



Skupščina DVRS

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Potencialni znaki invazivnosti in njihova uporabnost za prilagoditev ukrepov zatiranja pelinolistne ambrozije (*A. artemisiifolia* L.)

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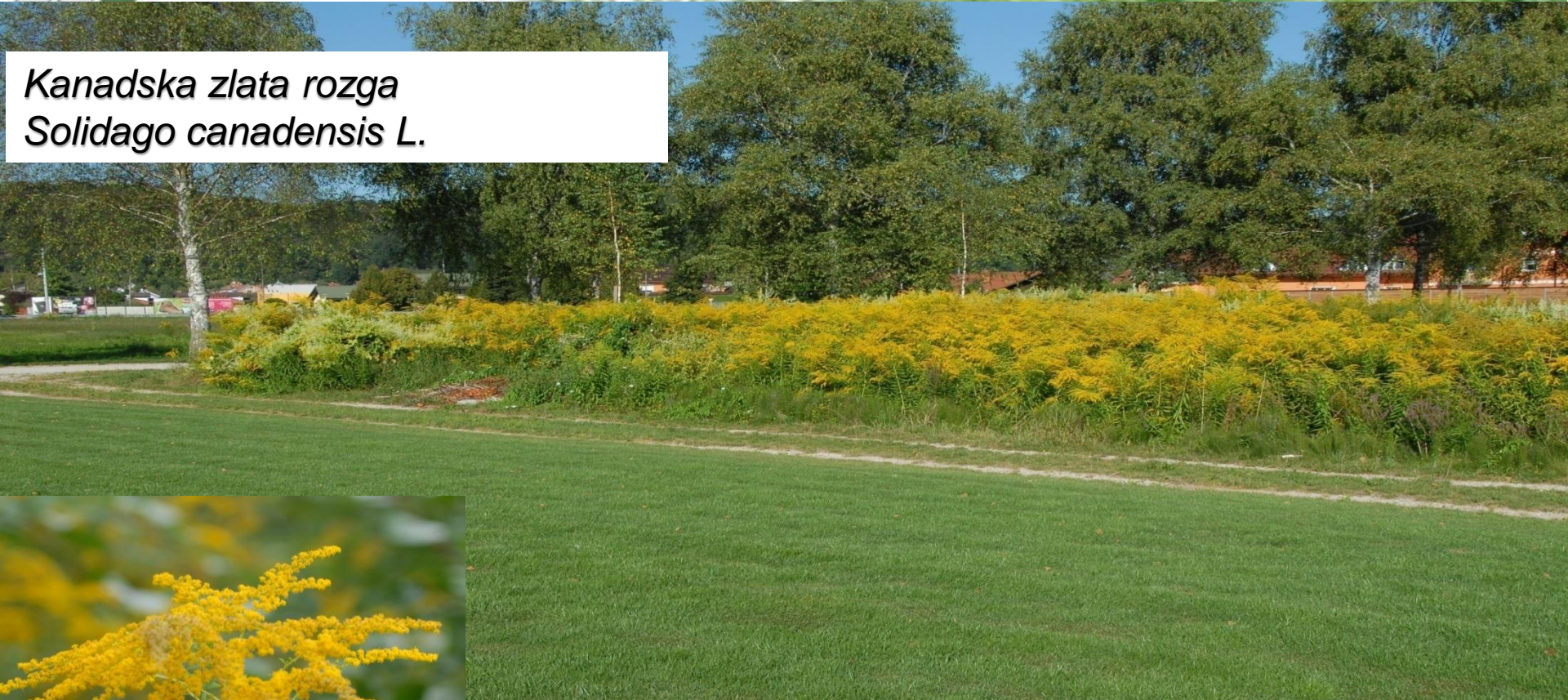


Uvod

- Rastlinske vrste, ki jih je v novo okolje, v katerem prej niso bile prisotne, naselil človek, imenujemo tujerodne vrste.
- Tiste tujerodne, ki (potencialno lahko) povzročajo gospodarsko škodo imenujemo invazivne tujerodne rastline (IAS).
- Kljub temu, da veliko rastlinskih vrst vstopi v prvo fazo invazivnega procesa, to je vnos v novo okolje, se večina rastlinskih vrst (99 %) ne začne širiti in uveljavljati v novem okolju.
- Povzročene gospodarske škode so izgube pridelkov, spremembe in uničenje naravnih habitatov, zdravstvena škoda povzročena ljudem (poslabšanje kvalitete vode, alergije) in živalim (zastrupitve).
- V ZDA namenijo za zdravljenje senenega nahoda 3,4 milijarde USD
- V Nemčiji je ocenjen strošek zdravljenja astme povzročene s pelodom pelinolistne ambrozije ocenjen na 24,5 milijonov €.



Kanadska zlata rozga
Solidago canadensis L.





Žlezava nedotika
Impatiens glandulifera Royle





Oljna bučka

Echinocystis lobata (Michx.) Torr. et Gray



Japonski dresnik
Reynoutria japonica Houtt.





Trikrpata ambrozija
Ambrosia trifida L.





Opis rastline

Morfologija

- **družina:** asteraceae, enoletnica
- **steblo:** pokončno, dlakavo
- **listi:** izmenično peresasto deljeni
- **višina:** 30 -90 cm (do 2 m)
- **cveti:** od julija do prve zmrzali
- **cvetovi:** moški, ženski. Ogromna količina peloda
- **semena:** 2 mm, od 6.000-60.000
razmnoževanje samo s semeni



Artemisia vulgaris L.
navadni pelin

Tanacetum vulgare L.
navadni vratič



Ekološki profil rastline

Podatki iz literature o ekologiji pelinolistne ambrozije:

- Visoka kalivost: 90 % v širokem temperaturnem razponu 5-40 °C
- Ne kali globlje od 10 cm, vendar ohranja dolgotrajno obstojnost semena v tleh: 30-35 let
- Prilagojena na različne talne tipe (lahka do težja tla, mokra do suha) in širok razpon pH 4-9.
- Tolerantna na pomanjkanja hranil, vode, visoke koncentracije soli in težkih kovin v tleh.
- Alelopatski vpliv na sosednje rastline.
- Sposobna formiranja mikoriznih simbiotskih povezav-AMF.





Čas cvetenja najpomembnejših alergenov

J F M A M J J A S O N D



leska, jelša

breza, jesen

trave, pelin

Ambrosia





Uvod

Pelinolistna ambrozija se širi v različne habitate, z različnimi dostopnostmi virov.

Obdelovalne površine:

- Koruza
- Žita
- Sončnice
- Sladkorna pesa
- Buče
- Soja itd





Nekmetijske površine





Uvod

Širitev ambrozije v tako različne habitate naj bi ji omogočali mehanizmi, ki imajo za posledico prilagoditev funkcionalnih znakov na različne ekološke pogoje:

- EICA-Evolucija povečane kompeticijske sposobnosti)
- ERH ("pobeg" pred škodljivci)
- EMH (Povečana mutualistična facilitacija)
- Komplementarnost niš
- Učinkovitost izrabe hranil
- Fenotipska plastičnost

Obstoj posameznega mehanizma je potrebno dokazati v primerjalnih rastnih poskusih (ponavadi med samoniklo in invazivno vrsto).





Hipoteze:

- V poljskih in lončnih poskusih nameravamo ovrednotiti funkcionalne znake preučevane invazivne rastline in njihov odziv na spreminjajoče se dostopnosti hranil (dušik), vode in kompeticije.
- Določiti plastičnost odziva funkcionalnih znakov pri različni dostopnosti virov ter v pogojih znotrajvrstne (intra-) in medvrstne (interspecifične) kompeticije.
- Oceniti njeno kompeticijsko sposobnost glede na relativno rast (RGR), porazdelitev (particijo) in premeščanje (alokacijo) suhe snovi.
- Določiti njene fiziološke rastlinske znake: velikost fotosinteze, učinkovitost izrabe dušika (NUE) in učinkovitost izrabe vode (WUE) pri različni dostopnosti virov.





Materiali in metode

Med leti 2008-2011 so bili izvedeni poljski in lončni poskusi.

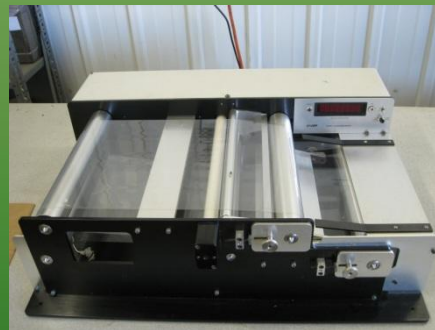
- Poljski poskus: 3 ravni dušika (N) (poljska raven, 100 kg N/ha and 200 kg N/ha) in 3 gostote (1.3/m² - nizka, 6.6/m² - srednja and 13.6/m² - visoka).
- Lončni poskus: 3 ravni dušika (N) (10, 50 and 100 kg N/ha), 2 ravni vode (40 and 80 % WHC) in 3 stopnje kompeticije. Jakosti kompeticije: brez, srednja (1:1) in visoka kompeticija (1:5), kjer je bil za kompetitorja izbrana mnogocvetna ljuljka (*Lolium multiflorum* L.)





Materiali in metode

- Destruktivna vzorčenja (meritve) v različnih fenofazah z merjenjem znakov: suhe mase listov, stebel, skupne suhe mase, listne površine (LA), socvetja, produkcije semena...
- Meritve fotosinteze v različnih razvojnih stadijih (V16, V18, V20) in izračun trenutnih vrednosti WUE.
- Lončni poskus: 2 ravni dušika (N) (10 and 100 kg N/ha) in 2 ravni vode (40 % in 80 % WHC v loncih). Na podlagi privzema N in porabe vode na enoto suhe snovi so bile izračunane vrednosti učinkovitosti izrabe dušika (NUE) in vode (WUE).

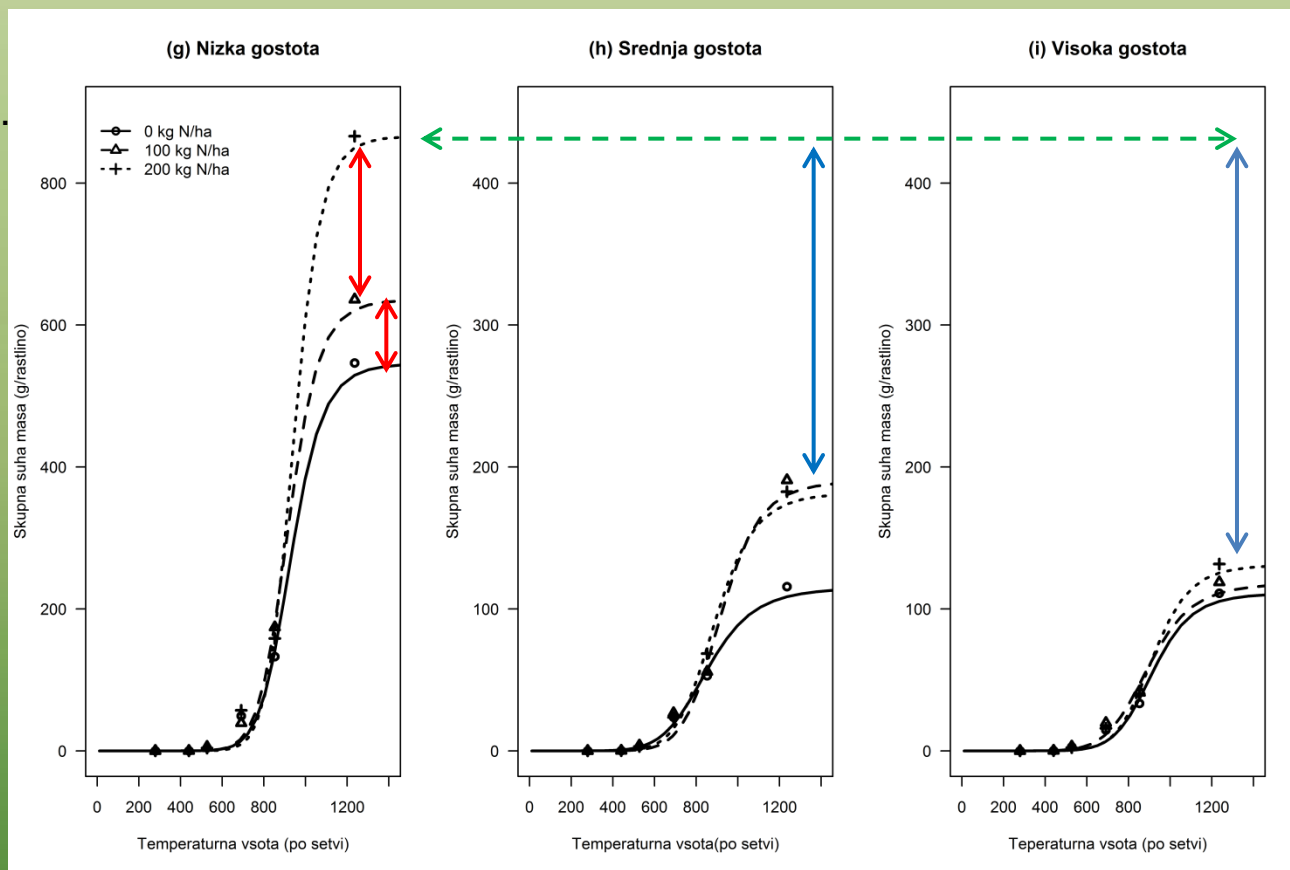




Rezultati

Poljski poskus z N in gostoto

- Plastičen odziv nadzemne suhe mase na dostopnost N.
- Močno zmanjšanje vseh rastlinskih znakov pod vplivom intraspecifične kompeticije.

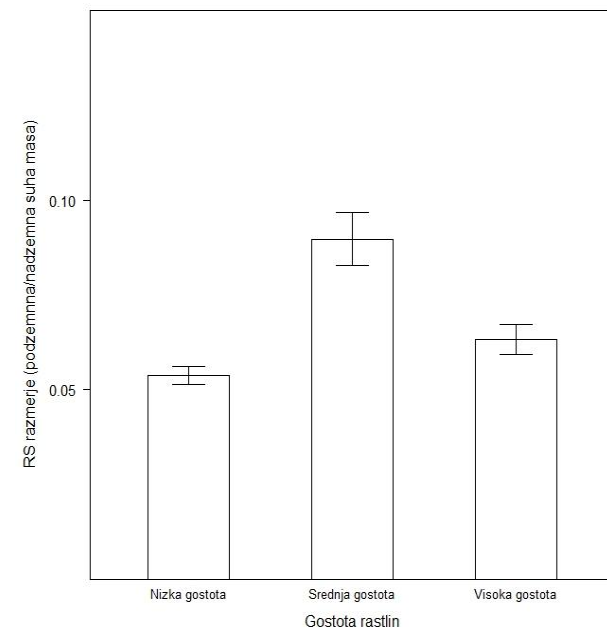
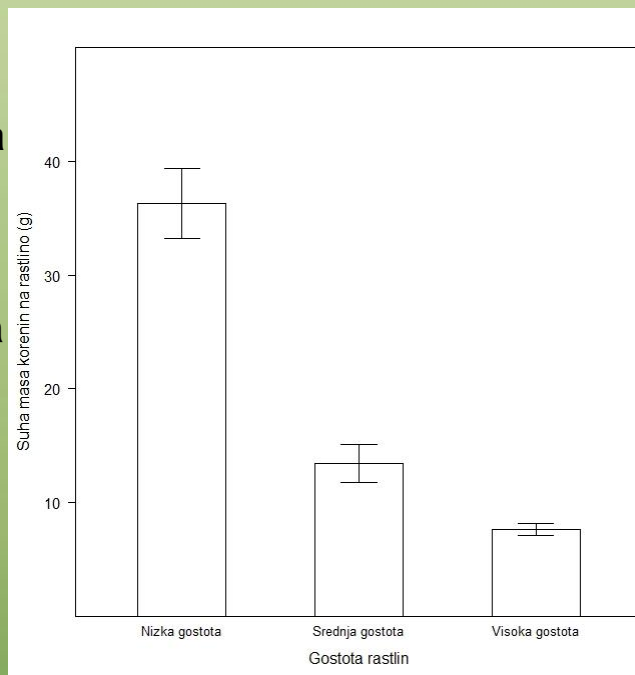




Rezultati

Poljski poskus z N in gostoto

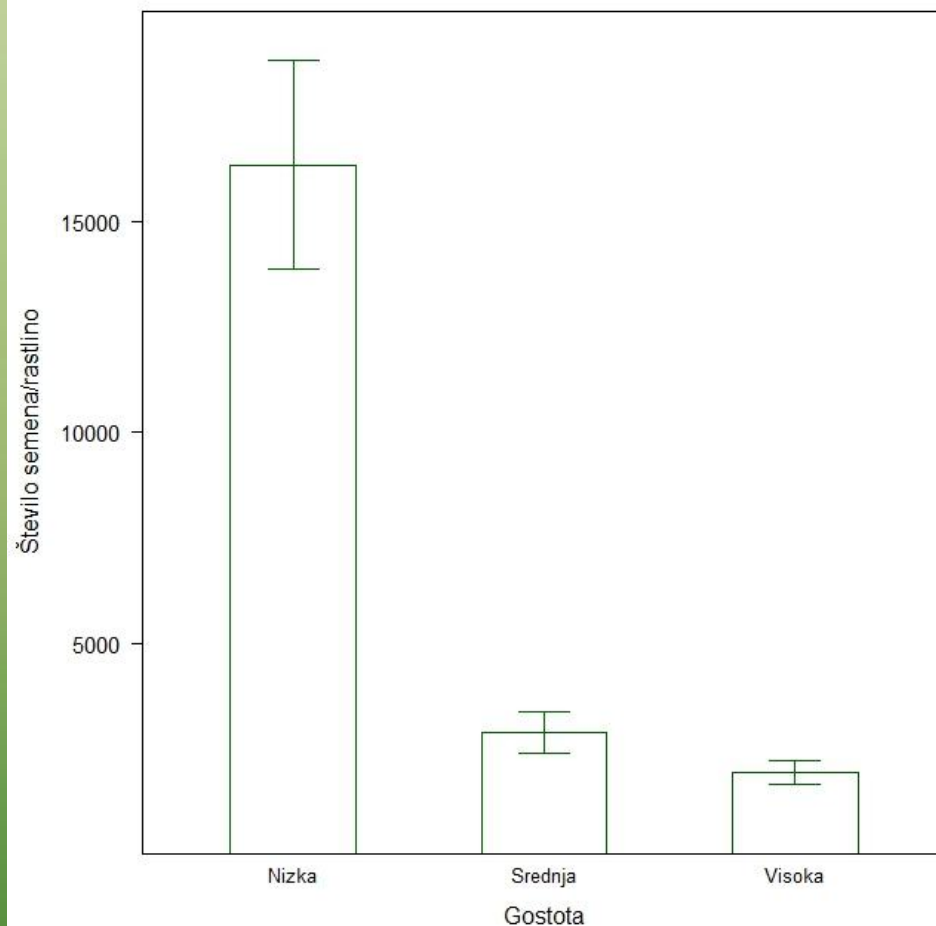
- Dostopnost dušika ni imela vpliv na produkcijo suhe mase korenin.
- Jakost kompeticije je imela močnejši učinek v nadzemnem delu v primerjavi s podzemnim delom.





Produkcija semena

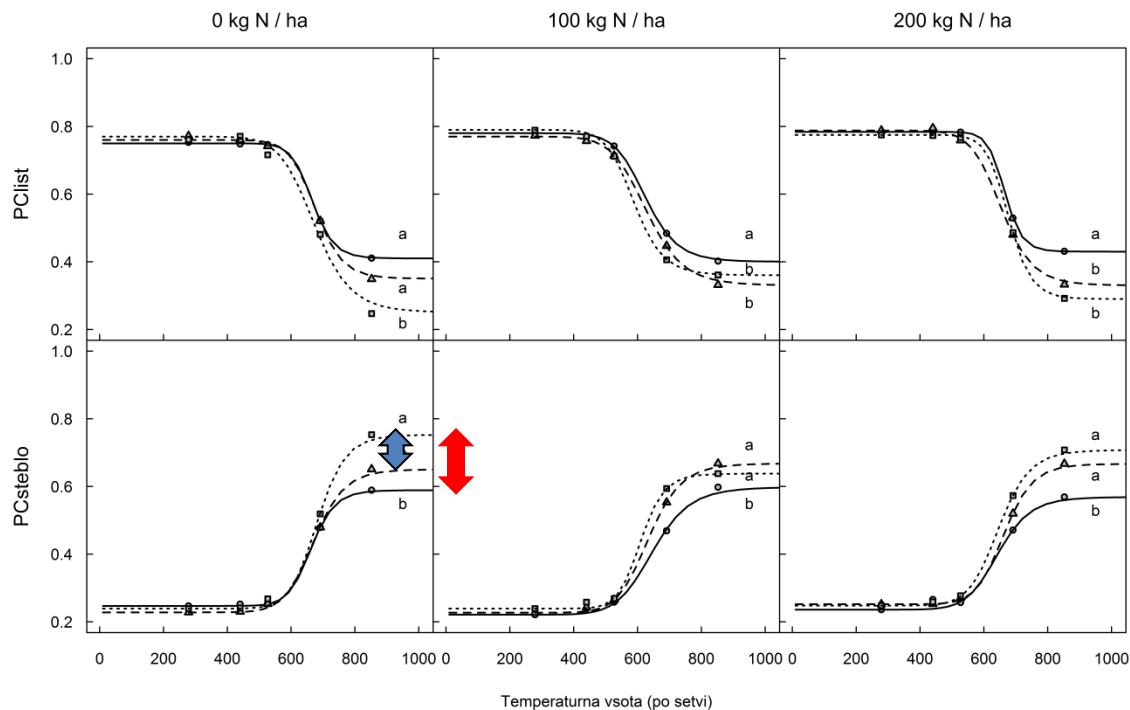
- Posamezne rastline lahko proizvedejo do 20.000 semen na rastlino.
- Povečana dostopnost N ni imela vpliv na produkcijo semena.
- Znotrajvrstna (intraspecifična) kompeticija je zmanjšala produkcijo semena na rastlino, toda število semena na površino (m^2) je bilo podobno.





Porazdelitev suhe snovi

- $PC_{(list, steblo)} = \Delta W_{(list, steblo)} / \Delta W_{rastlina}$
- Dostopnost N ni imela vpliva na PC_{list} in PC_{steblo}
- PC_{list} se je zmanjšal in PC_{steblo} povečal z naraščajočo gostoto (intraspecifično kompeticijo).

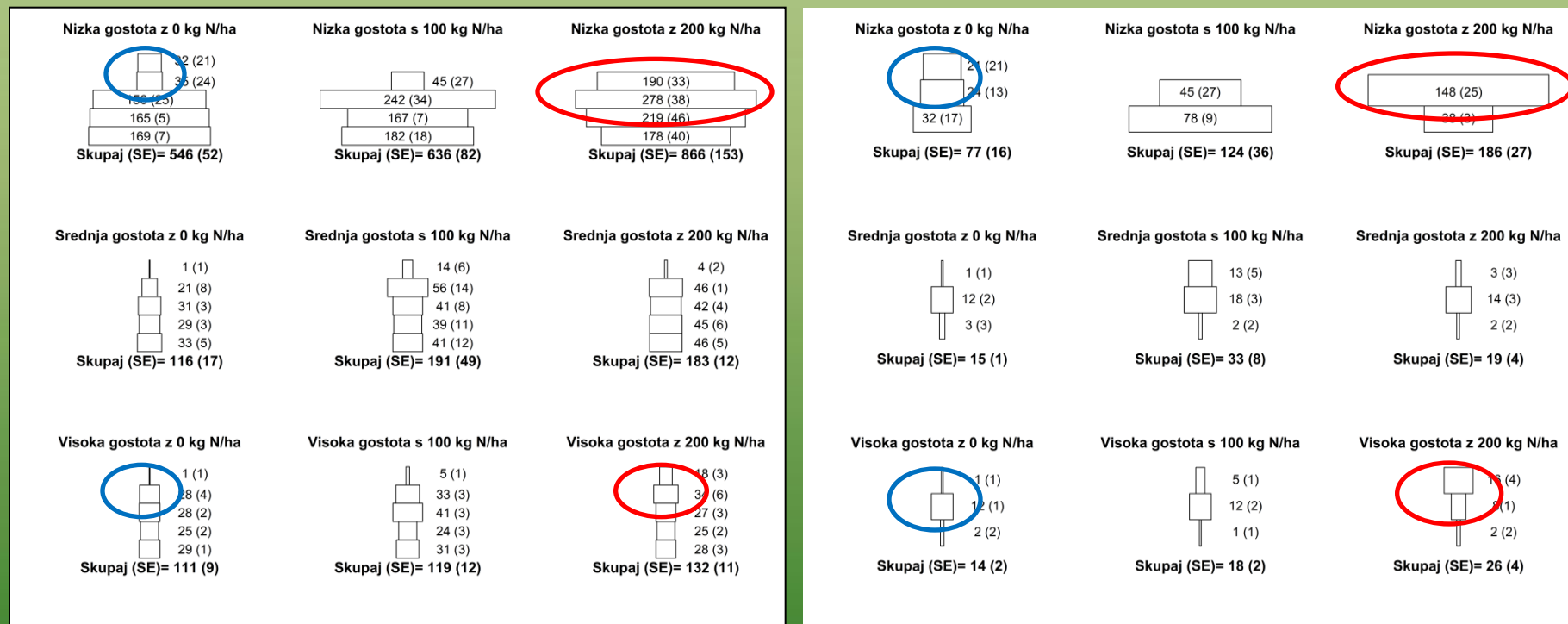


—○— Brez kompeticije -△- Srednja kompeticija ···□··· Visoka kompeticija



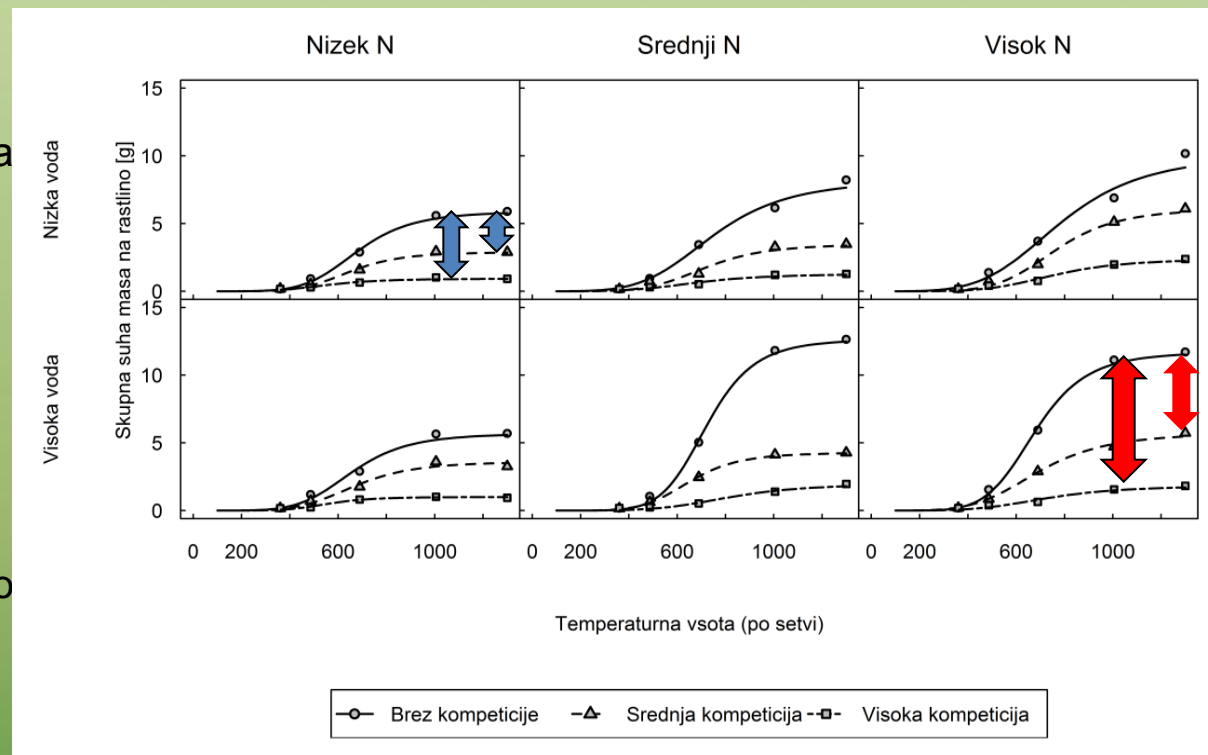
Premeščanje suhe snovi

- Dodajanje dušika je vplivalo na vertikalno distribucijo suhe mase listov, stebel in socvetij, pri čemer se je suha masa premestila v zgornje dele rastline.



Vpliv N, vode in kompeticije na produkcijo skupne suhe snovi

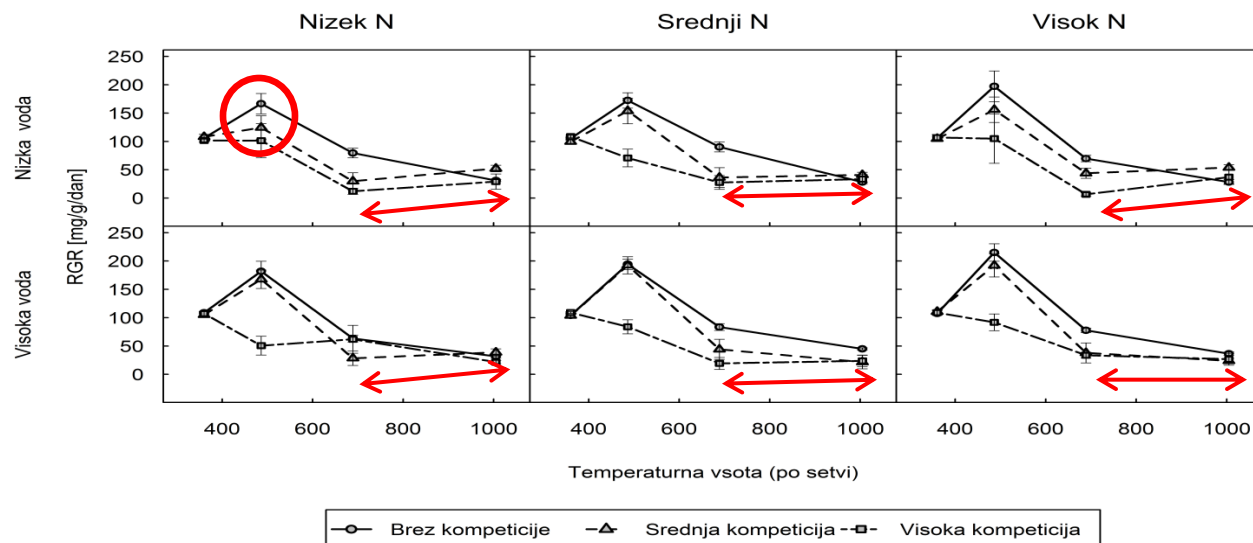
- Produkcija suhe snovi je bila močno zmanjšana zaradi vpliva kompeticije s strani mnogocvetne ljujke.
- Večja dostopnost virov je povečala kompeticijski učinek.
- Produkcija suhe snovi pelinolistne ambrozije pri višji dostopnosti virov se je relativno bolj zmanjšala v primerjavi z ambrozije brez vpliva kompeticije.





Vpliv N, vode in kompeticije na relativno rast (RGR)

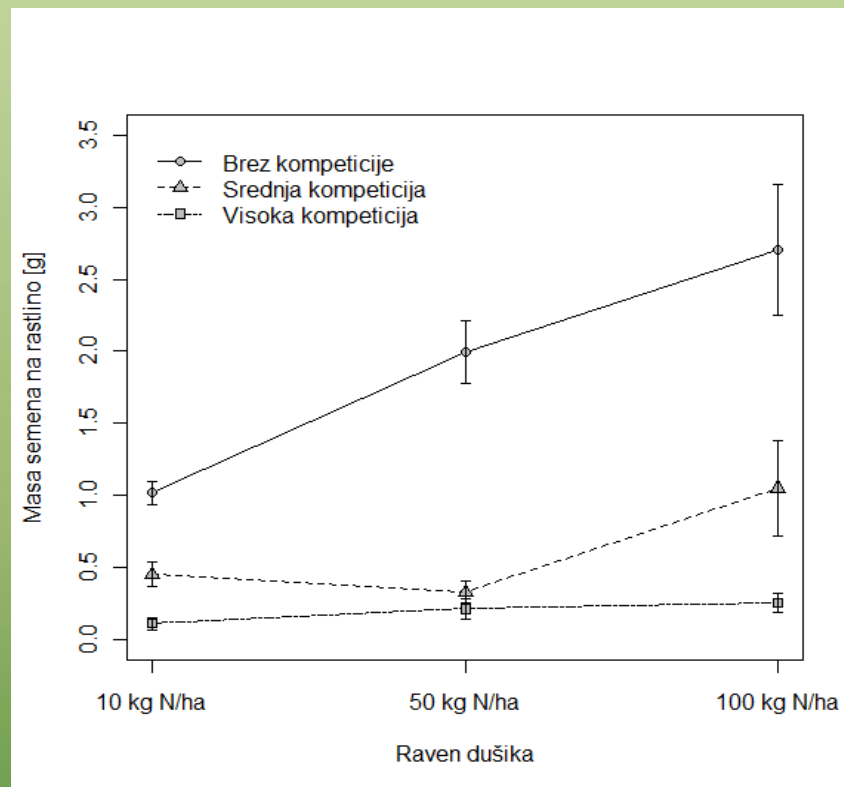
- Najvišja RGR je bila ugotovljena v zgodnji vegetativni fazi V10.
- Dostopnost N ni imela vpliva na RGR.
- V obdobju pred cvetenje je pelinolistna ambrozija povišala RGR s premestitvijo suhe snovi v reproduktivne organe.





Vpliv N in kompeticije na produkcijo semena

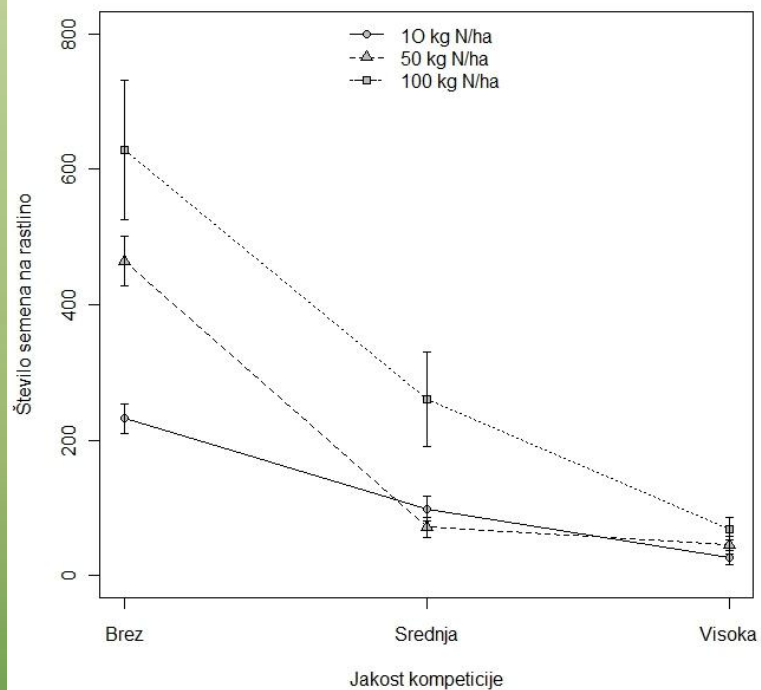
- Dostopnost N je imela vpliv na produkcijo semena samo v sestojih brez kompeticije.





Vpliv N, kompeticije na produkcijo semena

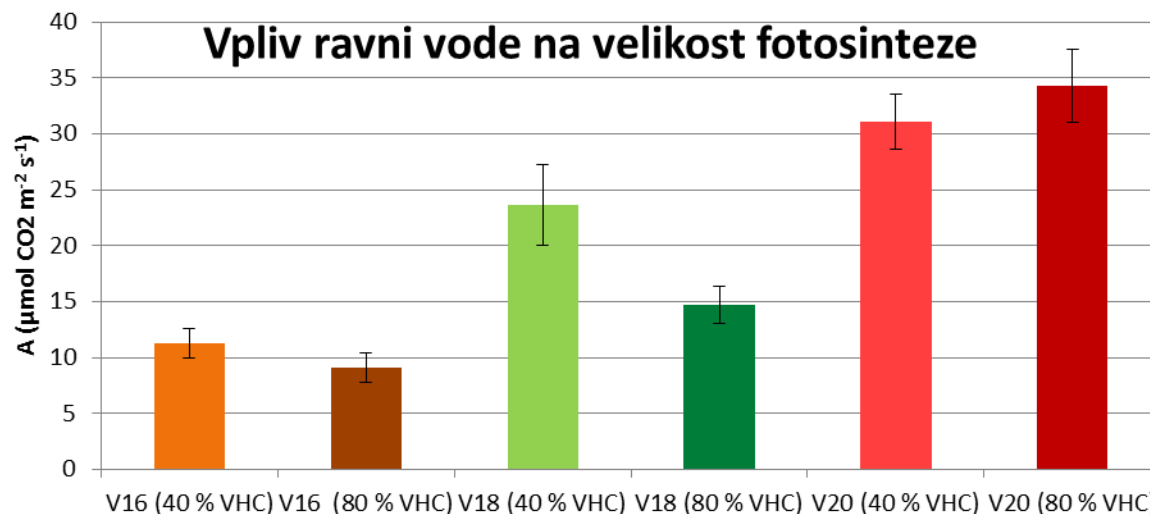
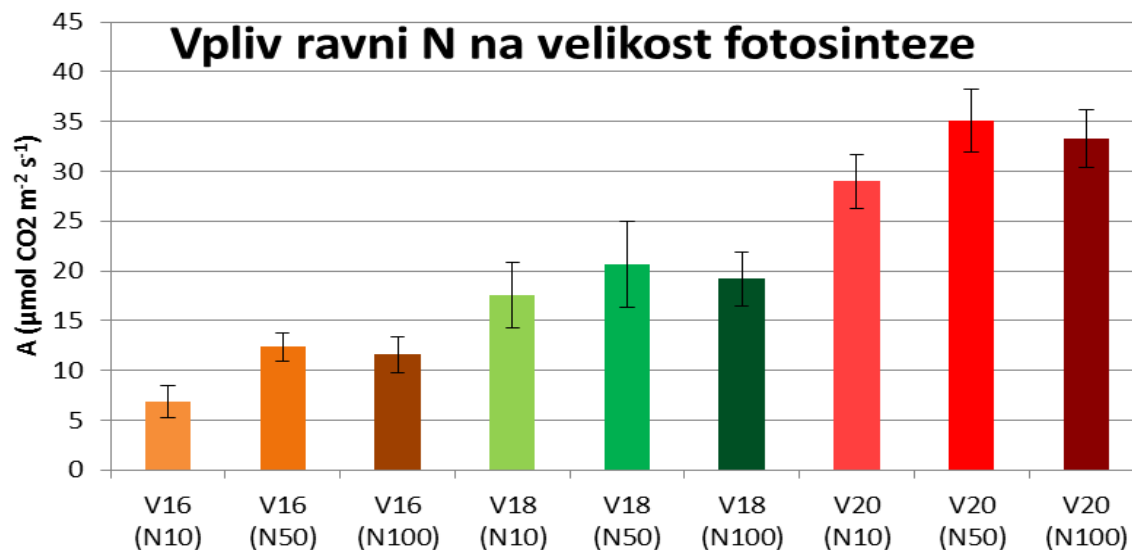
- V visoki kompeticiji se je produkcija suhe mase na rastlino zmanjšala za 83 % in število semen za 95 %. Kljub močnemu vplivu kompeticije in zmanjšanju števila semena so posamezne rastline proizvedle do 70 semen.





Vpliv N in vode na fotosintezo

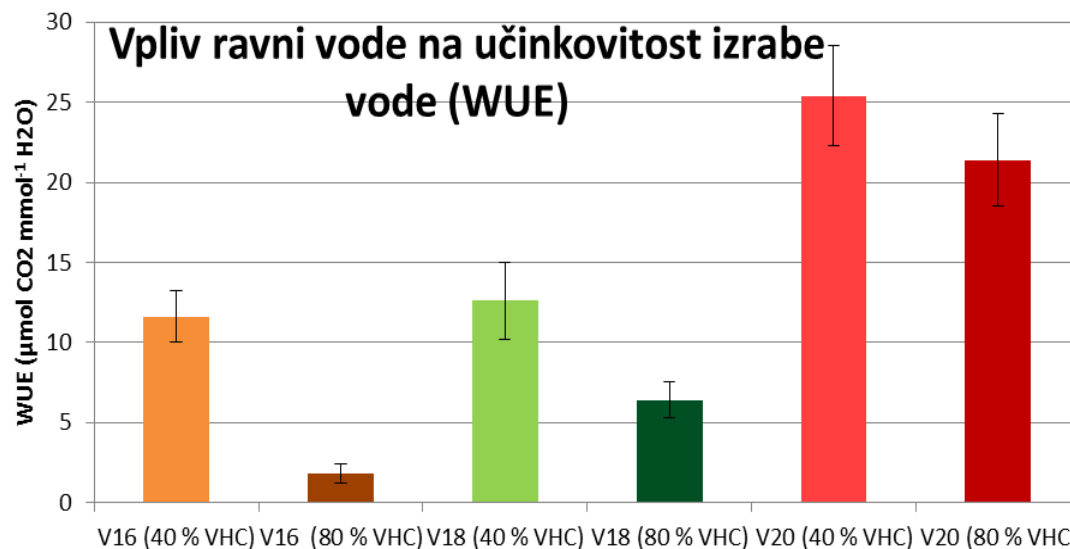
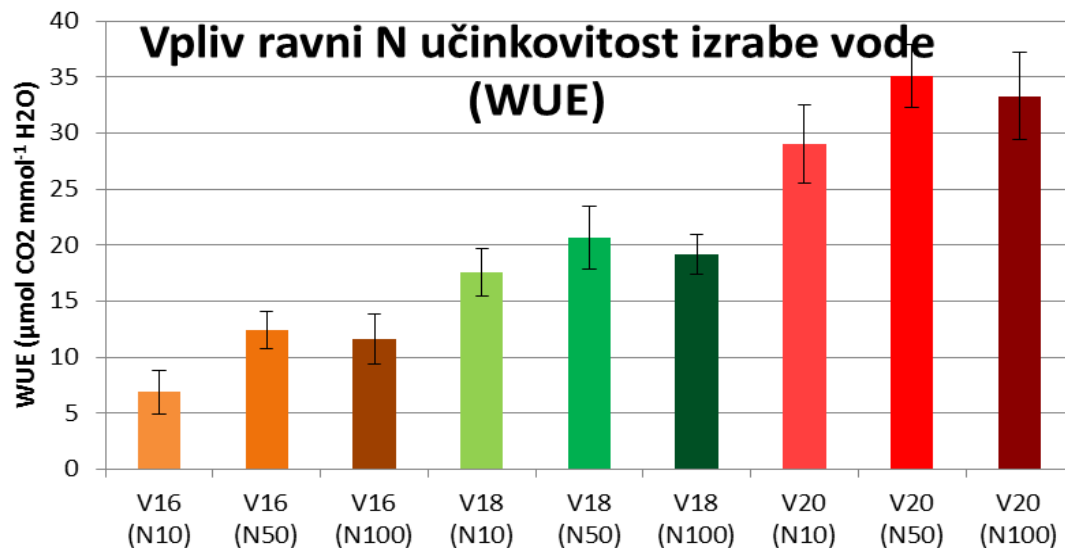
- Velikost fotosinteze se je povečevala v vegetativnem obdobju pred cvetenjem.
- Višje ravni dušika so povečale velikost fotosinteze.
- Boljša oskrba z vodo ni povečala fotosinteze.





Vpliv N in vode na učinkovitost izrabe vode (WUE)

- Učinkovitost izrabe vode se je pri višjih fenofazah in boljši oskrbi z dušikom povečala.
- Učinkovitost izrabe vode se je pri nižji oskrbi z vodo močno povečala.





Zaključki

- Plastičen odziv produkcije nadzemne suhe mase na dostopnost dušika, le-ta ni imela vpliva na produkcijo koreninske suhe mase.
- Jakost intraspecifične kompeticije je bila močnejše izražena na nadzemnem delu v primerjavi s podzemnim: razmerje med koreninsko in nadzemno suho maso (RS) se je povečalo.
- Višje ravni dušika so vplivale na premeščanje suhe snovi v zgornje dele rastline, niso pa imele vpliva na porazdelitev suhe snovi med stebila in liste.
- Pelinolistna ambrozija je slab kompetitor pri veliki dostopnosti virov, v pogojih okoljskega stresa (pomanjkanje hranil, vode) pa se je učinek kompeticije močno zmanjšal.
- Visoka reproduktivna sposobnost v širokem razponu dostopnosti virov.



Poskus

Vpliv fenofaze in frekvence košnje na razvoj in produkcijo semena ambrozije

- Materiali in metode

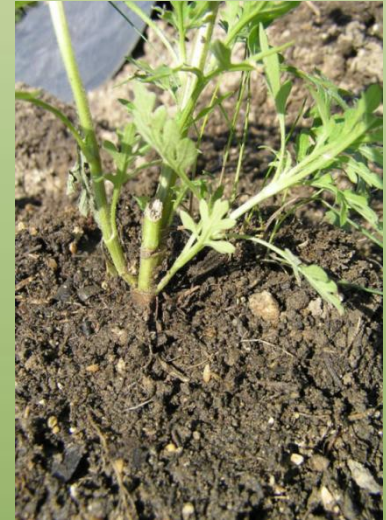
Lončni poskus (10 L lonci) s 5 rastlinami ambrozije v loncu rezane 3 cm nad tlemi

Naključna obravnavanja v 5 ponovitvah

Obravnavanja

- Začetek košnje v različnih fenofazah ambrozije: 2 lista, 4 listi, 8 listov
- 2. košnja: brez, 4 tedni, 6 tednov, 8 tednov, 12 tednov
- 3. košnja: brez, 3 tedni, 6 tednov

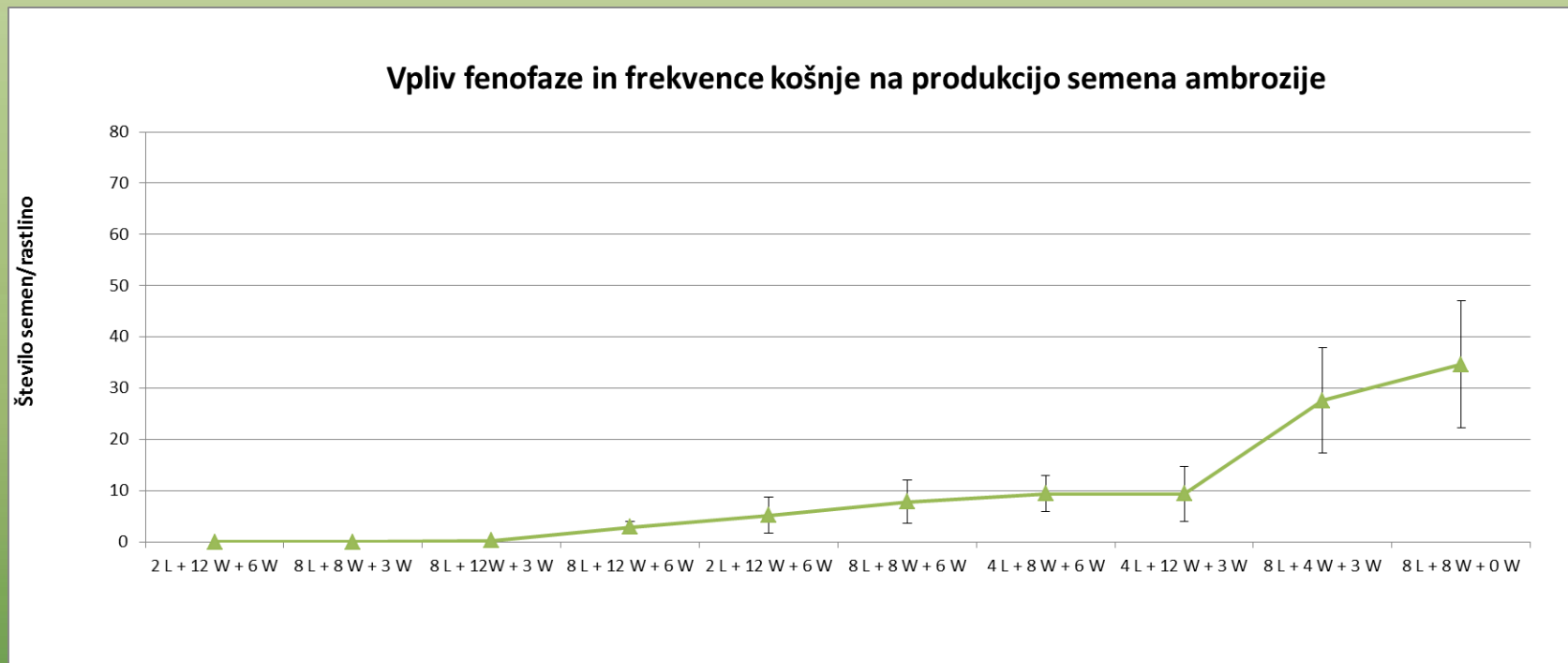
Vzorčenja: sveža biomasa, produkcija semena





Poskus

Vpliv fenofaze in frekvence košnje na razvoj in produkcijo semena ambrozije



- Povečanje intervala med 1 in 2 košnjo (8 in 12 tednov) in dodatna 3. košnja so močno zmanjšali produkcijo semena ambrozije



Poskus

Ohranjanje kalivosti semena ambrozije v tleh

Materiali in metode

- Poljski poskus v 5 ponovitvah
- 50 semen ambrozije zakopane v trajno travinje

Obravnavanja

- 2 populaciji (Avstrija, Madžarska)
- 2 globini zakopa semena (7 cm in 25 cm)

Vzorčenja: Kalitveni in TTC test po 1 letu

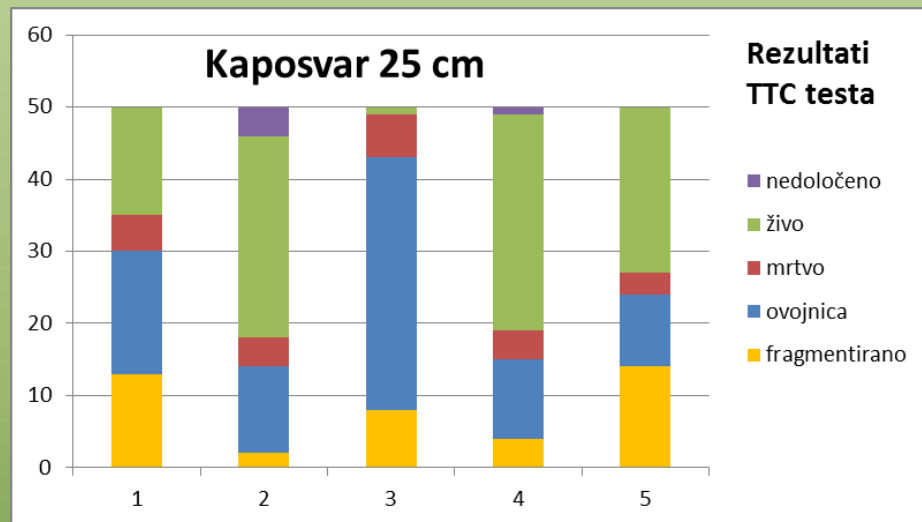
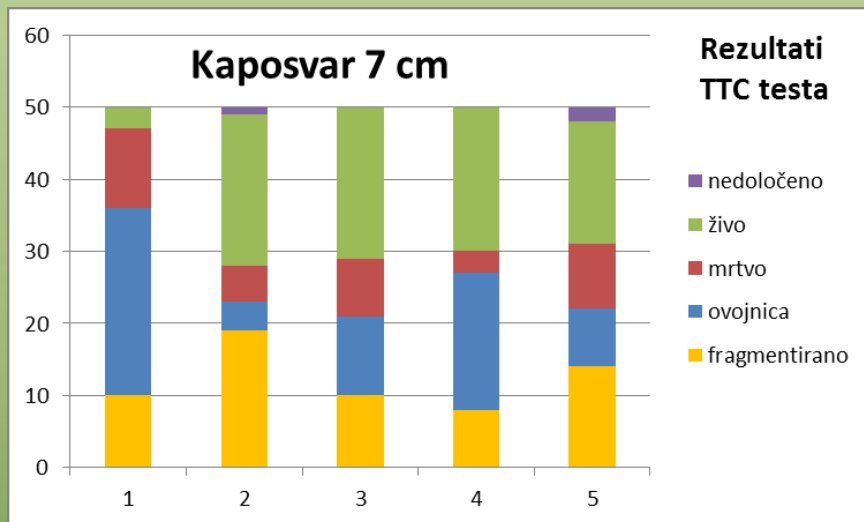


	1
	1
	0
	0,5
	0,5
	0,5



Rezultati

Ohranjanje kalivosti semena ambrozije v tleh

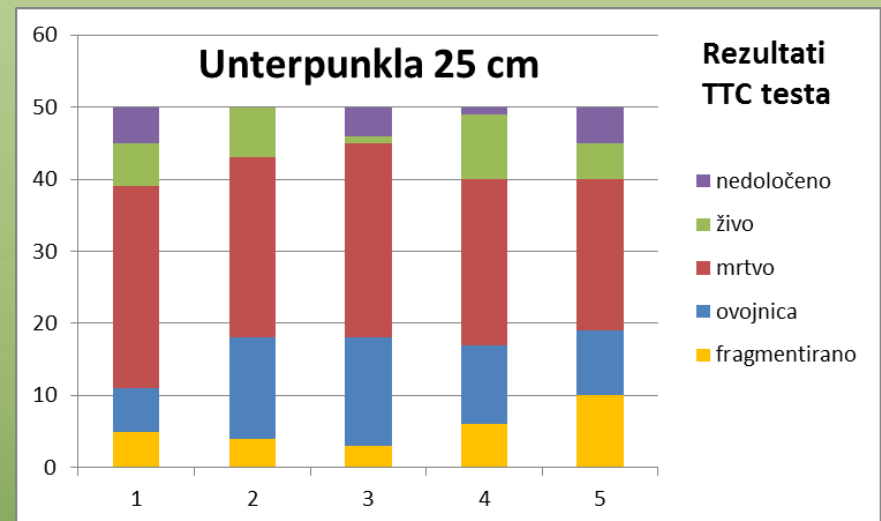
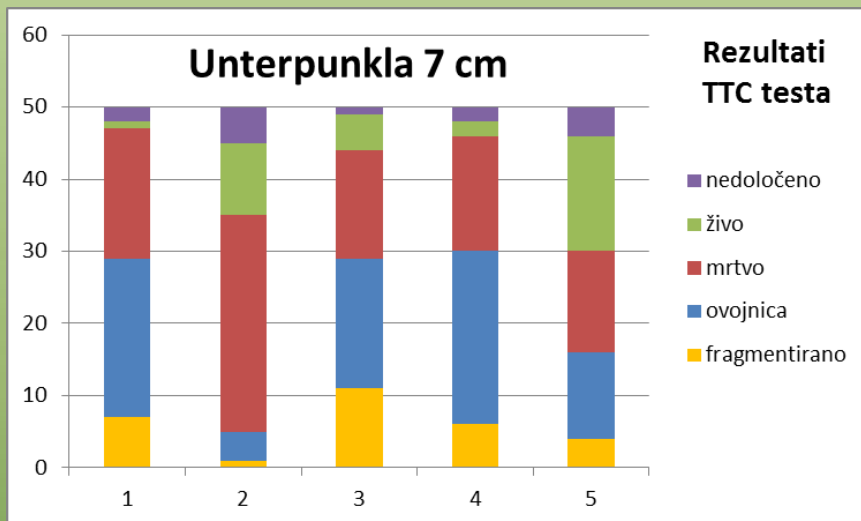


- Kalivost izhodiščnega vzorca ambrozije je bila 90 %
- Že po prvem letu kalivost semena ambrozije pade za približno 50 %



Rezultati

Ohranjanje kalivosti semena ambrozije v tleh



- Globina tal, v kateri je bilo skladiščeno seme ni imelo vpliva na kalitveno sposobnost semena
- Velika variabilnost rezultatov kalivosti (vremenski pogoji, izhodiščna populacija, dormanca..)



Rezultati

Implikacije za izboljšanje učinkovitosti mehanskih ukrepov (košnje)

- Košnja v obdobju manjše relativne rasti, ko ima rastlina manjšo obnovitveno sposobnost (manjše obraščanje)
- Poznejši začetek košnje ali podaljševanje obdobja med košnjami močno vplivajo na manjšo produkcijo semena ambrozije

Implikacije za zmanjševanje semenske banke ambrozije v tleh

- Globoka obdelava (oranje) je le trenutna rešitev, seme bo ostalo kalivo v globljih plasteh tal
- Boljša rešitev za kratkoročno zmanjšanje talne semenske banke ambrozije je plitka obdelava infestiranih strnišč (stimulacija kalitve iz zgornje plasti) in uporaba neselektivnega herbicida



Mednarodno sodelovanje in projekti

- Guidelines for management of common ragweed *Ambrosia artemisiifolia* – Euphresco (2009)
- EC DG Environment (Complex research on methods to halt the *Ambrosia* invasion in Europe) – HALT AMBROSIA
- COST FA 1203-SMARTER: Sustainable management of *Ambrosia artemisiifolia* in Europe
- Partnerske inštitucije: UNL Nebraska (ZDA), BOKU Wien (Avstrija), Aarhus University (Danska), Agroscope (Švica), Julius Kühn Institute (Nemčija), University of Copenhagen (Danska)



Navodila za zatiranje in preprečevanje
širjenja pelinolistne ambrozije
(*Ambrosia artemisiifolia*)



<http://www.EUPHRESCO.org>

Guidelines
for management of common ragweed,
Ambrosia artemisiifolia



<http://www.EUPHRESCO.org>

1. LESKOVŠEK, Robert, DATTA, Avishek, SIMONČIČ, Andrej, KNEZEVIĆ, Stevan Z. Influence of nitrogen and plant density on the growth and seed production of common ragweed (*Ambrosia artemisiifolia* L.). Journal of pest science, 2012, vol. , no. , str., ilustr., doi: 10.1007/s10340-012-0433-2.
2. LESKOVŠEK, Robert, ELER, Klemen, BATIČ, Franc, SIMONČIČ, Andrej. The influence of nitrogen, water and competition on the vegetative and reproductive growth of common ragweed (*Ambrosia artemisiifolia* L.). Plant ecol. (Dordr.), 2012, vol. 213, no. 5, str. 769-781, ilustr., doi: 10.1007/s11258-012-0040-6.
3. LESKOVŠEK, Robert, DATTA, Avishek, KNEZEVIĆ, Stevan Z., SIMONČIČ, Andrej. Common ragweed (*Ambrosia artemisiifolia* L.) dry matter allocation and partitioning under different nitrogen and density levels. Weed biol. manag. (Print), 2012, vol. , no. , str., ilustr., doi: 10.1111/j.1445-6664.2012.00439.x.
4. LESKOVŠEK, Robert, ELER, Klemen, BATIČ, Franc, SIMONČIČ, Andrej. Water and nitrogen use efficiency of common ragweed (*Ambrosia artemisiifolia* L.) at different nitrogen and water levels = Učinkovitost izrabe vode in dušika pri pelinolistni ambroziji (*Ambrosia artemisiifolia* L.) ob različnih ravneh dušika in vode. Acta agric. Slov.. [Tiskana izd.], 2012, letn. 99, št. 1, str. 41-47. http://aas.bf.uni-lj.si/marec2012/05leskovsek, doi: 10.2478/v10014-012-0005-4.

Plant Biol (2012) 23:769–781
DOI 10.1007/s11692-012-9166-4

The influence of nitrogen, water and competition on the vegetative and reproductive growth of common ragweed (*Ambrosia artemisiifolia* L.)

Robert Leskovšek · Klemen Eler · Franc Batič · Andrej Simončič

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Abstract Common ragweed (*Ambrosia artemisiifolia* L.) spreads across Europe and other regions, it is becoming both a health and an economic threat. To better understand which environmental conditions facilitate the spread of the invasive species, in 2010, a greenhouse experiment was conducted determining the effects of various nitrogen levels (0, 50 and 100 kg N/ha) and moisture level (low and high) and competition levels (no competition, medium competition and high competition) on the growth parameters of ragweed. Single-grown ragweed responded favourably to the medium nitrogen and water increase, whereas the ragweed grown in competition in competition increased only when high levels of nitrogen and water were added. High competition reduced the total dry matter of ragweed by up to 83%, but the ragweed continued to increase relative growth rate during the full flowering stage and allocate its dry matter to reproductive parts, producing up to 70 seeds per plant. Ragweed is a poor competitor when there is high resource availability; however, under disturbance

and in the shortage of nutrients and water conditions, the intensity of competition decreases and the ragweed performance is minimally affected. The addition of medium levels of nitrogen to promote the growth of competitive species, prevention of disturbance and establishment of plant communities with successional species is measures that should help to prevent the further spread of ragweed.

Keywords Nitrogen · Water availability · Competition · Common ragweed · *Zizium multiflorum* L. · *Taraxacum*

Introduction

Invasive plants generally possess physiological, morphological or life history traits that allow them to colonize disturbed areas quickly and rapidly grow in response to a high resource availability (Gonzalez et al. 2002; Rejmanek et al. 2005). Increased growth and competitive ability occur because of variations in the environmental conditions (nutrients, temperature and water) and from inherent differences in plant characteristics, such as the relative growth rate (RGR) (Cokerchip et al. 2002), seed size (Skellam 1951), emergence time (Van Balbeek et al. 2004) and phenological development (Gaskin et al. 2009). In combination, these traits enable the plants to use resources more efficiently than native species (Vitousek 1990).

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ORIGINAL PAPER

Influence of nitrogen and plant density on the growth and seed production of common ragweed (*Ambrosia artemisiifolia* L.)

Robert Leskovšek · Avishek Datta · Andrej Simončič · Stevan Z. Knezević

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Abstract Common ragweed is an important annual weed in crop production, and it is also considered to be a serious public health problem. Determination of common ragweed growth under various nitrogen (N) rate and plant density could aid the development of an integrated control program. Greenhouse and field experiments were conducted to determine the effects of N fertilizer and density on common ragweed growth and seed production. In the greenhouse study, the greatest shoot dry matter (SDM) plant⁻¹ was obtained with the 50 and 100 kg N ha⁻¹. In the field experiment, SDM plant⁻¹ in the low density plots responded favourably to the addition of medium and high levels of N compared to the field level of N. With increasing density, ragweed in higher density plots responded only with the highest N rate. The intensity of interspecific competition increased with increasing density. This and SDM plant⁻¹ was significantly reduced, regardless of N rate. Interspecific competition also reduced the reproductive production of common ragweed when seed production decreased as plant density increased. Plants grown at higher density produced less seeds per plant than, however, they produced a considerable number of seed on a per area land basis, which is important for the survival of the species and further expansion in agricultural land and

non-crop areas. Common ragweed is a fast-growing species, capable of producing considerable biomass and seed in various parts stand densities and N rates. It also justifies the need for early control to prevent weed production.

Keywords Interspecific competition · Fertilizer · Growth analysis · Invasive · Weed biology

Introduction

Common ragweed (*Ambrosia artemisiifolia* L.) (hereafter referred to as ragweed) is a native to the prairie region of North America. It was introduced to Europe in the mid eighteenth century, and since then it has spread over many European countries (Chen et al. 2000; Vogel et al. 2005). European countries (Chen et al. 2000; Vogel et al. 2005). Ragweed is of particular concern because of allergic reactions to its pollen, which causes ocular and respiratory allergies that often develop into asthma (Farrarman et al. 2001; Chavri and Charrel 2010). In North America, ragweed pollen is the most commonly known as an important cause of hay fever (allergic rhinitis) (Mishak 1996) and a form of dermatitis in some people (Fisher 1996).

Ragweed is also considered a troublesome summer annual weed in field crops because of its early emergence, and ability to compete for light, water, and nutrients (Rusch et al. 2007; Petriccione et al. 2011). In North America and in Europe, ragweed emergence typically peaks in April and May when and temperatures increase to approximately 14 °C (Meyers et al. 2006; Knezević et al. 2008). Mature plants reach in height from 0.3 to 2.0 m, which can obstruct harvest procedures (Rusch et al. 2007).

Ragweed has been reported to be one of the most

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ORIGINAL PAPER

Influence of nitrogen and plant density on the growth and seed production of common ragweed (*Ambrosia artemisiifolia* L.)

Robert Leskovšek · Avishek Datta · Andrej Simončič · Stevan Z. Knezević

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Hvala za pozornost !

