EFFECT OF NITROGEN AND PHOSPHORUS FERTILIZER ON YIELD AND YIELD COMPONENTS OF TWO SEED RAPE VARIETIES (*BRASSICA NAPUS*)

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Abstract: Two field experiments were conducted during 1997/98 and 1998/99 seasons, in the Agric. Exp. Stat. Far, of Assiut University at Assiut, to study the effect of nitrogen (30, 45, 60 kg N/fed.) and phosphorus (zero, 15.5, 31.0 kg/P_2O_5) fertilizers on yield and yield components of two oil seed rape varieties i.e. AD201 and Tower. Seeds were sown on Nov. 2 and Oct. 30 in the first and second season respectively, on ridges 50 cm apart in hill 15 cm leaving two plant/hill. At harvest the following characters were recorded, number of pods/plant, seed/pod, weight of 1000 seeds, seed yield/plant, seed yield/fed was calculated on plot basis. The data were subjected to normal statistical analysis and mean comparisons were done using LSD at 5% level. The data could be summarized as follows:

AD201 variety had higher number of pods/plant, seed index, seed yield/plant and feddan as compared to Tower. Seeds/pod was almost the same in both varieties.

The application of P fertilizer (15.5, 31.0 kg) to oil seed rape increased number of pods/plot, seeds/pod, seed index, seed yield/plant and feddans as compared to the control (zero).

The seed yield/fed. in 1997/98 for zero, 15.5 and 31.0 kg P_2O_5/fed. were 775.29, 800.00 and 783.00 kg/fed., respectively, in 1998/99 season, these values were 628.63, 652.71 and 671.83 kg for the same rate.

Increasing nitrogen rates from 30 to 45 or 60 kg/fed., increased number of pods/plant, seed index, seed/pod, seed yield/plant and feddan in both seasons. The seed yield/fed. for N rates of 30, 45 and 60 kg/fed. were 744.42, 791.79 and 822.08 kg, in 1997/98 season, while in 1998/99 season, these values were 608.91, 648.08 and 696.17 kg/fed. In general, the highest seed yield/fed. In 1997/98 season was obtained from AD201 when supplied with P at rates of 15.5 and N at a rate of 45 kg/fed. while in 1998/99 season, this value was obtained from Tower when it was provided with P and N at its highest rates.

Introduction

There was a wide gap in Egypt between the production of oil and its consumption. Recently about 80% of the consumed oil in Egypt is imported because of the lack in oil production as a result of decreasing cultivated area of oil crops (i.e. sesame, soybean, sunflower etc..), where the area of such crops are faced by strong competition with other main crops for the limited area.

The oil seed rape crop is an important oil crop in the world, and introduced recently in Egypt as winter crop and may be grown under new reclaimed soil. The productivity of such crop is affected by many factors, i.e. nitrogen and phosphate fertilizers are one of the important factor that affect yield. The differences between seed rape cultivars in yield and yield component were reported by many investigators (Thurling, 1974; Abd El-Hafez *et al.*, 1990, El-Saidy *et al.*, 1992; El-Ghamry *et al.*, 1992; Nour El-din *et al.*, 1983, Hassan and Hakeem, 1996). Oil seed rape varieties had a diverse reaction to high nitrogen rates and a rate of 180 kg/ha proved to be efficient for the most varieties (Wielebski and Wojtowicz, 1998). The effect of P and N fertilizer on the yield and yield components of oil seed rape are reported by many investigators. Ibrahim *et al.* 1989 and Hassan (1993) reported that there were a originated increase in seed yield, number of pods/plant; seed index with each applied increase of nitrogen rates up to 75 kg N/fed. The application of N fertilizer to oil seed rape crop increased number of pods/plant and seed index (Jang *et al.*, 1987, Choudhury *et al.*, 1990, Wojtowicz and Wielebski, 1995, Hocking *et al.*, 1997). Also seed yield per unit area increased by the application of N nitrogen fertilizer (Taylor *et al.*, 1991, Nutlal 1992, Graf *et al.*, 1994, Dressel and Weighelt, 1995, Brar *et al.* 1998, Brennan *et al.*, 2000). Also, the application of P fertilizer to oil seed rape crop increased yield and yield components (Nour El-din *et al.*, 1995, Kumar, 1995). Also, the application N, P fertilizer exerted a benefit effect on yield and its components (Kandil *et al.*, 1990, Nuttal *et al.*, 1992 and Khanday 1993).

Materials and Methods

Two field experiment were conducted during 1997/98 and 1998/99 seasons to study the effect of nitrogen and phosphorus fertilizer on yield and yield component of two oil seed rape varieties i.e. AD201 and Tower in the Experimental Station farm of Assiut University at Assiut. The seeds of both varieties were supplied from the Agronomy

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Seeds were sown on Nov. 2 and Oct. 30 in 1997/98 and 1998/99 seasons on ridges 50 cm apart in hills spaced at 15 cm leaving two plant/hill after thinning, with a plot area of 10.5 m^2.

The split split plot design with four replicates was applied, where the oil seed rape varieties were located in the main plot, nitrogen and phosphorus fertilizers were distributed to sub and sub-sub plot units, respectively. Phosphorus fertilizer rates were zero, 15.5 and 31.0 kg P_2O_5/fed., in the form of superphosphate (15.5%). Nitrogen fertilizers rates were 30, 45 and 60 kg N/fed., in the form of ammonium nitrate (33.5%) which were applied as one dose just before first irrigation. The preceding crops were maize in 1997/98 season, and soybean in 1998/99 season. Physical and chemical analysis for soil were presented in Table (1).

At harvest 4 plants were chosen at random from each plot and the following characters were recorded, number of pods/plant, number of seeds/pod, weight of 1000-seed (gm), seed yield/plant seed yield/fed., in kilogram, this was done on the plot basis at harvest.

All data were subjected to normal statistical analysis according to Gomez and Gomez (1984), and mean comparisons were made using LSD at 5%.

Table (1): Physical and chemical properties of the experimental soil.

	1997/98	1998/99
Sand	26.6	26.4
Silt	25.0	24.0
Clay	48.4	49.6
Organic matter	1.83	1.83
PH	7.8	7.7
Total N %	0.72	0.73
Extractable P (ppm)	9.0	9.13
Extractable K (ppm)	350	351

Results and Discussion

I- Varieties:

The data in Tables (2-6) revealed that oil seed rape varieties had no significant influence on number of pods/plant, seeds/pod, seed index and seed yield/plant and feddan in both seasons. However, the number of pods of AD201 was higher than Tower variety in both seasons. Such increase was 3.2 and 2.75% in 1997/98 and 1998/99 seasons, respectively. The increase in pod production of AD201 was accompanied by an increase in seed yield per plant as compared to Tower variety, and such increases were 2.17 and 7.77% for 1997/98 and 1998/99 seasons. These results are in line with those obtained by El-Saidi *et al.* (1992) who concluded that AD201 plants produced a greater number of pods/plant and higher seed yield/plant as compared to other varieties under studies. The results also showed that number of seed/pod was slightly higher in AD201 variety in 1997/98 season, and the reverse was true in 1998/99 season in comparison to Tower variety, on the contrary seed index (weight of 1000 seeds), behaved differently from seeds/pod, where the seed index of AD201 variety was lower in 1997/98 season and higher in 1998/99 season. This is due to the fact that the reduction in seed number/pod lead to the increase in seed size.

Concerning, the seed yield/fed., the data showed that seed yield/fed. of AD201 variety was higher than Tower variety in both seasons, this is mainly due to the increase in number of pods/plant of AD201 variety. The increase in yield/fed., of AD201 was 7.39 and 6.70% over Tower variety, in 1997.98 and 1998/99 seasons, respectively. These results are in accordance with those obtained by El-Saidi *et al.* (1992).

II- Phosphorus:

The data in Tables (2-6) showed that P application to oil seed rape exerted a significant influence on number of pods/plant (97/98 season). Seed yield/plant (both seasons). While it had no significant influence on seeds/pod, weight of 1000 seeds and seed yield/fed. in both seasons. The application of P fertilizer to oil seed rape increased pod production, seed/pod, seed index and seed yield/plant in both season. The increase in P rates from zero to 15.5 or 31.0 kg P_2O_5, increased number of pods/plant by 3.61 and 11.54% in the first season and 5.39 and 10.05% in the second season, respectively. Also, the increase in P rate up to 31.0 kg P_2O_5 increased seed of pod, and seed index in both seasons as compared to the check and the lower rate (15.5).

Also, seed yield/plant was higher when P rates was increased from zero to 31.0 kg P_2O_5, where the

increase in such yield was 6.97 and 30.83 in 1997/98 and 1998/99 seasons, when compared to the check, the increase in seed yield/plant is mainly due to the increase in number of pods/plant, seeds/pod and seed index.

The response of oil seed rape to P fertilizer was more positive, because P may exert its effect on plant metabolism and may consequently increase the vegetative growth by producing more leaves with high photosynthetic activity and this will increase the production of more nodes with higher seed number and heavy seed weight. Bolland (1999) concluded that canola crop responded positively to the application of P fertilizer.

The data revealed also that seed yield/fed. increase by the application of P fertilizer where the maximum yield was obtained when P rates were 15.5 and 31.0 kg P_2O_5/fed. in the 1997/98 and 1998/99 season, respectively. The increase in yield/fed. as a results of increasing P rate from zero to 15.5 and 31.0 kg P_2O_5 is due to the increase in pod production seed/pod, seed index and consequently seed yield/plant and this was more clear in 1998/99 season.

These results are in line with those reported by Kormin and Volkov, 1988, Nuttal *et al.* (1992), Khanday (1993), Kumar (1995) who concluded that P application to oil seed rape increased seed yield per unit area.

III- Nitrogen:

The data in Tables (2-6) revealed that the application of nitrogen fertilizers to oil seed rape exerted a significant effect on number of seeds/pod (1997/98), weight and 1000-seed (98/99) and seed yield/fed., (both seasons) while number of pods/plant and seed yield/plant was not significantly affected by N fertilizer in both seasons. The increase in N rates from 30 to 45 or 60 kg N/fed., increase number of pods/plant, where the increase were 2.5 and 11.46% in 1997/98 and 6.41 and 24.48% in 1998/99 season, the increase in pod production as a result of increasing N rates to 45 or 60 kg N/fed. is accompanied by an increase in seed yield plant, where such increase was 7.31 and 13.97% in 1997/98 season and 3.673 and 10.0% in 1998/99 season, respectively. Also, the increase in seed yield/plant may also due to the increase in seeds/pod and seed index where the increase in N rate from 30 to 45 or 60 kg N/fed., increased seed/pod as well as seed index (weight & 100 seeds).

The increase in pod production and other yield components as a results of increasing N rates may be due to the fact that nitrogen play an important role in plant metabolism,

Table (2): Effect of nitrogen and phosphorus fertilizers on number of pods/plant of two oil seed rape varieties in 1997/98 and 1998/99 seasons.

Varieties	Phosphorus fertilizers kg P_2O_5/fed.	Nitrogen fertilizer (kg/fed.)							
		1997/98				1998/99			
		30	45	60	Mean	30	45	60	Mean
AD201	Zero	303.75	322.25	372.00	332.67	190.00	190.00	208.75	196.25
	15.5	345.50	324.50	370.25	346.75	192.50	218.75	258.75	223.33
	31.0	383.75	398.00	386.25	389.33	207.50	213.75	246.25	222.50
Mean		344.33	348.25	376.17	356.25	196.67	207.50	237.92	214.03
Tower	Zero	322.50	323.75	358.75	335.00	187.50	193.75	235.00	205.42
	15.5	330.00	352.50	352.50	345.00	170.00	190.00	240.00	200.00
	31.0	325.00	340.00	401.25	355.42	201.25	216.25	241.25	219.58
Mean		325.83	338.75	370.83	345.14	186.25	200.00	238.75	208.33
Phosphorus x Nitrogen Fertilizer	Zero	313.13	323.00	365.38	333.84	138.75	191.88	221.88	200.84
	15.5	337.75	358.50	361.38	345.88	181.25	204.38	249.38	211.67
	31.0	354.38	369.00	393.75	372.38	204.38	215.00	243.75	221.04
Mean		335.09	343.50	373.50		191.46	203.75	238.34	

L.S.D. 5% for

Varieties (V)	:	N.S.	**V x P**	:	N.S.	**Varieties (V)**	:	N.S.	**V x P**	:	N.S.
Phosphorus (P)	:	26.98	**V x N**	:	N.S.	**Phosphorus (P)**	:	N.S.	**V x N**	:	N.S.
Nitrogen (N)	:	N.S.	**P x N**	:	N.S.	**Nitrogen (N)**	:	N.S.	**P x N**	:	N.S.
			VPN	:	N.S.				**VPN**	:	N.S.

Table (3): Effect of nitrogen and phosphorus fertilizers on number of seeds/pod of two oil seed rape varieties in 1997/98 and 1998/99 seasons.

Varieties	Phosphorus fertilizers kg P_2O_5/fed.	Nitrogen fertilizer (kg/fed.)							
		1997/98				1998/99			
		30	45	60	Mean	30	45	60	Mean
AD201	Zero	24.25	26.50	25.50	25.41	25.31	26.15	26.25	25.87
	15.5	25.75	24.50	26.50	25.58	24.50	26.00	27.25	25.92
	31.0	25.75	27.25	26.50	26.50	25.87	26.30	26.30	26.16
Mean		25.25	26.08	26.17	25.83	25.23	26.15	26.57	25.98
Tower	Zero	25.00	26.00	25.00	25.33	26.03	26.08	26.60	26.24
	15.5	25.25	26.00	26.50	25.92	26.08	26.30	26.90	26.43
	31.0	25.50	26.50	25.00	25.67	26.05	26.41	27.41	26.62
Mean		25.25	26.16	25.50	25.64	26.05	26.26	26.97	26.43
Phosphorus x Nitrogen Fertilizer	Zero	24.13	26.25	25.25	25.21	25.67	26.12	26.38	26.06
	15.5	25.50	25.25	26.50	25.75	25.29	26.15	27.08	26.17
	31.0	25.63	26.88	25.75	26.09	25.96	26.40	26.86	26.39
Mean		25.09	26.13	25.83		25.64	26.21	26.77	

L.S.D. 5% for

Varieties (V)	:	N.S.	**V x P**	:	N.S.	**Varieties (V)**	:	N.S.	**V x P**	:	N.S.
Phosphorus (P)	:	N.S.	**V x N**	:	N.S.	**Phosphorus (P)**	:	N.S.	**V x N**	:	N.S.
Nitrogen (N)	:	0.81	**P x N**	:	N.S.	**Nitrogen (N)**	:	N.S.	**P x N**	:	N.S.
			VPN	:	N.S.				**VPN**	:	N.S.

Table (4): Effect of nitrogen and phosphorus fertilizers on seed index (gm) of two oil seed rape varieties in 1997/98 and 1998/99 seasons.

Varieties	Phosphorus fertilizers kg P_2O_5/fed.	Nitrogen fertilizer (kg/fed.)							
		1997/98				1998/99			
		30	45	60	Mean	30	45	60	Mean
AD201	Zero	3.95	4.55	4.25	4.25	5.30	5.20	5.55	5.35
	15.5	3.85	5.10	4.20	4.38	5.20	5.30	6.65	5.38
	31.0	4.45	4.85	4.50	4.60	5.15	5.25	5.80	5.40
Mean		4.08	4.83	4.32	4.41	5.22	5.25	5.67	5.38
Tower	Zero	4.40	4.00	4.80	4.40	5.02	5.02	5.41	5.15
	15.5	4.35	4.55	4.70	4.53	5.15	5.17	5.52	5.28
	31.0	4.35	4.70	4.65	4.57	5.00	5.55	5.60	5.38
Mean		4.37	4.42	4.72	4.50	5.06	5.25	5.51	5.27
Phosphorus x Nitrogen Fertilizer	Zero	4.18	4.28	4.53	4.33	5.16	5.11	5.48	5.25
	15.5	4.10	4.83	4.45	4.46	5.18	5.24	5.59	5.34
	31.0	4.40	4.78	4.58	4.59	5.08	5.40	5.70	5.39
Mean		4.22	4.63	4.52		5.14	5.25	5.59	

L.S.D. 5% for									
Varieties (V)	:	N.S.	V x P	:	N.S.	Varieties (V)	:	N.S.	V x P	:	N.S.
Phosphorus (P)	:	N.S.	V x N	:	N.S.	Phosphorus (P)	:	N.S.	V x N	:	N.S.
Nitrogen (N)	:	N.S.	P x N	:	0.56	Nitrogen (N)	:	0.30	P x N	:	N.S.
			VPN	:	N.S.				VPN	:	N.S.

Table (5): Effect of nitrogen and phosphorus fertilizers on seed yield/plant (g) for two oil seed rape varieties in 1997/98 and 1998/99 seasons.

Varieties	Phosphorus fertilizers kg P_2O_5/fed.	Nitrogen fertilizer (kg/fed.)							
		1997/98				1998/99			
		30	45	60	Mean	30	45	60	Mean
AD201	Zero	16.50	16.75	19.75	17.66	17.10	17.71	14.22	16.34
	15.5	17.00	18.75	19.25	18.33	16.65	18.10	19.45	18.07
	31.0	17.00	19.50	20.75	19.08	18.90	19.00	19.91	19.27
Mean		16.83	18.33	19.91	18.35	17.55	18.27	17.86	17.89
Tower	Zero	16.75	16.73	17.75	17.07	13.51	14.10	14.50	14.04
	15.5	18.00	20.25	18.00	18.75	13.11	13.30	19.70	15.37
	31.0	16.50	17.25	20.50	18.08	19.60	20.50	21.11	20.40
Mean		17.08	18.07	18.75	17.96	15.41	15.97	18.44	16.60
Phosphorus x Nitrogen Fertilizer	Zero	16.63	16.74	18.75	17.37	15.31	15.86	14.36	15.18
	15.5	17.50	19.50	18.63	18.54	14.88	15.70	19.56	16.72
	31.0	16.75	18.38	20.63	18.58	19.30	19.75	20.52	19.86
Mean		16.96	18.20	19.33		16.50	17.10	18.15	

L.S.D. 5% for

Varieties (V)	:	N.S.	**V x P**	:	N.S.	**Varieties (V)**	:	N.S.	**V x P**	:	2.72
Phosphorus (P)	:	1.81	**V x N**	:	N.S.	**Phosphorus (P)**	:	1.92	**V x N**	:	N.S.
Nitrogen (N)	:	N.S.	**P x N**	:	2.67	**Nitrogen (N)**	:	N.S.	**P x N**	:	N.S.
			VPN	:	N.S.				**VPN**	:	N.S.

Table (6): Effect of nitrogen and phosphorus fertilizers on seed yield/fed. (kg) of two oil seed rape varieties in 1997/98 and 1998/99 seasons.

Varieties	Phosphorus fertilizers kg P_2O_5/fed.	Nitrogen fertilizer (kg/fed.)							
		1997/98				1998/99			
		30	45	60	Mean	30	45	60	Mean
AD201	Zero	751.50	845.00	850.00	815.50	615.00	668.50	674.50	652.67
	15.5	800.00	870.00	805.00	825.00	657.50	688.25	682.50	676.08
	31.0	795.00	778.00	832.50	801.83	670.75	681.25	711.25	687.75
Mean		782.17	831.00	829.17	814.11	647.75	679.33	689.42	672.17
Tower	Zero	700.00	717.75	787.50	735.08	536.25	632.50	645.00	604.58
	15.5	720.00	805.00	800.00	775.00	567.50	593.00	727.50	629.33
	31.0	700.00	735.00	857.50	764.17	606.50	625.00	736.25	655.92
Mean		706.67	752.58	815.00	758.08	570.08	616.83	702.90	629.94
Phosphorus x Nitrogen Fertilizer	Zero	725.75	781.38	818.75	775.29	575.63	650.50	659.75	628.63
	15.5	760.00	837.50	802.50	800.00	612.50	640.63	705.00	652.71
	31.0	747.50	756.50	845.00	783.00	638.62	653.12	723.75	671.83
Mean		744.42	791.79	822.08		608.91	648.08	696.17	

L.S.D. 5% for									
Varieties (V)	:	N.S.	V x P	:	N.S.	Varieties (V)	:	N.S.	V x P	:	N.S.
Phosphorus (P)	:	N.S.	V x N	:	N.S.	Phosphorus (P)	:	N.S.	V x N	:	33.64
Nitrogen (N)	:	43.88	P x N	:	N.S.	Nitrogen (N)	:	23.79	P x N	:	41.20
			VPN	:	N.S.				VPN	:	58.27

where it increase, vegetative growth by increasing plant height and more leaves with higher leaf area this will lead to the increase in dry matter production and consequently produce more pods with heavier seeds. Hocking *et al.* (1997) and Geng Yaha (1998) concluded that N application to oil seed rape increased pod production with a heavier seeds and consequently increased seed index. Also, Wang *et al.* (1996) reported that seeds/pod was the highest when N was applied at a rate of 16-24 kg/mount.

Seed yield/fed. increased as N rates increased from 30 to 45 or 60 kg and the maximum yield was obtained when N rate was applied at 60 kg N/fed. The increase in such yield as a result of increasing N rate from 30 to 60 kg N/fed. were 10.43 and 14.33% in 1997/98 and 1998/99 season respectively. The increase in seed yield as a result of increasing N rates, may be due to the increase in pod number, seeds/pod, seed index and consequently seed yield/plant. These results are in harmony with those obtained by Mekki (1990), Basak *et al.* (1990), Leto *et al.* (1994), Wang *et al.* (1996), Brar *et al.* (1998) and Brennan *et al.* (2000) who concluded that increasing N rates to oil seed rape increased seed yield/plant area.

IV- Interactions:

The data revealed that number of pods/plant and seed/pod were not significantly affected by interactions in both season. On the other hand, seed index was significantly affected by the interaction between P and N fertilizer in 1997/98 season, where the highest value was obtained from the application of P at a rate of 15.5 kg P_2O_5/fed. and N at a rate of 45 kg/fed. Seed yield/plant was significantly affected by the interaction between varieties and P rates in 1998/99 season where the highest value was obtained from Tower plants when received P at a rate of 31.0 kg P_2O_5/fed. Also this trait was significantly affected by the interaction between P and N fertilizer in 1997/98 season, where the highest value was obtained from P at a rate of 31.0 kg P_2O_5 and N at a rate of 60 kg N/fed.

Seed yield/fed. was significantly affected by all interaction in 1998/99 season except the interaction between varieties and P fertilizers. While in 1997/98 season. This trait was not significantly affected by any interaction. In general, the highest seed yield/fed. in 1997/98 season (870.0 kg) was obtained from AD201 variety when supplied with P at a rate of 15.5 kg P_2O_5/fed and N at a rate 15.5 kg/fed., while in 1998/99 season, the highest seed yield/fed. (736.25) was obtained

from Tower plant when received with P at a rate of 31.0 kg P_2O_5/fed. and N at a rate of 60 kg/fed. Liu *et al.* (1987), Kormin and Volkov (1987), Mekki (1990) and Kolnik and Zubal (1998) concluded that seed yield of oil seed rape increased by a combined N and P fertilizers and the response report on the site of the experiment.

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تأثير التسميد الآزوتى والفوسفاتى على المحصول ومكوناته لصنفين من أصناف الراب

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أجريت تجربتان حقليتان فى موسمى الزراعة ١٩٩٨/٩٧ و ١٩٩٩/٩٨ بمحطة التجارب الزراعية بكلية الزراعة بأسيوط لدراسة تأثير التسميد الآزوتى (٣٠ ، ٤٥ ، ٦٠ كيلوجرام آزوت للفدان) والفوسفاتى (صفر ، ١٥,٥ ، ٣١,٥ كيلوجرام فو٢أ٥ / للفدان) على المحصول ومكوناته لصنفين من أصناف الراب هما AD201 و Tower زرعت البذور فى ٢ نوفمبر و ٣٠ أكتوبر للموسم الأول والثانى على خطوط بعرض ٥٠ سم وفى جور المسافة بينها ١٥ سم مع ترك نباتين فى الجورة الواحدة . وعند الحصاد تم تقدير الصفات التالية للنبات: عدد القرون ، وزن ١٠٠٠ بذرة ، عدد البذور للقرن ، وزن البذور للنبات ، وزن البذور للفدان ، كمية مقدرة من وزن البذور للقطعة التجريبية .

ولقد أمكن تلخيص النتائج فى التالى :

وجد أن الصنف AD201 أعطى عدد أعلى من القرون للنبات ووزن أكبر من ١٠٠٠ بذرة ومحصول النبات الواحد بالجرام ومحصول الفدان من البذور اذا ما قورن بالصنف Tower وكان عدد البذور للقرن تقريبا متساويا فى الصنفين .

وجد أن استخدام التسميد الفوسفاتى (١٥,٥ أو ٣١,٥ كيلوجرام بو٢أ٥ للفدان) للمحصول أدى الى زيادة عدد القرون للنبات وعدد البذور للقرن ووزن ١٠٠٠ بذرة ومحصول البذور للنبات والفدان اذا ما قورن بمعاملة الكونترول (صفر بو٢أ٥) . وجد أن محصول البذور للفدان فى موسم ١٩٩٨/٩٧ للمعدلات صفر ، ١٥,٥ ، ٣١,٥ كيلوجرام بو٢أ٥/ف هى ٧٧٥,٢٩ و ٨٠٠,٠٠ و ٧٨٣,٠ كيلوجرام للفدان على التوالى أما فى موسم ١٩٩٩/٩٨ فكانت القيم هى ٦٢٨,٦٣ ، ٦٥٣,٧١ و ٦٧١,٨٣ لنفس المعدلات على الترتيب.

وجد أن زيادة معدلات السماد الآزوتى من ٣٠ إلى ٤٥ أو ٦٠ كيلوجرام آزوت للفدان أدى الى زيادة عدد القرون للنبات ، عدد البذور للقرن ووزن ١٠٠٠ بذرة ومحصول البذور للنبات والفدان.

وجد أن محصول البذور للفدان للمعدلات ٣٠ ، ٤٥ و ٦٠ كيلوجرام آزوت فى موسم ١٩٩٨/٩٧ هى ٧٤٤,٤٢ ، ٧٨١,٧٩ و ٨٢٢,٠٨ كيلوجرام على التوالى أما فى موسم ١٩٩٩/٩٨ فكانت القيم هى ٦٠٨.٩١ ، ٦٤٨,٠٨ و ٨٦٨,١٧ كيلوجرام للفدان على الترتيب.

وجد بصفة عامة أن أعلى محصول من البذور للفدان فى موسم ١٩٩٨/٩٧ أمكن الحصول عليه من الصنف AD201 عندما سمدت نباتاته بسماد فوسفاتى بمعدل ١٥,٥ بو٢أ٥ للفدان ومعدل آزوتى ٤٥ كيلوجرام للفدان أما فى موسم ١٩٩٩/٩٨ فكانت أعلى قيمة من الصنف Tower عندما سمدت نباتاته بسماد آزوتى وفوسفاتى بأعلى معدلاته .