saj so prvi simptomi delovanja vidni že po 1-3 dneh ter možnost mešanja z ostalimi herbicidi, fungicidi in regulatorji rasti. Za zatiranje bolezni v žitih predstavljamo preventiven in kurativen sistemični fungicid OPUS®1. Za zatiranje plevelov v zgodnji fazi razvoja koruze pa priporočamo uporabo F4 kombinacije herbicidov.

ABSTRACT

Pinus, BASF SE: new opportunities for cereal and maize protection

Slovenia has the natural conditions for production of most arable crops, but at the same time farmers are facing enormous problems due to difficult economy situation and general not so good economic situation of farmers, as well as climate changes and unusual weather conditions. Certain changes are neccessary to improve the situation of farmers. In collaboration and partnership with company BASF SE we are presenting new opportunities for cereal and maize protection in season 2011 - ARRAT® - a selective systemic herbicide in the form of wettable granules (WG) to control annual and perennial broadleaved weeds in winter and spring cereals (wheat, barley) and in maize. ARRAT® main features are broad spectrum of activity, easy to use, low dose rate, fast effect - first symptoms are visible already after 1-3 days and possibility of mixing with other herbicides, fungicides and plant growth regulators. For diseases control in cereals we are presenting preventive and curative systemic fungicide OPUS®1. For weed control in the early development stage of maize we recommend to use F4 combination of herbicides.

Nove možnosti uporabe učinkovine spinosad (insekticida Laser 240 SC in GF-120) podjetja Dow Agrosciences v integriranem in biotičnem varstvu rastlin

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Učinkovina spinosad (spinosin A in spinosin B) spada v nov kemični razred insekticidov, ki se imenuje spinosini (razred 5). Aktivna snov spinosad se pridobiva iz bakterije *Saccharopolyspora spinosa*, preko fermentacije njenih metabolitov. To je insekticid, ki združuje učinkovitost sintetičnih pripravkov in je hkrati dovoljen v ekološki pridelavi. Spinosad deluje dotikalno in preko prebavil. Dotikalno pomeni neposredni nanos na insekt oz. zadrževanje insekta na tretiranem površju. Čeprav je dotikalno delovanje zelo učinkovito, je delovanje preko prebavil še 5-10-krat močnejše. Spinosad ima poseben način delovanja, ki se razlikuje od vseh drugih insekticidov. Povzroči vzburjanje živčnega sistema, ki vodi k nenadzorovanemu krčenju mišic, izčrpanosti in tresavici, na koncu sledi paraliza. Ti učinki so skladni z aktivacijo nikotinskih receptorjev acetilholina, vendar z mehanizmom, ki je povsem nov in edinstven med vsemi znanimi insekticidnimi spojinami. Zaradi svojega delovanja je spinosad zelo zaželen v anti-rezistenčnem programih. V Sloveniji vsebujeta učinkovino spinosad dva insekticida. Prvi je GF-120, ki se uporablja za zatiranje oljčne muhe na oljki *(Bactrocera oleae)*, drugi pa je LASER 240 SC. Oba sta uvrščena med biotične insekticide. LASER 240 SC je v letu 2010 dobil povsem novo registracijo in je sedaj dovoljen za uporabo na veliko, predvsem zelenjadarskih kulturah. Zatira cvetličnega *(Frankliniella occidentalis)* in tobakovega resarja *(Thrips tabaci)*, gosenice sovk iz rodu *Spodoptera* in južne plodovrtke *(Helicoverpa armigera)* ter koloradskega hrošča *(Leptinotarsa decemlineata)*.

ABSTRACT

New possibilities of active spinosad (insecticides Laser 240 SC and GF-120) from Dow Agrosciences in integrated and biological plant protection

Active spinosad (Spinosyn A and Spinosyn B) belongs to a new chemical class of insecticides called spinosyns (Class 5). Active substance Spinosad is derived from the bacterium *Saccharopolyspora spinosa*, through fermentation metabolites. This is an insecticide that combines the effectiveness of synthetic preparations and is also permitted in organic production. Spinosad works by contact and by ingestion. Contact means direct application on the insect or. retention of insects on treated areas. Although the contact functioning very effectively, is to work through the ingestion is 5-10 times stronger. Spinosad has a special mode that is different from all other insecticides. It causes excitation of the nervous system leading to uncontrolled contraction of muscles, exhaustion and shivering, in the end followed by paralysis. These effects are consistent with the activation of nicotinic acetylcholine receptors, but with the mechanism that is completely new and unique among all known insecticidal compounds. Because of his operation spinosad is highly desirable in anti-resistant programs. In Slovenia two insecticide contains a.i. spinosad. First, the GF-120, which is used to control of the olive fly *(Bactrocera oleae)* on the olive tree, the other is Laser 240 SC. Both are classified as biological insect pest control products. Laser 240 SC in 2010 got a brand new registration and is now permitted for use on large, especially vegetable cultures. It controls *Thrips tabaci* and *Frankliniella occidentalis*, armyworms of genus *Spodoptera*, corn earworm *(Helicoverpa armigera)* and Colorado potato beetle *(Leptinotarsa decemlineata)*.

Affirm je sodobni insekticid, ki združuje visoko učinkovitost na gosenice škodljivih metuljev in zagotavlja minimalne ostanke

Simon ARNŠEK

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Proizvajalci rastlinske hrane so soočeni s čedalje višjimi pričakovanji trga, ki na eni strani zahteva kakovostne in po videzu popolne pridelke, hkrati pa varno in neoporečno hrano. Syngenta s sodobnim insekticidom Affirm zagotavlja učinkovito varstvo pred škodljivimi gosenicami (ličinkami metuljev), hkrati pa imajo pridelki kljub kratkim karencam zelo malo ostankov, ti pa so blizu ali pa celo pod mejami vrednosti detekcije analiz.

ABSTRACT

Affirm - new insecticide that combines outstanding efficacy on Lepidoptora larvae and guarantees lowest residues

Producers of plant origin food are faced with increasingly demanding consumer market, requiring on one hand good quality and visually perfect products, and on the other hand safe food without pesticide residues. With the modern insecticide Affirm Syngenta provides effective protection against harmful caterpillars of butterfly order (Lepidoptera), and at the same time ensures that pesticide residues are near or below the detection level.

Laudis® - novi herbicid v koruzi

Laszlo KEREK

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Laudis® je nov Bayer-jev herbicid za zatiranje plevela v koruzi z novo aktivno snovjo tembotrion.. Tembotrion na listih plevelov uniči karotenoide, ki ščitijo klorofil pred škodljivimi UV žarki. Pri razgradnji klorofila, zaradi vpliva UV žarkov, pleveli zbledijo (pobelijo), kasneje porjavijo in se na koncu posušijo. Varovalo izoksadifen-etil prepreči sprejem aktivne snovi v kulturno rastlino in s tem nudi popolno selektivnost posevku koruze. Laudis je namenjen za zatiranje enoletnih ozkolistnih in širokolistnih plevelov po vzniku koruze. Uporabo Laudisa priporočamo od razvojne faze koruze BBCH 12 do BBCH 18.. Pripravek zagotavlja visoko učinkovitost in širok spekter delovanja na 92 plevelnih vrst v vsakih vremenskih pogojih.

ABSTRACT

Laudis® - new herbicide in maize

Laudis® is new Bayer herbicide in maize, with new active ingredient tembotrione. Tembotrione destroys carotenoids in weed's leaves which protect chlorophyll from damaging effect of UV rays. Lacking chlorophyll weeds first turn white then become brown and at the end dry out. Safener isoxadifen-ethyl prevents a.i. to enter the maize and therefore offer perfect safety to maize crop. Laudis is used post emergence for control of annual grass weeds and broadleaf weeds. It can be used in flexible timing from second to eighth leaf of maize (BBCH 12 to BBCH 18). Laudis excellent controls 92 weed species in all weather conditions.

Remedier, novi biotični fungicid italijanskega podjetja Isagro S.p.A., na osnovi antagonističnih gliv *Trichoderma harzianum* in *Trichoderma viride*, za zatiranje talnih glivičnih bolezni v pridelavi vrtnin, okrasnih rastlin in lončnic ter aromatičnih zelišč

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Reševanje problematike talnih gliv pri nas ni bilo posebej aktivno, čeprav so problemi veliki. Razlog za to je bil seveda to, da je pridelava določenih vrtnin še vedno dovolj dobičkonosna in prenese določen izpad pridelka in kakor tudi dejstvo, da v Sloveniji nismo imeli registriranega nobenega sredstva za ta namen, sploh pa ne biotičnega. V ta namen je naše podjetje, na podlagi 23. B člena ZfFS, registriralo biotični fungicid REMEDIER, kot »nujno potrebno sredstvo«. Sredstvo vsebuje naravno zastopane in izbrane soje antagonističnih gliv *Trichoderma asperellum* in *Trichoderma gamsii*, formulirano pa je v obliki močljivega praška (WP). Način delovanja je formiranje micelija okoli korenin gojene rastline, ki deluje kot nekakšna bariera. Tako nastopi konkurenca za življenjski prostor in hranila. Sredstvo REMEDIER deluje samo preventivno. Najvišja učinkovitost se dosega z aplikacijo tal 5-7 dni pred setvijo ali ob njej ali presajanjem. Uporabljamo ga za razkuževanje zemlje oziroma za zatiranje fitopatogenih gliv, ki se razvijajo na koreninah in koreninskem vratu gojenih rastlin, kot so črna solatna gniloba *(Rhizoctonia solani),* bela gniloba *(Sclerotinia sclerotium),* uvelost rastlin *(Verticilium dahliae)* in gnitje plodov paprike *(Phytophtora capsici).* Trenutno ima pripravek dovoljenje za uporabo pretežno na vrtninah in aromatičnih zeliščih, v prihodnjih letih pa se pričakuje razširitev uporabe tudi na vinsko trto, koščičarje, pečkarje in jagodičevje.

ABSTRACT

Remedier, new biological fungicide from company Isagro S.p.A Italy, based on antagonistic fungi *Trichoderma harzianum* and *Trichoderma viride* with antagonistic activity to prevent soil borne fungal diseases in the cultivation of vegetables, ornamental plants, potted plants and aromatic herbs

Addressing the issue of soil fungi in Slovenia has not been particularly active, although of the existing big problems. The reason for this situation was also that the cultivation of certain vegetables is still sufficiently profitable and transferred to a crop failure and of

course the fact that Slovenia had not registered any fungicides for this purpose, especially not biotic. For this purpose, Karsia company, registered biological fungicide Remedier, under the 23rd B Article of ZfFS as "urgent needed product". Product contains naturally occurring and selected strains of antagonistic fungi *Trichoderma asperellum* and *Trichoderma gamsii.* It is formulated as a wettable powder (WP). Remedier is particularly indicated for the prevention of attacks of phytopathogenic fungi such as: black rot Salad (*Rhizoctonia solani),* white rot *(Sclerotinia sclerotium),* wilting plants *(Verticillium dahliae)* and rotting pappers *(Phytophthora capsici)* to root system and collar region of interested crops. The antagonistic fungi, after application, colonize soil and roots and compete with plant pathogenic fungi for space and nutrients. Moreover, the antagonists also attack the cell walls of pathogens with enzymes. Therefore, it is important to apply Remedier before the fungal pathogens colonization occurs. Currently the product is registered for use mainly in vegetables and aromatic herbs in the coming years is expected to extend the registration on vines, stone fruits, apples, pears and berries.

Prosaro – novi standard v varstvu žit

Alojz SREŠ

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Glive iz rodu *Fusarium* spp. lahko močno poškodujejo posevke in zmanjšajo količino ter kakovost pridelka žit. Močnejše okužbe žit z glivami iz rodu *Fusarium* spp. so se pojavile v začetku devetdesetih let prejšnjega stoletja. Družba Bayer CropScience je skupaj s strokovnjaki različnih panog (prehrambena industrija, fitofarmacija, kmetijstvo) začela z načrtnimi raziskavami in razvojem aktivne snovi, s katero bi še izboljšali učinkovitost zatiranja gliv iz rodu *Fusarium* spp. Rezultat načrtnega raziskovanja je bilo odkritje aktivne snovi protiokonazol, ki spada v skupino triazolnih aktivnih snovi. Sistemični fungicid Prosaro je sestavljen iz dveh aktivnih snovi: tebukonazola, ki je bil že do sedaj standard pri zatiranju gliv iz rodu *Fusarium* spp., in nove aktivne snovi, protiokonazola. Pripravek Prosaro odlično zatira vse najpomembnejše bolezni žit, prav tako pa povečuje količino in kakovost pridelka, saj se delovanje obeh aktivnih snovi zelo dobro dopolnjuje. Prosaro tudi dosega najvišje učinkovitosti zatiranja gliv iz rodu *Fusarium* spp., s tem pa zmanjšuje količino mikotoksinov v pridelku. Pripravek je registriran za zatiranje glivičnih bolezni na pšenici, ječmenu, rži in tritikali.

ABSTRACT

Prosaro – a new standard in crop protection of cereals

Fungus *Fusarium* spp. may cause considerable damage of cereals crops and reduce quantity and quality of cereals yield. Strongest infections of cereals with fungus *Fusarium* spp. appeared in the beginning of '90 in last century. In the cooperation with experts of different branches (food industry, phytopharmacy and agriculture) Bayer CropScience started carefully planned investigations and development of new active ingredient, main goals being improving efficacy of fungus *Fusarium* spp. control. As a result a new active ingredient prothioconazole from group of triazoles active ingredients was developed. Systemic fungicide Prosaro combines two active ingredients: tebuconazole already being the standard in *Fusarium* spp. control and new active ingredient prothioconazole. For excellent complementation of both active ingredients Prosaro performs high control of most important diseases in cereals. Prosaro also increases quantity and quality of cereals

yield. In comparison with other products Prosaro is achieving highest efficacy in *Fusarium* spp. control and reducing quantity of mycotoxins in cereals. Prosaro is registered to control fungus diseases in wheat, barley, rye and triticale.

Posterji

Interakcija med kostanjevim listnim zavrtačem (*Cameraria ohridella* Deschka & Dimić) in listno sušico divjega kostanja (*Guignardia aesculi* /Peck/ V. B. Stewart)

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Na listih navadnega divjega kostanja (*Aesculus hippocastanum* L.) sta v Sloveniji sočasno zastopana škodljivec, kostanjev listni zavrtač (*Cameraria ohridella* Deschka & Dimić) in bolezen listna sušica divjega kostanja (*Guignardia aesculi* /Peck/ V. B. Stewart). Namen raziskave je oceniti napad in okužbo na listih navadnega divjega kostanja in na listih križanca *A.* x *carnea* Hayne, z obema organizmoma. Istočasno smo spremljali zgoščenost populacije kostanjevega listnega zavrtača s feromonskimi vabami. Raziskava je potekala v Ljubljani, od spomladi do jeseni 2005. Rezultati poskusa so pokazali, da je navadni divji kostanj bolj napaden s kostanjevim listnim zavrtačem, na rdeče cvetnem križancu *A.* x *carnea* je prevladovala listna sušica divjega kostanja. Na lokaciji, kjer skrbno odstranjujejo odpadlo listje, so bile poškodbe od kostanjevega listnega zavrtača blažje, drevesa so bila bolj okužena z listno sušico. Pri primerjavi različno starih dreves so se pokazale razlike v stopnji napadenosti s kostanjevim listnim zavrtačem; mlajša drevesa so bila bolj napadena. Drevesa, okužena z glivo *Guignardia aesculi*, so bila manj napadena s kostanjevim listnim zavrtačem. Ulov metuljčkov je bil večji v feromonski vabi na rdeče cvetnem divjem kostanju. V mesecu avgustu 2005, smo našteli 7547 samcev na vabo.

ABSTRACT

Interaction between horse chestnut leaf miner (*Cameraria ohridella* Deschka & Dimić) and leaf blotch (*Guignardia aesculi* /Peck/ V. B. Stewart)

On the leaves of common horse chestnut (*Aesculus hippocastanum L.*) in Slovenia are simultaneously present horse chestnut leaf miner (*Cameraria ohridella* Deschka & Dimić) and leaf blotch (*Guignardia aesculi* /Peck/ V. B. Stewart). Purpose of this study is to assess the attack and infection of leaves of common horse chestnut and of red horse chestnut (*Aesculus x carnea* Hayne) by both organisms. At the same time we monitored the population density of horse chestnut leaf miner in pheromone traps on both horse chestnuts. The experiment took place in Ljubljana, from summer until autumn 2005. The results of the experiment showed that the common horse chestnut was more attacked by horse chestnut leaf miner, the red flower hybrid *A.* x *carnea* Hayne was dominated by leaf blotch. On location where carefully remove fallen leaves were injuries from horse chestnut leaf miner milder, more trees were infested by leaf blotch. When comparing trees of different ages, trees have revealed differences in the level of attack by chestnut leaf miner, younger trees have been increasingly under attack. Trees infested by *Guignardia aesculi* were less attacked by horse chestnut leaf miner. Moths catch was greater in pheromone trap at the red horse chestnut. In August, we encountered 7547 male per trap.

Spremljanje kostanjevega listnega zavrtača (*Cameraria ohridella* Deschka & Dimić) in njegovih naravnih sovražnikov na območju Ljubljane

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V raziskavi, ki je potekala v letih 2006 in 2007 na območju parka Tivoli in drevoreda v Rožni dolini (Ljubljana), smo spremljali bionomijo kostanjevega listnega zavrtača (*Cameraria ohridella* /Deschka & Dimić/) s feromonskimi vabami in ugotavljali zastopanost njegovih naravnih sovražnikov. Rezultati spremljanja žuželke s feromonskimi vabami potrjujejo, da razvije žuželka na območju raziskave tri rodove na leto. Metuljčki izletavajo na opazovanem območju od konca aprila do konca septembra. Njihovo izletavanje je odvisno od vremenskih razmer. Rezultati pregledovanja listnih izvrtin so pokazali, da je parazitiranost ličink v Ljubljani majhna. Med pregledanimi izvrtinami smo našli tri parazitoide, ki jih uvrščamo v družino Eulophidae, dva osebka pripadata vrsti *Minotetrastichus frontalis* (Nees). Iz gosenic v izvrtinah smo izolirali glive, ki so pripadale naslednjim rodovom: *Fusarium* sp. (62 %), *Alternaria* sp. (21 %), *Cladosporium* sp. (14 %), *Penicillium* sp. (3 %).

ABSTRACT

Monitoring of the horse chestnut leaf miner (*Cameraria ohridella* Deschka & Dimić) and its natural enemies in the area of Ljubljana

In a research, which took place in 2006 and 2007 in the Tivoli park and tree-lined alley in Rožna dolina (Ljubljana), we followed the bionomics of horse chestnut leaf miner (*Cameraria ohridella* /Deschka & Dimić/) using pheromone traps and observed the occurrence of their natural enemies. Information gathered by observation with pheromone traps showed that three generations of the horse chestnut leaf miner developed in the course of the year. Moths emerged from the late April until the late September. Their emergence is dependent on weather conditions. The results of our research showed that parasitism rate of larvae in Ljubljana was very low. During our research we found three parasitoids, which are classified in the Eulophidae family, two specimens belong to *Minotetrastichus frontalis* (Nees). We observed four different fungus genus: *Fusarium* sp. (62 %), *Alternaria* sp. (21 %), *Cladosporium* sp. (14 %), *Penicillium* sp. (3 %). They were isolated from the leaf miner larvae.

Območja tveganja za vnos borove ogorčice *Bursaphelenchus xylophilus* v Sloveniji

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Borova ogorčica ***Bursaphelenchus xylophilus*** (Steiner & Buhrer) Nickle je nevaren škodljivec iglastih gozdnih sestojev, ker lahko povzroči zelo hitro propadanje gostiteljskih rastlin, vrst rodu ***Pinus***. Borovo ogorčico je zelo težko obvladovati, saj je vezana na prenos s hrošči rodu ***Monochamus*** in se lahko v eni rastni sezoni nenadzorovano razširi na večja in včasih tudi težko dostopna območja. Edini učinkovit način obrambe je preprečevanje vnosa v naravno okolje, v primeru le tega pa je potrebno takojšnje ukrepanje, da se zatre zgodnji napad na manjših območjih in s tem prepreči njeno nadaljnje širjenje. Borova ogorčica se na nenapadena območja najpogosteje prenaša prek mednarodnega trgovanja z lesom in lesenimi proizvodi. Kritične točke za vnos borove ogorčice v Slovenijo so vstopne točke mednarodne trgovine (pristanišče in letališče); razne točke razkladanja in skladiščenja lesa, lesenih proizvodov, lesene pakirne embalaže in lubja iglavcev; ter lesni proizvodni obrati. Za potrebe nadzora borove ogorčice v Sloveniji smo določili območja večjega tveganja za vnos tega škodljivca v državo. Po vsej državi smo identificirali več kot 130 kritičnih točk za vnos ter jih povezali s podatki o razširjenosti gostiteljskih rastlin. 3 km pas okrog kritičnih točk smo opredelili kot območja večjega tveganja. S pomočjo geografskega informacijskega sistema smo izdelali karto, kjer opravljamo intenzivnejše preglede in vzorčenja gostiteljskih rastlin v sklopu posebnega nadzora borove ogorčice.

ABSTRACT

Risk areas for Pinewood nematode *Bursaphelenchus xylophilus* introduction to Slovenia

Pinewood nematode *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle is a dangerous pest of conifer forests which can cause sudden dying of their *Pinus* hosts. Pinewood nematode is very difficult to control because its relation to the beetle vectors of the *Monochamus* genus. The beetles can spread the nematode to bigger sometimes hardly accessible areas during one growing season. The most effective approach to fight pinewood nematode is the prevention of its introduction into the natural environment and immediate action to suppress an early infestation on smaller areas thus preventing its further spread. The most frequent spread of the nematode to non-infested areas occurs through international trade of wood and wood products. The critical points of entry for the pinewood nematode in Slovenia are entry points of international trade (port and airport); various points of unloading and storage timber, wood products, wood package material and bark of conifers, and wood manufacturing plants. For the nematode control purposes in Slovenia we have determined the areas of greatest risk of introducing this pest into the country. Throughout the country we have identified more than 130 critical points of entry linked to data on the host plants distribution. Risk areas were classified as 3 km zone around the critical points. Using geographical information system we created a map of risk areas where more intensive inspections and sampling of the host plants takes place in the national pinewood nematode survey.

The scale insects (Hemiptera: Coccoidea) on citrus plants in Croatia

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This paper deals with the scale insects on citrus plants (Rutaceae) in the open field, and on house and greenhouse pot plants in Croatia. They have been monitored during a six year investigation (2005-2010). Inspections have resulted in scale species, namely Coccidae: *Ceroplastes japonicus* Green, *C. rusci* (Linnaeus), *Coccus hesperidum* Linnaeus, 1758, *C. pseudomagnoliarum* (Kuwana, 1914), *Parthenolecanium persicae* (Fabricius), *Saissetia coffeae* (Walker), and *S. oleae* (Olivier); Diaspididae: *Aonidiella aurantii* (Maskell), *C. dictyospermi* (Morgan), *Lepidosaphes beckii* (Newman), *L. gloverii* (Packard), *Parlatoria oleae* (Colvée), *P. ziziphi* (Lucas), *Pinnaspis aspidistrae* (Signoret), Margarodidae: *Icerya purchasi* Maskell, and Pseudococcidae: *Planococcus citri* (Risso), *P. longispinus* (Targioni Tozzetti), *P. viburni* (Signoret). Distribution (according to UTM system) and host plants of these species in Croatia will be reported.

Slovenski izvleček ni bil predložen.

Izkušnje v prvih letih uporabe mrežnika za zagotavljanje cepilnega materiala pri koščičastih sadnih vrstah

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Gojenje zdravih matičnih rastlin in uporaba zdravega cepilnega materiala pri vegetativnem razmnoževanju predstavlja pomemben preventivni ukrep pri preprečevanju širjenja bolezni pri sadnih rastlinah. Pri koščičastih sadnih vrstah iz roda *Prunus* je vzdrževanje zdravih matičnih rastlin na prostem precej težavno, predvsem v okoljih z velikim infekcijskim pritiskom, zaradi razširjenosti gostiteljskih rastlin in zastopanosti prenašalcev bolezni. Nevarni karantenski bolezni, kot sta klorotično zvijanje listov koščičarjev, ki jo povzroča fitoplazma European stone fruit yellows (ESFY) in šarka, ki jo povzroča virus *Plum pox potyvirus* (PPV) se na gostiteljske rastline iz roda *Prunus* širita z žuželčjimi prenašalci in pomenita v naših pridelovalnih območjih koščičarjev stalno nevarnost okužb matičnih rastlin. V prispevku so prikazane ugotovitve spremljanja zdravstvenega stanja matičnih rastlin ter spremljanja prenašalcev, kakor tudi rezultati spremljanja parametrov razvoja rastlin v razmerah mrežnika, primerjalno s kontrolnimi rastlinami na prostem, v prvih letih uporabe mrežnika. Rezultati potrjujejo učinkovitost mrežnika pri preprečevanju prenosa bolezni koščičarjev s prenašalci ter možnost zagotavljanja cepičev ustrezne tehnološke kakovosti.

ABSTRACT

First experiences with the use of insect-proof net-house in assuring the propagating material of stone fruits

The cultivation of healthy mother plants and the use of healthy propagating material is an important preventive measure to control the spread of the diseases in fruit plants. In stone fruits, the maintenance of healthy mother plants in open field is quite difficult, particularly in the areas with high infection pressure due to the widespread of host plants and the presence of vectors. The quarantine pathogens phytoplasma responsible for the

European stone fruit yellows (ESFY) and the *Plum pox virus* (PPV) are transmitted to the host plants of the genus *Prunus* by vectors; in Slovenia, in several areas where stone fruits are cultivated, they present constant danger of infection of mother plants. Some findings on vector monitoring and disease control as well as some tree growth parameters of mother plants grown in an insect-proof net-house, compared to the control trees growing outside are reported in this paper. The results suggest good opportunities and importance of *Prunus* mother plant cultivation in protected environment for the production of healthy, well developed bud wood for nursery needs.

Učinkovitost fungicidov za zatiranje gliv iz rodu *Monilinia* sp. pri breskvah in določitev relativne zastopanosti vrste *Monilinia fructicola*

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V breskovem nasadu na Primorskem smo ugotavljali učinkovitost nekaterih fungicidov za zatiranje gliv iz rodu *Monilinia* sp. Poskus smo izvedli na sorti 'Norman', kjer smo v letu 2009 ugotovili okužbe s plodovo monilijo *Monilinia fructicola*. Opravili smo dve škropljenji v času cvetenja, eno pa pred zorenjem plodov. Med cvetenjem smo škropili s pripravki na osnovi iprodiona, difenokonazola, tebukonazola, fenbukonazola, pirimetanila, kombinacije boskalida in piraklostrobina, ciprodinila in fludioksonila ter s pripravkom na osnovi *Bacillus subtilis*. Za varstvo plodov smo uporabili iste pripravke razen difenokonazola, tebukonazola in fenbukonazola. Dodatno smo uporabili še pripravek na osnovi fenheksamida. Ocenjevali smo okuženosti cvetov, poganjkov in plodov. Z laboratorijskimi analizami smo ugotavljali relativno zastopanost vrste *Monilinia fructicola* na mumificiranih plodovih, cvetovih, plodičih in zrelih plodovih. Za zatiranje cvetnih okužb so določeno učinkovitost pokazali fungicidi difenokonazol, kombinacija ciprodinila in fludioksonila, fenbukonazol in *Bacillus subtilis*. Za varstvo plodov sta bila učinkovita fenheksamid in kombinacija ciprodinila s fludioksonilom.

ABSTRACT

Efficiency of fungicides used for the brown rot control *Monilinia* sp. in peaches and determination of relative presence of the species *Monilinia fructicola*

Efficiency of certain fungicides for the brown rot control *Monilinia* sp. was studied in a peach plantation situated in Primorska region. The experiment was carried out using the variety 'Norman' in which the infection with fungi *Monilinia fructicola* was determined. Two sprayings were performed during blooming, and one before fruit ripening. During blooming chemicals based on iprodione, difenoconazole, tebuconazole, fenbuconazole, pyrimetanil, combination of boscalid and pyraclostrobin, cyprodinil and fludioxonil as well as chemical based on *Bacillus subtilis* were used. The same chemicals with the exception of difenoconazole, tebuconazole and fenbuconazole were used for fruit protection. Additional for fruit protection chemical based on fenhexamid was used. Infection of blossoms shoots and fruits were evaluated. Laboratory analyses were used for determination of relative presence of the species *Monilinia fructicola* on mummified fruits, blossoms, fruitlets and ripe fruits. Blossom infections were controlled with certain efficiency by the fungicides difenokonazol, the combination of ciprodinil and fludioksonil, fenbukonazol and *Bacillus subtilis*. Fruit protection was efficiently performed by fenhexamid and the combination of cyprodinil with fludioxonil.

The results of the monitoring of South American tomato moth *Tuta absoluta* Povolny, 1994 (Lepidoptera: Gelechiidae) in 2010 in Croatia

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The South American tomato moth, *Tuta absoluta* Povolny, 1994 is a serious devastating pest of tomato. Larvae feed on all parts of tomato plants and can cause severe crop damage. *T. absoluta* is a pest of tomato in many South American countries since 1970. Recently, this dangerous pest was detected in many countries in Europe and Mediterranean region. In Croatia the presence of *T. absoluta* was reported for the first time at the end of 2009. In 2010 we conducted the monitoring of *T. absoluta* from April to July in tomato protected production on 19 localities in 8 counties of Croatia along Adriatic coast and continental border part with Slovenia. Presence of *T. absoluta* in tomato plantation was established by the visual inspection of tomato plants on symptoms of larvae feeding and by hanging of sex pheromone traps above the plants. After approximately one month from installation, the traps were removed from glasshouses and analysed in laboratory. The species of male moths caught in traps was identified according to their morphological characteristics and by dissection of genital segment of several specimens. During the monitoring in 2010 by using of the listed methods, the species *T. absoluta* was reported on 16 localities in 6 counties of Croatia. The number of caught males of *T. absoluta* in traps was ranged from 1 to even 317 moths per 1 trap. Since the first detection of *T. absoluta* in 2009, the results of monitoring in 2010 show that this serious pest of tomato is spreading rapidly across Croatia. The significant damage on leaves and fruits was reported in tomato protected production in coastal part of Croatia.

Slovenski izvleček ni bil predložen.

Mehkokožna plenilka *Macrolophus melanotoma* (Costa) – domorodni koristni organizem

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Mehkokožna plenilka *Macrolophus melanotoma* iz družine mehkokožnih stenic (Heteroptera: Miridae) je domorodni (avtohton) koristni organizem. Je polifag, ki se prehranjuje z rastlinjakovim ščitkarjem (*Trialeurodes vaporariorum* [Westwood]), listnimi ušmi (Aphididae), pršicami (Acarina), jajčeci in gosenicami vešč (Lepidoptera), ličinkami listnih zavrtalk (Agromyzidae) in resarji (Thysanoptera). V sosednjih državah to vrsto že več let uporabljajo v biotičnem varstvu, in sicer predvsem za zmanjševanje populacij

oziroma zatiranje rastlinjakovega ščitkarja v zavarovanih prostorih. V zadnjem obdobju ta koristna vrsta še dodatno pridobiva na pomenu, saj naj bi bila tudi uspešen plenilec paradižnikovega molja (*Tuta absoluta* Povolny), nevarnega škodljivca paradižnika v zavarovanih prostorih, katerega zastopanost je bila potrjena tudi že v Sloveniji. V prispevku bo opisana vrsta, predstavljena bionomija te koristne vrste ter domače praktične izkušnje z njeno uporabo v biotičnem varstvu paradižnika v zavarovanih prostorih. Domače praktične izkušnje potrjujejo navedbe iz tujine, da je potrebno za uspešno obvladovanje rastlinjakovega ščitkarja mehkokožno plenilko naseliti kmalu po sajenju glavne rastlinske vrste, jo najprej še dopolnilno hraniti ter ves čas skrbeti za vzdrževanje ustreznih razmer v zavarovanem prostoru za optimalen razvoj te vrste.

ABSTRACT

Predatory bug *Macrolophus melanotoma* (Costa) – native beneficial organism

Predatory bug *Macrolophus melanotoma* (Heteroptera: Miridae) is native (indigenous) beneficial organism. It is polyphagous species, which feeds on greenhouse whitefly (*Trialeurodes vaporariorum* [Westwood]), aphids (Aphididae), spider mites (Acarina), moth eggs and caterpillars (Lepidoptera), larvae of miners (Agromyzidae) and thrips (Tysanoptera). In the neighbouring countries this species is used in biological control for many years with the aim of reducing or controlling the populations of greenhouse whitefly in the greenhouses. In recent time the species became more important, since it is known as one of more successful predators of tomato leaf miner (*Tuta absoluta*), a dangerous pest on tomato producing in the greenhouses. The presence of this pest is already confirmed in Slovenia. This paper presents the description and the bionomics of *Macrolophus melanotoma* and domestic practical experiences with its use as beneficial organism in the biological control of tomato in greenhouses. Practical experiences in Slovenia confirm indications from abroad. For successful management of greenhouse whiteflies it is necessary to colonise *Macrolophus melanotoma* shortly after planting of main crops. After colonising in the greenhouse it is necessary to add additional food for *Macrolophus melanotoma*. All the time we have to take care to maintain suitable conditions in the greenhouses for the optimal development of this species.

Preučevanje učinkovitosti navadne nokote in vrtnega šetraja kot vmesnih posevkov za zmanjševanje škodljivosti tobakovega resarja (*Thrips tabaci* Lindeman, Thysanoptera, Thripidae) na poru

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V letu 2009 smo na Laboratorijskem polju Biotehniške fakultete v Ljubljani izvedli poljski poskus, v katerem smo preučevali učinkovitost dveh vmesnih posevkov, navadne nokote (*Lotus corniculatus* L.) in vrtnega šetraja (*Satureja hortensis* L.), za zmanjševanje škodljivosti tobakovega resarja (*Thrips tabaci* Lindeman) na poru (*Allium porrum* L.). V poskusu smo uporabili štiri hibride pora: 'columbus', 'forrest', 'lancelot' in 'lincoln'.

Povprečni indeks poškodb zaradi škodljivca na listih pora se je v obravnavanjih z obema vmesnima posevkoma in v kontrolnem obravnavanju (brez vmesnega posevka) povečeval od prvega ocenjevanja (13. julij) naprej. Significantno najbolj učinkovit vmesni posevek, v smislu najmanjšega obsega poškodb na listih pora, je bila navadna nokota. Tudi vrtni šetraj se je v primerjavi s kontrolnim obravnavanjem izkazal kot učinkovit vmesni posevek. V vseh obravnavanjih je bil najmanj poškodovan hibrid 'lancelot'. Vmesni posevek in hibrid sta imela signifikanten vpliv tudi na pridelek rastlin pora. Signifikantno najbolj produktivne so bile namreč rastline v kontrolnem obravnavanju, medtem ko ugotavljamo, da sta navadna nokota in vrtni šetraj precej tekmovalna posevka in so bili pridelki pora v obravnavanjih z njima signifikantno manjši.

ABSTRACT

Research on efficiency of two intercrops, birdsfood trefoil and summer savory, to reduce damage caused by onion thrips (*Thrips tabaci* Lindeman, Thysanoptera, Thripidae) on leek

In 2009, a field experiment was carried out at the Laboratory Field of the Biotechnical Faculty in Ljubljana with the aim to investigate a suitability of two intercrops, birdsfood trefoil (*Lotus corniculatus* L.) and summer savory (*Satureja hortensis* L.), for reducing damage caused by onion thrips (*Thrips tabaci* Lindeman) on leek (*Allium porrum* L.). Four leek hybrids – 'columbus', 'forrest', 'lancelot', and 'lincoln' – were used in the research. The mean index of damage caused by feeding of the pest on the leek leaves increased from the first evaluation in both treatments with intercrops and in control treatment (without intercrop). Leek grown with birdfood trefoil as intercrop was significantly the least damaged from thrips. Also summer savoy was efficient in the same context in comparison with control treatment. Hybrid 'lancelot' was the least damaged in all treatments. Intercrop and hybrid also had significant influence on the yield of leek. The highest yield was obtained on the control plots, meanwhile birdsfood trefoil and summer savory were pretty competitive and the yield of leek grown with them as intercrops was therefore significantly lower.

Sezonska dinamika kapusove sovke (*Mamestra brassicae* [L.], Lepidoptera, Noctuidae) na območju Ljubljane

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Kapusova sovka (*Mamestra brassicae*) je polifagna žuželčja vrsta, njene gosenice pa v Evropi povzročajo najbolj intenzivne poškodbe zlasti na kapusnicah. Gosenice se prehranjujejo zlasti z nadzemskimi deli zelja (*Brassica oleracea* L. var. *capitata* L.), pogosto pa napadajo tudi druge rastlinske vrste. Med leti 2008 in 2010 smo na Laboratorijskem polju Biotehniške fakultete v Ljubljani spremljali številčnost odraslih osebkov tega škodljivca v rastni dobi. S poskusom smo želeli natančneje določiti pojavljanje odraslih osebkov, zlasti njegov začetek in vrh(ova), in ugotoviti povezavo med številčnostjo škodljivcev in povprečno dnevno temperaturo zraka ter povprečno dnevno množino padavin. V štiri feromonske vabe (tip VARL+ CSalomon®, Budimpešta) smo

lovili samce kapusove sovke na njivi z različnimi zgodnjimi in poznimi genotipi zelja. V prvem letu je bil ulov metuljev najmanjši, prvi osebek pa se je pojavil v obdobju med 16. in 23. junijem. V naslednjih dveh letih smo na istem zemljišču ulovili večje povprečno število samcev na vabo na dan, hkrati pa je iz rezultatov razvidna bivoltilnost vrste. V letu 2009 smo ugotovili, da se je največ osebkov prvega rodu v vabe ujelo med 26. majem in 3. junijem, medtem ko je bil vrh drugega rodu dosežen v obdobju med 12. in 24. avgustom. Predviden pojav metuljev prvega rodu smo določili z uporabo hipotetičnega spodnjega praga aktivnosti 10 °C in računanja vsote efektivne temperature.

ABSTRACT

Seasonal dynamics of cabbage armyworm (*Mamestra brassicae* [L.], Lepidoptera, Noctuidae) in the region of Ljubljana

The cabbage armyworm is one of the most common polyphagous insects in Europe. The caterpillars are known by the damage on cabbage (*Brassica oleracea* L. var. *capitata* L.) leaves, but they can also be pests of other crop plants. From 2008 to 2010 we conducted a monitoring of adults at the Laboratory Field of the Biotechnical Faculty in Ljubljana. The main aim of the research was to evaluate the flight start of adult males, and to determinate connections between the pest occurrence and the average air daily temperatures and average daily ammounts of precipitations. By using four pheromone traps (type VARL+ Csalomon, Budapest) we have caught male organisms in the field with different cabbage genotypes. During the first year, when the number of moths were the lowest, the first males appeared between the 16th and the 23rd of June. In the next two years the number of pests captured on the target field were higher. At the same time it was noticed two generations of the pest. In 2009 we found out that the peak of the first generation was between the 26th of May and the 3rd of July. The second peak was reached between the 12th and the 24 th of August. The expected appearance of the first generation moths was defined by the sum of the effective temperatures (hypothetical lower developmental threshold was 10 °C).

Pomen dejavnikov antiksenoze kot mehanizma odpornosti zelja na primerih kapusovih bolhačev (*Phyllotreta* spp.) in kapusovih stenic (*Eurydema* spp.)

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Kapusovi bolhači (*Phyllotreta* spp.) in kapusove stenice (*Eurydema* spp.) so gospodarsko pomembni škodljivci zelja v Sloveniji. Cilj naše raziskave je bil oceniti potencialni učinek biokemične sestave zeljnih listov kot obrambnega mehanizma proti omenjenim škodljivcem. Vpliv barve listov (L* a* b* sistem), vsebnosti epikutikularnega voska, skupnih polifenolov in antioksidacijskega potenciala na obseg poškodb, ki jih povzročajo omenjeni škodljivci, smo proučevali na 20 genotipih zelja (*Brassica oleracea* L. var. *capitata*), posajenih na Laboratorijskem polju Biotehniške fakultete v Ljubljani. V poljski poskus je bilo vključenih 9 zgodnjih, 5 srednje zgodnjih in 6 poznih genotipov (glede na dolžino rastne dobe), 3 rdeči in 17 belih genotipov (glede na barvo listov) ter 14 hibridov in 6 sort (glede na izvor). Statistična analiza je pokazala, da biokemična sestava listov zelja najbolj vpliva na odpornost te vrtnine na napad bolhačev. Ti namreč kažejo šibko

preferenco do zgodnjega in rdečega zelja ter do hibridov, ki imajo visoko vsebnost epikutikularnega voska (r^2 = -0,6137, r^2 = -0,7603 in r^2 = -0,6812). Prav tako smo pri bolhačih ugotovili močno negativno korelacijo med antioksidacijskim potencialom in obsegom poškodb pri poznem zelju (r^2 = -0,7185), pri rdečem zelju (r^2 = -0,7811) in pri sortah zelja (r^2 = -0,7802).

ABSTRACT

Significance of different factors of antixenosis as resistance mechanism of cabbage: a case study of flea beetles (*Phyllotreta* spp.) and cabbage stink bugs (*Eurydema* spp.)

Flea beetles (*Phyllotreta* spp.) and cabbage stink bugs (*Eurydema* spp.) cause significant economic problems to Slovenian cabbage growers. The aim of our study was to assess the potential effect of the biochemical composition of leaves as defence mechanism against both groups of cabbage pests. The impact of colour of the leaves (L * a * b * system), epicuticular wax content, polyphenols and antioxidative potential in relation to damage levels on the leaves caused by cabbage pests were studied under field conditions at the Experimental Field of the Biotechnical Faculty in Ljubljana. In a field trial the following 20 cabbage (*Brassica oleracea* L. var. *capitata*) genotypes were included: 9 early, 5 mid- early, 6 late (regarding the longevity of growing period), 3 red, 17 white (regarding the colour), 14 hybrids and 6 varieties (regarding genetic origin). Statistical analysis showed that the biochemical composition of cabbage leaves has the greatest impact on resistance of this vegetable to flea beetles attack. Flea beetles showed only weak preference to early and red cabbage, and to the hybrids, which have a high epicuticular wax content (r^2 = -0.6137, r^2 = -0.7603, and r^2 = -0.6812). It has also been found a strong negative relationship between the antioxidative potential and extent of damage in the late cabbage (r^2 = -0.7185), red cabbage (r^2 = -0.7811) and cabbage varieties (r^2 = -0.7802).

Possibilities for use of floral baited colour traps for detection of scarabaeid beetle (Coleoptera: Scarabaeoidea) pests

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One of the possibilities for detection (as well as a rough estimation) of the scarabaeid beetle pests in specific areas are the CSALOMON® VARb3 floral baited colour traps (produced by Plant Prot. Inst., HAS, Budapest, Hungary). These traps, offered for the pest species *Tropinota (Epicometis) hirta* (Poda, 1761), *Oxythyrea funesta* (Poda, 1761) and

Cetonia aurata (Linnaeus, 1761), were used for detection and seasonal monitoring of the above mentioned pests in different regions of Bulgaria in 2009 and 2010. Besides the target species, the following species of the superfamily Scarabaeoidea were caught also: ***Protaetia (Netocia) cuprea*** (Fabricius, 1775) – in Troyan and, as single specimens, in Dryanovo and Plovdiv; ***Valgus hemipterus*** (Linnaeus, 1758) – in Dryanovo, Gabrovo, Karnobat, Knezha, Kystendil, Petrich, Plovdiv and Troyan; ***Blitopertha lineolata*** (Fischer von Waldhein, 1824) – in Dryanovo, and as single specimens in Karnobat and Kyustendil, and ***Anisoplia (Autanisoplia) austriaca*** (Herbst, 1783) - in Knezha. All these species, with the exception of ***P. cuprea*** and ***A. austriaca,*** were caught by means of the same traps, in orchards in the region of Sofia earlier.

Slovenski izvleček ni bil predložen.

Biofumigacija kot način zatiranja talnih škodljivih žuželk

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Biofumigacija je način varstva rastlin, ki za zatiranje talnih škodljivih organizmov uporablja hlapljive kemične snovi (alelokemikalije), ki se izločajo pri razgradnji zelinja predhodno sejanih rastlin (dosevki). Do biofumigacije pride, ko začnejo zaorani nadzemski in podzemni deli izbranih vrst križnic pri razpadanju (glukozidni hidrolizi) izločati sekundarne snovi. Križnice so kot biofumiganti sposobne tvoriti med 30 in 40 različnih glukozinolatov, ki nato v kombinaciji z drugimi dejavniki negativno vplivajo na pojav talnih škodljivcev in povzročiteljev bolezni. V članku bodo predstavljene vrste križnic, ki so ustrezne kot biofumiganti, njihove agronomske značilnosti in tehnologija pridelave za namen biofumigacije. Prav tako bodo podane informacije, na katere talne škodljive žuželke imajo lahko potencialni vpliv. Biofumigacija lahko v izbranih razmerah rastlinske pridelave predstavlja način zmanjšanja uporabe nekaterih sredstev za varstvo rastlin proti talnim škodljivim žuželkam.

ABSTRACT

Biofumigation as a control method against soil insect pests

Biofumigation is a plant protection method in which the control of soil harmful organisms is conducted through volatile chemicals (allelochemicals) produced in the process of herbage decomposition of previously seeded crops. Biofumigation takes place when ploughed residues of above and below ground biomass of selected Brassicas start to breakdown (glucosinolate hydrolysis) and production of secondary compounds starts. Brassicas are able to produce between 30 and 40 different glucosinolates, which when combined with other factors negatively effect on the appearance of soil pests and diseases. The paper will consist of presentation on Brassicas species which are suitable as biofumigants, their agronomic characteristics and technology in production for the purpose of biofumigation. Also information about the spectrum of soil pest insects, which can be controled by biofumigants, will be given. In selected terms of conditions for plant production biofumigation can represent a way of reduction of plant protection products, which are commonly used to supress the soil pest insects.

Združene setve proti boleznim in škodljivcem

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Mešani posevki so lahko zelo učinkoviti v boju proti boleznim in škodljivcem. Gre za obliko posnemanja biotske raznovrstnosti naravnih biocenoz, pri kateri nadgradimo kolobar s poznavanjem številnih sinergističnih in antagonističnih lastnosti gojenih rastlin. Iz strokovne in znanstvene literature so znane medvrstne mešanice (interspeciesne mešanice) in mešanice sort v okviru iste vrste (intraspeciesne mešanice). Mešani posevki so pogostejši način pridobivanja biotično vrednejše krme za prehrano domačih živali. Mešanice poljščin za prehrano ljudi se pridelujejo redkeje. Tradicionalna mešanica, ki so jo sejali kmetje tudi pri nas je bila soržica, to je mehanska mešanica pšenice in rži. V posevku soržice je rž varovala pšenico pred povzročitelji glivičnih bolezni, pšenica pa je zmanjšala okuženost cvetov rži z glivo rženega rožička (*Claviceps purpurea* L.). Z večanjem intenzivnosti kmetovanja se je pridelovanje soržice opustilo. V primerjavi s konvencionalnim kmetijstvom, ki zanemarja pomen kolobarja poljščin in vrtnin, pa nove trajnostne oblike kmetovanja priporočajo, zahtevajo ali celo določajo čas in način kolobarjenja (integrirana pridelava poljščin in vrtnin) ter setev mešanih posevkov (permakultura). Zadnja kot oblika trajnostnega kmetijstva (permanent agriculture) temelji na mešanih posevkih v kolobarju, permakulturniki pa iščejo vedno nove koristne povezave med rastlinami v smeri zdravega pridelka. Spoznanja permakulture uporabljajo tudi številni ekološki kmetje v svetu in pri nas. S pomočjo analize posevkov poljščin in vrtnin na permakulturnih in ekoloških kmetijah po Sloveniji bodo predstavljene ugodne in neugodne sosednje kulture, rastline, ki se podpirajo v medsebojni rasti s preprečevanjem napada škodljivcev in okužb s povzročitelji bolezni ter rastline, ki odvračajo povzročitelje bolezni in škodljivce z izločanjem biotičnih učinkovin (fitoncidi) oziroma spodbujajo ali zavirajo rast sosednjih rastlin.

ABSTRACT

Intercropping against pests and diseases

Intercropping can be very effective in preventing dispersion of pests and diseases. It tends to emulate biodiversity of natural biocenoses where crop rotation, enriched with many synergistic and antagonistic properties of cultivated plants, is presented. From professional and scientific literature, many mixtures of different species (interspecies mixture) and mixtures of cultivars within the same species (intraspecies mixture) are known. Intercropping is more common way to gain higher quality of feed for animals while for human consumption it is used to a lesser extent. A traditional intercrop sown by farmers in our country was a mechanical obtained mixture of wheat and rye, called "soržica". In "soržica" crop the rye protected wheat against fungal diseases while the presence of wheat reduced contamination of rye's flower with ergot (*Claviceps purpurea* L.). By increasing the intensity of farming the cultivation of "soržica" was abandoned. Compared with conventional agriculture, which ignores the importance of crop rotation of crops and vegetables, the new sustainable forms of farming recommend, require or even

determine the timing and the manner of crop rotation (integrated crops and vegetables production) and sowing of intercrops (permaculture). The last of forms of sustainable agriculture (permaculture) is based on intercropping in the crop rotation; permaculture users are always looking for new useful interactions among plants towards a healthy yield. The aspect of permaculture agriculture has been used by many organic farmers in our country and abroad. With help of analysed field- and vegetable crops at permaculture and organic farms in Slovenia the following plants will be presented: a) favourable and unfavourable neighbouring plants, b) plants that support each other in their mutual growth by preventing infestations of pests and infections with pathogens and c) plants that repel pests and pathogens by the secretion of biological substances (fitoncides), or promote or inhibit the growth of neighbouring plants.

Razvojni krog koloradskega hrošča (*Leptinotarsa decemlineata* [Say], Coleoptera, Chrysomelidae) in njegove interakcije na njivi s krompirjem

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V letu 2010 smo na Laboratorijskem polju Biotehniške fakultete v Ljubljani izvedli poljski poskus, kjer smo preučevali vpliv treh foliarnih pripravkov (LabiSinergic, Algo-Plasmin, Agrostemin) na pojavljanje koloradskega hrošča (*Leptinotarsa decemlineata*) na štirih sortah krompirja ('Aladin', 'Pekaro', 'Cosmos' in 'Sante'). Poškodbe preučevanega škodljivca na listih krompirja in pojavljanje jajčnih legel, mladih in starejših ličink ter odraslih osebkov smo ocenjevali v 14-dnevnih intervalih. Z uporabljenimi foliarnimi pripravki smo krompir tretirali trikrat v rastni dobi, in sicer 4. junija, 22. junija in 8. julija. V določenih časovnih terminih smo jemali vzorce listov za analizo nitritov in nitratov, merili smo temperaturo listov in tal ter vsebnost klorofila v listih. Razlike v pridelku gomoljev štirih sort v štirih načinih pridelave smo stastistično izvrednotili. Rezultati generalne statistične analize kažejo na obstoj signifikantnih razlik v intenzivnosti poškodb med posameznimi sortami krompirja, ne pa tudi med različnimi foliarnimi pripravki. V prispevku bodo natančno prikazane interakcije med različnimi dejavniki v poskusu.

ABSTRACT

Life cycle of Colorado potato beetle (*Leptinotarsa decemlineata* [Say], Coleoptera, Chrysomelidae) and its interactions on potato field

During 2010 field experiment at the Laboratory field of Biotehnical Faculty in Ljubljana was performed. We studied the influence of three different foliar products (LabiSinergic, Algo-Plasmin, Agrostemin) on occurrence of the Colorado potato beetle (*Leptinotarsa decemlineata*) in four potato cultivars ('Aladin', 'Pekaro', 'Cosmos', and 'Sante'). Assessment on extent of damaged potato leaves caused by the pest in question and occurrence of egg clusters, young and old larvae and adults was made in 14-day intervals. During growing season potato was treated three times with foliar products; on the 4th of June; on the 22nd of June, and on the 8th of July. In certain time periods we took leaf samples for analysis of nitrates and nitrites. We also measured leaf and soil temperature, and chlorophyll content in potato leaves. The differences in yield between four different potato varieties was statistically evaluated. The results of statistical analysis of pooled results show significant differences in the extent of damage of different potato

cultivars, but not between four foliar products. All interactions between different factors of experiment will be presented in the paper.

Vpliv agrotehničnih ukrepov na okuženost semena pšenice (*Triticum aestivum* L. emend. Fiori et Paol.) s povzročitelji glivičnih bolezni

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Onesnaženja pridelkov in izdelkov žit so lahko posledica slabe pridelovalne prakse, zlasti neupoštevanja običajnih agrotehničnih ukrepov, med katerimi je razkuževanje semena. Namen raziskave je bil ugotoviti vpliv razkuževanja semena na okuženost zrnja pšenice pred setvijo in pridelka zrnja iz poljskega poskusa Biotehniške fakultete (BF) ter okuženost pridelka zrnja na kmetijah pri konvencionalni in ekološki pridelavi. Pri laboratorijski inkubaciji zrnja na agarju pred setvijo poljskega poskusa na BF z različnimi razkužili smo ugotovili, da tretiranje semena s fungicidoma Maxim 050 FS in Vitavax 200-FF (2 % okuženih zrn) močno izboljša zdravstveno stanje v primerjavi z nerazkuženim dodelanim semenom (25 % okuženih zrn). Delovanje obeh fungicidnih pripravkov je bilo statistično značilno boljše (2 % okuženih zrn) od pripravkov Agrostemin in Fitolife, ki sta dovoljena v ekološkem kmetijstvu (15 % okuženih zrn). Pri inkubaciji pridelka zrnja iz poljskega poskusa z različnimi razkužili smo potrdili pozitiven vpliv tretiranja semena s fungicidoma na zdravstveno stanje pridelanega zrnja (27 % okuženih zrn) v primerjavi s setvijo nerazkuženega semena (34 % okuženih zrn). Dobljen je bil tudi pozitiven vpliv razkuževanja semena pšenice s pripravkoma uporabnima v ekološkem kmetijstvu v primerjavi s kontrolo. Tudi v tem primeru je imelo razkuževanje s fungicidoma večji vpliv na boljše zdravstveno stanje pridelanega semena kot pripravka dovoljena v ekološkem kmetijstvu (29 % okuženih zrn). Vpliv razkuževanja na zdravstveno stanje pridelanega zrnja je največji pri fungicidu Vitavax 200-FF. Pri laboratorijski inkubaciji pridelka zrnja pšenice na agarju iz osmih slovenskih kmetij smo ugotovili, da je bil delež okuženega zrnja od 1,5 % do 19,5 %. Okuženost vzorcev pridelka zrnja iz ekološke pridelave (7 % okuženih zrn) je bila na ravni vzorcev iz konvencionalne pridelave (8,4 % okuženih zrn), pri katerih pa je bil razpon okuženosti od 1,5 % do 19,5 %. Analiza sestave kolobarja na posamezni njivi v zadnjih petih letih je pokazala, da je na okuženost pridelka zrnja vplival predposevek, zlasti delež žit in koruze v kolobarju.

ABSTRACT

The impact of agrotechnical treatments on wheat seed infection (*Triticum aestivum* L. emend. Fiori et Paola.) with the agents of fungal diseases

Contamination of cereal crops and their products could be the result of inappropriate agricultural practices as well as disregarding usual agrotechnical treatments, including the seed treatment. The aim of the study was to determine the impact of seed treatment on wheat seed infection before sowing and infection of grain yield from field trial on Biotechnical faculty (BF); also the infection of grain yield on the farms at conventional and organic production were compared. Laboratory incubation of grain on agar before sowing on the field was carried out with various disinfectants. We found that seed treatment with

fungicides Maxim 050 FS and Vitavax 200-FF (2% infected grains) had significantly improved health status compared to untreated processed seed (25% infected grains). The effectiveness of both fungicide were significantly better (2% infected grains) as preparations Agrostemin and Fitolife, which are allowed in organic farming (15% infected grains). By the incubation of grain yield from field experiment with different seed treatments, the positive effect of fungicide on the health status of grain yield was confirmed (27% infected grains), compared to the sowing of seed that were not treated with disinfectants (34% infected grains). Comparing with the control a positive effect of wheat seed treatment for disinfectants used in organic farming was determined. Furthermore, seed treatment with fungicides had a greater influence on improving the health status of grain yield, compared to above mentioned preparations allowed in organic farming (29% infected grains). Effect of seed treatment on the health status of grain yield was the greatest by using fungicide Vitavax 200-FF. The percentage of infected grains through laboratory incubation of grain yield of wheat on agar, sampled from eight Slovenian farms, ranged from 1.5 to 19.5%. Infection of sampled grain yield at organic production (7% infected grains) was comparable with infection of grain yield at conventional agriculture (8.4% infected grains), where the infection ranged from 1.5% to 19.5%. Analysis of crop rotation for each field in the last five years indicated that the previous crop, especially the proportion of cereals and maize in crop rotation, had a great impact on infection of grain yield.

Ispitivanje lokalnog hercegovačkog kultivara krumpira Poluranka na prisutnost PLRV, PVY, PVX, PVA

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Proizvodnja krumpira je pod direktnim utjecajem različitih biotičkih faktora među kojima najznačajnije mjesto pripada virusima. Poznato je više od 20 virusa koji u prirodnim uvjetima mogu da zaraze krumpir, koji zbog toga zaostaje u porastu te ostvaruje dvostruko manji prinos. U cilju očuvanja lokalnog hercegovačkog krumpira Poluranka, koji je u prošlosti bio dominantan kultivar na brdsko-planinskom području Hercegovine, bilo bi nužno poduzeti fitosanitarne mjere za očuvanje ovog lokalnog kultivara kako ne bi doživio sudbinu brojnih drugih autohtonih biljnih genetskih izvora koji su zauvijek nestali sa ovih prostora. Kao glavna mjera očuvanja navedenog kultivara podrazumijeva se pronalazak i očuvanje zdravog sadnog materijala potrebnog za daljnju reprodukciju. Prvi korak u ostvarivanju navedenog je kontrola postojećeg sadnog materijala na prisutnost četiri ekonomski najznačajnija virusa krumpira. U radu će biti predstavljeni rezultati DAS ELISA testa dva uzorka sa različitih lokaliteta (ravničarski/brdski). Do sada nisu rađena istraživanja o zdravstvenoj ispravnosti lokalnog hercegovačkog kultivara krumpira Poluranka, te nisu poduzete odgovarajuće mjere u očuvanju ovog korisnog oplemenjivačkog materijala.

ABSTRACT

Testing of local Herzegovinian potato cultivar Poluranka on presence of PLRV, PVY, PVX, PVA

Potato production is directly influenced by various biological factors among which the most important place takes the viruses. It is already known more than 20 viruses which infect the potatoes in natural environment and thus retarded growth and generate half the yield. In order to preserve the local potato cultivar Poluranka which jut to be historically dominant cultivar in the mountainous region of Herzegovina, it is necessary to take phytosanitary measures for the conservation of this variety. Many other indigenous plant genetic resources are gone forever from this space and this cultivar should not share the same fate. A main measure will be identification and preservation of healthy planting material required for further reproduction. The first step in achieving this is testing the existing plant material at the presence of four economically most important potato viruses. The paper presents the results of DAS ELISA test on two samples from different locations (plains / mountain). Testing of health quality of potato cultivar Poluranka so far it has not been investigate and it haven't been taken adequate measures to preserve this useful breeding material.

Test usposobljenosti kot del zagotavljanja kakovosti v diagnostičnih laboratorijih

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Izvajanje testov usposobljenosti (ang. »proficiency test«) je eden izmed več načinov zagotavljanja kakovosti diagnostičnih laboratorijev in potrjevanja usposobljenosti za izvajanje diagnostičnih analiz. Temeljijo na primerjavi rezultatov analiz centralno pripravljenih in preverjenih vzorcih med laboratoriji. V Evropi teste usposobljenosti na področju fitodiagnostike od leta 2007 ponuja podjetje FAPAS® (angl. »Food Analysis Performance Assessment Scheme«), od leta 2009 v okviru programa PhytoPAS. V letu 2009 so laboratoriji v več kot desetih testih na področju varstva rastlin opravili skupno 93 testov. V našem laboratoriju smo v okviru FAPAS v preteklih letih uspešno sodelovali pri več testih usposobljenosti za detekcijo rastlinskih patogenih bakterij in virusov kot so *Ralstonia solanacearum*, *Clavibacter michiganensis subsp. sepedonicus*, *Erwinia amylovora*, virus mozaika pepina (PepMV) in virus pegavosti in venenja paradižnika (TSWV). V okviru prispevka bomo predstavili načine zagotavljanja kakovosti ter naše rezultate in izkušnje sodelovanja v testih usposobljenosti.

ABSTRACT

Proficiency tests as a part of quality assurance system and proof of competence for diagnostic laboratories

Proficiency tests are an important part of quality assurance system and offer an independent proof of competence diagnostic testing. It is based on the comparison of laboratories' results in an inter-laboratory trial. Furthermore, the quality of a laboratory's result is checked against criteria that are set independently of the laboratory carrying out

the testing. Since 2007 proficiency tests have been organised by FAPAS® (Food Analysis Performance Assessment Scheme), an international proficiency test provider. In 2009 FAPAS® organised over 10 plant health proficiency tests under the trademark PhytoPAS, distributing 93 individual tests to diagnostic laboratories around the world. We have successfully participated in several proficiency tests in the past years, which included detection of plant pathogenic microorganisms such as *Ralstonia solanacearum*, *Clavibacter michiganensis subsp. sepedonicus*, *Erwinia amylovora*, Pepino mosaic virus (PepMV) and Tomato spot wilt virus (TSWV). In the following article we will present different systems for quality assurance and our experience and results from proficiency tests.

Growth of common ragweed (*Ambrosia artemisiifolia*) on different soil types with various nitrogen supplies

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Common ragweed is one of the most dangerous and allergen weed species in Europe and Hungary. The reason of its wide spreading is very good adaptability to environmental factors. *Ambrosia artemisiifolia* can be found on all soil types, but it multitudinous on brown forest soil and loose sandy soil. Biomass production and seed yield of plants are influenced by nutrient supply, first of all by nitrogen nutrition. Common ragweed is known as a nitrofill plant. Plant species can utilize nitrogen as nitrate or ammonium form. According to early researches there are differences between species according to utilization of nitrogen forms. We had no data's about that how can influence nitrogen forms of growth and biomass production of common ragweed. The aim of our pot experiment was to study the effect of soil type and different nitrogen fertilizers - péti-salt (,ammonium-nitrate + calcium-carbonate), ammonium-nitrate and carbamide - on early growth of *Ambrosia artemisiifolia.* The experiment was set up on meadow soil, sandy soil with acidic pH and Ramann-brown forest soil. We also had control pots without fertilization on all three soil types. Plants grew poorly on settled meadow soil, fresh mass of ten plants was 5.06 g without fertilizers, while on sandy soil was 13.17 g, and on Ramann-brown forest soil was 10.39 g. Height, leaf area and dry mass of plants also staid behind plants grown on other type of soil. Nitrogen treatments increased fresh mass, it was significant in ammonium-nitrate (15.36 g) and carbamide (16.6 g) treatments on sandy soil. Nitrogen forms influenced the examined parameters differently on all three examined soil types.

Slovenski izvleček ni bil predložen.

Competition between crops and weeds in additive experiments

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Most competition studies in agriculture are based on the additive experiments, where two species are grown together. The density of a crop is maintained constant and that of weed species is changed. Additive experiments are commonly used to establish the economic thresholds in a crop. Additive designs are suitable for determination of weed cost in terms of yield loss, and to know what weed(s) is(are) most competitive in a particular crop, or what is the effect of a management practice. Small plot experiments were set up in order to study the effect of velvetleaf (*Abutilon theophrasti*) and Jimsonweed (*Datura stramonium*) density (1, 2, 5 and 10 plants m^{-2}) on sunflower and maize yield, respectively. It was concluded that competition between *A. theophrasti* and sunflower was not considerable, not even at the highest weed density of *A. theophrasti*. Slight (4-7 %), no significant yield losses were observed due to 1-10 *A. theophrasti* m^{-2}. Competitive ability of *D. stramonium* was much more stronger in maize crop. Increasing density of *D. stramonium* the maize yield proportionally decreased. *D. stramonium* at densities of 1, 2, 5 and 10 plant m^{-2} caused 31, 43, 59 and 63 %reduction in maize yield, respectively.

Slovenski izvleček ni bil predložen.

Nadzor izvajanja fitosanitarnih ukrepov za preprečevanje širjenja verticilijske uvelosti hmelja

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Verticilijska uvelost, ki jo povzročata glivi *Verticillium albo-atrum* Reinke et Berthold in *V. dahliae* Klebahn, spada med najpomembnejše bolezni hmelja. Gliva *V. albo-atrum*, povzroča letalno obliko bolezenskih znamenj z odmiranjem rastlin, medtem ko *V. dahliae* povzroča blažjo bolezensko obliko, ki ne zajame propadanja rastlin. V Sloveniji je bila blaga oblika bolezni prvič odkrita leta 1974, letalna oblika pa leta 1997. Prvi večji izbruh letalne oblike bolezni smo odkrili leta 1998, ko so bili izvršeni tudi prvi eradikativni fitosanitarni ukrepi. Od takrat dalje se bolezen redno pojavlja v že okuženih hmeljiščih, prav tako se v omejenem obsegu še vedno širi na nova hmeljišča v Savinjski dolini. Okužba z letalno obliko verticilijske uvelosti se je skupno razširila že na 194 ha hmeljišč, od tega pa je bilo v celoti že uničenih 137 ha. Okužbe rastlin hmelja z letalno obliko

bolezni so omejene na območje Savinjske doline, blaga oblika bolezni pa se pojavlja tudi v ostalih hmeljskih območjih Slovenije. Fitosanitarna inšpekcija, v okviru sistematičnega nadzora, odreja in nadzira izvrševanje fitosanitarnih ukrepov, ki temeljijo na Pravilniku o ukrepih za preprečevanje širjenja in zatiranja hmeljeve uvelosti (Uradni list RS, št. 65/01, 117/02 in 31/04) ter strokovnih priporočilih pooblaščene javne službe zdravstvenega varstva rastlin na Inštitutu za hmeljarstvo in pivovarstvo Slovenije (IHPS). Za učinkovito preprečevanje širjenja okužb je obvezno izvajanje fitosanitarnih ukrepov: uničenje rastlin, začasna prepoved pridelave hmelja v okuženih hmeljiščih ter drugi nujni fitosanitarni ukrepi za preprečevanje širjenja bolezni pri obdelavi hmeljišč kot so npr. kolobarjenje, termična obdelava hmeljevine, razkuževanje orodja itd. Ob pojavu velikega števila okuženih rastlin je nujni ukrep uničenje celotnega hmeljišča. Pri pojavu posameznih okuženih rastlin pa je s fitosanitarnega vidika zadostno uničenje posameznih rastlin z rastlinami pripadajočega varnostnega pasu. Pri nadzoru izvajanja navedenih ukrepov ugotavljamo, da se osveščenost hmeljarjev o nevarnosti bolezni povečuje in da hmeljarji dobro izvajajo navedene fitosanitarne ukrepe. Za neučinkovito izvajanje fitosanitarnih ukrepov Fitosanitarna inšpekcija v skladu s pooblastili izreka sankcije.

ABSTRACT

Inspection over performance of the phytosanitary measures for preventing spreading of verticillium wilt of hops

Verticillium wilt, caused by fungi *Verticillium albo-atrum* Reinke et Berthold and *V. dahliae* Klebahn*,* is one of the most important hop diseases. Fungus *V. albo-atrum* causes lethal disease symptoms with dieback of plants, while *V. dahliae* causes milder disease form, which does not reflect in dieback of the plants. Milder form of the disease was first reported in Slovenia in 1974, while the lethal one in 1997. First wider outbreak was detected in 1998, when the first eradicate phytosanitary measures were performed. Since then the disease is regularly appearing in infected hop fields. It is also spreading into others, still uninfected hop fields in Savinja valley in a limited extend. Infection by the lethal form of the disease has been present on 194 ha of hop fields, 137 ha of them were completely destroyed. Infection by the lethal form of the disease is limited to Savinja valley, while the milder form appears in the other hop growing areas in Slovenia, too. Phytosanitary inspection orders and supervises execution of the phytosanitary measures which base on the Rules of measures for preventing the spread and for suppression of the hop wilt, …(Official Gazette of the RS, No 65/01, 117/02 and 31/04) and on professional recommendations of authorised public service for plant protection at the Slovenian Institute of Hop Research and Brewing. For effective suppression of infection spreading it is obligatory to perform phytosanitary measures: destroying plants, temporary prohibition of hop production in the infected hop fields, and other necessary phytosanitary measures that are made with the goal to prevent disease spreading at soil cultivation, as are field crop rotation, thermic treatment of hop residues, disinfection of tools etc. When lots of infected plants appear, the necessary measure is destroying the whole hop plantation. But, from the phytosanitary point of view it is enough to destroy individual plants with sufficient security area when individual infected plants appear. When performing control of the mentioned measures it is found out that awareness of hop producers about the dangerousness of that disease is increasing and that they are performing the stated phytosanitary measures. For ineffective performance of phytosanitary measures Phytosanitary inspection declares sanctions with regard to authorization.

Migracija ameriškega škržatka (*Scaphoideus titanus* Ball) iz bližnjih vinogradov v trsnico

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Z namenom preučitve nevarnosti širjenja vektorja zlate trsne rumenice z razmnoževalnim materialom trte smo v letu 2009 izvedli raziskavo učinkovitosti tretiranja z insekticidi zoper ameriškega škržatka (*Scaphoideus titanus* Ball) v treh trsnicah v vinorodni deželi Primorska. Zastopanost in nalet ameriškega škržatka smo ugotavljali s pomočjo rumenih lepljivih plošč, ki so bile postavljene na 3 enakomernih dolžinah od roba trsnice in vinogradov v 3 vzporednih ponovitvah. S postavitvijo plošč v enakomernih oddaljenostih od roba trsnice in vinogradov smo želeli ugotoviti morebitni gradient naleta. Z monitoringom naleta smo začeli v 5. stadiju ličinke (sredi junija) in ga zaključili v prvi dekadi oktobra. Tretiranje z insekticidom je bilo izvedeno dvakrat v trsnici, skladno z navodili za uporabo insketicida in z obstoječimi navodili za zatiranje ameriškega škržatka. Populacija ameriškega škržatka v vinogradih je bila na vseh treh lokacijah visoka, kar predstavlja velik migracijski potecial vektorja proti trsnicam. Navkljub visoki populaciji v bližnjih vinogradih je bilo število ujetih škržatkov v trsnicah na lokaciji Slap in Lože nizko. Število ujetih osebkov na lokaciji Poreče je bilo kljub tretiranju z insekticidom visoko. Vzrok za to gre iskati v neprimernem času tretiranja z insekticidom ali v dodatnem naletu ameriškega škržatka iz bližnjih vinogradov. Sama razdalja med trsnico in vinogradom ni vplivala na število ujetih škržatkov v trsnici.

ABSTRACT

Immigration of *Scaphoideus titanus* Ball from surrounding vineyards into a nursery

In order to determining the risk of Flavescence doree vector spreading with the planting material, a one year study of insecticide treatment efficacy against *Scaphoideus titanus* Ball (ST) were managed in three nurseries in Primorska winegrowing region. The presence of ST was monitored with yellow sticky traps, which were posted on 3 distances in nurseries and nearby vineyards on 3 parallel lines (replicates). Traps were equal disposed from the nursery and vineyard border in order to determine provisional distance gradient. A monitoring started up at the latest nymphal stages (middle of June) and terminated in October. Insecticide treatments have been applied in nurseries, according to national practices. On all plots the population level of ST in vineyards was relatively high, which means a grate immigration potential of the vector towards nurseries. In two locations, catches have been very low in the nursery plots although high numbers of ST adults have been caught in the adjacent untreated vineyards. In one plot, insecticide treatments have not been sufficient to avoid important catches in the nursery. This could be related with sub-optimal timing of the 1st insecticide treatment and/or with an immigration of adults from 2 nearby untreated vineyards located at a distance of 70 and 150 m.

Razširjenost RBDV na vinski trti v Sloveniji

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V letu 2001 so kolegi iz svetovalne službe na cepljenkah sorte 'laški rizling' na Primorskem opazili močan pojav za vinsko trto nenavadnih bolezenskih znamenj. Na posameznih listih so se pojavljali nepravilni rumeni vzorci in/ali močno rumenenje. Podobna bolezenska znamenja smo opazili tudi v naslednjem letu na cepljenkah sort 'laški rizling' in 'štajerska belina'. Virus smo v laboratoriju na Kmetijskem inštitutu Slovenije identificirali kot virus razraščanja in pritlikavosti malin (*Raspberry bushy dwarf virus* - RBDV), ki do tedaj še ni bil najden na vinski trti. Od odkritja smo na območju Slovenije analizirali že preko 2000 vzorcev vinske trte različnih sort. Okužbo z RBDV smo potrdili na številnih belih in rdečih vinskih sortah. Med njimi so sorte 'cabernet sauvignon', 'chardonnay', 'kraljevina', 'laški rizling', 'malvazija', 'modra frankinja', 'modri pinot', 'radgonska ranina', 'renski rizling', 'rizvanec', 'sauvignon', 'šipon', 'štajerska belina', 'tokaj', 'traminec' in 'zweigeld'. V vinorodni deželi Primorska smo vzorčili v vseh štirih vinorodnih okoliših, vendar smo okužbo z RBDV potrdili le na območju Vipavske doline, v Vrhpolju in neposredni okolici. V vinorodnih deželah Podravje in Posavje pa je virus splošno razširjen.

ABSTRACT

Distribution of RBDV in grapevine in Slovenia

Unusual virus-like symptoms were observed on grapevine grafts of cv. Laški Rizling by extension service in 2001. Some leaves showed yellow line patterns and/or yellowing. Similar symptoms were observed next year on grapevine grafts of cvs. Laški Rizling and Štajerska belina. In the laboratory at Agricultural Institute of Slovenia the virus was identified as *Raspberry bushy dwarf virus* (RBDV). This was the first finding of RBDV in non-*Rubus* host. Since the virus identification in grapevine in 2003 more than 2000 grapevine samples of different varieties were analysed for the presence of RBDV. RBDV infection was confirmed in several white and red grapevine varieties including Cabernet Sauvignon, Chardonnay, Kraljevina, Laški Rizling, Malvazija, Modra Frankinja, Modri Pinot, Radgonska Ranina, Renski Rizling, Rizvanec, Sauvignon, Šipon, Štajerska belina, Tokaj, Traminec and Zweigeld. In Primorska winegrowing region RBDV infection was found only in Vipava valley around Vrhpolje but the virus is widespread in winegrowing regions Podravje and Posavje.

Detekcija in kvantifikacija virusa pahljačavosti listov vinske trte (GFLV) z metodo obratnega prepisovanja in verižne reakcije s polimerazo v realnem času (RT-qPCR) v enem koraku

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Virus pahljačavosti listov vinske trte (*Grapevine fanleaf virus*, GFLV) povzroča bolezen imenovano kužna izrojenost vinske trte. Zanesljivo določanje GFLV je nujno za proizvodnjo certificiranega zdravega sadilnega materiala in za učinkovito omejevanje širjenja GFLV. Standardna metoda za določanje GFLV je test ELISA, ki pa ni dovolj občutljiv za zaznavanje nizkih koncentracij virusa. Razvili smo novo metodo za določanje zastopanosti in količine GFLV, ki temelji na obratnem prepisovanju in verižni reakciji s polimerazo v realnem času v enem koraku (RT-qPCR) ohranjenega področja molekule RNA2 GFLV. Specifičnost metode smo preverili na izolatih GFLV iz različnih lokacij v Evropi in Kaliforniji, na drugih virusih, ki okužujejo vinsko trto, in na zdravih rastlinah. Za relativno kvantifikacijo GFLV v floemu smo izbrali kontrolne gene za normalizacijo in preverili stabilnost njihovega izražanja. Občutljivost novo razvite metode je približno 1000-krat večja kot občutljivost testa ELISA in v reakciji zanesljivo določi najmanj 10 kopij genoma GFLV. Novo razvita metoda je enostavno uporabna za določanje GFLV pri velikem številu vzorcev in v različnih tipih rastlinskega materiala, vključno s floemom dormantnih rozg. Poleg tega je novo razvita metoda uporabna tudi za relativno kvantifikacijo GFLV.

ABSTRACT

One-step RT real-time PCR assay for the detection and quantification of *Grapevine fanleaf virus* (GFLV)

GFLV is the causal agent of the fanleaf degeneration disease on grapevines. Correct diagnosis is essential for the production of certified pathogen-free propagation material and for the effective control of GFLV spreading. ELISA is the standard procedure for GFLV diagnostics, which lacking the sensitivity required for the detection of low virus concentrations. In this study, a one-step RT-qPCR assay was developed for the specific detection of GFLV, targeting a conserved region within GFLV RNA2 molecule. The assay specificity was evaluated on GFLV isolates from a wide range of geographical locations in Europe and California and also on all other viruses infecting grapevines, as well as on healthy plants. For relative quantification of GFLV in phloem, control genes for normalisation were selected and their stability of expression was validated. The sensitivity of the developed assay was approximately 1000-fold higher than the sensitivity of the conventional ELISA test, reliably detecting down to 10 genome copies of GFLV per reaction. The newly developed method is also easily applicable for high-throughput diagnosis of GFLV in different types of plant material including dormant phloem scrapings. Complementary to ELISA or other methods it can also be used for relative quantification of GFLV virus.

Izpiranje izbranih herbicidov v koruzi na območju Apaške doline - ocenjeno z modelom PELMO

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Model FOCUS PELMO 3.3.2 spada med uveljavljene modele za ocenjevanje tveganja izpiranja fitofarmacevtskih sredstev (FFS) in se uporablja tudi za namen registracije FFS v državah članicah EU. Z modelom PELMO 3.2.2 smo ocenjevali možnost izpiranja treh izbranih herbicidnih pripravkov (Lumax, Primextra Gold 720 SC in Primextra 500 tekoči) na območju Apaške doline. Za ocenjevanje smo namesto standardnih FOCUS scenarijev, vključenih v model, uporabili specifične (»lastne«) podatke s preučevanega območja: klimatske podatke z meteorološke postaje Murska Sobota (20-letni dnevni podatki: količina padavin, potencialna evapotranspiracija, temperatura zraka, relativna zračna vlaga) in pedološke podatke 19 talnih profilov (globina, horizonti, volumska gostota, tekstura, vsebnost organske snovi, pH). Uporabili smo največje dovoljene odmerke priravkov oz. aktivnih snovi, ki so se (atrazin) oz. se še (terbutilazin, metolaklor) uporabljajo za zatiranje plevelov v koruzi na izbranem območju. Izračuni so pokazali največji potencial izpranja pri atrazinu, sledi terbutilazin, medtem ko izpiranja S-metolaklora ob zgoraj omenjenih vhodnih podatkih nismo zaznali. To lahko pripišemo najvišjemu odmerku nanosa atrazina kot tudi nizkemu porazdelitvenemu koeficientu (K_{OC}) ter razmeroma dolgi razpolovni dobi te aktivne snovi. Ocenjene koncentracije izpranega atrazina in terbutilazina v odcednih vodah na dnu profilov kažejo na veliko variabilnost med posameznimi profili, tudi znotraj pedokartografskih enot (PKE), čemur je v prihodnje potrebno nameniti več pozornosti z namenom zmanjševanja izgub FFS v podtalnico.

ABSTRACT

Leaching of selected herbicides used in maize in the Apače Valley area - estimated by model PELMO

Model FOCUS Pelmo 3.3.2 is one of the widely used models for predicting pesticide leaching and can be used also for the pesticide registration purposes in the EU Member States. The leaching potential for the three selected herbicides (Lumax Primextra Gold 720 SC, and 500 Primextra liquid) was estimated in the Apače Valley area. Instead of the standard FOCUS scenarios, which are included in the model, we have used site specific data from the studied area: climate data from meteorological stations Murska Sobota (20 year daily data: rainfall, potential evapotranspiration, air temperature, relative humidity), and soil data of 19 profiles (soil depth, horizons, bulk density, texture, organic matter content, pH). We considered the maximal allowed dose of plant protection products or active substances (atrazine, terbuthylazine, metolachlor) which have been used for weeds control in maize in the selected area. Calculations show the greatest leaching potential for atrazine, then for terbuthylazine, while leaching of S-metolachlor was calculated to be bellow detection. Results can be explained with the highest application dose for atrazine, as well as its low partition coefficient (K_{OC} value), and the relatively long half-life. Estimated concentrations of atrazine and terbuthylazine in percolated waters at the bottom of the soil profiles show a large variation between individual profiles, even within

the same soil map units (SMU), which needs more attention in the future for reducing pesticide losses to groundwater.

Izpiranje, površinski odtok in zanašanje izbranih herbicidov v koruzi na območju Apaške doline - ocenjeno z orodjem FOOT-FS

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Novo računalniško orodje FOOT-FS, ki je že pripravljeno za uporabo v slovenskem jeziku, je namenjeno kmetijskim svetovalcem, kmetovalcem, agronomom in drugim, ki želijo na ravni posestva (kmetije) ocenjevati tveganja prenosov fitofarmacevtskih sredstev v površinske vode in podtalnico. Orodje je tako v pomoč pri razvoju okolju prijaznih strategij uporabe fitofarmacevtskih sredstev na kmetiji, saj identificira ravnanja in poti prenosa, ki najbolj prispevajo k onesnaženju vodnih virov. Poleg tega uporabniku poda krajevno specifična priporočila za dobro kmetijsko prakso in možne omilitvene ukrepe, ki zmanjšujejo prenose fitofarmacevtskih sredstev v sosednje ekosisteme. Predstavili bomo orodje FOOT-FS in rezultate testiranj orodja na območju Apaške doline.

ABSTRACT

Leaching, surface runoff and drift of selected herbicides used in maize in the Apače Valley area - estimated by FOOT-FS tool

The new FOOT-FS software tool, which is already prepared for the use in Slovenian language, is designed for extension advisers, farmers, agronomists and others interested in evaluating the risks, at the field scale, of pesticides polluting surface and ground waters. It aims to assist in the development of environmentally sound pesticide strategies for the farm by identifying the activities and pathways that most contribute to the contamination of water resources. It also provides site-specific recommendations for best practice and mitigation options to limit transfers of pesticides in the neighbour ecosystems. FOOT-FS tool and results of testing the tool in the Apače Valley will be presented.

Primerjava različnih izvedb šob glede kakovosti nanosa FFS na krompirju (*Solanum tuberosum* L.)

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V letu 2009 smo v poskusu ugotavljali odstotek pokritosti in število odtisov kapljic na cm^2 na rastlini krompirja pri uporabi 4 različnih izvedb šob. Uporabili smo standardne špranjaste šobe Lechler ST 110-03, standardne vrtinčne šobe Lechler TR 80-03 C,

injektorske špranjaste šobe z enojnim curkom Lechler IDK 120-03 C in injektorske špranjaste šobe z dvojnim curkom Albuz AVI-TWIN 110-03. Poraba vode je znašala 400 l/ha pri vozni hitrosti 4,1 km/h in tlaku 4,0 bara. Glede pokritosti na celotni rastlini krompirja je navzgor odstopala injektorska šoba IDK, glede števila odtisov kapljic na cm^2 pa šoba TR. Injektorska špranjasta šoba z dvojnim curkom AVI-TWIN ni pokazala boljše kakovosti nanosa od ostalih izvedb šob.

ABSTRACT

Comparison of different nozzle types regarding the coverage quality of phyto-pharmaceutical products on potato (*Solanum tuberosum* L.)

In the year 2009, the coverage value and the droplet impression number per cm^2 were determined on the potato plant by using 4 different nozzle types. Standard Lechler ST 110-03 flat spray nozzles, standard Lechler TR 80-03 C hollow cone nozzles, Lechler IDK 120-03 C flat spray injector nozzles with a single spraying jet and Albuz AVI-TWIN 110-03 flat spray injector nozzles with a double spraying jet were used in the trial. Spray volume amounted to 400 l/ha at the speed of 4.1 km/h and the pressure of 4.0 bars. The IDK injector nozzle reached the best results in view of the coverage value of the entire potato plant, while the TR nozzle stood out in the droplet impression number per cm^2. The AVI-TWIN injector nozzle did not show a better application quality on potato crops in comparison with the other nozzle types.

"Risk envelope" approach for the registration of plant protection products within the EU with focus on member states in the Central Zone – current experiences

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For registration of plant protection products (PPP) in the EU at national level the draft Registration Report (dRR) for applicant submissions has been introduced. Within this registration report the "risk envelope" approach has been proposed when performing exposure and risk assessments. Aim of this approach is to define a critical use that covers all uses required across the zone and reflects the worst case assessment in each technical area. This should minimise the number of individual uses assessed and, furthermore, maximise the value and relevance of the core assessment to all MS. It also reduces duplication of work for both applicants and competent authorities. This approach can be applied within the products, within a group of products and across the zone. According to the new directive 1107/2009 EEC, there are 13 countries in the Central Zone, including Slovenia. The rapporteur MS in a zone evaluates a core assessment, which can then be used by other MS in the zone as a basis for their national assessment. It is recommended to perform the risk assessment based on the critical GAP/risk envelope approach. However, it is not always possible to define the risk envelope for all areas of the assessment requirements, being especially difficult for the exposure assessment within the environmental fate section. Due to a large number of factors and processes determining fate and behaviour of the substance and its metabolites in environmental compartments it turned out in several cases that the definition of critical/worst case uses representative for all MS within the zone is challenging. Examples for difficulties to determine a risk

envelope from the perspective of environmental fate will be presented based on current experience.

Slovenski izvleček ni bil predložen.

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