The Determination of Macro and Micro Elements Uptake from Soil by Different Densities of Corn Poppy (papaver rhoeas l.) Causing Damage on Wheat

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Abstract: The present study was conducted in order to determine the macro and micro elements uptake from the soil by corn poppy (Papaver rhoeas L.) depending on its existence in different densities. The study was carried out on Karahan-99 type wheat-cultivated field in Arduçlu Village (arid) of central Selcuklu Konya in 2007. The trial was carried out having corn poppy problem on wheat cultivated fields which exemplified the Province of Konya. During the trial, each of the plots was allocated as 1 m^2 and the trial layout consisted of random plots with four repetitions. The number of corn poppy in the plots was determined as 1, 3, 5, 7 number/m^2. At the harvesting time, corn poppy samples were taken to the laboratory. After the necessary pre-treatments were analysed. Depending on the increasing corn poppy numbers, it was determined to uptake more macro and micro elements from the soil (N, P, K, Ca, Mg, Na, S, Mn, Fe, Zn, Cu) (P<0,01).

Keywords: Wheat, corn poppy (Papaver rhoeas L.), macro and micro elements.

Introduction

In Turkey, wheat is especially grown on the lands of Konya Plain and among other cities Konya has 8,34 % of all wheat cultivation lands in Turkey. According to the data from 2007, wheat production is 17.234.000 ton in Turkey and it is 1.026.565 ton in Konya, the land of cultivation is 80.977.000 da in Turkey and 6.751.320 da in Konya (Anonymous, 2008).

As in many countries, the main vermin of wheat 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 et al., 1993; Rodosevich ve Holt, 1984). Because of weed competition, the average cereal loss all over the world is about 20-40 % (Koch, 1970). The wheat yield loss in world because of weeds is reported to be 9.8 % (Cramer, 1967). 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 (Bilgir,1965; Tepe,1998), 24 % in East Anatolia (Güncan, 1976), 22,5 % in Central Anatolia (Güncan, 2006 referring to FAO) and 20 % in Cukurova region (Uygur et al.,1986). According to these data, the average wheat loss is 24 % in Turkey. This statistical information indicates the importance of weeds in wheat cultivation fields.

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^2, Boreava orientalis (yellow weed) 3.48 number/m^2 , Centaurea depressa Bieb. (dark blue bottle) 3.48 number/m^2 and B. radians Bieb. (bifora) 2.16 number/m^2 , respectively(Taştan and Ercişş, 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 wheat-weed competition in different densities of corn poppy.

Material and Method

All This study was carried out in Ardıçlı village (arid) of central Selcuklu-Konya-Turkey, which can represent Konya province. Corn poppy trial was set up in a wheat (Karahan 99 type-arid) field. The trial plots were 1 m^2 each and security lines of at least 25 cm were drawn between them. The plots set included weeds. The density of corn poppy varies between 1, 3, 5 and 7 number/m^2. All the other wide and narrow leafed weed in the plots were manually extracted at intervals of ten days at the latest and plots of desired density were arranged. All weeds in 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 of MINITAB and Mstat packet programs.

Conclusions

Some physical and chemical features of wheat 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 a low amount of organic substances. The potassium, calcium, magnesium and copper levels of the soil are sufficient, phosphorus is low (compared to values given for wheat cultivation in Central Anatolia (Yurtsever, 1975), and the level of manganese is low, zinc level is very low and iron content is at medium level.

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

Depending on the number of weeds in plot, the difference between amount of N, K, Ca, Mg, S, Fe, Cu, Mn and Cr contents uptake from soil by corn poppies are significant at $P<0.01$ level and the difference between P and Mo contents uptake from soil by corn poppies are at significant level $P<0.05$. As the number of corn poppy in the plot increase, the amount of element uptake increases significantly. It is interesting to note that the increase in the number of the weeds 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 11.02 g/da and the amount of nitrogen uptake by 7 weeds is 222.16 g/da. While the amount of Ca for 1 weed/plot is 91.9 g/da, it raised up to 1435 g/da in 7 weeds/plot. This shows us that the increase in the number of weeds in plots increase the amount of element uptake 15-20 folds. In wheat cultivation fields in Tokat, the nitrogen uptake by corn poppy is 0.023 kg/ha, phosphorus is 0.0037 kg/ha and potassium is 0.0371 kg/ha (Sırma and Güncan, 1997).

The weed element contents depending on the number corn poppies left in trial plots are given in Table 3. As it can be seen from the table, K content ranges between 2.39-2.53 %, phosphorus content ranges between 0.19 -0.27%, Ca content ranges between 2.09-2.71 %, Mg content ranges between 0.19-0.22%. 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 weeds suffer from N, P, Ca, Mg, Fe and Zn insufficiency, and the weeds are in a better situation. The Fe, Mn, Cu and Zn content of corn poppies ranges from 423-1178 mg/kg, 1.71-3.58 mg/kg, 28.04-47.38 mg/kg and 5.77-15.07 mg/kg, respectively. In a study conducted by Kadıoğlu et al. (2005), found Mn content of S.halepense 96.5 µg/g and C.regalis 95.0 µg/g. Mendil et al. (2004) found iron and manganese contents as 714-1206 µg/g in weed samples. Ajasa et al. (2004) reported iron and copper contents as 35-241 µg/g and 2.96-24.4 µg/g in some weeds.

In Table 3, the sufficient nutrient element contents of wheat before earring stage are also given (Alpaslan et al., 2004). When these values are compared with nutrient elements of corn poppy, it is seen that especially K, P, Ca and Fe contents are highly above the sufficiency limit values for wheat.

As a result, it is found out that corn poppy which is one the outstanding weeds causing problems in wheat cultivation uptakes significant amount of nutrient element from the soil. It was designated that as the number of corn poppy -which competes with wheat- per m^2 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 wheat cultivation.

Parameters	Values
Clay (%)	37.50
Silt (%)	26.96
Sand (%)	35.54
Texture class	Clay Loam (CL)
pH (1:2,5)	7.80
EC (1:5)(µS/cm)	136.5
$CaCO_3$ (%)	44.9
Organic matter (%)	1.10
Available P_2O_5 (mg/kg)	11.89
Soluble Ca (mg/kg)	6578
Soluble K_2O (mg/kg)	214.25
Soluble Mg (mg/kg)	217.45
Soluble Na (mg/kg)	8.87
DTPA-extractable Cu (mg/kg)	0.849
DTPA-extractable Fe (mg/kg)	4.16
DTPA-extractable Mn (mg/kg)	9.97
DTPA-extractable Zn (mg/kg)	0.122

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

Corn poppy number in plot(number/m^2)	Weed weight in trial plot (g/plot)	The amount of element uptakes from soil by corn poppy(g/da)					
		N	**P**	**K**	**Ca**	**Mg**	**S**
1	3,87±2,43	11,02±8,49	8,88±4,66	88,5±51,1	91,9±53,0	7,36±4,79	1910±903
3	22,29±8,94	76,46±31,67	41,42±13,51	559,1±265,9	577,2±228,7	50,54±22,64	10293±4117
5	35,03±11,37	124,47±44,63	96,30±37,68	886,0±289,3	722,8±233,1	68,60±20,21	16317±5389
7	68,41±19,80	222,16±68,41	184,83±62,42	1718,0±607,6	1435,0±444,9	150,41±47,83	31684±9406
Corn poppy number in plot (number/m^2)	**The amount of element uptakes from soil by corn poppy(g/da)**						
	Fe	**Cu**	**Mn**	**Zn**	**Mo(mg/da)**	**B**	**Na**
1	4,3±4,2	0,007±0,005	0,164±0,114	0,045±0,034	1,18±0,69	0,022±0,0152	3,42±1,77
3	9,08±2,7	0,077±0,040	0,618±0,235	0,125±0,050	9,55±5,91	0,021±0,0169	20,12±11,65
5	33,81±6,0	0,090±0,031	1,556±0,655	0,286±0,172	20,36±4,99	0,008±0,0122	35,39±16,34
7	81,64±30,3	0,245±0,093	2,828±0,886	0,455±0,103	30,17±23,92	0,089±0,1178	77,6±27,11

Table 2. Depending on the Number of Corn Poppy 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 Soil by Corn Poppy (± Se, N = 4)

Corn poppy number in plot(number/m^2)	%					mg/kg						
	N	**K**	**P**	**Ca**	**Mg**	**Fe**	**Cu**	**Mn**	**Zn**	**B**	**Na**	**Mo**
1	0,27	2,39	0,26	2,71	0,19	1167	1,71	42,45	15,07	5,53	1057	0,37
3	0,34	2,46	0,19	2,60	0,22	423	3,35	28,04	5,77	1,05	854	0,43
5	0,35	2,53	0,27	2,10	0,20	1005	2,70	47,38	8,28	0,20	991	0,65
7	0,32	2,47	0,27	2,09	0,22	1178	3,58	41,09	7,05	1,24	1122	0,41
Wheat(Triticum aestivum)(wintery)	**N**	**K**	**P**	**Ca**	**Mg**	**Fe**	**Cu**	**Mn**	**Zn**	**B**	**Na**	**Mo**
* The sufficient nutrient element contents of wheat before earring stage	1,75-3,00	1,51-3,00	0,21-0,50	0,21-1,00	0,16-1,00	10-300	5-50	16-200	21-70	-	-	-

Table 3. The Amount of N, P, K, Ca, Mg, S, Fe, Cu, Mn, Zn, Mo, B and Na of Corn Poppy and Nutrient Element Contents of Wheat Before Earring Stage

*Alpaslan et al.,2004.

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