DINAMIKA PORAZDELITVE MAKRO HRANIL PO ORGANIH NJIVSKEGA SLAKA (*Convolvulus arvensis*)

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IZVLEČEK

Njivski slak (*Convolvulus arvensis*) je eden najpomembnejših trajnih plevelov njiv, vinogradov, vrtov, nekmetijskih zemljišč in obcestnih zemljišč. Po podatkih pridobljenih v raziskavah četrtega Madžarskega nacionalnega popisa plevelov, ki je potekal v letih 1996 in 1997 je slak glede na pogostost pojavljanja zavzemal šesto mesto, s povprečno stopnjo pokrovnosti 1,66% v vseh opazovanih sestojih plevelnih združb. Lahko uspeva skoraj na vseh tipih zemljišč. Ta hitro rastoč in ovijajoč se plevel ima horizontalno in vertikalno razpreden koreninski splet, ki sega do globine dveh metrov in več. Stebla dosežejo dolžino od 20 do 200 cm. Slak zelo težko zatremo (iztrebimo) zaradi velike obnovitvene sposobnosti s podzemnimi živicami in korenikami. Korenike rastlini služijo kot shramba za hranilne snovi. Poznavanje biotičnih lastnosti plevelov in njihovih značilnosti pri odvzemu hranil je pomembno za učinkovito zatiranje plevelov. Namen raziskave opravljene na slaku je bil preučiti značilnosti odvzema hranil pri tem plevelu in slediti njihovo porazdelitev po rastlini. V obdobju od aprila do decembra leta 2002 smo na njivah nabirali vzorce rastlin slaka. Ugotavljali smo maso svežih poganjkov in korenin, maso suhe snovi poganjkov in korenin in določili vsebnost (koncentracijo) dušika, fosforja, kalija in kalcija v suhi snovi. Vsebnost hranil v poganjkih in korenikah slaka mora biti povezana s fiziološkimi procesi rastline. Zelo intenziven odvzem hranil ima pomembno vlogo pri njegovi veliki tekmovalni sposobnosti. Koncentracije dušika, fosforja in kalcija v nadzemnih poganjkih je bila v poletnem obdobju do začetka jeseni večja, kot v koreninskem sistemu, konec oktobra se je koncentracija teh hranil v poganjkih izenačila s koncentracijo v koreninskem sistemu. Koncentracija kalija je bila v nadzemnih delih rastline konstantno, v vseh preučevanih obdobjih rastne dobe večja, kot v koreninskem sistemu.

Ključne besede: *Convolvulus arvensis*, rastlinska fiziologija, odvzem hranil, dušik, fosfor, kalij, kalcij

ABSTRACT

DYNAMIC OF MACRONUTRIENTS IN PLANT PARTS OF *Convolvulus arvensis*

Convolvulus arvensis – field bindweed - is one of the most important perennial weeds of the fields, vineyards, gardens, uncultivated areas, and roadsides. It can be found almost on every soil types. Eradication of this weed is difficult because it can reproduce successfully and vigorously by underground rootstocks. Study of biological characteristics and nutrient uptake of the weeds are essential for effective weed control. Our aim was to follow the nutrient content and their changes in plant parts of *Convolvulus arvensis* during a vegetation period.

Key words: *Convolvulus arvensis*, nutrient content, roots, shoots

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1. INTRODUCTION

Field bindweed (*Convolvulus arvensis* L.*)* is included among the 'world's worst weeds (Holm *et al.*, 1977). On the base of IV. Hungarian National Weed Survey 1996-1997, it takes the sixth place in the dominance sequence, with 1,66 % average covering (Hunyadi *et al.*, 2000). It can be found on the fields, vineyards, gardens, ruderals, and roadsides. This weed has vertical and horizontal root system, to 2 m or more depth. Stems are 20-100 cm long. *Convolvulus arvensis* is difficult to eradicate. Initially dispersed by seeds to new sites, but also can reproduce successfully and vigorously by underground rootstocks (Bakke, 1930). Fragmentation of rhizomes is one of the primary mechanisms by which it disperses and persists in cultivated fields (Buhler *et al.*, 1994). These deep rhizomes provide an important dormancy mechanism for survival. Germination of seeds is slow, due to the hard seed coat. Its seeds remain in the soil for long periods (Hunyadi-Kocsondi, 1998).
Control of *Convolvulus arvensis* successful with combination of cultivation – variable tillage and cropping practices – crop rotation and herbicides. Several kinds of herbicides have been used against bindweed in cultivated fields. General use of herbicides, mainly 2,4-D, MCPA and glyphosates a little repressed, but with sulphonyl-urea herbicides could
not be controlled the bindweed (Béres *et al.*, 2004). Field conditions, including amount and time of cultivation and soil moisture appear to be critical factors determining effectiveness of some herbicides.
In the interest of effective weed control we can know the biological characteristics and nutrient uptake processes of the weeds in detail (Lehoczky, *2000;* Lehoczky *et al.*, 2003). Our aim was to study nutrient uptake and their changes in plant parts of *Convolvulus arvensis* in a really dry growing season in 2002.

2. METHODS

Convolvulus arvensis plants were collected from the fields round of city Keszthely in Hungary from April to December in 2002. The type of soil was Ramann's brown forest soil. Nutrient content of soil was examined. Main characteristics of this soil are below (Tab. 1.).

Table 1. Characteristics of experimental soil

Humus:	1,88 %
Mineral N	11,07 mg kg^{-1}
AL-P_2O_5	152 mg kg^{-1}
AL-K_2O	168 mg kg^{-1}
$pH_{(H2O)}$	7,05

We measured the fresh mass of root and shoot samples and after 40 C° drying the dry mass too, and calculated the water content of plant samples.
Nitrogen concentration was determined by Kjeldahl method, phosphorus concentration by spectrophotometer, potassium and calcium concentration by flame photometer.

3. RESULTS AND DISCUSSION

2002 was a really rainless period. Rainfall in April was similar to average of years, but in May and June was by far behind. Rain in July hardly exceeded the ordinary quantity. August was rainier, in this month fell 21 mm over the average of 50 years.

Nitrogen concentration in the dry mass of shoots altered highly between 1,7-3,7% (Fig. 1.). At the beginning of May decreased until 2,5% in consequence of vigorous growth and nutrients dilution. After this time suddenly rose to 3,7%, and later decreased continuously to 1,7%. N content of roots were lower: 1,1-2,2% and changed less than in shoots.

Phosphorus concentration altered reversely as nitrogen. In shoots was 0,18-0,97%, and in roots 0,15-0,84%. In autumn in roots increased N and P concentration because of roots stored nutrients.

According to our examination *Convolvulus arvensis* can uptake potassium in a great quantity under blossoming from June to September (Fig. 2.). Roots and shoots samples contained potassium in highest concentration at the beginning of September and after decreased quickly. Shoots had more potassium than roots.

Calcium concentration was lower than potassium. It was between 0,5-1,3% in shoots. Roots contained more calcium (0,8-1,4%) than shoots in contradiction to potassium.

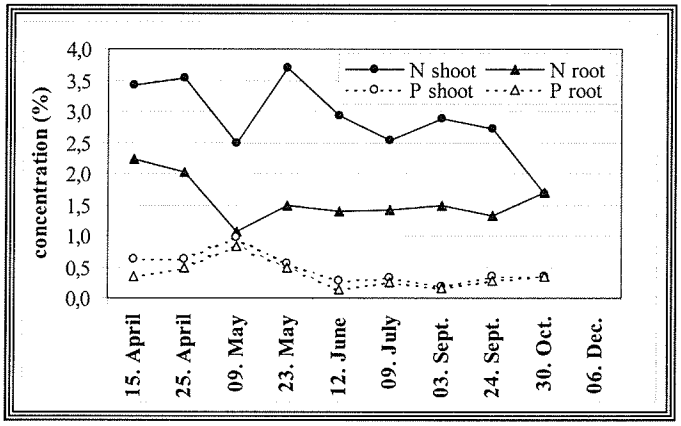

Figure 1. Nitrogen and phosphorus concentration in shoots and roots of *Convolvulus arvensis*

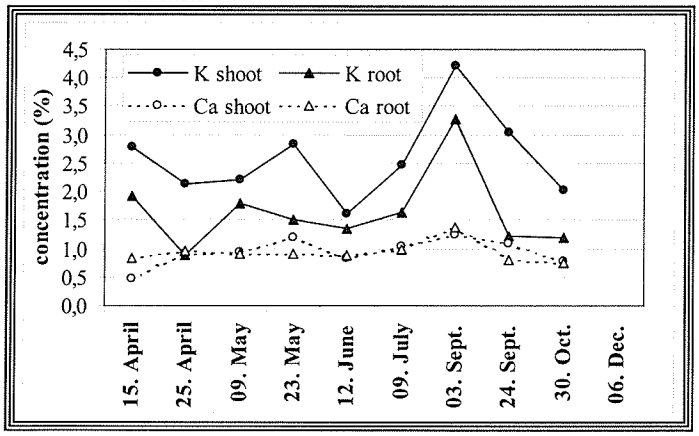

Figure 2. Potassium and calcium concentration in shoots and roots of *Convolvulus arvensis*

4. CONCLUSIONS

We found, that rootstocks stored a lot of nutrients. Therefore in autumn increased nitrogen and phosphorus concentration in roots. Changes of nutrient concentration of shoots and roots would connect with physiological processes of the plant. Intensive nutrient uptake of *Convolvulus arvensis* has an important roll in its considerable competitive capacity. Nitrogen, phosphorus and calcium concentration of shoots were higher than roots during active vegetation period, and became equal at the end of October. Potassium content of shoots remained higher in all examined period than of roots.

5. ACKNOWLEDGEMENT

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