CREEPING THISTLE (CIRSIUM ARVENSE (L.) SCOP.) – AN IMPORTANT COMPETITOR OF NUTRIENTS CONSUMPTION IN GRAIN MAIZE STANDS (ZEA MAYS L.)

PICHLIAČ ROĽNÝ (CIRSIUM ARVENSE (L.) SCOP.) – VÝZNAMNÝ KONKURENT PORASTOV KUKURICE SIATEJ (ZEA MAYS L.) V ODBERE ŽIVÍN

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ABSTRACT

The aim of this research was to compare the competition ability of creeping thistle to grain maize stands during vegetation period, to establish the nutrient equivalents according the elements content in plants and to find out the coherence between competitive relations of grain maize and creeping thistle. In 2002 – 2004 nutrient equivalents of creeping thistle (Cirsium arvense (L.) Scop.) in grain maize stands (Zea mays L.) were researched on experimental fields of Slovak University of Agriculture in Nitra (locality Nitra – Dolná Malanta). The ratio between nutrient content (N, P, K, Ca, Mg) in dry mass weight of creeping thistle and nutrient content (N, P, K, Ca, Mg) in dry mass weight of grain maize was compute as nutrient equivalent. The creeping thistle has shown the higher competitive ability against grain maize expressed as nutrient equivalent in May 2004 (soil dryness condition). It declined about in order June 2003 → June 2004 → May 2003 → May 2002 → June 2002. Creeping thistle with comparison to grain maize absorbed in average 1.09 – 1.65 N, 1.12 – 1.16 P, 0.87 – 2.51 K, 2.59 – 11.29 Ca and 0.82 – 1.74 Mg (table 3). Ca was the most drawn element from soil during all observed period 2002 – 2004. The competitive ability of creeping thistle in grain maize was the highest in water deficit conditions mainly, lower competition ability was recorded in sufficient soil moisture conditions. Nutrients absorption by grain maize and creeping thistle was affected by an individual climatic characteristics in each year.

Key words: Cirsium arvense, Zea mays, nutrient equivalent, competition, N, P, K, Ca, Mg

ABSTRACT IN SLOVAK LANGUAGE

V rokoch 2002-2004 boli na experimentálnej báze Slovenskej poľnohospodárskej univerzity v Nitre (lokalita Nitra – Dolná Malanta) založené pokusy na skúmanie tzv. živinových ekvivalentov pichliača roľného (Cirsium arvense (L.) Scop.) v porastoch kukurice siatej (Zea mays L.). Živinový ekvivalent vyjadruje pomer medzi obsahom živín (N, P, K, Ca, Mg) obsiahnutých v suchej hmote pichliača roľného a obsahom živín v suchej hmote kukurice siatej. Najvyššiu konkurenčnú schopnosť vyjadrenú ako živinový ekvivalent preukázal pichliač roľný voči kukurici siatej v máji 2004 (v podmienkach pôdneho sucha). Jeho konkurenčná schopnosť klesala ďalej približne v poradí jún 2003 → jún 2004 → máj 2003 → máj 2002 → jún 2002. Pichliač roľný absorboval v priemere niekoľko násobne viac alebo menej živín ako kukurica siata na zrno, konkrétne v intervaloch: 1,09 – 1,65 N, 1,12 – 1,16 P, 0,87 – 2,51 K, 2,59 – 11,29 Ca a 0,82 – 1,74 Mg. Vápnik bol najviac čerpaným prvkom z pôdy počas celého sledovaného obdobia 2002 – 2004. Konkurenčná schopnosť pichliača roľného v kukurici siatej na zrno bola najvyššia v podmienkach vodného deficitu, nižšia bola zaznamenaná v podmienkach dostatočnej pôdnej vlhkosti. Čerpanie živín kukuricou siatou aj pichliačom roľným bolo ovplyvnené klimatickými podmienkami v období sledovania v každom roku.

Kľúčové slová: pichliač roľný, kukurica siata, živinový ekvivalent, konkurencia, N, P, K, Ca, Mg

Detailed abstract in Slovak language

Prognóza škodlivosti zisteného stavu zaburinenosti má značný význam pre prax. Cieľom je nájsť spôsob stanovenia hodnoty, ktorá by umožnila výpočet tzv. hospodárskeho prahu škodlivosti. Po stanovení tejto hodnoty je možné posúdiť ekonomickú návratnosť prostriedkov vynaložených na reguláciu zaburinenosti.

Na experimentálnej báze Slovenskej poľnohospodárskej univerzity v Nitre (Nitra – Dolná Malanta) boli v rokoch 2002 - 2004 založené pokusy na skúmanie živinových ekvivalentov pichliača roľného (Cirsium arvense (L.) Scop.) v porastoch kukurice siatej (Zea mays L.). Stanovište pokusu sa nachádza na rozhraní sprašových sedimentov Žitavskej pahorkatiny a svahových sedimentov pohoria Tribeč, má rovinatý charakter s nadmorskou výškou 175 m n. m. Pôdny typ je hnedozem na proluviálnych zasprašovaných sedimentoch, subtyp hnedozem kultizemná (HMa). Obsah humusu je v rozmedzí 1,95 – 2,60 %, výmenná pôdna reakcia pH (KCl) je od 5,03 do 5,69 [4].

Odbery vzoriek pichliača roľného a kukurice siatej na zrno boli urobené z plochy 4 x 0,25m^2 z hĺbky 0,6 m z variantov nehnojených priemyselnými hnojivami. Termíny odberov v jednotlivých rokoch pokusu boli 17. mája a 17. – 19. júna. Z pôdy bolo vybraných po 30 rastlín kukurice siatej aj pichliača roľného v monolite pôdy. Zvyšky pôdy z koreňov boli odstránené prúdom vody (použili sa sitá s priemerom otvorov 0,2 a 2,0 mm). Po vyplavení boli nadzemná časť a korene mechanicky oddelené a predsušené. Odvážená bola osobitne nadzemná časť a korene. Zisťované boli nasledovné parametre: rastové fázy podľa BBCH, počet koreňov, dĺžka koreňov, výška rastlín, počet listov, hmotnosť nadzemnej časti rastlín v čerstvom stave, hmotnosť koreňov v čerstvom stave. Po vysušení pri teplote 60°C bola zistená hmotnosť sušiny koreňov, hmotnosť sušiny hmoty nadzemnej časti rastlín a vypočítaná hmotnosť sušiny hmoty rastlín spolu. Pre pichliač roľný a kukuricu siatu na zrno bola vypočítaná priemerná hmotnosť sušiny na jednu rastlinu (tabuľka 1 a 2).

Rastlinný materiál bol analyzovaný na obsah prvkov N, P, K, Ca, Mg. Obsah N bol stanovený podľa Kjeldahla, P spektrofotometricky podľa Koppora, K a Ca plamennou fotometriou a Mg atómovou absorbčnou spektrometriou. Separátne sa analyzovali korene a nadzemná časť. Zo zistených hodnôt bol vypočítaný živinový ekvivalent (NE_i) pre jednotlivé prvky podľa vzťahu:

$NE_i = Q_{cw} / Q_{cv}$, $Q_{cw} = C_{cw} / W_{cw}$, $Q_{cv} = C_{cv} / W_{cv}$,
kde:

NE_{i} = živinový ekvivalent pre odber príslušného prvku (napr. dusíka), C_{cw} = odber príslušného prvku (mg) jednou rastlinou burinového druhu, C_{cv} = odber príslušného prvku (mg) jednou kultúrnou rastlinou, W_{cw}= hmotnosť suchej hmoty jednej rastliny burinového druhu (mg.r^{-1}), W_{cv}= hmotnosť suchej hmoty jednej kultúrnej rastliny (mg.r^{-1}). Rovnaký vzťah bol použitý aj pre ďalšie prvky (P, K, Ca, Mg).

Autor [16] posudzoval relatívnu konkurenčnú schopnosť burín na základe tzv. plodinových ekvivalentov. Plodinový ekvivalent vyjadruje pomer medzi hmotnosťou suchej hmoty jednej rastliny buriny ku hmotnosti suchej hmoty jednej rastliny kultúrnej plodiny, v ktorej sa burina vyskytuje. Buriny s plodinovým ekvivalentom vyšším ako 1 majú vyššiu konkurenčnú schopnosť ako pestovaná kultúrna plodina, a naopak. Na základe plodinových ekvivalentov boli odvodené živinové ekvivalenty. Živinový ekvivalent vyjadruje pomer medzi obsahom živín (N, P, K, Ca, Mg) obsiahnutým v suchej hmote jednej rastliny buriny a obsahom živín v suchej hmote jednej rastliny pestovanej plodiny.

Dosiahnuté výsledky sú sumarizované v tabuľke 1, 2 a 3. Hodnoty živinových ekvivalentov a morfologické parametre pichliača roľného aj kukurice siatej boli ovplyvnené klimatickými podmienkami sledovaného obdobia v každom roku.

Introduction

A major component of integrated weed management is the use of more competitive crops [8]. Although selection for better crop competitiveness is a difficult task [12]. Authors [9, 3, 15] recorded significant effects of tall cultivars of erect growth habit on individual weed species and populations. Plants are influenced by abiotic factors (temperature, pH) as well as others biotic interactions. The elements as nitrogen, phosphorus and potassium are the main reason for plant competition [1]. The harmful effect prognosis of a determined weed infestation rate has significant meaning for practise. The goal is find out the calculation method to establish the economic threshold of weed harmful effect. By the establishment of that economic value is possible to evaluate the economic efficiency of means which have been invested into weediness control. Based on obtained crop equivalents values of the nutrient equivalents were calculated.

Material and methods

The field trials were established on experimental fields of Slovak University of Agriculture in Nitra – Dolná Malanta on Orthic Luvisols on proluvial sediment mixed with loess [4] in 2002 - 2004 years. Area with lowland character and altitude 175 m above sea level with the

Table 1
Tabuľka 1

Some morfological parameters and nutrients content in dry mass of grain maize
Niektoré morfologické parametre a obsah živín v suchej hmote kukurice siatej

Evaluated parameters (2)		Grain maize - *Zea mays* L. (1)					
		2002		2003		2004	
		sampling (3)		sampling (3)		sampling (3)	
Sowing date (4)		23/04/2002		23/04/2003		29/04/2004	
Sampling date (5)		17-svi	17-lip	19-svi	17-lip	17-svi	17-lip
BBCH growth stage (6)		13	63	15	65	15	63
Roots amount (pcs.plant^{-1}) (7)		13	28	10	21	11	23
Roots lenght (mm) (8)		113	200	156	230	100	150
Plants height (mm) (9)		185	660	304	1400	80	980
Leaves amount (pcs.plant^{-1}) (10)		5	14	6	12	3	11
Plant dry weight (g.plant^{-1}) (11) $\mathbf{W_{cv}}$		**0,56**	**29,74**	**1,11**	**34,51**	**0,25**	**20,50**
roots (g.plant^{-1}) (12)		0,14	6,45	0,38	7,28	0,22	5,50
above ground part (g.plant^{-1}) (13)		0,42	23,29	0,73	27,23	0,03	15,00
Nutrients content in dry mass of plant (mg) (14) $\mathbf{C_{cv}}$							
N	Σ	14,30	705,06	35,85	548,41	4,12	454,15
P	Σ	1,57	144,18	2,89	69,24	0,88	59,51
K	Σ	23,50	725,88	43,65	1111,50	2,00	552,75
Ca	Σ	7,20	104,40	5,14	63,05	0,40	22,34
Mg	Σ	2,52	78,49	3,07	56,65	0,39	39,47

Notes:
Poznámky:
(1) názov rastliny, (2) hodnotené parametre, (3) odbery, (4) dátum sejby, (5) dátum odberov, (6) rastová fáza BBCH, (7) počet koreňov (ks.rastlina^{-1}), (8) dĺžka koreňov (mm), (9) výška rastlín (mm), (10) počet listov (ks.rastlina^{-1}), (11) suchá hmota rastliny (g.rastlina^{-1}), (12) suchá hmota koreňov (g.rastlina^{-1}), (13) suchá hmota nadzemnej časti rastliny (g.rastlina^{-1}), (14) obsah prvkov v suchej hmote rastliny

Table 2
Tabuľka 2

Some morfological parameters and nutrients content in dry mass of creeping thistle
Niektoré morfologické parametre a obsah živín v suchej hmote pichliača roľného

Evaluated parameters (2)		Creeping thistle - *Cirsium arvense* (L.) Scop. (1)					
		2002		2003		2004	
		Sampling (3)		Sampling (3)		Sampling (3)	
Sampling date (5)		17-svi	17-lip	19-svi	17-lip	17-svi	17-lip
BBCH growth stage (6)		30	60	32	51	32	50
Roots amount (pcs.plant^{-1}) (7)		40	72	7	29	35	63
Roots lenght (mm) (8)		366	650	165	270	240	260
Plants height (mm) (9)		295	830	185	500	180	800
Leaves amount (pcs.plant^{-1}) (10)		47	152	20	150	18	85
Plant dry weight (g.plant^{-1}) (11) $\mathbf{W_{cw}}$		**6,11**	**20,43**	**2,40**	**8,90**	**2,85**	**23,50**
roots (g.plant^{-1}) (12)		0,89	5,35	0,40	1,63	0,52	4,50
above ground part (g.plant^{-1}) (13)		5,22	15,08	2,00	7,29	2,33	19,00
Nutrients content in dry mass of plant (mg) (14) $\mathbf{C_{cw}}$							
N	Σ	218,90	380,30	95,50	263,60	103,90	562,23
P	Σ	26,50	75,40	7,48	20,70	10,60	80,56
K	Σ	237,70	405,50	86,83	267,80	87,41	739,28
Ca	Σ	205,30	183,70	66,04	208,30	50,22	293,08
Mg	Σ	21,30	45,30	8,60	31,20	8,62	50,57

Notes are the same as under table 1 (with the exception of suppressing sowing date(4)).
Poznámky sú tie isté ako pod tabuľkou 1 (s výnimkou vypusteného dátumu sejby(4)).

humus content 1.95-2.60 %, pH value (KCl) = 5.03-5.69, belongs to very warm agri-climatic region with sum of average daily air temperature TS ≥ 10 ºC, during the main vegetation period more than 3000 ºC. The grain maize and creeping thistle sampling was done monthly. The treatments without fertilization and herbicide application from area 4 x 0.25 m^2 were evaluated at 17th May and 17th – 19th June. 30 plants of grain maize and creeping thistle were taken from the depth 0.60 m. The soil residues were removed carefully from roots by stream of water (above sieves with sieve mesh 0,1 and 2,0 mm). Above ground part and roots were mechanically separated and predried. The above ground part and roots were separately weighted. The next morphological parameters have been analysed: the root number, root length, plant height, number of leaves, fresh weight of above ground part and roots. After drying at 60 ºC weight of the above ground mass, the roots mass and total dry mass were ascertained. The growth stages were determined according the BBCH scale. The N, P, K, Ca and Mg content have been determined. N was determined based according to Kjeldahl method, P by spectrophotometry according to Koppor, K and Ca by flame photometry and Mg by atomic absorption spectrophotometry. The chemical analysis was done for roots and above ground part separately. The nutrient equivalents from individual elements were calculated based on obtained values according following:

$NE_i = Q_{cw} / Q_{cv}$, $Q_{cw} = C_{cw} / W_{cw}$, $Q_{cv} = C_{cv} / W_{cv}$,

where:

NE_i = nutrient equivalent for selected element absorption

Table 3
Tabuľka 3

Nutrient equivalents (NEi) of *Cirsium arvense* (L.) Scop. in grain maize stands
Živinové ekvivalenty (NEi) *Cirsium arvense* (L.) Scop. v poraste kukurice siatej

NE_i	2002			2003			2004		
	Sampling date (1)			Sampling date (1)			Sampling date (1)		
	17-svi	17-lip	$\bar{x}$	19-svi	17-lip	$\bar{x}$	17-svi	17-lip	$\bar{x}$
N	1,4	0,78	1,09	1,23	1,86	1,55	2,21	1,08	1,65
P	1,55	0,76	1,16	1,2	1,15	1,18	1,05	1,18	1,12
K	0,93	0,81	0,87	0,92	0,93	0,93	3,84	1,17	2,51
Ca	2,61	2,57	2,59	5,98	12,95	9,47	11	11,57	11,29
Mg	0,78	0,85	0,82	1,29	2,19	1,74	1,94	1,11	1,53
$\sum$	7,27	5,77	6,53	10,62	19,08	14,87	20,04	16,11	18,1

Note:
Poznámka:
(1) dátum odberu

Table 4 Average of air temperature in 2,0 m (°C) in Nitra in 2002 - 2004 years in decades
Tabuľka 4 Priemerná teplota vzduchu v 2,0 m (°C) v Nitre v rokoch 2002 - 2004 po dekádach

Decades (1)	Months (2)												
year 2002 (3)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	$\bar{x}$ 2002
1.-10.	-5,8	3,2	5,5	6	17	16,7	22,5	21,5	19,8	10,3	4,5	3,3	10,4
11.-20.	-3	4	7,8	11	17,3	21,2	22,4	20,2	13,9	9,1	10,8	-3,1	11
21.-31.	5,3	3,2	5,6	12,7	18	20,8	21,5	20,7	11	9,5	8,6	-1,5	11,3
$\bar{x}$ 1.-31.	-1,2	3,5	6,3	9,9	17,4	19,6	22,1	20,8	14,9	9,7	8	-0,4	10,9
year 2003 (4)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	$\bar{x}$ 2003
1.-10.	-3,5	-2,8	2,3	4,8	19,6	23	19,9	24	15,9	11,7	6,8	2,4	10,3
11.-20.	-3,7	-2,5	4,9	11,8	16,5	20,9	21,9	23	16,1	7,6	4,6	1,2	10,2
21.-31.	1,1	0,1	7,7	15,6	20,1	20,1	21,9	21,2	15,5	4,6	9,7	-0,7	11,4
$\bar{x}$ 1.-31.	-1,9	-1,8	5,1	10,7	18,8	21,3	21,2	22,7	15,8	7,9	7	0,9	10,6
year 2004 (5)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	$\bar{x}$ 2004
1.-10.	-5,4	4,8	-0,7	9,1	14,1	18,1	19,1	21,1	17,1	12,8	9	2,8	10,2
11.-20.	1,8	-0,1	8,2	11,4	14,5	18	19,2	21,7	16	7,9	6,1	-1,1	10,3
21.-31.	-5,4	0	6,5	14,6	14,2	17,7	21,6	17,7	12,5	14,1	2	0,6	9,7
$\bar{x}$ 1.-31.	-3,1	1,6	4,7	11,7	14,3	17,9	20	20,1	15,2	11,7	5,7	0,8	10

Notes:
Poznámky:
(1) dekády, (2) mesiace, (3) rok 2002, (4) rok 2003, (5) rok 2004

Table 5 Sum of precipitation (mm) in Nitra in 2002 - 2004 years in decades
Tabuľka 5 Úhrn zrážok (mm) v Nitre v rokoch 2002 - 2004 po dekádach

Decades (1)	Months (2)												
year 2002 (3)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Σ 2002
1.-10.	0,3	6,2	2,3	5,6	36,1	60,8	0,3	27,9	3,2	12,9	15,9	22,7	194,2
11.-20.	6,1	15,3	13,5	32,7	2,1	5,6	39,1	61,8	25,7	49,4	8,5	4,7	264,5
21.-31.	5,5	14,2	12,9	6,2	24,1	2,1	11,5	0,3	33,2	15,9	17,6	10,3	153,8
Σ 1.-31.	11,9	35,7	28,7	44,5	62,3	68,5	50,9	90	62,1	78,2	42	37,7	612,5
year 2003 (4)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Σ 2003
1.-10.	15,4	0,6	2,2	18,2	6,1	0	16,6	12,8	0,1	36,4	14,3	1,5	124,2
11.-20.	2,1	0,1	0,1	3,8	23,3	6,2	12,7	0,6	1,6	7,1	4,6	17,3	79,5
21.-31.	15,5	0	0	5	15,1	0,3	62,7	10,4	13,8	22,5	14	5,2	164,5
Σ 1.-31.	33	0,7	2,3	27	44,5	6,5	92	23,8	15,5	66	32,9	24	368,2
year 2004 (5)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Σ 2004
1.-10.	9,4	9	16,5	21,7	7,8	46,1	19,2	4,6	0	6,8	26,5	6,8	174,4
11.-20.	43,5	1,6	1	10,9	2,5	35,4	0,6	6,8	0,8	34,7	12,2	2,6	152,6
21.-31.	3	20,5	35,3	3,7	26,6	12,3	14	8	35,9	3,8	7	17,4	187,5
Σ 1.-31.	55,9	31,1	52,8	36,3	36,9	93,8	33,8	19,4	36,7	45,3	45,7	26,8	514,5

Notes are the same as under table 4.
Poznámky sú tie isté ako pod tabuľkou 4.

by creeping thistle, W_{cw} = creeping thistle plant weight (mg. plant^{-1}), W_{cv} = maize for grain plant weight (mg. plant^{-1}), C_{cw} = element absorption of the creeping thistle plant (mg. plant^{-1}), C_{cv} = element absorption of maize for graine plant (mg. plant^{-1}). The same calculation was used for elements N, P, K, Ca, Mg. $NE_i < 1$, means that weed species has lower consumption of special nutrient (N, P, K, Ca Mg) than crop (in multiples). NEi > 1, means that weed species has higher consumption of special nutrient (N, P, K, Ca Mg) than crop (in multiples).

Results

Climatic characteristics in decades shows table 4 and 5 (according [10, 13, 14], adapted data). Morphological parameters are shown in table 1 and 2, calculated values of nutrient equivalents in table 3. The averages of daily air temperatures declined in order 2002 → 2003 → 2004 year (in the second decades of May and June, where sampling was done). The precipitation was low in the first and the second decades of May and June 2003 and May 2004, what caused the water deficit in soil. The first decades in May and June 2002 were very wet. There was sufficient soil moisture for crops and weeds growth, too (even though the second decade of May and June 2002 was with rainfall deficit). The growth phases of grain maize and creeping thistle were balanced about in all years of observation, with exception of June 2003 (soil dryness) and June 2004 for creping thistle (later sowing date and thus later soil tillage under grain maize against 2003 and 2002 years). Grain maize and creeping thistle produced lowest number of roots in water deficit conditions (May, June 2003). But in the same period grain maize created longest roots, highest plants and heaviest dry mass of plant. Creeping thistle showed opposite tendency in these parameters on these same conditions. It achieved highest values of mentioned three parameters in sufficient soil moisture conditions (May, June 2002). The number of leaves of grain maize was balanced about, with exception May, June 2004, with later date of sowing. Creeping thistle generated lower number of leaves in May 2003 and May 2004.

The creeping thistle has shown the higher competitive ability against grain maize expressed as nutrient equivalent in May 2004 (soil dryness condition). It declined about in order June 2003 → June 2004 → May 2003 → May 2002 → June 2002 (table 3). Creeping thistle absorbed 1.09 – 1.65 N, 1.12 – 1.16 P, 0.87 – 2.51 K, 2.59 – 11.29 Ca and 0.82 – 1.74 Mg than grain maize in average (table 3). Ca was the most drawn element from soil during all observed period 2002 – 2004.

Discussion

Grain maize has a slow growth on the beginning of vegetation. After accomplishing the height 0,3 - 0,4 m has more intensive growth. It represents second half of June in climatic conditions of grain maize region in Slovak Republic. Nutrients resorption, mainly of nitrogen and potassium, is slightly ahead of organic mass accrual. Till the milk ripeness follows the nutrients resorption curve the organic mass accrual curve when the potassium absorption recedes but nitrogen and mainly phosphorus absorption is continuing [5, 2]. The crops absorb since springing to flowering 58-60 % of total amount of N, 53-56 % of P and 82-86 % of K [11]. The grain corn due to a high biomass production absorbs a significant amount of nutrients from the soil. During the period of maximum biomass production (July – August) is nutrients and water income the most intensive.

The creeping thistle belongs to ten the most widespread and the most important weed in the world. The creeping thistle propagated by vegetative and generative way. It creates massive root system consisted of horizontal and vertical roots offsets. From the competition point of view it is very intense plant able to absorb quantity of moisture and nutrients. Meanwhile, other plants are suffering drought, the creeping thistle massive root system reaching layers below an arable land. An allelopathic substances secreted by roots suppress surrounding weeds and crops [6]. Three creeping thistle plants on one square meter absorb 5 kg N . ha^{-1}, 0,8 kg P . ha^{-1}, 4 kg K . ha^{-1} approximately. In a case of serious occurrence (in "focuses") the creeping thistle absorbs more than 300 kg N, 40 kg P and almost 400 kg K from the area of 1 ha, not mentioning Ca, Mg etc. [7].

According our results we can conclude, creeping thistle had higher competitiveness against grain maize in nutrient uptake, mainly in water deficit conditions in soil, but not all the time. Lower competitive ability was recorded in sufficient soil moisture conditions, although majority morphological parameters followed opposite trend.

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