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RESPONSE OF CANOLA PLANTS TO DIFFERENT NITROGEN FERTILIZER LEVELS, SEEDING RATES AND ROW SPACINGS IN NEWLY RECLAIMED SANDY SOILS.

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ABSTRACT

Two field experiments were carried out at Ismailia Agricultural Research Station in Ismsilia governorate during 2002/2003 and 2003/2004 growing seasons to study the effect of three nitrogen levels (30,45 and 60 Kg N/fed), three seeding rates (1.5,2.5 and 3.5 Kg seeds/fed) and two spacing between rows (25 and 50 cm) on growth, yield and yield components as well as seed oil content of canola (cv Serw 4) (*Brassica napus , L.).*

Results over the two growing seasons revealed that :

1- Plant height, number of racemes and siliquas/plant, seed yield /plant, weight of 1000- seed, seed and oil yields /fed were significantly increased with increasing nitrogen level up to 60 kg N/fed. The opposite was true for seed oil content in both seasons.
2- Increasing seeding rates significantly decreased plant height, number of racemes and sliquas /plant ,seed yield/plant, weight of 1000-seed and seed oil content. Seed and oil yields /fed were maximum at seeding rate of 2.5 Kg/fed, followed by 3.5 Kg/fed. The lowest seed and oil yields/fed were obtained when seeding rate 1.5 Kg /fed in the two seasons.
3- Increasing row spacing from 25 to 50 cm resulted in significant increases in all studied characters, except seed oil content in the two seasons.
4- In both seasons the interaction effect between nitrogen levels and seeding rates had significant on plant height ,seed yield/fed, seed oil content and oil yield/ fed ,while number of racemes /plant significant in the second season. The interaction effect between nitrogen levels and row spacings had significant on plant height in both seasons and number of racemes/plant in the first season .Also the interaction effects between seeding rates and row spacings had significant on number of racemes/plant in the first season ,seed yield/plant and seed oil content in the second season. The highest values of seed and oil yields/fed were obtained when canola plants grown at 2.5 kg seed/fed in rows 50 cm apart and received 60 kg N/fed.
5- Simple correlation among studied characters revealed that seed yield/fed was positively and significantly correlated with plant height , number of racemes and siliquas /plant , seed yield/plant, 1000-seed weight and oil yield /fed in both seasons. Seed yield /fed was significantly and negatively correlated with seed oil content in the two seasons .

INTRODUCTION

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 production, through increasing the oil crops area, introducing new oil crops such as canola and improve productivity and seed oil content.

Canola *(Brassica napus, L.)* is considered one of the most important oil seed crops all over the world. Seeds contain about 40-50 % oil of high quality for human consumption and the remaining is a high protein meal for livestock feed. Nutrition experts recognize canola oil as having the best fatty acid profile of any edible oil . It is characterized by less than 2% erucic acid and higher percent of oleic acid which has been shown to reduce serum cholesterol level.

Information about cultural practices of Canola under Egyptian conditions needs more research. Yield of canola is affected by several agricultural practices, among nitrogen fertilizer levels , seeding rates and row spacings .

Response of canola to nitrogen fertilizer may differ according to location, soil type , variety and other factors . *Abo EL-Hamd (2003*) reported that increasing nitrogen levels from 30 to 60 Kg N/fed significantly increased plant height , number of seeds/siliqua , 1000-seed weight, seed and oil yields /fed, while oil percent was only responsive to the lowest dose. *Ismail and Sorour (2005*) reported that, increasing of nitrogen level up to 60 Kg N/fed increased plant height , number of siliquas/plant , seed yield /plant , 1000-seed weight, seed and oil yields/fed , but oil percent took the reverse trend. Increasing nitrogen fertilizer level up to 60 Kg N/fed significantly increased seed yield as reported by *Qayyum et al . (1999*) , *Sharief and Keshta (2000) and Ahmed (2001). More, Leilah et al.(2003*), found that increasing nitrogen fertilizer levels from 45 to 60 Kg N/fed was associated with marked increases in seed and oil yields, but seed oil content was significantly decreased with increasing nitrogen rates.

Plant population density is also an important factor for increasing canola productivity per unit area of land. *Mahasi (1988*) reported that canola plants were short at higher densities. *Guirguis et al. (1996*) reported that number of primary racemes/plant decreased at high plant densities. They also added that increasing plant population densities from 70000 to 280000 plant /fed decreased seed oil content. Increasing plant population decreased plant height , number of racemes/plant, 1000-seed weight , seed and oil yields /fed, *Bassal et al.,(1998*).

Growth and seed yield of canola are also affected by row spacing. *Patil and Rajat (1978*) reported that seed oil content was significantly decreased, whereas number of siliquas/plant was increased with wider spacing.

Mendham et al.(1981) found that number of racemes/plant was significantly increased with wider spacing . *Kandil et al.(1990*) reported that the highest seed yield/plant and seed oil content were obtained from growing canola at 60 cm between rows. *Abo EL-Hamd, (2003*) found that increasing the distance between rows from 50 to 70 cm resulted in significant increases in number of racemes/plant , number of siliquas/plant and 1000-seed weight as well as seed and oil yields /fed.

The present experiment aims to study the response of canola crop to applied nitrogen, seeding rate and row spacing under newly reclaimed sandy soils.

MATERIALS AND METHODS

Two field experiments were carried out at Ismailia Agricultural Research Station, in Ismsilia governorate during the two successive winter seasons of 2002 /2003 and 2003/2004 to investigate the effect of nitrogen levels, seeding rates and row spacings on growth, yield and yield components of Canola (cv Serw 4) *(Barassica napus, L*.).

The studied treatments were as follow:

A- Nitrogen fertilizer levels were 30, 45 and 60 Kg N/fed.
B- Seeding rates were 1.5, 2.5 and 3.5 Kg seeds/fed.
C- Row spacing were 25 and 50 cm .

Split split-plot design with three replications was used. Nitrogen levels were assigned to the main plots, while the sub plots were devoted to seeding rates and the sub- sub plots comprised row spacing. Plot area was 10.5 m^2 (3.5 × 3 m). Canola cultivar was Serw 4 planted on 20 and 25 November in 2002/2003 and 2003/2004 seasons, respectively. Physical and chemical analysis of the experimental site are presented in Table 1. Monocalcium superphosphate (15 % P2O5) was applied at the rate of 200 Kg/fed during seed bed preparation. Nitrogen fertilizer levels (30,45 and 60 Kg N/fed) were applied in the form of ammonium sulphate (20.6 % N) added in three equal doses, the first dose was added immediately after 21 days from sowing, while the second and third doses were applied 40 and 60 days after sowing. Potassium sulphate (50% K2O) was applied at the rate of 50 Kg/fed in two equal doses, during land preparation and 30 days after sowing . Sprinkler irrigation system was used and watering was at 4 days intervals.

Table 1 : Physical and chemical analysis of the experimental sites During the two seasons.

Soil properties	2002/2003	2003/2004
Mechanical analysis :		
Coarse sand %	58.7	59.3
Fine sand %	38.6	38.2
Silt %	1.7	1.5
Clay %	1	1
Soil texture	sandy	sandy
Chemical analysis :		
pH	7.5	7.8
Ca CO 3	1.3	1.7
Organic matter %	0.12	0.15
Available N, ppm	15	10
Available P, ppm	8	8
Available K, ppm	31	39
Available Zn, ppm	0.7	0.7
Available Mn, ppm	1.3	1.5
Available Fe, ppm	1.8	2.2

Ten guarded plants were randomly taken at harvesting from each sub - sub plot to measure:
1-Plant height (cm).
2-Number of racemes/plant.
3-Number of siliquas/plant .
4-Seed yield/plant (g)

Harvest took place on May 1st and May 3rd in the first and second seasons ,respectively to determine:
5- Weight of 1000- seed was estimated on plot basis.
6-Seed yield/fed: mature canola plants in each sub- sub plot were harvested and left for natural dryness, then threshed and seed yield was weighted in Kg/plot and transferred into seed yield in Kg/fed. basis.
7-Seed oil content was estimated using Soxhlet apparatus and petroleum ether (40-60%) as solvent according to *(A.O.A.C., 1990*).
8-Oil yield /fed. was determined by multiplying seed oil content by seed yield/fed.

Data were statistically analyzed according to *Gomez and Gomez (1984)* Means were compared by using LSD test at 5% level of probability.

RESULTS AND DISCUSSION

1-Effect of nitrogen levels:

It was not notes in Tables 1 that the texture is sandy soil without salinity or alkalinity problems. The soil had low organic matter and available nitrogen and therefore the main factor of this experiment is nitrogen fertilizer levels.

Data presented in Tables 2 & 3 revealed that increasing nitrogen levels from 30 to 60 kg N/fed significantly increased plant height, number of racemes, number of siliquas /plant, seed yield/plant, weight of 1000-seed, seed and oil yields /fed. The opposite was true with regard to oil content. The increase in number of siliquas /plant may be due to the active role of nitrogen in stimulating meristematic activity towards more growth and the formation of more flowering branches and eventually produced more siliquas /plant and heavier 1000-seed weight . Similar results were reported by *Sharief and Keshta (2000*), *Abo El-Hamd (2003)* and *Leilah et al. (2003*).

Applying nitrogen fertilizer at the levels of 45 and 60 Kg N/fed caused 28.1,38.13 and 45.2, 55.14 % increases in seed yield/fed in the first and the second seasons , respectively as compared with the lowest nitrogen level (30 Kg N/fed). The highest nitrogen level (60 Kg N/fed) gave 36.38 and 46.49 % increase in oil yield/fed over the lowest nitrogen level (30 kg N/fed) in 2002/2003 and 2003/2004 seasons, respectively. This can be attributed to the role of nitrogen as an important element to increase growth building substance from which living material or protoplasm of every plant cell is made and therefore, increase the growth vigor of plant organs *(Salisbury and Ross 1994*). Similar results were reported by *Qayyum et al.(1999),Ahmed (2001*) and *Ismail and Sorour (2005*). Vice versa the percentage of seed oil was decreased with the increase in nitrogen rates. The reduction in seed oil

percentage with increasing nitrogen level could be attributed to the disturbance of carbohydrates translocation mechanism (*Salisbury and Ross*, *1994).*

2-Effect of seeding rates:

Data in Tables 2 & 3 show the effect of seeding rates on canola growth, yield and yield components. It is clearly evident that increasing seeding rates from 1.5 to 2.5 and /or 3.5 Kg/fed significantly decreased plant height, number of racemes and siliquas/plant, seed yield/plant, 1000-seed weight and seed oil content. Higher densities lead to competition among plants for nutrients, water and light, reduced growth, branching and inhibit photo-synthetic assimilation which in turn decreased seed and oil yield. These results are in good agreement with those obtained by *Mendham et al.,(1981),Mahasi (1988*);*Guirguis* e*t al., (1996*) and *Bassal et al.,(1998*).

Seed and oil yields /fed were maximal at seed rate of 2.5 Kg/fed surpassing those of 1.5 and 3.5 Kg seeds /fed. It is evident that the rate of 2.5 Kg/fed gave the highest values of seed and oil yields /fed in both seasons. Seeding rate with 2.5 Kg/fed gave (158.15 , 137.31 kg) seed yield/fed and (66.73 and 58.84 kg) oil yield/fed over the highest seeding rate (3.5 Kg/fed) in 2002/2003 and 2003/2004 seasons ,respectively. Higher densities among plants led to plant competition for nutrients, water and light and therefore reduced growth, branching and inhibit photo-synthetic assimilation which in turn decreased seed and oil yields/fed. Similar results were reported by *Mahasi (1988)* and *Bassal et al. (1998*).

The percentage of seed oil was decreased with the increase of seeding rates from 1.5 to 2.5 and 3.5 kg seed/fed as shown in Table 3. These decrease might be due to high competition among plants, producing small seeds with reduced oil content. These results go in line with those obtained by Mahasi (1988).

3-Effect of row spacing:

Data presented in Tables 2 & 3 show that except seed oil content, row spacing of 50 cm significantly increased plant height, number of racemes and siliquas/plant, seed yield /plant, weight of 1000 seeds , seed and oil yields/fed in both seasons. Similar findings were reported by *Mendham e*t *al.(1981*)and *Abo El-Hamd (2003*).The data of yield attributes showed that wider row spaced crop (50cm) significantly produced more siliquas and seed yield/plant than 25 cm spaced plants. Increases in yield attributes with wider row spacing may be due to less competition among plants for natural resources. Similar observations were recorded by *Butter and Aulakh(1999*) and *Abo El- Hamd (2003*).

Data showed also that seed yield was significantly influenced by row spacing and the seed yield was increased by 64.65 and 53.46 Kg/fed with increasing spacing from 25 to 50 cm in the first and second seasons, respectively. While oil yield / fed was increased by 22.66 and 17.85 kg/fed in the two respective seasons when row spacing increased from 25 to 50 cm apart. These results are in general harmony with Buttar and Aulakh (1999)and AboEl-Hamed (2003) .

On the other hand, seed oil content was decreased at wider spacing (Table 3), the same trend was detected by *Patil and Rajat (1978)and Shivani and Sanjeev Kumar (2002*).

Table 2: Averages of plant height , number of racemes/plant, number of siliquas/plant and seed yield /plant as affected by nitrogen levels, seeding rates and row spacing in 2002/2003 and 2003/2004 seasons.

Characters / Treatments	Plant height (cm)		Number of racemes/plant		Number of siliquas/plant		Seed yield/ plant (g)	
	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004
A-Nitrogen levels								
30 Kg/Fed.	118.8	126.37	4.13	3.83	58.31	53.93	4.61	4.56
45 Kg/Fed.	136.52	141.50	5.73	5.55	76.76	67.02	7.33	6.61
60 Kg/Fed.	163.67	160.32	6.57	6.19	98.68	86.77	8.89	8.46
F. test	*	*	*	*	*	*	*	*
LSD at 5%	2.24	3.85	0.38	0.10	5.55	3.32	0.56	0.46
B-Seeding rates								
1.5 Kg/Fed.	147.61	151.68	6.18	5.82	84.27	77.89	7.58	7.13
2.5 Kg/Fed.	142.3	142.17	5.88	5.70	81.17	71.14	7.28	6.89
3.5 Kg/Fed.	129.08	134.33	4.38	4.06	68.31	58.68	5.97	5.51
F. test	*	*	*	*	*	*	*	*
LSD at 5%	2.85	2.98	0.38	0.20	6.73	2.79	0.36	0.26
C-Row spacings								
25 cm	136.75	139.47	5.15	4.97	74.65	51.88	6.7	6.30
50 cm	142.58	145.99	5.80	5.41	81.19	55.99	7.19	6.72
F. test	*	*	*	*	*	*	*	*

Table 3: Averages of weight of 1000- seed , seed yield/fed, seed oil content and oil yield/fed as affected by nitrogen levels, seeding rates and row spacing in 2002/2003 and 2003/2004 seasons .

Characters / Treatments	Weight of 1000-seed (g)		Seed yield/fed (Kg)		Seed oil Content %		Oil yield /fed (Kg)	
	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004
A-Nitrogen levels								
30 Kg/Fed.	2.65	3.06	510.43	423.63	40.46	40.20	206.25	170.09
45 Kg/Fed.	3.17	3.55	653.88	585.15	39.04	39.24	254.81	229.00
60 Kg/Fed.	3.63	3.80	741.16	657.22	37.97	38.00	281.29	249.16
F. test	*	*	*	*	*	*	*	*
L.S.D at 5%	0.23	0.23	19.45	22.09	0.19	0.33	8.12	8.97
B-Seeding rates								
1.5 Kg/Fed.	3.37	3.81	528.76	469.80	39.94	40.63	210.30	190.07
2.5 Kg/Fed.	3.22	3.66	767.45	666.75	39.23	39.00	299.38	258.51
3.5 Kg/Fed.	2.86	2.94	609.30	529.44	38.30	37.81	232.65	199.67
F. test	*	*	*	*	*	*	*	*
LSD at 5%	0.15	0.24	15.43	13.44	0.13	0.29	5.82	5.86
C-Row spacing								
25 cm	3.09	3.37	602.83	528.6	39.36	39.41	236.12	207.14
50 cm	3.22	3.57	667.48	582.06	38.96	38.88	258.78	225.03
F. test	*	*	*	*	*	*	*	*

4 – Effect of interactions :

A–Effect of the interaction between nitrogen fertilizer levels and seeding rates.

The effect of interaction, data in Table 4 indicate that the interaction effect between nitrogen levels and seed rates on canola growth and yield components evidenced two opposing trends which over dominated the interacted treatments. There were consistent and regular increases in the values of these traits with increasing nitrogen fertilizer rate up to 60 kg N/fed. There were gradual decreases in the values of these traits with increasing the rate of seeding within each nitrogen fertilizer rate. However ,significance only occurred in case of plant height in both seasons and the average number of racemes /plant in the second season. It is also evident that both seed and oil yields/fed tended to increase with increasing nitrogen fertilizer rate up to 60 kg N/fed under the same rate of seeding (2.5 kg/ fed). On other hand ,the values of both traits were maximum when the rate of seed was 2.5 kg /fed under different nitrogen levels. The highest seed and oil yields /fed were obtained when canola plants received 60kg nitrogen/fed and seeded at 2.5 kg seed/fed .On other hand, the interaction had distinctive effect on seed oil content. There were gradual reductions with increasing the rate of seed up to 3.5 kg/fed within each rate of nitrogen fertilizer .In other words, there were reductions in seed oil content with increasing the rate of nitrogen at the same rate of seeding.

B - Effect of the interaction between nitrogen fertilizer levels and row spacings.

The nitrogen fertilizer levels and row spacings interaction effect on plant height in both seasons and average number of racemes /plant in the first season revealed regular trend (Table 5). The trend was governed by the two main variables, being similar to their behavior alone. Values of both traits tended to increase with increasing the rate of nitrogen fertilizer up to 60 kg N/fed under the same row spacing . Similarly , values of both traits tended to increase when row spacing increased from 25 to 50 cm. within each rate of nitrogen fertilizer. The interaction effect between nitrogen fertilizer levels and row spacing on canola yield components failed to reach the 5% level of significant.

C – Effect of the interaction between seeding rates and row spacings.

Data in Table 6 revealed that the interaction effect between seeding rates and row spacings was also governed by the two main variables. The average number of racemes /plant tended to decrease with increasing the rate of seeding up to 3.5 kg/fed under the same row spacing (25 or 50 cm) .On other hand, there were consistent increases in the values of both traits with increases row spacings from 25 to 50 cm under the same respective rate of seeding .Moreover, the statistical analysis revealed significant differences in the first season in case of the average number of racemes/plant.

The statistical analysis also revealed significant differences in case of seed yield/plant in the second season. Also, the presented data in Table 6 revealed that highest values were recorded when canola plants were seeded at a rate of 1.5kg/fed with row spacing of 50cm, followed by seeding at the rate of 2.5 kg/fed in rows spaced 25cm apart..

Although seed oil content tended to decrease with increasing seeding rate. There were decreases in seed oil content with increasing row spacing within each category of seeding rate. Moreover, the statistical analysis revealed significant differences in the second season.

D -Effect of the interaction between nitrogen levels, seeding rates and row spacing:

It was failed to reach the 5 % level of significance in any of the two seasons under the local conditions of the present investigation.

Table 5: Effect of the interaction between nitrogen levels and row spacing on some characters of canola in 2002 /2003 and 2003 / 2004 seasons.

Characters / Treatments		Plant height (cm)		No. of racems / plant	
		2002 / 2003	2003 / 2004	2002 / 2003	2003 / 2004
30 kg N /fed	25 cm	116.21	124.23	3.97	3.70
	50 cm	121.39	128.50	4.30	3.97
45 kg N /fed	25 cm	131.60	136.63	5.41	5.27
	50 cm	141.43	146.37	6.06	5.83
60 kg N /fed	25 cm	162.43	157.54	6.08	5.96
	50 cm	164.91	163.09	7.06	6.43
F test		*	*	*	N.S
LSD at 5 %		3.82	2.69	0.32	-

Table 6: Effect of the interaction between seeding rates and row spacing on some characters of canola in 2002 /2003 and 2003 / 2004 seasons.

Characters / Treatments		No. of racems/plant		Seed yield / plant (g)		Seed oil %	
		2002 / 2003	2003 / 2004	2002 / 2003	2003 / 2004	2002 / 2003	2003 / 2004
1.5 kg seeds /fed	25 cm	5.96	5.61	7.28	6.73	40.19	41.07
	50 cm	6.41	6.02	7.88	7.52	39.68	40.20
2.5 kg seeds /fed	25 cm	5.32	5.56	7.06	6.78	39.38	39.22
	50 cm	6.41	5.84	7.51	7.00	39.08	38.76
3.5 kg seeds /fed	25 cm	4.18	6.76	5.76	5.38	38.50	37.94
	50 cm	4.59	4.37	6.18	5.63	38.11	37.68
F test		*	N.S	N.S	*	N.S	*
LSD at 5 %		0.32	-	-	0.29	-	0.32

5- Correlation coefficient

Data in Table 7 revealed that there were positive and highly significant correlations between plant height and number of racemes/plant, number of siliquas/plant , seed yield /plant and 1000 - seed weight . Moreover, the correlation was a positive and significant as detected between plant height and seed as well as oil yields /fed, while, the correlation was significant but negative with seed oil content.

Simple correlations between number of racemes /plant and number of siliquas / plant , seed yield /plant and 1000 - seed weight were positive and highly significant. On other hand, number of racemes /plant were significantly and positively correlated with seed and oil yields /fed, but the correlation between number of racemes and seed oil content was negative but insignificant.

The average number of siliquas / plant was positively and highly significantly correlated with seed yield/plant and 1000 - seed weight. However the correlation was positive and significant with seed and oil yields /fed. It was negative and significant in case of seed oil content.

Seed yield/plant was significantly and positively correlated with 1000 - seed weight, seed and oil yields /fed. On other hand , seed yield /plant was significantly and negatively correlated with seed oil content.

The 1000 - seed weight was positively correlated with seed yield/fed as well as oil yield/fed but it was negatively correlated with seed oil content.

Seed oil content was negatively and significantly correlated with all characters, except the number of racemes /plant, it was negatively but insignificantly correlated.

The seed yield/fed was positively correlated with oil yield /fed and the correlation was highly significant. It was negatively correlated with seed oil content. Seed oil content was negatively correlated with oil yield /fed and the correlation was significant .

In 2003/2004 season, nature of correlations among these characters were similar to those recorded in 2002/2003, except for 1000- seed weight, where the correlation with seed oil content was positive in the second season (Table 8). It could be concluded that seed yield / fed was positively and significantly correlated with plant height, number of racemes and siliquas /plant , seed yield /plant, 1000 - seed weight and oil yield/fed in both seasons. Seed yield /fed was negatively and highly significant by correlated with seed oil content in the two seasons.

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استجابة نباتات الكانولا لمستويات مختلفة من السماد الآزوتى ومعدلات التقاوي والمسافة بين السطور في الأراضي الرملية حديثة الاستصلاح.

رجب أحمد أحمد عطاالله

معهد بحوث المحاصيل الحقلية –مركز البحوث الزراعية - مصر

أقيمت تجربتان حقليتان خلال موسمي الزراعة ٢٠٠٢/٢٠٠٣و٢٠٠٣/٢٠٠٤ بمحطة البحوث الزراعية بالإسماعيلية – محافظة الإسماعيلية لدراسة تأثير ثلاث معدلات للسماد الأزوتى (٣٠ ، ٤٥؛ ٦٠ كجم نيتروجين / فدان) وثلاث معدلات تقاوي ١,٥ ، ٢,٥ ، ٣,٥ كجم/فدان) ومسافتي زراعة (٢٥ ، ٥٠ سم بين السطور) على النمو والمحصول ومكوناته لمحصول الكانولا صنف سرو ٤ وكانت أهم النتائج كما يلي:

١- كانت هناك زيادة معنوية بزيادة معدلات التسميد الازوتى من ٣٠ إلى ٦٠ وحدة/ فدان لصفات ارتفاع النبات وعدد الأفرع والكبسولات للنبات ووزن ١٠٠٠ بذرة ومحصول البذرة للنبات ومحصول البذور والزيت للفدان خلال موسمي الزراعة بينما قلت نسبة الزيت بالبذور بزيادة معدلات التسميد الازوتى.

٢- بزيادة معدلات التقاوي كان هناك نقصا معنويا في ارتفاع النبات وعدد الأفرع والكبسولات للنبات ومحصول النبات من البذور ووزن الألف بذرة ونسبة الزيت فى البذور فى كلا الموسمين .

كانت أعلى قيم لمحصول الفدان من البذور والزيت عند معدل التقاوي ٢,٥ كجم/فدان ثم تبعة المعدل ٣,٥ كجم/فدان بينما أعطى المعدل ١,٥كجم تقاوي/فدان اقل محصول بذور وزيت للفدان خلال موسمي الزراعة .

٣- زيادة المسافة بين السطور من ٢٥ الى٥٠ سم أعطت زيادة معنوية في كل الصفات المدروسة فيما عدا نسبة الزيت التى قلت بزيادة المسافة بين السطورفي كلا الموسمين .

٤- أظهر التفاعل بين مستويات التسميد النتروجينى ومعدل التقاوى زيادة معنوية في طول النبات ومحصول الفدان من البذور والزيت ونسبة الزيت بالبذور فى كلا الموسمين وعدد الأفرع/ للنبات فى الموسم الثانى فقط. كان تأثير التفاعل بين مستويات التسميد النتروجينى ومسافات الزراعة بين السطور معنويا على ارتفاع النبات فى كلا الموسمين وكذلك عدد الافرع/نبات فى الموسم الأول. بينما كان التفاعل بين معدلات التقاوى ومسافات الزراعة بين السطور معنويا على عدد الأفرع/نبات فى الموسم الأول ومحصول النبات ونسبة الزيت فى الموسم الثانى. وقد تم الحصول على اعلى قيم المحصول من البذور والزيت للفدان باستخدام ٢,٥ كجم تقاوى للفدان والزراعة على مسافة ٥٠ سم بين السطور على ان يضاف ٦٠ كجم نيتروجين للفدان.

٥- وجد ارتباط معنوي موجب بين محصول البذور للفدان وكلا من ارتفاع النبات,عدد أفرع وكبسولات النبات,محصول النبات ,وزن الألف حبة ومحصول الزيت للفدان. كما وجد ارتباط معنوي سالب بين محصول البذور للفدان من الزيت.

Table 7 : Simple correlation coefficient among canola characters through 2002 /2003 season.

Characters	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Plant height (cm)	---	0.84**	0.96**	0.93**	0.87**	0.58*	-0.53*	0.54*
2. Number of racemes / plant		-----	0.88**	0.89**	0.87**	0.53*	-0.34	0.54*
3. Number of siliquas / plant			---	0.91**	0.89**	0.55*	-0.47*	0.52*
4. Seed Yield / plant (g)				----	0.90**	0.58*	-0.57*	0.57*
5.1000 – Seed weight (g)					----	0.49*	-0.45*	0.50*
6.Seed Yield / fed (Kg)						----	-0.67**	0.96**
7. Seed oil content							----	-0.58*
8. Oil Yield / fed (Kg)								----

Table 8 : Simple correlation coefficients among canola characters through 2003 / 2004 season

Characters	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Plant height (cm)	----	0.83**	0.93**	0.93**	0.71**	0.51*	-0.18	0.52*
2. Number of racemes / plant		----	0..87**	0.88**	0.86**	00.62**	-0.07	0.67**
3. Number of siliquas / plant			----	0.95**	0.77**	0.53*	-0.16	0.54*
4. Seed Yield / plant (g)				----	0.76**	0.66**	-0.29	0.67**
5. 1000 – Seed weight (g)					-----	0.47*	0.10	0.53*
6.Seed Yield / fed (Kg)						----	-0.61**	0.99**
7. Seed oil content							----	-0.51*
8. Oil Yield / fed (Kg)								----

*** and**means significant at 0.05 and 0.01 levels of probability , respectively**

Table 4 : Effect of the interaction between nitrogen levels and seeding rates on some growth characters, yield components and yield of Canola in 2002/2003 and 2003 / 2004 seasons.

Characters / Treatments		plant height cm		No. of racems / plant		Seed yield / fed (kg)		Seed oil %		Oil yield kg / fed	
		2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004
30 kg N /fed	1.5 kg seeds /fed	126.80	137.02	4.77	4.27	440.95	392.17	41.20	41.95	181.65	164.47
	2.5 kg seeds /fed	120.12	127.30	4.30	4.10	566.67	640.62	40.73	40.15	230.76	184.86
	3.5 kg seeds /fed	109.48	114.78	3.33	3.13	523.67	418.10	39.44	38.49	206.33	160.94
45 kg N /fed	1.5 kg seeds /fed	141.30	154.23	6.62	6.25	512.00	463.92	39.92	40.63	204.30	188.45
	2.5 kg seeds /fed	140.20	137.02	5.97	6.32	824.05	734.37	38.89	39.11	320.47	287.06
	3.5 kg seeds /fed	128.05	133.25	4.62	4.08	825.58	557.17	38.32	37.98	239.65	211.50
60 kg N /fed	1.5 kg seeds /fed	174.20	163.80	7.17	6.93	633.33	553.32	38.70	39.31	244.96	217.29
	2.5 kg seeds /fed	166.58	162.20	7.33	6.68	911.50	805.27	38.07	37.72	346.94	303.62
	3.5 kg seeds /fed	149.72	154.95	5.20	4.97	678.65	613.07	37.14	36.97	251.98	226.56
F. test		*	*	N.S.	*	*	*	*	*	*	*
LSD 5 %		4.94	5.16		0.35	26.72	23.27	0.21	0.51	10.08	10.15