

## The Ratio of Elements Uptake from the Soil by Yellow Weed (*Boreava Orientalis* Jaub And Spach.) Which Causes Problems for Barley Cultivated Under Arid Conditions

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**Abstract:** Study was conducted in order to determine the amount of elements uptake from the soil by different densities of yellow weed depending on its competition against barley in barley cultivated areas in Ardıçlı Village (arid) of Central Selcuklu Konya in 2007. At the harvesting time of barley, yellow weed samples in all the plots were extracted with their roots and analysed following the necessary pre-treatments. As a consequence, when the yellow weed numbers are 1, 3 and 6 number /m<sup>2</sup>, the amounts of N uptake from the soil by yellow weed were determined to be 32.09 – 146.67 – 311.07 g/da; P , 15.57 - 72.56 -144.28 g/da; K , 76.94 - 375.94 – 961.21 g/da, respectively. As the result of the analysis performed, depending on the numbers of yellow weed in the plots were observed statistically significant differences between the amounts of N, P, K, Ca, Mg, Mn, Fe, Zn and Mo uptake from soil by yellow weed at P<0.05 level.

**Keywords:** Barley, yellow weed (*Boreava orientalis* Jaub and Spach.), element uptake, competition.

### Introduction

According to the data from 2007, barley production is 7.306.800 ton in Turkey and it is 606.630 ton in Konya, the land of cultivation is 34.280.165 da in Turkey and 3.579.806 da in Konya (Anonymous, 2008). As in many countries, the main vermin of cereal are weeds.

Weeds get in competition with wheat in terms of nutrient, water, light and place and every year it leads to about 25-35 % yield loss (Özer, 1993; Vencill ve ark., 1993; Rodosevich ve Holt, 1984). Because many kinds of weeds have a strong root system and very much branched out, they compete with plants which have been cultivated. Because of weed competition, the average cereal loss all over the world is about 20-40 % (Koch, 1970). The wheat yield loss because of weeds was researched in different regions of Turkey, and it was found out that the loss is 30 % in Aegean region (Bilgic, 1965; Tepe, 1998), 24 % in East Anatolia (Günçan, 1976), 22,5 % in Central Anatolia (Günçan, 2006 referring to FAO) and 20 % in Cukurova region (Uygur et al., 1986). Yellow weed (*Boreava orientalis*) is a weed of widespread occurrence in barley and wheat field in middle of Turkey, Konya and other locaties in which barley and wheat are cultivated as a winter crop. This weed is also distributed all over the world.

In a survey study carried out in Central Anatolia, 76 species were determined. It was reported that the most common types are *Galium tricornutum* Dandy (rough bedstraw) 3.75 number/m<sup>2</sup>, *Boreava orientalis* (yellow weed) 3.48 number/m<sup>2</sup>, *Centaurea depressa* Bieb. (dark blue bottle) 3.48 number/m<sup>2</sup> and *B. radians* Bieb. (bifora) 2.16 number/m<sup>2</sup>, respectively (Taştan and Erciş, 1994).

The level competition of weed have in grain cultivation fields and to what extent these weeds use nutrients in soil or nutrient elements applied to the soil for culture plants is not known for every type of weed. With this aim, this study was carried out in 2007 to determine different amounts of nutrient uptake by weeds as a result of barley-weed competition in different densities of yellow weed.

## Material and Method

This study was carried out in Arduçlı Village (arid) of Central Selcuklu-Konya-Turkey, which can represent Konya province. The trial was carried out on barley cultivated fields (arid) which exemplified the Province of Konya. The trial plots were 1 m<sup>2</sup> each, the experiments were conducted with four repetitions and security lines of at least 25 cm were drawn between them. The plots set included weeds. The density of yellow weed varies between 1, 3 and 6 number/m<sup>2</sup>. All the other wide and narrow leafed weed plants in the plots were manually extracted at intervals of ten days at the latest and plots of desired density were arranged. All weeds in the plots were harvested together with their roots in the time of harvest, the sample weeds whose roots were cleaned off soil in laboratories were burned in a microwave device (200 PSI) (CEM-Mars -5 model) after necessary pre-processes, and filtrates were obtained. The element analyses of these were carried out with ICP-OES devices (Varian, Vista model).

The statistical analyses of the results obtained were done with MINITAB and Mstat packet programs.

## Conclusions

Some physical and chemical features of barley field soil on which the trial is applied are given Table 1. The soil of the trial field has a clay loam texture, and is slightly alkaline, unsalted, highly limy and low amount of organic substances. The potassium and copper levels of the soil are sufficient, phosphorus and manganese are low (compared to values given for wheat cultivation in Central Anatolia (Yurtsever, 1975), zinc level is very low and iron content is at medium level.

Depending on the number of yellow weed, the weight of weed left on the plot (g/plot) and the N, P, K, Ca, Mg and S contents uptake from soil by weeds are given in Table 2.

Depending on the number of weeds in plot, the difference between amount of N, K, P, Ca, Mg, Fe, Mn, Zn, Mo ve Cr contents uptake from soil by yellow weed are significant at P<0.05 level and the difference between S content uptake from soil by yellow weed is at significant level P<0.01. As the number of yellow weed in the plot increase, the amount of element uptake increases significantly.

It is interesting to note that the increase in the number of weed in a plot and the increase in the amount of nutrient uptake are not simply correlated. In other words, the increase in the amount of nutrient uptake is much more than the increase in number. For example, the amount of nitrogen uptake by 1 weed is 26.15 g/da and the amount of nitrogen uptake by 6 weeds is 262.57 g/da, the amount of phosphorus uptake by one weed is 13.03 g/da and the amount of nitrogen uptake by 6 weeds is 144.28 g/da. While the amount of Ca for 1 weed/m<sup>2</sup> is 90.05 g/da, it raised up to 1233.61 g/da in 6 weed/m<sup>2</sup>. This shows us that the increase in the number of weeds in plots increase the amount of element uptake 10-13 folds. In wheat cultivation fields in Tokat, the nitrogen uptake by Papaver rhoeas is 0.023 kg/ha, phosphorus is 0.0037 kg/ha and potassium is 0.0371 kg/ha (Sirma ve Güncan, 1997). N, P, K uptake from soil by the common weed species in wheat field in Tokat-Turkey were found Nitrogen 17.81 kg/ha, Phosphorus 2.86 kg/ha and Potassium 21.51 kg/ha respectively (Sirma and Güncan, 1997).

Parameters	Values
Clay (%)	38.80
Silt (%)	28.54
Sand (%)	32.66
Texture class	Clay loam (CL)
pH (1:2,5)	7.79
EC (1:5)( $\mu$ S/cm)	158.5
CaCO <sub>3</sub> (%)	41.45
Organic matter (%)	1.62
Available P <sub>2</sub> O <sub>5</sub> ( mg/kg )	6.40
Soluble Ca ( mg/kg )	7529
Soluble K <sub>2</sub> O ( mg/kg )	234.9
Soluble Mg (mg/kg)	275.95
Soluble Na ( mg/kg)	14.89
DTPA-extractable Cu ( mg/kg)	0.531
DTPA-extractable Fe ( mg/kg )	3.3
DTPA-extractable Mn ( mg/kg )	9.72
DTPA-extractable Zn ( mg/kg )	0.145

Table 1. Some Physical and Chemical Features of Experiment Area Soil

The weed element contents depending on the number of yellow weed left in trial plots are given in Table 3. As it can be seen from the table, K content ranges between 0.986-1.117 %, phosphorus content ranges between 0.193-0.208 %, Ca content ranges between 1.28-1.81 % and Mg content ranges between 0.113-0.168. In a study conducted by Güncan (1980) in Erzurum on 76 types of weed, the P content in weeds ranged between 0.10-1.15 % and K content ranged between 0.66-4.56 %. In a study conducted by Tepe et al. (1997), when the amount of nutrients are considered in terms proportion, it is seen that the plants suffer from N, P, Ca, Mg, Fe and Zn insufficiency, and the weeds are in a better situation.

In our study, the Fe, Mn, Cu and Zn content of yellow weed ranges from 382.88-463.07 mg/kg, 25.20-26.71 mg/kg, 0.00-0.005 mg/kg and 14.67-24.93 mg/kg, respectively. In a study conducted by Kadioğlu et al. (2005) found Mn content of *S.halepense* 96.5  $\mu$ g/g and *C.regalis* 95.0  $\mu$ g/g. Mendil et al.(2004) found iron and manganese contents as 714-1206  $\mu$ g/g in weed samples. Ajasa et al. (2004) reported iron and copper contents as 35-241  $\mu$ g/g and 2.96-24.4  $\mu$ g/g in some weeds. Calcium values of the weeds ranged from 27-800 mg/100 gr, Mg values 30.33-293.08 mg/100 gr, Fe values 0.17-4.88 mg/100 gr, Mn values 0.04-1.27 mg/100 gr, Zn values 0.10-2.29 mg/100 gr and Cu values 0.005-1.17 mg/100 gr obtained in weeds in Eastern Anatolia (Turan et al., 2003). The element concentrations in some weeds collected from Tokat in Turkey were found to be 122-695, 13.9-96.5, 4.3-17.3, 1.9-8.5, 13.1-30.3 and 1.0-5.5 $\mu$ g for Fe, Mn, Cu, Ni, Zn and Cr respectively (Kadioğlu et al., 2005).

In Table 3, the sufficient nutrient element contents of barley at beginning of earing stage are also given (Alpaslan et al., 2004). When these values are compared with nutrient elements of yellow weed, it is seen that especially Ca, Mn and Fe contents are highly above the sufficiency limit values for barley.

As a result, it is found out that yellow weed which is one the outstanding weeds causing problems in wheat and barley cultivation uptakes significant amount of nutrient element from soil. It was designated that as the number of yellow weed -which competes with barley- per m<sup>2</sup> increase, the amount of nutrient element it uptakes from soil increases at a higher speed. These results reveal the importance of combat against weeds in barley cultivation.

**Table 2.** Depending on the Number of Yellow Weed in Plot, Weed Weight in Trial Plot (g/plot) and the Amount of N, P, K, Ca, Mg, S, Fe, Cu, Mn, Zn, Mo, B and Na Uptakes From the Soil by Yellow Weed ( $\pm$  Se, N = 4)

Yellow weed number in plot(number/m <sup>2</sup> )	Weed weight in trial plot(g/m <sup>2</sup> )	The amount of element uptakes from soil by yellow weed (g/da)					
		N	P	K	Ca	Mg	S
1	6,97 $\pm$ 3,44	26,15 $\pm$ 13,68	13,03 $\pm$ 5,82	76,94 $\pm$ 55,7	90,05 $\pm$ 48,7	8,58 $\pm$ 5,68	3296,28 $\pm$ 1622
3	37,06 $\pm$ 21,14	146,67 $\pm$ 80,64	72,56 $\pm$ 43,38	486,64 $\pm$ 225,5	675,97 $\pm$ 422	61,88 $\pm$ 34,41	17727,13 $\pm$ 9992
6	67,97 $\pm$ 28,53	262,57 $\pm$ 126,10	144,28 $\pm$ 70,64	795,05 $\pm$ 415,7	1233,61 $\pm$ 828	105,86 $\pm$ 60,14	32451,83 $\pm$ 13257
Yellow weed number in plot(number/m <sup>2</sup> )	Fe	Cu	Mn	Zn	B	Mo(mg/da)	Na
1	2,69 $\pm$ 0,62	0 $\pm$ 0	0,175 $\pm$ 0,084	0,103 $\pm$ 0,0764	0,0498 $\pm$ 0,0341	0,25 $\pm$ 0,5	5,16 $\pm$ 1,43
3	18,06 $\pm$ 14,24	0 $\pm$ 0	0,996 $\pm$ 0,576	0,873 $\pm$ 0,5598	0,3193 $\pm$ 0,2004	5 $\pm$ 5,033	28,61 $\pm$ 15,6
6	27,08 $\pm$ 14,62	0,005 $\pm$ 0,01	1,764 $\pm$ 0,857	1,304 $\pm$ 0,5894	0,449 $\pm$ 0,4542	16,25 $\pm$ 12,685	99,27 $\pm$ 91,26

**Table 3.** The Amount of N, P, K, Ca, Mg, S, Fe, Cu, Mn, Zn, Mo, B and Na of Yellow Weed and Nutrient Element Contents of Barley at Beginning of Earring Stage

Yellow weed number in plot(number/m <sup>2</sup> )	%					mg/kg						
	N	K	P	Ca	Mg	Fe	Cu	Mn	Zn	Cr	Na	Mo
1	0,37	0,986	0,193	1,28	0,113	463,07	0,00	25,26	14,67	1,95	884,58	0,03
3	0,40	1,359	0,194	1,81	0,168	456,55	0,00	26,71	24,93	2,12	791,78	0,12
6	0,38	1,117	0,208	1,68	0,147	382,88	0,05	25,20	19,78	2,19	1356,56	0,20
<b>Arpa(Hordeum vulgare)</b>	<b>N</b>	<b>K</b>	<b>P</b>	<b>Ca</b>	<b>Mg</b>	<b>Fe</b>	<b>Cu</b>	<b>Mn</b>	<b>Zn</b>	<b>Cr</b>	<b>Na</b>	<b>Mo</b>
* The sufficient nutrient element contents of barley at beginning of earring stage	1.75-3.0	1.5-3.0	0.20-0.50	0.30-1.20	0.15-0.50	25-100	5-25	0.11-0.18	15-70			

\*Alpaslan et al.,2004.

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