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CANOLA REQUIREMENTS FROM MACRO NUTRIENTS (NPK) UNDER NEWLY RECLAIMED SANDY SALINE SOILS CONDITIONS

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ABSTRACT

Two field experiments were conducted at the Experimental Station Farm in Kalapsho and Zaian region, Fac. of Agric., Mansoura Univ. during 2004/2005 and 2005/2006 seasons to determine the effect of nitrogen, phosphorus and potassium fertilizers levels as well as their interactions on growth, seed yield and its components as well as quality of oil seed rape (canola). Pactol cultivar under conditions of newly reclaimed sandy saline soils as in Kalapsho and Zaian region, Dakahlia Governorate was used. The main results of this study can be summarized as follows:

- Increasing nitrogen fertilizer levels from 45 to 60 and 75 kg N/fed significantly increased plant height, number of primary and secondary branches/plant, number of pods/plant, pod length, number of seeds/pod, 1000-seed weight, seed yield/fed and in both seasons. However, oil % markedly reduced by increasing nitrogen levels.
- Phosphorus fertilizer levels markedly increased all studied characters in favour of 30 kg P_2O_5/fed in both seasons, except for oil % only in the first seasons.
- Increasing potassium levels up to 24 kg K_2O/fed significantly increased plant height, number of primary and secondary branches/plant, number of pods/plant, pod length, number of seeds/pod, 1000-seed weight, seed yield/feddan and oil % in both seasons. Except for number of secondary branches/plant in the first season, 1000-seed weight in the second season and oil percentage in both seasons where the differences between K levels did not reach the level of significance.

It can be concluded that using NPK fertilization at 75 kg N + 30 kg P2O5 + 24 kg K2O/fed in order to maximizing seed and oil yields of canola under the environmental conditions of Kalabsho and Zayian district – Dakahila Governorate.

INTRODUCTION

Canola (*Brassica napus* var. *oleifera* L.) is considered one of the most important oil seed crops all over the world. Canola seeds contains about 40-50 % oil of high quality for human consumption and the remaining is a high protein meal for livestock feed. Canola oil have the best fatty acid profile of any edible oil. It is characterized by less than 1 % erucic acid and higher percent of oleic which has been shown to reduce serum cholesterol level.

In Egypt, there is a great shortage with respect to edible oils. The local production of vegetable oils fall to face the increasing rate of the consumption. This reflects the problem and shows the need for expanding oil seed crop productivity. Therefore, introducing a new oil crop such as canola in the winter season seems to be practical due to its less water requirements than summer ones, moreover it could be cultivated in the newly reclaimed soils.

In order to maximize canola productivity it is essential to find out the suitable fertilization program of nitrogen, phosphorus and potassium fertilizer levels under sandy saline soil conditions in North Delta region as in Kalapsho and Zaian area as a newly reclaimed sandy saline soils. Nitrogen fertilization is one of the most important factors which comprised about 50 % of the dry matter of protoplasm in canola plant cells. Also, nitrogen fertilizer has a pronounced effect on its growth as well as physiological and chemical characteristics of the canola crop (Jackson, 2000 ; Sharief and Keshta, 2000 ; Hocking and Stapper, 2001 ; Amit and Dhillon, 2003 ; Leilah and Al-Khateeb, 2003 ; Wang and Xiu, 2004 ; Jankowski *et al.,* 2005 and Jacobs *et al.,* 2006). Nitrogen fertilization caused favorable effect on growth, yield and yield components of canola especially under newly reclaimed sandy saline soil conditions, which are poor in organic and mineral nitrogen content. In this concern, Abo El-Hamd (2003) and Atalla (2007) found that increasing nitrogen fertilizer level up to 60 kg N/fed significantly increased plant height, number of pods/plant, seeds weight/pod, 1000-seed weight, seed yield per plant and feddan. Whilst, oil percentage was responded to low level of nitrogen fertilizer *i.e.* 20 kg N/fed.

Phosphorus is an essential component of the genetic material of the cell nucleus in canola. Cells can not divide unless there is adequate phosphorus to form the new nuclei. Phosphorus deficiency causes delay in maturity and reduces seed quality, this effects show reduction in vegetative growth. In this concern; Aulakh and Parsicha (1999) showed that the mustard crop responded significantly by 46 % to phosphorus fertilizer rate up to 40 kg P_2O_5/ha. Jayesh *et al.* (2000) found that direct application of phosphorus at the rate of 60 kg P_2O_5/ha resulted in higher yields of gobhi sarson (canola). Brennan and Bolland (2001) indicated that application of phosphorus fertilizer as single superphosphate at the rates of 0, 5, 10, 15, 20 and 25 kg P_2O_5/ha significantly affected yields of canola crop. They also added that the highest yield of canola resulted from the highest rate of phosphorus fertilizer. On the other hand, Amit and Dhillon (2003) found that growth and yield contributing characters as well as seed yield were not affect by phosphorus application. Hadzic (2005) reported that increasing phosphorus fertilizer levels led to an increase in plant height by 1 % and seed yield by 5 %.

Potassium also plays an important role in photosynthesis, protein synthesis, translocation of assimilates. Thus, it can increase plant growth and yield of canola and plays an important role in oil production. There are many reports with this respect including; Khan *et al.* (2004) whey found that increasing potassium fertilizer levels from 0 to 25, 75, 100, 125 and 150 kg K_2O/ha significantly increased seed yield (3473 kg/ha), number of seeds per pod and 1000-seed weight (6.639 g). However, the highest value of oil content (42.86 %) was obtained from the control treatment (no fertilizer). Szozepaniak (2004) showed that potassium has critical influence on crop yield. More, Badr *et al.* (2005) showed that application of potassium at the rate of 24 kg K_2O/fed increased number of branches/plant and yield components *i.e.* number and weight of pods, straw and seed yields, seed index and oil percentage. Jankowski *et al.* (2005) pointed out that increasing potassium fertilizer levels above 120 kg K_2O/ha significantly increased seed

yield of canola. Finally, Govahi and Saffari (2006) reported that increasing potassium fertilizer rate up to 90 kg K_2O/ha was enough to increase plant height, number of primary and secondary branches and protein yield. In addition, seed yield, oil and protein contents and oil yield were increased by increasing potassium level up to 120 kg K_2O/ha.

The objectives of this investigation were to determine the effect of nitrogen, phosphorus and potassium fertilizers levels as well as their interactions on growth, seed yield and its components as well as quality of canola under conditions of newly reclaimed sandy saline soils as in Kalapsho and Zaian region, Dakahlia Governorate.

MATERIALS AND METHODS

Two field experiments were conducted at the Experimental Station Farm in Kalapsho and Zaian region, Fac. of Agric., Mansoura Univ. during 2004/2005 and 2005/2006 seasons to determine the requirements of canola to nitrogen, phosphorus and potassium fertilizers levels as well as their interactions on growth, seed yield and its components. Canola Pactol cultivar was obtained from Oil Section, Agriculture Research Center (ARC), Ministry of Agriculture was used.

Each experiment included twelve treatments which were three nitrogen fertilizer levels (45, 60 and 75 kg N/fed), two phosphorus fertilizer levels (15 and 30 kg P_2O_5/fed) and two potassium fertilizer levels (12 and 24 kg K_2O/fed), which were laid-out in factorial randomized complete block design with four replications.

Nitrogen and potassium fertilizers were in the forms of ammonium nitrate (33.0 % N) and potassium sulphate (48 % K_2O), respectively and were applied as a side-dressing in three equal doses at the above mentioned rates before the second, third and fourth irrigations. Phosphorus fertilizer was in the form of calcium superphosphate (15.5 % P_2O_5) and applied at previously mentioned rates after ridging.

Each experimental basic unit included five ridges, each 60 cm apart and 3.5 m long, resulted in an area of 10.5 m^2 (1/400 fed) in both seasons. Soil samples were taken at random from the experimental field area at a depth of 15 and 30 cm from soil surface before soil preparation to determine the chemical and physical soil properties as described by Page (1982) as shown in Table 1.

Canola seeds were sown on 15th and 22nd of November using hand sown on one side of the ridge at 15 cm distance during the first and second seasons, respectively. Plants were thinned at the age of 30 days from planting to obtain one plant/hill. Plants were kept free from weeds, which were manually controlled by hand hoeing for three times before first, second and third irrigations. The common agricultural practices for growing canola according to the recommendations of Ministry of Agriculture were followed, except the factors under study.

Table 1: Physical and chemical soil characteristics at the experimental sites during 2004/2005 and 2005/2006 seasons.

Soil analysis \ Seasons	2004/2005	2005/2006
A: Mechanical analysis		
Sand (%)	92.97	91.50
Silt (%)	1.99	2.39
Clay (%)	5.04	6.11
Texture class	Sandy	Sandy
B: Chemical analysis		
Organic matter (%)	0.04	0.05
Available nitrogen (ppm)	12.10	11.13
Available phosphate (ppm)	8.20	7.30
Exchangeable potassium (ppm)	85.21	81.13
EC m-mohes/cm at 25^0C	8.39	8.85
Soil reaction pH	7.93	8.02

Studied characters:

At harvest random samples of ten plants from the outer ridges of each plot were taken to determine the following characters:

1- Plant height (cm).
2- Number of primary branches/plant.
3- Number of secondary branches/plant.
4- Number of pods /plant.
5- Pod length (cm).
6- Number of seeds/pod.
7- 1000-seed weight (g).
8- Seed yield/fed (kg): It was determined from the plants of the two inner ridges from each plot. The plants were harvested and dried under sunshine for one week. Thereafter the pods were threshed and seeds were cleaned after separation from pods . Seed yield per plot and then per feddan was estimated in kg/fed.
9- Oil seed percentage: It was estimated by using 50 g from each plot, cleaned and ground into very fine powder by grinder to determine seed oil percentage as described by A.O.A.C. (1990) using Soxhelt apparatus and petroleum hexan as an organic solvent.

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the randomized complete block design as published by Gomez and Gomez (1984) using means of "MSTAT-C " Computer software package. The treatments means were compared using the Newly Least Significant Differences (NLSD) according to the producer outlined by Waller and Duncan (1969).

RESULTS AND DISCUSSION

I- Effect of nitrogen fertilizer levels:

All studied characters *i.e.* plant height, number of primary and secondary branches/plant, number of pods/plant, pod length, number of seeds/pod and 1000-seed weight and seed yield/fed and oil percentage in

seeds were significantly affected due to increasing nitrogen fertilizer levels from 45 up to 75 kg N/fed in the two growing seasons under conditions of this study as shown in Tables 2 and 3. The highest nitrogen fertilizer level *i.e.* 75 kg N/fed caused a significant increase in all studied characters and resulted in the highest values of them in both seasons, except oil concentration. On the other hand, the lowest values of these characters resulted from fertilizing canola plants with 45 kg N/fed in the two growing seasons. Increasing nitrogen levels from 45 through 75 kg N/fed markedly reduced seed oil concentration in the seeds in both seasons. Whilst, the lowest nitrogen fertilizer level resulted in the highest increase oil content in seeds of canola. The decrease in oil content also might be explained by increased amination of such metabolites which are precursors common to both amino acids and acetyl Co. A. Such increases in agronomic characters may be attributed to the role of nitrogen fertilizer in stimulating the meristemic activity and elongation of plant and pods as well as increasing photosynthetic activity of canola plant and consequently increased seed yield per unit area. Similar results were recorded by other investigators among them Abo El-Hamd (2003), Leilah and Al-Khateeb (2003), Wang and Xiu (2004), Jankowski *et al.* (2005) Jacobs *et al.* (2006) and Atalla (2007).

II- Effect of phosphorus fertilizer levels:

Tables 2 and 3 indicate the effect of phosphorus fertilizer levels on all studied characters, increasing phosphorus fertilizer levels from 15 to 30 kg P_2O_5/fed markedly recorded significant increase in plant height, number of primary and secondary branches/plant, number of pods/plant, pod length, number of seeds/pod, 1000-seed weight and seed yield/fed in both seasons, except oil % in the second seasons. The highest values of all studied characters resulted from fertilizing canola plants with the highest level of phosphorus fertilizer (30 kg P_2O_5/fed) in both seasons. Such increases might be attributed to the role of phosphorus in encouraging photosynthetic activity and increasing enzymes as well as root growth which in turn induced such effects. Beside, the increase in seed yield by phosphorus fertilizer might be related to the increase in seed weight and size. These results are in line with those stated by Amit and Dhillon (2003) and Hadzic (2005).

III- Effect of potassium fertilizer levels:

Potassium fertilization showed marked and statistical increases in most of the studied characteristics in both seasons as reported in Tables 2 and 3, with the exception of number of secondary branches/plant (in the first season), 1000-seed weight (in the second season) and oil percentage (in both seasons). Increasing potassium fertilizer levels from 12 up to 24 kg K_2O/fed led to a significant increase in most studied characters in the first and second seasons. The highest level of potassium fertilizer (24 kg K_2O/fed) markedly possessed significant increase in all studied characters compared with the lowest level (12 kg K_2O/fed). Potassium addition encouraged the development of seeds due to the great amount of metabolites synthesized in the plants and translocated to the reproduction organs with the consequent increase in yield and its components. These results are in agreement with those reported by Khan *et al.* (2004), Szozepaniak (2004), Badr *et al.* (2005), Jankowski *et al.* (2005) and Govahi and Saffari (2006).

Table 2: Means of plant height, number of primary and secondary branches/plant, number of pods/plant and pod length as affected by nitrogen, phosphorus and potassium fertilizers levels of canola during 2004/2005 and 2005/2006 seasons.

Characters / Treatments	Plant height (cm)		No. of primary branches/ plant		No. of secondary branches/ plant		No. of pods/plant		Pod length (cm)	
	2004 /2005	2005 /2006	2004 /2005	2005 /2006	2004 /2005	2005 /2006	2004/2 005	2005 /2006	2004 /2005	2005 /2006
A- Nitrogen fertilizer levels:										
45 kg N/fed	86.5	90.2	9.71	6.21	10.23	15.86	248.7	268.1	6.29	6.47
60 kg N/fed	87.9	94.8	10.56	6.94	11.70	19.08	284.6	286.7	6.39	6.71
75 kg N/fed	89.0	100.7	11.29	7.43	13.10	23.97	299.5	306.3	6.54	7.20
F. test	**	**	**	**	**	**	**	**	**	**
LSD 5 %	0.1	1.1	0.26	0.15	0.43	0.37	2.2	3.4	0.08	0.06
B- Phosphorus fertilizer levels:										
15 kg P_2O_5/fed	87.2	93.8	10.18	6.68	11.37	18.79	271.9	281.2	6.34	6.71
30 kg P_2O_5/fed	88.3	96.7	10.86	7.04	11.98	20.48	283.3	292.8	6.48	6.88
F. test	**	**	**	**	**	**	**	**	**	**
C- Potassium fertilizer levels:										
12 kg K_2O/fed	87.5	94.7	10.33	6.80	11.52	19.27	275.0	284.9	6.36	6.75
24 kg K_2O/fed	88.1	95.8	10.71	6.92	11.83	20.00	280.1	289.1	6.46	6.84
F. test	**	*	**	*	NS	**	**	**	**	**

Table 3: Means of number of seeds/pod, 1000-seed weight, seed yield/fed and oil percentage in seeds as affected by nitrogen, phosphorus and potassium fertilizers levels of canola during 2002/2003 and 2003/2004 seasons.

Characters / Treatments	No. of seeds/pod		1000-seed weight (g)		Seed yield (kg/fed)		Oil percentage (%)	
	2004 /2005	2005 /2006	2004 /2005	2005 /2006	2004 /2005	2005 /2006	2004 /2005	2005 /2006
A- Nitrogen fertilizer levels:								
45 kg N/fed	25.58	27.08	3.01	3.09	600.4	627.2	39.25	42.24
60 kg N/fed	25.72	28.72	3.32	3.46	825.7	915.7	39.73	41.07
75 kg N/fed	26.13	29.69	3.61	3.76	1035.6	1129.3	37.86	40.34
F. test	**	**	**	**	**	**	**	**
LSD 5 %	0.15	0.30	0.10	0.08	29.2	29.7	0.85	0.73
B- Phosphorus fertilizer levels:								
15 kg P_2O_5/fed	25.59	28.06	3.21	3.34	777.6	835.1	38.75	40.92
30 kg P_2O_5/fed	26.03	28.93	3.41	3.53	863.5	946.4	39.15	41.51
F. test	**	*	**	**	**	**	NS	*
C- Potassium fertilizer levels:								
12 kg K_2O/fed	25.58	28.34	3.26	3.40	795.1	863.6	38.72	41.08
24 kg K_2O/fed	26.04	28.66	3.36	3.47	846.0	917.9	39.18	41.35
F. test	**	*	*	NS	**	**	NS	NS

IV- Effect of interactions:

The interaction between nitrogen and phosphorus fertilizer levels had a significant effect on 1000 – seed weight only in the first season (Table 4). Increasing nitrogen fertilizer levels from 45 through 75 kg N/fed significantly increased 1000 – seed weight under different phosphorus fertilizer levels. The maximum 1000 – seed weight (3.67 g) was recorded from the highest

level of nitrogen fertilizer at 75 kg N/fed together with addition of 30 kg P_2O_5/fed in the first season.

Significant interaction was recorded among NPK fertilizer levels on oil % only in the first season (Table 5). The maximum oil concentration (40.37 %) resulted from the addition of phosphorus fertilizer at the rate of 30 kg P_2O_5/ fed together with 24 K_2O/fed and 60 kg N/fed (60 kg N + 30 kg P_2O_5 + 24 K_2O/fed). On the other hand, the lowest oil content (36.19 %) resulted from 75 kg N + 15 kg P_2O_5 + 24 K_2O/fed.

It could be stated that maximum seed yield of canola at Kalapsho and Zaian region could be obtained by using NPK fertilization at 75 kg N + 30 kg P_2O_5 + 24 kg K_2O/fed.

Table 4: Means of 1000-seed weight (g) as affected by the interaction between nitrogen and phosphorus fertilizers levels of canola during 2004/2005 season.

Treatments	Phosphorus fertilizer levels	
	15 kg P_2O_5/fed	30 kg P_2O_5/fed
Nitrogen fertilizer levels:		
45 kg N/fed	2.82	3.19
60 kg N/fed	3.27	3.37
75 kg N/fed	3.55	3.67
F. test	*	
LSD 5 %	0.12	

Table 5: Means of oil percentage as affected by the interaction among nitrogen, phosphorus and potassium fertilizers levels of canola during 2004/2005 season.

Phosphorus fertilizer levels / *Potassium fertilizer levels*	15 kg P_2O_5/fed		30 kg P_2O_5/fed	
	12 kg K_2O/fed	24 kg K_2O/fed	12 kg K_2O/fed	24 kg K_2O/fed
Nitrogen fertilizer levels:				
45 kg N/fed	38.37	40.00	39.35	39.30
60 kg N/fed	39.85	39.97	38.75	40.37
75 kg N/fed	38.25	36.10	37.75	39.37
F. test	**			
LSD 5 %	1.70			

REFERENCES

A.O.A.C. (1990) Official Methods of Analysis Association of Official Analytical Chemists. 15th Ed. Inc. Wash. D.C. Nutrient Cycling in Agroecosystems, 56 (3):263-275.

Abo El-Hamd, A.S. (2003) Response of some canola varieties to drill spacing and nitrogen fertilizer rates. J. Agric. Sci. Mansoura Univ., 28 (4): 2497-2504.

Amit, S. and S.A. Dhillon (2003) Effect of nitrogen and phosphorus on growth, yield and nutrient uptake of canola gobhi sarson (*Brassica napus* L.). Annals of Agric. Bio. Res., 8 (2): 227-231.

Atalla, R.A.A. (2007) Response of canola plants to different nitrogen fertilizer levels, seeding rates and row spacing in newly reclaimed sandy soils. J. Agric. Sci. Mansoura Univ., 32 (9): 7063-7075.

Aulakh, M.S. and N.S. Parsicha (1999) Effects of rate and frequency of applied P on crop yields, P uptake and fertilizer, P use efficiency and its recovery in groundnut – mustard rotation. J. of Agric. Sci., 132 (2): 181-188.

Badr, N.M. ; A.T. Thaalooth and M.M. Tawfik (2005) Effect of different patterns of potassium fertilization on growth and yield of canola (*Brassica napus* L.) grown under different levels of saline irrigation. Bull. of the National Res. Center, Cairo, 30 (5): 507-520.

Brennan, R.F. and M.D.A. Bolland (2001) Comparing phosphorus fertilizer requirements of canola, lupine and wheat. J. of Plant Nutrition, 24 (12): 1885-1900.

Gomez, K.N. and A.A. Gomez (1984) Statistical procedures for agricultural research. John Wiley and Sons, Inc., New York, 2nd ed., pp 680.

Govahi, M. and M. Saffari (2006) Effect of potassium and sulphur fertilizers on yield, yield components and seed quality of spring canola (*Brassica napus* L.). J. of Agron., 5(4): 577-582.

Hadzic, A. (2005) The effect of various concentrations of mineral fertilizers on germination and growth of oilseed rape (*Brassica napus* var. *oleifera* L.). Radovi Plojoprivrednog Fakalteta Univerziteta u Sarajevu, Works of the Faculty of Agricultural University of Sarajevu, 55 (2): 85-98 (C.F. Computer Search).

Hocking, P.J. and M. Stapper (2001) Effects of sowing time and nitrogen fertilizer on canola and wheat, and nitrogen fertilizer on Indian mustard. I- Dry matter production, grain yield and yield components. Australian J. of Exp. Agric., 41 (4): 826-833.

Jackson, G.D. (2000) Effects of nitrogen and sulfur on canola yield and nutrient uptake. Agron. J., 92: 644-649.

Jacobs, J.J. ; G.N. Ward ; F.R. Mackenzie and G. Kearny (2006) Irrigation and nitrogen fertilizer effects on dry matter yield, water use efficiency and nutritive characteristics of oilseed rape in South West Victoria. Australian J. of Exp. Agric., 46 (9): 1139-1149.

Jankowski, K.J. ; R. Rybacki and S.W. Budzynki (2005) Relation between fertilization and yield of oilseed rape in big area farms. Rosliny Oleiste, 26(2): 437-450 (C.F. Computer Search).

Jayesh, S. ; J.S. Koler and J.S. Deal (2000) Response of gobhi sarson (*Brassica napus* subsp. *oleifera* var *annua*) soybean (*Glycine max*) sequence to phosphorus and sulphur. Indian J. of Agron., 45 (1): 31-36.

Khan, H.Z. ; H.A. Malik ; M.F. Saleem and A. Imran (2004) Effect of different potassium fertilization levels on growth, seed yield and oil content of canola (*Brassica napus* L.). Intern. J. of Agric. And Bio., 6 (3): 557-559.

Leilah, A.A. and S.A. Al-Khateeb (2003) Growth and yield of canola (*Brassica napus* L.) in relation to irrigation treatments and nitrogen levels. J. Agric. Sci. Mansoura Univ., 28 (2): 819-828.

Page, A.L. (1982) Methods of soil analysis. Ed part 2: chemical and microbiological properties. Agron. J. Amer. Soc. Inc. Puble. Madison, Wisc, USA.

Sharief, A.E. and M.M. Keshta (2000) Response of some canola cultivars (*Brassica napus* L.) to different sources and levels of nitrogen fertilizer in soil affected by salinity. Zagazig J. Agric. Res., 27 (3): 603-616.

Szozepaniak, W. (2004) Reaction of crops to potassium fertilizers. J. of Elementology, 9(4 supplement): 57-66 (C.F. Computer Search).

Waller, R.A. and D.B. Duncan (1969) A bays rule for the symmetric multiple comparison problem. J. Amer. Assoc., 64: 1484-1503.

Wang, Z. and L.S. Xiu (2004) Effects of nitrogen and phosphorus fertilization on plant growth and nitrate accumulation in plant. J. of Plant Nutrition, 27 (3): 539-556.

إحتياجات الكانولا من العناصر الكبرى (NPK) تحت ظروف الأراضى الرملية الملحية حديثة الإستصلاح

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أقيمت تجربتان حقليتان بمحطة التجارب والبحوث الزراعية بقلابشو وزيان – كلية الزراعة – جامعة المنصورة خلال موسمى ٢٠٠٤/٢٠٠٥ و ٢٠٠٥/٢٠٠٦ م لدراسة مستويات النيتروجين (٤٥ ، ٦٠ و ٧٥ كجم نيتروجين/فدان) والفوسفور (١٥ و ٣٠ كجم P_2O_5/فدان) والبوتاسيوم (١٢ و ٢٤ كجم K_2O/فدان) والتفاعل بينهم على نمو ومحصول الكانولا صنف باكتول تحت ظروف الأراضى الرملية الملحية حديثة الإستصلاح بمنطقة قلابشو وزيان – محافظة الدقهلية وإمكانية زراعة محصول الكانولا كمحصول زيتى شتوى تحت ظروف الأراضى الرملية الملحية حديثة الإستصلاح حيث يعد ذلك متطلب أساسى فى مصر لزيادة إنتاج الزيت. ونفذت التجارب فى تصميم تجربة عاملية فى قطاعات كاملة العشوائية ذو أربع مكررات.

- ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى:

١- تشير نتائج التحليل الإحصائى للبيانات أن جميع الصفات تحت الدراسة تأثرت معنوياً بزيادة مستويات السماد النيتروجينى من ٤٥ إلى ٧٥ كجم نيتروجين/فدان فى موسمى الدراسة. وزادت جميع الصفات زيادة تدريجية بزيادة مستويات السماد النيتروجينى من ٤٥ إلى ٧٥ كجم نيتروجين/فدان ما عدا نسبة الزيت بالبذور حيث إنخفضت بزيادة معدل التسميد النيتروجينى حتى ٧٥ كجم نيتروجين/فدان..

٢- أظهرت مستويات التسميد الفوسفاتى تأثيراً معنوياً على جميع الصفات تحت الدراسة خلال موسمى الدراسة عدا صفة النسبة المئوية للزيت فى البذور فى الموسم الأول فقط. جميع الصفات تحت الدراسة أظهرت زيادة ملحوظة نتيجة زيادة مستويات التسميد الفوسفاتى من ١٥ إلى ٣٠ كجم P_2O_5/فدان.

٣- أدت زيادة مستويات التسميد البوتاسى من ١٢ إلى ٢٤ كجم K_2O/فدان إلى تأثير معنوى على جميع الصفات تحت الدراسة فى كلا الموسمين ماعدا عدد الأفرع الثانوية/نبات (فى الموسم الأول) ، وزن ١٠٠٠ بذرة (فى الموسم الثانى) والنسبة المئوية للزيت فى البذور (فى كلا الموسمين). وأدى أستخدام المعدل الأعلى من التسميد البوتاسى (٢٤ كجم K_2O/فدان) إلى الحصول على أعلى القيم لجميع الصفات تحت الدراسة فى كلا الموسمين بالمقارنة بالمعدل الأقل.

عموماً يوصى بتسميد محصول الكانولا بـ ٧٥ كجم نيتروجين + ٣٠ كجم P_2O_5/فدان + ٢٤ كجم K_2O/فدان لزيادة إنتاجيتها تحت ظروف الأراضى الرملية الملحية حديثة الإستصلاح المنتشرة بمنطقة قلابشو وزيان - محافظة الدقهلية.