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A Study on the Effect of Nitrogen and Potassium Elements on the Grain Yield of Canola Cultivars in Zehak

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ABSTRACT

To examine the effect of nitrogen and potassium elements on the quality and quantity of canola cultivars, an experiment has been conducted on the research farm of Zabol University in Zehak (Chah-Nimeh) during the cropping years of 2010-2011. The examined treatments include F0 (disuse of nitrogen and potassium fertilizer), F1 (use of 125 kg of potassium sulphate and 200 kg of Urea), F2 (200 kg potassium sulphate with 300 kg urea) and F3 (mixing of 300 kg of potassium sulphate fertilizer and 400 kg of urea). The experiment has been conducted in form of factorial and complete randomized block design with 4 replications on two cultivars of rapeseeds (Sarigol and Hayola 401). The results indicate that Sarigol cultivar has more siliques per plant compared to Hayola 401. However, Hayola 401 cultivar has more grains per siliques and harvest index as well as better grain yield, biological yield compared to Sarigol cultivar. The measurements of both cultivars show that both of them have the most grain yield in treatment F3, the highest oil rate in treatment F2 and the least traits in treatment.

Keywords: Nitrogen, Potassium, Grain yield, Harvest index.

INTRODUCTION

Canola is one of the main plants of common stock brassica with seeds containing over 40 percent of oil and meal full of protein. This plant can be also grown in fall, The especial traits of this plant, its adaptability to the climatic conditions of most of the regions in the country, lack of growth disorder of the crops in spring and summer, the growth period adaptability to wet periods the of year (fall and winter) made this plant growth development a hope point in the ten-year plan (2004-2014) of oilseed production increase for providing the needed raw oil of the country and ensuring the independence. Consuming the chemical fertilizers played a pivotal role in modern agriculture. Fertilization is a crucial principle for agricultural crops stability. Fertilization share in improving agronomic plants growth has been assessed to be 30 up to 50 percent of the whole yield increase on the world [13]. Unbalanced use of the chemical fertilizers is one of the major influential factors on diminishing the quality and quantity of oilseeds. Has indicated that nitrogen is highly influential on increasing the forage and grain of canola.based on an experiment titled

The Effect of Base and Top-dress Nitrogen on the Quality and Quantity of Fall Canola Yield concluded that the maximum yield of canola grain can be obtained by consuming 200 up to 240 kg of nitrogen in three steps [11]. During an experiment titled The Effect of Growth Date and Nitrogen Top-dress Fertilizer on the Growth, Yield and Yield Elements of Canola has concluded that the highest rate of used nitrogen which leads to the maximum yield is 250 kg [10]. Conducting an experiment titled Reaction of Canola Genotypes to the Environmental Conditions Yield Rate and the Seed Oil Rate concluded that potassium fertilizer enhances canola yield and its resistance against the environmental tensions [5]. Canola cultivation development has been widely considered in Iran during the last few years; however, there is not sufficient information about the fertilization needs of this plant. This research has been done aiming at examination of the effect of nitrogen and potassium elements on the grain yield and oil rate and some other agronomic traits of two canola cultivars.

MATERIALS AND METHODS

To study the effect of nitrogen and potassium elements on the qualitative and quantitative traits of canola an experiment has been conducted during the cropping years of 2010-2011 on the research farm of Zabol Agricultural Research Institute located in Chah-Nimeh. This farm is located in 30 kilometers south-east of Zabol and its geographical position is 61 degrees 41 minutes east and 30 degrees 54 minutes north latitude and altitude of 480 meters above sea level.

The experiment has been conducted on two variations of canola (Sarigol and Hayola 401) in form of factorial and complete randomized block design with four replications. The elements of examined ground -which has been fallow for one year - has been determined through sampling from its different spots from the depth of 0 up to 30 centimeters and sending the compound samples to the laboratory (table 3). To prepare the seedbed, the land was ploughed and disc ploughed twice perpendicularly. Afterwards, the scheme map was implemented by workers force and the farm was irrigated via Hiramkari method so that soil reaches the agronomic moisture. Then, the fertilization treatments including F0 (disuse of nitrogen and potassium fertilizer), F1 (use of 125 kg of potassium sulphate and 200 kg of Urea), F2 (200 kg potassium sulphate with 300 kg urea) and F3 (a mixing of 300 kg of potassium sulphate fertilizer and 400 kg of urea) are scattered steadily in each plot design. There were four crop lines in each plot design, the distance between each raw was 30 centimeters and the distance between two plants was 5 centimeters. Each plot design was 5 meters long. The distance between two plot designs was 0.5 meter and the distance of each replication was 1 meter. Until seedling establishment the surface irrigation was done once in five days. The moisture measurements have been done during the growth season according to the plant needs. Weeding has been done three times to eliminate weeds. At the end of the growth season, grain yield, biological yield, the number of silique per plant, the number of grain per silique, harvest index have been calculated. Afterwards, the variance analysis has been done by means of MSTAT-C software and the charts have been drawn by Excel. The mean comparison was done via Duncan method.

RESULTS AND DISCUSSION

The number of siliques per plant:

The results of variance analysis show that the effect of different levels of fertilizer on the number of siliques per plant is remarkably significant at the level of 1%. Treatment F3 produced 219 siliques per plant, and F0 produced 42 siliques per plant. Treatments F1 and F2 do not show any significant difference in the number of siliques per plant. This is similar to the findings of some other researchers [1, 8, 10]. The variance analysis table shows that the effect of fertilizer and

cultivar is not significant. Sarigol cultivar produces more siliques per plant compared to Hayola 401.

The number of grains per silique:
The results show that the effect of fertilizer on the number of grains is significant at the level of 1%. The comparison of the means shows that the treatments F3, F2 and F1 do not have any significant difference in the number of grains. However, the treatment F0 has a significant difference. This is similar to the findings of some researchers [1, 5, 6, 8, 10]. Hayola 401 cultivar produces more grains per silique compared to Sarigol.

Grain yield:
The results of the variance analysis show that the different levels of fertilizer effect of grain yield are significant at the level of 1%. The treatment F3 with a yield of 5349 kg and F0 with a yield of 780 kg have respectively the most and the least grain yield. The treatments F2 and F1 do not show any significant difference in grain yield. The results are similar to the findings of some other researchers [4, 8]. According to the results, the more yield of treatment F3 compared to the other treatments can be attributed to the increased fertilizer which increased the number of siliques per plant and the number of grains per silique. The decreased yield of F0 can be attributed to the less siliques and grains. Hayola 401 cultivar had more yield compared to Sarigol. Since Hayola 401 has more grains per silique. Sarigol in spite of having more siliques has fewer yields due to having fewer grains per silique.

Biological yield:
The variance analysis table shows that the different level of nitrogen and potassium fertilizers effect of the plant`s biological yield is significant at the level of 1%. The comparison of the means indicated that the highest rate of biological yield belongs to the treatment F3 with a weight of 15910 kg. The lowest biological yield belongs to the treatment F0 with a weight of 3027 kg. This result is similar to the findings of some other researchers [2, 6, 7, 8, 15]. According to the results of the variance analysis table the effect of fertilizer and cultivar of biological yield was not significant.

Harvest index:
According to the variance analysis table the different levels of fertilization effect on the harvest index is significant at the level of 1%. The examination of mean comparison table shows that treatment F3 with a yield of 32/71 % and the treatment F0 with a yield of 25/80% have respectively the highest and the lowest harvest indexes. This is similar to the findings of [12]. According to the variance analysis table the effect of fertilizer and cultivar was not significant on the harvest index. More fertilizer increased the harvest index due to more grains and the weight of 1000 grains in the plant. Sarigol cultivar had more vegetative growth and Hayola 401 had more reproductive growth. Therefore, Hayola 401 had more harvest index. This result is similar to the findings of some other researchers [3, 7, 14].

Table 1- Soil Test

Soil texture	Clay %	K ava ppm	P ava ppm	N%	O.C %	T.N.V %	PH	EC Ds/m	cm depth	Profile
Loam - clay loam	20-30	350	15	0/15	1/5	10	7-7/5	2		Normal
Silt loam	18	288	27/2	0/03	0/32	16/9	8/5	1/78	0-30	sampel

Table 2- Variance Analysis

S.O.V	D.F.	Silique per plant	Grain per Silique	Biological yield	Yield t/h	Harvest index
(Replication)	3	ns 4909/523	Ns 7/101	ns 32432971/750	ns 2/417	** 134.382
(K*N)	3	** 125987/461	** 299/050	** 671543245.5	** 84/679	** 224.766
Variation	1	ns 31/008	** 243/929	* 53235721.125	** 15/538	** 225.380
Fertilizer *Variation	3	ns 1362/086	ns 1/145	ns 31718752.375	ns 8/040	** 10.598
(Error)	21	33179/664	155/750	297786494.75	40/396	218.699
(C.V)		%31/43	%12/71	%41.79	%48/25	%10.66

*ns: non- significant and * , ** : significant at the 5% and 1% levels of probability, respectively*

Table 3. Mean comparison

	Silique per plant	Grain per Silique	Biological yield	Grain Yield	Harvest index
F0	42.56 b	16.38 b	3026.750b	0/7809 b	25.800b
F1	121.7 ab	23.23 a	8823.750 b	2/758 ab	31.275 a
F2	122.1 ab	21.76 a	8286.750 b	2/611 ab	31.337 a
F3	219.6 a	24. 36 a	15908.250 a	5/348 a	32.712 a
A1 Sari gol	127.5 a	18.67 a	7721.563a	2/178 b	27.456 a
A2 Hayola 401	125.5 a	24.19 a	10301.188a	3/572 b	33.106 a
A1F0	45.63 bc	13.76 b	31145.750ab	0/7247 b	23.250 c
A2F0	39.50 c	19.00 ab	2907.750b	0/8370b	28.350 bc
A1F1	117.9 abc	20. 65 ab	7603.500ab	2/217 ab	29.250 abc
A2F1	125.5 abc	25.80 a	10044.000ab	3/300 ab	33.300 ab
A1F2	116 abc	18.70 ab	6922.000ab	1/872 ab	27.850 bc
A2F2	128.1 abc	24.81 ab	9651.500ab	3/35 ab	34.825 ab
A1F3	230.3 a	21.56 ab	13215.000ab	3/897 ab	29.475 abc
A2F3	208.9 ab	27.15 a	18601.500 a	6/799 a	35.950 a

Means in each column followed by the similar letter(s) are not significantly different at 5% probability level, using Duncan's Multiple Range Test

CONCLUSION

The variance analysis table shows that the different fertilization levels effect on the number of grains, the number of siliques, grain yield, biological yield, harvest index, oil rate are significant at the level of 1% and have significant difference. Sarigol cultivar has more siliques but less grain per silique compared to Hayola 401. This leads to Sarigol less grain yield. Generally, with more fertilization levels, the traits will have significant increase and have positive reaction. Hayola 401 has remarkable advantages compared to Sarigol.

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