ISSN 1110-0419

Annals Of Agric. Sc., Moshtohor,
Vol. 44(3): 847-858, (2006).

EFFECT OF DIFFERENT RATES OF NITROGENOUS (MINERAL AND BIO) AND POTASSIUM FERTILIZATION ON SESAME CROP (*Sesamum indicum* L.) IN NEWLY RECLAIMED SANDY SOILS

BY

Hafiz, S. I. and Kotb, M. A.
Agron. Dept., Fac. Agric., Suez Canal Univ., Ismailia, Egypt

ABSTRACT

Two field experiments were conducted at the Experimental Farm, Faculty of Agriculture, Suez Canal University at Ismailia during 2003 and 2004 seasons to study the effect of four treatments of mineral and bio nitrogen fertilization namely 30, 50, 70 and 50 kg N/fad plus biofertilizer (Syrialin) and three rates of potassium fertilizer 25, 45 and 65 kg K_2O/fad on yield, its components and yield quality of sesame Shandawyl 3 variety in sandy soils of Ismailia Governorate.

Increasing mineral nitrogen fertilizer level from 30 to 70 kg N/fad significantly increased plant height, fruiting zone length, number of branches, capsules and seeds/plant, seeds/capsule, weight of capsules and seeds/plant, shelling percentage, 1000-seed weight and seed and oil yields/fad, while seed oil content (%) was decreased .

Applying biofertilizer (Syrialin) + 50 kg N/fad produced the highest values of the mentioned characters except seed oil content (%) and it deviated in this respect significantly with the rates 30 and 50 Kg N/fad but insignificantly with 70 Kg N/fad.

Fertilizing sesame plants with 65 kg K_2O/fad produced significant increases compared to 25 kg K_2O/fad in all studied traits except number of seeds/capsule.

In the combined data, there was significant interaction between nitrogen and potassium fertilization on number of capsules/plant, weight of seeds/plant and seed yield/fad of sesame. Over the two seasons, the highest seed yield/fad (11.94 ardab/fad) was achieved by application of 50 kg N/fad plus biofertilizer (Syrialin) and adding 65 kg K_2O/fad.

INTRODUCTION

Sesame (*Sesamum indicum* L.) could be considered as one of the most important oil crops in the world because its seeds have high contents of oil and protein. In Egypt most of the seed production is consumed as edible products

such as Tehena, Halawa tahinniya and bakery products. The total production of edible oil is about 10% of the consumption in Egypt. Therefore many attempts are being made to raise total production of oil crops particularly sesame for narrowing oil deficiency gap. Increasing the area devoted to sesame in the Nile Valley is very difficult due to great competition from other summer cash crops and its lower net income compared to these crops such as cotton, rice and corn. Therefore, expanding area under sesame should be taken in newly reclaimed sandy soils which facing many problems like low fertility, poverty and high loss of nutrients by leaching. Growing sesame in new reclaimed sandy soils should be preceded by accurate adopting of its agronomic practices on such lands especially estimating the optimum requirements of nitrogen and potassium fertilizers.

N is the most important essential nutrient in plant nutrition, it is a constituent of a large number of necessary organic compounds such as amino acids, proteins, coenzymes, nucleic acids, ribosomes, chlorophyll, cytochrome and some vitamins (Marschner, 1986). The positive effects of applying nitrogen fertilizer on growth, yield attributes, seed yield and quality of sesame were reported by Mondal *et al.* (1992), Basha (1994), El-Quesni *et al.* (1994), Gomaa *et al.* (1994), El-Emam *et al.* (1997), Bassiem and Anton (1998), Ali (1999), El-Shakre (1999), Fayed *et al.* (2000), Patra (2001), Ali (2002) and Malic *et al.* (2003).

Moreover, potassium is the most important cation in plant because of its important role in physiological and biochemical functions such as activation of various enzymatic systems, stimulating synthesis of protein and many other compounds such as sugar, cellulose and cell wall (Marschner, 1986). The beneficial effects of potassium on sesame growth, yield, its components and quality were emphasized by Satyanaraya (1978), Dasmahapatra *et al.* (1990), Mondal *et al.* (1992), Nageshwar *et al.* (1995), El-Emam *et al.* (1997), Singh *et al.* (1997), Bassiem and Anton (1998), Gabr (1998), Kathiresan (1999) and Ali (2002).

Undoubtedly application of N chemical fertilizers not only raises the cost of production but also causes environmental pollution. Hence using bio nitrogen fertilizers may avoid these problems and increase the crop productivity. The favorable effects of N biofertilizer (nitrogen fixing bacteria) on growth, yield and its attributes were demonstrated by El-Mandoh and Abdel-Magid (1996), Abdel-Wahab *et al.* (1999), Palaniappan *et al.* (1999), El-Kramany *et al.* (2000) and Kumar *et al.* (2000).

MATERIALS AND METHODS

Two field experiments were conducted during 2003 and 2004 seasons at the Experimental Farm, Faculty of Agriculture, Suez Canal University at Ismailia to study the effect of mineral and bio fertilization of nitrogen and potassium fertilization on yield, its components and yield quality of sesame.

The soil of the experiments was sandy with pH values of 7.82 and 7.70 and contained 2.91 and 3.22 ppm available N, 1.63 and 1.75 ppm available P, 8.45 and 9.33 ppm available K and 0.045% and 0.052% organic matter in the two seasons, respectively.

Every experiment included 12 treatments which were the combination of four treatments of mineral and bio nitrogen fertilization namely 30, 50, 70 and 50 kg N/fad plus biofertilizer (Syrialin) and three rates of potassium fertilizer 25, 45 and 65 kg K_2O/fad.

The experimental design was split plots with five replications. Four mineral and bio nitrogen fertilizer treatments were arranged randomly in the main plots and the three potassium fertilizer rates were distributed randomly in the sub plots. Each experimental sub plot consisted of 6 ridges, 3.5 meter in length and 50 cm in width (plot area was 10.5 m^2). Seeds of sesame Shandawyl 3 variety were sown on one side of the ridge in hills 10 cm apart on May 14 and 8 in 2003 and 2004 seasons, respectively. After 20 days from sowing, sesame plants were thinned to two plants per hill.

Nitrogen in the form of ammonium nitrate (33.5% N) at the previous levels was applied at three equal doses, after thinning, 35 and 50 days from sowing. Potassium in the form of potassium sulphate (48% K_2O) at the previous rates was applied at three equal doses, after thinning, 35 and 75 days from sowing. A basal dose of calcium superphosphate fertilizer (15.5% P_2O_5) was applied at the rate of 200 kg/fad during preparing experimental soil. Biofertilizer (Syrialin) which contain nitrogen fixer nonsymbiotic bacteria as a commercial packet was produced by Ministry of Agriculture in Egypt. Biofertilizer Syrialin was inoculated to seeds coated by Arab gum immediately before sowing. The normal cultural practices for growing sesame crop at Ismailia Governorate were followed.

At harvest time, after 120 days from sowing, samples of 10 guarded plants were randomly taken from the inner ridges in each sub plot to estimate plant height (cm), fruiting zone length (cm), number of branches, capsules and seeds/plant, weight of capsules and seeds/plant (g), number of seeds/capsule, 1000-seed weight (g) and shelling percentage. Seed yield (ardab/fad) was determined from the plants of the two middle ridges (the 3rd and 4th ridges) in each plot and the yield per fad was calculated. Seed oil content (%) was determined by using Soxhelt continuous extraction apparatus with petroleum ether as an organic solvent according to A.O.A.C (1975) and seed oil yield (ton/fad) was calculated by multiplying oil percentage and seed yield per fad.

The analysis of variance of split plots design was used according to Snedecor and Cochran (1982). Means followed by the same alphabetical letters are not statistically different according to Duncan's Multiple Range Test at the 5% level of significance (Duncan, 1955).

RESULTS AND DISCUSSION

A- Effect of nitrogen fertilization :

Data in Tables (1 and 2) indicate that increasing mineral nitrogen fertilizer level from 30 to 50 and 70 kg N/fad consistently and significantly increased plant height, fruiting zone length, number of branches, capsules and seeds/plant of sesame in the two seasons. These results were expected since nitrogen stimulates cell division and extension in turn increases number and length of internodes resulting in taller plants. Also, N favours the meristematic activity and photosynthesis rate which produced more number of branches/plant. The increase in number of pods/plant might be due to the favorable effect of N on pods setting. Confirming results were found by Bassiem and Anton (1998), El-Shakre (1999), Fayed *et al.* (2000), Patra (2001) and Ali (2002).

Applying biofertilizer (Syrialin) with 50 kg N/fad produced the highest values of the mentioned characters but the increases over 70 kg N/fad were not significant (Tables 1 and 2). Similar results were recorded by Palaniappan *et al.* (1999) and El-Kramany *et al.* (2000).

Table (1): Effect of nitrogen and potassium fertilization on plant height, fruiting zone length, number of branches/plant and number of capsules/plant of sesame.

Treatments	Plant height (cm)		Fruiting zone length (cm)		Number of branches/plant		Number of capsules/plant	
	2003	2004	2003	2004	2003	2004	2003	2004
Nitrogen fertilization (N)								
30 KgN/fad	82.77c	95.70c	65.30c	82.41c	2.60c	2.86c	52.15c	60.35c
50 Kg N/fad	101.35b	114.90b	76.11b	93.40b	2.95b	3.20b	65.83b	72.58b
70 Kg N/fad	118.61a	130.98a	83.05a	100.78a	3.21a	3.46a	78.47a	83.30a
50 Kg N/fad +Syrialin	122.37a	133.65a	83.45a	101.10a	3.23a	3.49a	82.43a	85.73a
F.test	*	*	*	*	*	*	*	*
Potassium fertilization (K)								
25 Kg K_2O/fad	96.86b	108.91b	71.76b	88.63b	2.83b	3.07b	59.43c	65.92c
45 Kg K_2O/fad	108.90a	121.55a	78.79a	96.58a	3.04a	3.30a	70.27b	76.45b
65 Kg K_2O/fad	113.07a	125.96a	80.38a	98.05a	3.12a	3.37a	79.46a	84.09a
F.test	*	*	*	*	*	*	*	*
NxK	NS	NS	NS	*	NS	NS	*	*

The highest level of mineral nitrogen fertilizer (70 kg N/fad) significantly outnumbered moderate and low levels (50 and 30 kg N/fad) in number of seeds/capsule without significant differences between them and that was true in the two seasons (Table 2). Such increase in number of seeds/capsule due to N applying

might owe much to the increase in photosynthesis rate and amount of metabolites synthesized by plant, which in turn might furnished enough food to face the requirements of greater number of seeds/capsule. These results are in accordance with those found by Mondal *et al.* (1992), Gomaa *et al.* (1994) and Ali (1999).

Meanwhile, adding biofertilizer (Syrialin) combined with 50 kg N/fad produced number of seeds/capsule higher than that of 70 kg N/fad but without significant difference between them (Table 2).

Table (2): Effect of nitrogen and potassium fertilization on number of seeds/plant, number of seeds/capsule and weight of capsules/ plant of sesame.

Treatments	Number of seeds/plant		Number of seeds/capsule		Weight of capsules/plant (g)	
	2003	2004	2003	2004	2003	2004
Nitrogen fertilization (N)						
30 Kg N/fad	1069.8c	1251.83c	20.45b	20.72b	13.03c	16.35c
50 Kg N/fad	1380.8b	1536.66b	20.90b	21.15b	16.65b	19.88b
70 Kg N/fad	1772.2a	1896.50a	22.51a	22.74a	19.94a	23.07a
50 Kg N/fad + Syrialin	1889.2a	2006.00a	22.84a	23.37a	20.95a	24.01a
F.test	*	*	*	*	*	*
Potassium fertilization (K)						
25 Kg K_2O/fad	1280.6c	1480.00c	21.36a	22.28 a	15.01 c	18.12c
45 Kg K_2O/fad	1516.1b	1658.50b	21.38a	21.52 a	17.78 b	21.08b
65 Kg K_2O/fad	1787.2a	1879.75a	22.28a	22.18 a	20.15 a	23.28a
F.test	*	*	NS	NS	*	*
NxK	*	NS	NS	NS	*	NS

The data presented in Tables (2 and 3) illustrate that fertilizing sesame plants with 70 kg N/fad produced significantly the heaviest weight of capsules and seeds/plant as well as the highest shelling percentage. That held true in the two seasons. While 1000-seed weight was significantly increased as N level increased from 30 to 50 kg N/fad, but the increase in N level over 50 kg N/fad produced insignificant increase in this trait in both seasons (Table 3). The favorable effect of higher N dose on 1000-seed weight might be due to that N encouraged plant growth i.e. plant height and number of branches/plant which resulted in increasing the amount of light energy intercepted by leaves. Also, N increases photosynthetic pigments content and photosynthesis rate which in turn increased the amount of metabolites synthesized, and consequently resulted in higher dry matter accumulation in leaves and partitioned to fruiting organs i.e. pods and seeds. While, the increase in weight of pods/plant may be due to increasing in number of pods/plant, seeds/pod and 1000-seed weight. But the increase in weight of seeds/plant might be attributed to increasing in weight of pods/plant, number of seeds/pod, shelling percentage and 1000-seed weight. These results are in harmony with those reported by Basha (1994), Bassiem and Anton (1998), Fayed *et al.* (2000), Patra (2001) and Ali (2002).

Table (3): Effect of nitrogen and potassium fertilization on weight of seeds/plant, shelling percentage and 1000-seed weight of sesame.

Treatments	Weight of seeds/plant (g)		Shelling percentage		1000-seed weight (g)	
	2003	2004	2003	2004	2003	2004
Nitrogen fertilization (N)						
30 Kg N/fad	4.93 c	5.91 c	37.59 c	36.01 c	4.81 b	4.93 b
50 Kg N/fad	6.71 b	7.68 b	40.09 b	38.47 b	5.09 a	5.23 a
70 Kg N/fad	8.67 a	9.57 a	43.21 a	41.35 a	5.12a	5.28 a
50 Kg N/fad + Syrialin	9.26 a	10.18 a	43.95 a	42.26 a	5.13 a	5.31 a
F.test	*	*	*	*	*	*
Potassium fertilization (K)						
25 Kg K_2O/fad	5.92 c	7.01 c	39.04 c	38.33 b	4.83 b	4.95 b
45 Kg K_2O/fad	7.42 b	8.36 b	41.25 b	39.28 b	5.11 a	5.27 a
65 Kg K_2O/fad	8.84 a	9.63 a	43.34 a	40.95 a	5.17 a	5.35 a
F.test	*	*	*	*	*	*
NxK	*	*	NS	*	NS	NS

Application of biofertilizer (Syrialin) combined with 50 kg N/fad surpassed 30 and 50 kg N/fad significantly and 70 kg N/fad insignificantly concerning weight of capsules and seeds/plant as well as shelling percentage during the two growing seasons. Also, Syrialin plus 50 kg N/fad produced the heaviest 1000-seed weight as compared with all mineral N levels but the difference was significant only with 30 kg N/fad. That held true at both seasons (Tables 2 and 3). Similar results were recorded by El-Mandoh and Abdel-Magid (1996) and Abdel-Wahab *et al.* (1999).

It is clearly evident from Table (4) that seed yield/fad increased significantly and consistently as N fertilizer rate was increased from 30 to 50 and 70 kg N/fad in the two growing seasons. Fertilizing sesame plants with 70 kg N/fad outyielded those received 30 and 50 kg N/fad in seed yield/fad by 71.21% and 27.05% in the first season and 60.41% and 24.11% in the second one, respectively. The positive effect of increasing nitrogen fertilizer level on seed yield/fad of sesame might be attributed to the beneficial role of nitrogen on encouraging sesame plant growth as expressed by plant height and number of branches/plant which reflected favourably on yield components such as number and weight of capsules and seeds/plant, number of seeds/capsule, shelling percentage and 1000-seed weight and finally increased seed yield/fad. These results are in a same trend with those obtained by Basha (1994), El-Emam *et al.* (1997), Ali (1999), Fayed *et al.* (2000), Patra (2001) and Malic *et al.* (2003).

Biofertilization of sesame plants with Syrialin plus 50 kg N mineral/fad recorded the highest seed yield/fad with significant increase over 30 and 50 kg N/fad, but the variation with 70 kg N/fad was not great enough to reach the 5% level of significance and that was true during the two seasons (Table 4). Adding biofertilizer (Syrialin) combined with 50 kg N/fad outyielded 30, 50 and 70 kg N/fad in seed yield/fad by 81.87%, 34.95% and 6.22% in 2003 season and 70.43%, 31.86 % and 6.24% in 2004 season, respectively. The increase in seed yield/fad of sesame by applying biofertilizer (Syrialin) which contain bacteria fixing nitrogen nonsymbiotic might be due to its effect on increasing available nitrogen gradually and consistently ready for plant nutrition as well as increasing phytohormones such as auxin, gibberellin and cytokinin which play an important role in formation a greater active root system and hence increasing nutrients uptake, photosynthesis rate and translocation (Ahmed, 1995). Similar results were emphasized by El-Mandoh and Abdel-Magid (1996), Palaniappan *et al.* (1999) and El-Kramany *et al.* (2000).

Table (4) shows that seed oil content (%) was negatively and significantly affected by increasing N level from 30 Kg/fad to 50 or 70 or 50 Kg N+biofertilizer (Syrialin) which did not differ significantly from each other regarding the effect on this trait. These results were expected since the low N level resulted in smaller seeds (1000-seed weight) and this might be on the expense of carbohydrate storage rather than oils which resulted in increasing percentage of the laters. These results are in harmony with those reported by Basha (1994), Gomaa *et al.* (1994), Bassiem and Anton (1998), Ali (1999) and Ali (2002).

Table (4): Effect of nitrogen and potassium fertilization on seed yield/fad, seed oil content(%) and oil yield/fad of sesame.

Treatments	Seed yield (ardab/fad)		Seed oil content (%)		Oil yield (ton/fad)	
	2003	2004	2003	2004	2003	2004
Nitrogen fertilization (N)						
30 Kg N/fad	5.35 c	6.29 c	59.53 a	57.37 a	0.385 c	0.435 c
50 Kg N/fad	7.21 b	8.13 b	55 14 b	53.38 b	0.480 b	0.523 b
70 Kg N/fad	9.16 a	10.09 a	52.07 b	50.61 b	0.577 a	0.616 a
50 Kg N/fad + Syrialin	9.73 a	10.72 a	51.83 b	50.51 b	0.610 a	0.654 a
F.test	*	*	*	*	*	*
Potassium fertilization (K)						
25 Kg K_2O/fad	6.39 c	7.42 c	49.69 c	48.51 c	0.375 c	0.426 c
45 Kg K_2O/fad	7.89 b	8.84 b	54.89 b	53.20 b	0.512 b	0.557 b
65 Kg K_2O/fad	9.30 a	10.16 a	59.35 a	57.19 a	0.652 a	0.688 a
F.test	*	*	*	*	*	*
NxK	*	*	NS	*	*	NS

(Ardab seed =120 Kg)

Oil yield/fad of sesame gradually and significantly increased as mineral N fertilizer level was increased up to 70 kg N/fad in both seasons (Table 4). Fertilizing sesame plants with 70 kg N/fad surpassed 30 and 50 kg N/fad in oil yield/fad by 49.87% and 20.21% in the first season and 41.61% and 17.78% in the second season, respectively. The increase in oil yield/fad by increasing N rate could be mainly due to the increase in seed yield/fad regardless the negative effect of that on seed oil percentage. These findings agree with those obtained by Gomaa *et al.* (1994), Fayed *et al.* (2000), Patra (2001) and Ali (2002).

Moreover, the data presented in Table (4) reveal that oil yield/fad of sesame was significantly increased by applying biofertilizer (Syrialin) plus 50 kg N/fad compared to all mineral N fertilizer rates except that the difference with 70 kg N/fad in this respect did not attain statistical significancy. That was true in both growing seasons. The biofertilizer treatment exceeded 30, 50 and 70 kg N/fad for oil yield/fad by 58.44%, 27.08% and 5.72% in the first season and 50.34%, 25.05% and 6.17% in the second season, respectively. The increase in oil yield/fad by application of biofertilizer treatment could be due to the increase in seed yield/fad.

B- Effect of potassium fertilization:

Results in Tables (1 and 2) show that plant height, fruiting zone length and number of branches/plant were significantly increased by increasing potassium fertilizer rate up to 45 kg K_2O/fad, while number of capsules and seeds/plant increased up to 65 kg K_2O/fad and that was true during the two growing seasons. These findings were expected since potassium plays a major role in cell extension and osmoregulation, also, it enhances metabolic processes and various enzymes. Confirming results were emphasized by Mondal *et al.* (1992), El-Emam *et al.* (1997) and Ali (2002).

Potassium fertilizer rates did not exert significant effect on number of seeds/capsule in both growing seasons (Table 2). Similar results were recorded by Bassiem and Anton (1998).

The data presented in Tables (2 and 3) demonstrate that increasing potassium fertilizer rate from 25 to 45 and 65 kg K_2O/fad resulted in consistent significant increases in weight of capsules and seeds/plant in the two seasons. That was true for shelling percentage also but the difference between 25 and 45 Kg K_2O/fad was not significant in the second season. These results might be due to the important role of potassium in activation synthesis of protein and many other compounds including starch, sugar, cellulose, cell wall and vitamins. Also, K encourages various enzymes and photosynthesis as well as plant root development (Follett *et al.*, 1981) which in turn resulted in higher dry matter accumulation in leaves. Moreover, K enhances translocation of metabolites synthesized from leaves (the source) to capsules and seeds (the sink) and consequently increases weight of capsules and seeds/plant as well as shelling percentage. These results are in a same trend with those found by Gabr (1998) and Ali (2002).

Table (3) shows that 1000-seed weight was significantly increased by increasing K fertilizer rate from 25 to 45 kg K_2O/fad, whereas the addition of K at the highest rate (65 kg K_2O/fad) produced insignificant increase in 1000-seed weight compared with the moderate rate (45 kg K_2O/fad). The beneficial effect of potassium on 1000-seed weight of sesame might be attributed to its important role in encouraging many enzymatic systems, photosynthesis, synthesis of proteins and carbohydrates and in turn increasing metabolites synthesized. Also, K favors translocation from leaves to seeds which increase the average of seed weight. Similar results were detected by Dasmahapatra *et al.* (1990), Mondal *et al.* (1992), El-Emam *et al.* (1997) and Kathiresan (1999).

It is clearly evident from Table (4) that sesame seed yield/fad increased consistently and significantly with increasing K fertilizer rate up to 65 Kg K_2O/fad. That was true in two growing seasons. Application of 65 kg K_2O/fad outyielded 25 and 45 kg K_2O/fad in seed yield/fad by 45.54% and 17.87% in the first season and 36.93% and 14.93% in the second one, respectively. The favorable effect of applying potassium fertilizer on seed yield/fad of sesame may be due to encouraging plant growth i.e. plant height and number of branches/plant as well as yield components such as number and weight of capsules and seeds/plant, shelling percentage and 1000-seed weight. These results are in conformity with those reported by Dasmahapatra *et al.* (1990), Mondal *et al.* (1992), Nageshwar *et al.* (1995), Singh *et al.* (1997), Kathiresan (1999) and Ali (2002).

Also, results recorded in Table (4) reveal that increasing potassium fertilizer rate up to 65 kg K_2O/fad significantly increased seed oil content (%) of sesame in the two growing seasons. Confirming results were detected by Singh *et al.* (1997), Bassiem and Anton (1998), Gabr (1998) and Ali (2002).

Consequently, fertilizing sesame plants with 65 kg K_2O/fad produced the highest oil yield/fad followed by 45 and 25 kg K_2O/fad, respectively with significant differences among the three rates. That held true in both growing seasons (Table 4). The increments in oil yield/fad of sesame by increasing K fertilizer rate could be due to the increase in seed yield/fad as well as seed oil content (%). These findings are in accordance with those reported by Satyanaraya (1978), Kathiresan (1999) and Ali (2002).

C- Interaction effect:

The combined analysis of variance for the data of the two seasons revealed that there was significant interaction effect between nitrogen and potassium fertilization on number of capsules/plant, weight of seeds/plant and seed yield/fad (Table 5). The highest number of capsules/plant was produced with applying 65 kg K_2O/fad and 50 kg N/fad plus biofertilizer (Syrialin) followed by 70 kg N/fad without significant difference between them. The lowest value was obtained by adding 30 kg N/fad and 25 kg K_2O/fad.

Regarding weight of seeds/plant as well as seed yield/fad the highest values for both traits (11.43 g/plant and 11.94 ardab/fad) were achieved by

application of 50 kg N/fad + biofertilizer (Syrialin) and adding 65 kg K_2O/fad. Meanwhile, applying 50 kg N/fad plus biofertilizer (Syrialin) surpassed applying 70 kg N/fad in this respect significantly with applying 45 or 65 Kg K_2O/fad and insignificantly with applying 25 Kg K_2O/fad. While the lowest values of the two mentioned characters resulted by adding 30 Kg N + 25 Kg K_2O/fad.

Table (5): Effect of the interaction between nitrogen and potassium fertilization on number of capsules/plant, weight of seeds/plant and seed yield/fad of sesame (the combined data).

N fertilization	Kg K_2O/fad			Kg K_2O/fad			Kg K_2O/fad		
	25	45	65	25	45	65	25	45	65
	No. of capsules/plant			Weight of seeds/plant(g)			Seed yield (ardab/fad)		
30 KgN/fad	48.50	56.87	63.36	4.45	5.44	6.35	4.83	5.84	6.80
50 KgN/fad	59.73	69.93	77.96	5.92	7.22	8.44	6.36	7.69	8.95
70 KgN/fad	69.87	81.71	91.06	7.51	9.15	10.70	7.98	9.66	11.23
50 KgN/fad + Syrialin	72.60	84.92	94.72	7.98	9.76	11.43	8.46	10.28	11.94
LSD 5%	6.52			0.48			0.62		

REFERENCES

Abdel-Wahab, A.M.; Yakout, G.M.; Ali, E.A. and Greish, M.H. (1999): Response of soybean crop to phosphatic fertilization, organic manuring and biofertilization under new reclaimed sandy soil conditions. Egypt. J. Appl. Sci., 14 (8): 125-138.

Ahmed, A.E.A. (1995): Response of wheat plants to nitrogen and biological fertilization under condition of north west coast of Egypt. M. Sc. Thesis, Fac. Agric., Ain Shams Univ.

Ali, E.A. (2002): Response of sesame crop (*Sesamum indicum* L.) to nitrogen and PK fertilizers. Proc. 27th International Conf. for Statistics, Computer Science and its Applications, Cairo Univ., April 2002, 297-309.

Ali, F.M.I. (1999): Agronomic studies on sesame. Ph.D. Thesis, Fac. Agric., Zagazig Univ.

A.O.A.C. (1975): Official Methods of Analysis. 12th Ed. Assoc. Official Agric. Chem., Washington, D.C.

Basha, H.A. (1994): Response of two sesame cultivars to nitrogen level in newly reclaimed sandy soil. Zagazig J. Agric. Res., 21 (3A): 603-616.

Bassiem, M.M. and Anton, N.A. (1998): Effect of nitrogen and potassium fertilizers and foliar spray with ascorbic acid on sesame plant in sandy soil. Ann. Agric. Sci., Moshtohor, 36 (1): 95-103.

Dasmahapatra, A.N.; Mondal, S.S.; Pradhan, B.K. and Pan, P.K. (1990): Response of sesame to potassium nutrition. J. Potassium Res., 6 (3): 124-128.

Duncan, D.B. (1955): Multiple Range and Multiple "F" Tests. Biometrics, 11: 1-24.

El-Emam, M.A.; El-Serogy, S.T. and El-Ahmar, B.A. (1997): Effect of NK levels on some economic characters of sesame (*Sesamum indicum* L.). J. Agric. Sci., Mansoura Univ., 22 (10): 3065-3071.

El-Kramany, M.F.; Ahmed, M.K.A.; Bahr, A.A. and Kabesh, M.O. (2000): Effect of organic manuring, chemical and biofertilizers on yield and nutrients content of sesame grown in newly reclaimed soil. Egyptian J. Applied Sci., 15 (11): 137-153.

El-Mandoh, M.E. and Abdel-Magid, M.N. (1996): Response of some sesame genotypes (*Sesamum indicum* L.) to inoculation by different biofertilizers. Assiut J. Agric. Sci., 27 (1): 169-178.

El-Quesni, F.E.M.; Gaweesh, S.S.M. and Abd El-Haleem, A.K. (1994): Effect of plant population density, weed control and nitrogen level on associated weeds, growth and yield of sesame plant. Bull. Fac. Agric., Cairo Univ., 45:371-388.

El-Shakre, H.E.M. (1999): Evaluation of some sesame genotypes under different levels of nitrogen fertilization. M. Sc. Thesis, Fac. Agric., Cairo Univ.

Fayed, E.H.M.; Hassan, A.A. and Hussain, S.M.A. (2000): Sesame performance as affected by seeding rate and nitrogen levels under drip irrigation system in newly cultivated sandy soil. I. Yield and yield attributes. Ann. Agric. Sci., Moshtohor, 38 (1): 65-73.

Follett, R.H.; Murphy, L.S. and Donahue, R.L. (1981): Fertilizers and soil amendments. Prentice-Hall International, INC., London.

Gabr, E.M.A. (1998): Effect of preceding winter crops and potassium fertilizer levels on growth and yield of intercropped peanut and sesame in new sandy soils. Proc. 8th Conf. Agron., Suez Canal Univ., Ismailia, Egypt. Nov. 1998, 553-560.

Gomaa, M.A.; Nigem, S.A. and Zaky, S.H. (1994): Intercropping studies on peanut with sesame under various levels of nitrogen and phosphorus fertilization. B- Influence of intercropping on yield and quality of sesame. Zagazig J. Agric. Res., 21 (6): 1671-1681.

Kathiresan, G. (1999): Influence of nutrient levels on sesame in different seasons. Sesame and Safflower Newsletter, 14: 39-42.

Kumar, R.; Imayavaramban, V.; Thanunathan, K. and Manickam, G. (2000): Effect of inter-row spacing and different levels of nitrogen in combination with Azospirillium inoculation on growth and yield of sesame. Res. On Crops, 1 (3): 351-354.

Malic, M.A.; Saleem, M.F.; Cheema, M.A. and Ahmed, S. (2003): Influence of different nitrogen levels on productivity of sesame (*Sesamum indicum* L.) under varying planting patterns. Int. J. Agric. Biol., 5 (4): 490-492.

Marschner, H. (1986): Mineral nutrition of higher plants. Academic Press INC, U.S.A., 674 pp.

Mondal, S.S.; Verma, D. and Kuila, S. (1992): Effect of organic sources of nutrients on growth and seed yield of sesame (*Sesamum indicum*). Indian J. Agric. Sci., 62 (4): 258-262.

Nageshwar, L.; Sarawgi, S.K.; Tripathi, R.S. and Bhambri, M.C. (1995): Effect of nitrogen, potassium and sulphur on seed yield, nutrient uptake, quality and economics of summer sesame (*Sesamum indicum*). Indian J. of Agronomy, 40 (2): 333-335.

Palaniappan, S.P.; Jeyabal, A. and Chelliah, S. (1999): Evaluation of integrated nutrient management in summer sesame (*Sesamum indicum* L.). Sesame and Safflower Newsletter, 14: 32-35.

Patra, A.K. (2001): Yield and quality of sesame (*Sesamum indicum* L.) as influenced by N and P during post-rainy season. Ann. Agric. Res., 22 (2): 249-252.

Satyanaraya, V. (1978): Effect of plant density, nitrogen and potassium on the yield of two gingelly (*Sesamum indicum* L.) varieties. Thesis Abstracts, 4 (1), p. 13.

Singh, V.; Rathore, S.S. and Sandeep, S. (1997): Response of some oilseed crops to potassium. J. Potassium Res., 13 (2): 148-152.

Snedecor, W.G. and Cochran, W.G. (1982): Statistical Methods. 7th Ed. 2nd Printing, Iowa State Univ., Ames. Iowa, USA, 507 pp.

تأثير مستويات مختلفة من التسميد الأزوتى (المعدنى والحيوى) والبوتاسى على محصول السمسم فى الأراضى الرملية حديثة الاستصلاح

صلاح عزت حافظ ، ماهر عبد الله قطب
قسم المحاصيل – كلية الزراعة – جامعة قناة السويس – الإسماعيلية

أجريت تجربتان حقليتان بمزرعة كلية الزراعة – جامعة قناة السويس بالإسماعيلية خلال موسمى ٢٠٠٣ و ٢٠٠٤ لدراسة تأثير أربعة معاملات من التسميد الازوتى (المعدنى والحيوى) هى ٣٠ و ٥٠ و ٧٠ و ٥٠ كجم أزوت/فدان + سماد حيوى (سريالين) وثلاثة معدلات من التسميد البوتاسى ٢٥ و ٤٥ و ٦٥ كجم بو٢أ/فدان على المحصول ومكوناته وجودته فى السمسم صنف شندويل ٣ فى الاراضى الرملية بمحافظة الإسماعيلية، ويمكن تلخيص النتائج كما يلى:

١. أدت زيادة معدل التسميد الازوتى المعدنى من ٣٠ إلى ٧٠ كجم أزوت/فدان إلى زيادة معنوية فى ارتفاع النبات وطول المنطقة الثمرية وعدد الأفرع/نبات وعدد الكبسولات/نبات وعدد البذور/نبات وعدد البذور/الكبسولة ووزن الكبسولات/نبات ووزن البذور/نبات ونسبة التصافى ووزن الألف بذرة ومحصول البذور/فدان ومحصول الزيت/فدان ، بينما انخفضت معنويا نسبة الزيت بالبذور (%).
٢. أدت إضافة السماد الحيوى (سريالين) + ٥٠ كجم أزوت/فدان إلى تحقيق أعلى القيم لكل الصفات السابقة باستثناء نسبة الزيت بالبذور (%) ولكن الفروق مع معاملة ٧٠ كجم أزوت معدنى/فدان لم تصل حد المعنوية.
٣. أدت إضافة ٦٥ كجم بو٢أ/فدان إلى زيادة معنوية فى جميع الصفات المدروسة ماعدا عدد البذور/الكبسولة وذلك بالمقارنة مع إضافة ٢٥ كجم بو٢أ/فدان.
٤. فوق مستوى الموسمين وجد تأثير معنوى للتفاعل بين التسميد الازوتى × البوتاسى على عدد الكبسولات/نبات ووزن البذور/نبات ومحصول البذور/فدان. وقد تحقق أعلى محصول بذور/فدان (١١,٩٤ أردب/فدان) بالتسميد بمعدل ٥٠ كجم أزوت/فدان + سماد حيوى (سريالين) وإضافة ٦٥ كجم بو٢أ/فدان.