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EFFECT OF INTERCROPPING SYSTEMS AND NITROGEN LEVELS ON CERTAIN CHARACTERS OF SNAP BEAN AND PEPPER. III. EFFECT ON COMPETITION PARAMETERS

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ABSTRACT

The competition parameters measured in order to throw some light advance on the expected yield resulting from the tested treatments.

1. Land equivalent ratio (LER):

The land equivalent ratio (LER) of pepper and snap bean showed values more than one in all intercropping systems in both seasons. The highest values for both crops were obtained from the IS_3 intercropping system in both seasons.

With respect to the nitrogen levels, the data cleared that the highest value was obtained at zero nitrogen level for pepper, snap bean and both crops in both seasons. By increasing nitrogen level, the land equivalent ratio was decreased in both seasons.

The effect of interaction on land equivalent ratio of pepper, snap bean and both crops significantly observed in both seasons. The interaction between IS_3 system and zero nitrogen level gave the best results of land equivalent ratio of pepper, snap bean and both crops in both seasons.

2. Relative crowding coefficient (RCC):

The intercropping systems and nitrogen levels had no effect on this parameter in both seasons. The same trend was obtained by the interaction between intercropping systems and nitrogen levels in both seasons, except relative crowding coefficient of snap bean (Ks) in the second season.

3. Aggressivity (A):

The highest aggression value of pepper (Aps) was obtained under the IS_4 intercropping system in both seasons. All intercropping systems gave a dominated aggression value for pepper (Aps) in both seasons, however all intercropping systems gave recessive aggression values of snap bean (Asp) in both seasons.

Concerning the effect of nitrogen levels, the highest dominant value of aggression in pepper (Aps) was obtained by zero nitrogen level in both seasons. However aggression values of snap bean was negative in both seasons.

The superior aggression value of pepper resulted from the interaction between the IS_4 system and zero nitrogen level in both seasons, followed by the interaction between the IS_3 system and zero nitrogen level in both seasons.

4. Mean of net income:

The highest net income was obtained from the IS_3 system, followed by the IS_4 system in both seasons, whereas the least net income per feddan was obtained from the IS_0 system (planting pepper as a solid crop).

Nitrogen levels were not significant on net income per feddan. The highest net income per feddan was obtained from zero nitrogen level in both seasons.

With respect to the interaction between intercropping systems and nitrogen levels, the obtained results showed that the highest net income per feddan was obtained from the IS_3 system with zero nitrogen level in both seasons. However, the least net income per feddan was obtained from the interaction between IS_0 system and zero nitrogen level in both seasons.

INTRODUCTION

Competition among the high plant population densities on light, food and water has a great effect on plant growth and yield.

Certain investigators indicated that increasing plants population per unit area stimulated the productivity of bean plants, while the number and weight of pods per plant were decreased (Hodneit and Campbell, 1963 and Appadurai *et al.*, 1967). Similar results were also found with okra by Mcferran *et al.* (1963) and Alberegts and Howard (1974).

Cordero and Mocollum (1979) found that intercropping maize with soybean or *Phaseolus vulgaris* reduced yield of maize. The land equivalent ratio of intercropping was from 1.20 to 1.40, which represented an increase equal to 20-40% in total production.

Faris *et al.* (1983) showed that a sorghum / cowpea or *Phaseolus vulgaris* intercrop system yielded amount of grain higher than the monocrop system and produced a land equivalent ratio higher than one. In cowpeas, relative crowding coefficient values was positively related with the number of pods and seeds / plant.

Sarhan (1985) intercropped soybean on corn. The results revealed that varying soybean population in the intercropping systems, which were used did not affect the competition function studied, land equivalent ratio (LER), relative crowding coefficient (K) and aggression (A). Moreover, corn was dominant.

El-Gazar *et al.* (1988c) found that the land equivalent ratio (LER) of kidney beans and okra showed values more than one in all intercropping systems and nitrogen levels studied. The effect of interaction between intercropping systems and nitrogen levels on land equivalent ratio, kidney beans, okra and both crops was not cleared by intercropping systems and different nitrogen levels. On the other hand, the relative crowding coefficient in kidney beans had a significant increase under the different intercropping systems used. Aggressivity values of okra were positive, okra was dominant, while kidney beans was dominated.

Sultan *et al.* (1988) studied intercropping soybean with sorghum. They found that the land equivalent ratio at the two crops (LER) and relative crowding coefficient of soybean (Ksb) were significantly affected by the

interaction between intercropping systems and nitrogen levels in the second season. Aggressivity (A) values for sorghum and soybean were significantly affected by intercropping systems. Sorghum was dominant in both seasons.

Osman (1995) found that the land equivalent ratio of maize and soybean valued more than one. Intercropped soybean with maize gave highly significant increase in the total relative crowding coefficient. Aggressivity values for maize was positive, maize was the dominant crop and soybean was dominated.

Askar *et al.* (1997) studied some intercropping systems on bean and cucumber. They found that the land equivalent ratio was greater than one for all intercropping systems.

Farghly (1997) found that the values of relative crowding coefficient showed a clear yield advantage for intercropping faba bean with sugar cane. Aggressivity values of intercropping indicated that sugar cane crop was dominant.

El-Moursi (1999) found that the land equivalent ratio (LER) of garlic and snap bean was exceeded than one under all intercropping systems studied. Relative crowding coefficient of garlic (KG) was affected by intercropping systems in the first season only. On the other hand, the intercropping systems had a significant effect on aggression values of garlic and snap bean in both studied seasons. The nitrogen level had a positive effect on aggression values in snap bean, under these levels, snap bean was dominated over garlic, expect the minimum level of nitrogen in the first season. The interaction between intercropping systems and nitrogen had a significant effect on the mean of net income per feddan in both seasons.

The aim of this part of the work is to investigate the effect of five intercropping systems and three nitrogen levels on the competition degree between pepper and snap bean plants.

MATERIALS AND METHODS

The materials and methods followed in this work were previously described in paper number 1 of this series. In order to assess the degree of competition between pepper and snap bean plants, the following parameters were determined.

1. Land equivalent ratio (LER):

This parameter was measured to give values which can be used as an index for the increase or the reduction in yield resulting from intercropping systems used. The land equivalent ratio of pepper (Lp) if added to the ratio of snap bean (Ls) and sum was higher than one, this means that there is an increase in yield and the value over one points to the ratio of such increase. This method was determined according to Willey and Osiro (1972). The equations adopted were as follows:

$$Lp = \frac{\text{Intercrop yield of pepper}}{\text{Pure stand yield of pepper}}$$

$$Ls = \frac{\text{Intercrop yield of snap bean}}{\text{Pure stand yield of snap bean}}$$

$$LER = Lp + Ls$$

2. Relative crowding coefficient (RCC):

This parameter was measured to give information about the resulted yield. Relative crowded coefficient value of lesser than, equal to or higher than one means that plants produced lower yield, the same yield or higher yield than the expected, respectively. The presence or absence yield advantages was determined by multiplying the values of RCC for crops and the result was symbolized ask. The value of K > 1 means yield advantages, K = 1 means no differences and K < 1 means yield disadvantages presented. It was computed for pepper (Kp), snap bean (Ks) and for the two crops (K) according to the method described by Hall (1974).

a. If the ratio between pepper and snap bean plants was 50:50 the following formula was used.

$$Kp = \frac{\text{Mixture yield of pepper}}{\text{Pure stand yield of pepper - mixture yield of pepper}}$$

$$Ks = \frac{\text{Mixture yield of snap bean}}{\text{Pure stand yield of snap bean - mixture yield of snap bean}}$$

b. If the ratios of intercropping systems were 66.67 : 33.33, 75 : 25 and 40 : 60 mixtures.

$$Kp = \frac{Yps \times Zsp}{(Ypp - Yps) \times Zps}$$

$$Ks = \frac{Ysp \times Zps}{(Yss - Ysp) \times Zsp}$$

$$K = Kp \times Ks$$

Where:

Ypp = Pure stand yield of pepper.
Yss = Pure stand yield of snap bean.
Yps = Mixture yield of pepper (in combination with snap bean).
Ysp = Mixture yield of snap bean (in combination with pepper).
Zps = Proportion of pepper in mixture with snap bean.
Zsp = Proportion of snap bean in mixture with pepper.

3. Aggressivity (A):

An aggressivity value of zero indicates that the competition between the cultivated crops is equal. For any other situation, both cultivars will have a numerical value, but the value of the dominant cultivar will be positive (+) and that of the recessive one will be negative (-).

Aggressivity values of pepper (Aps) and snap bean (Asp) were determined according to Megillchrist (1965).

a. For the combination of 50 : 50, the equations used were:

$$Aps = \frac{\text{Mixture yield of pepper}}{\text{Expected yield of pepper}} - \frac{\text{Mixture yield of snap bean}}{\text{Expected yield of snap bean}}$$

$$Asp = \frac{\text{Mixture yield of snap bean}}{\text{Expected yield of snap bean}} - \frac{\text{Mixture yield of pepper}}{\text{Expected yield of pepper}}$$

b. For the other combination ratios, the equations used were:

$$Aps = \frac{Yps}{Ypp \times Zps} - \frac{Ysp}{Yss \times Zsp}$$

$$Asp = \frac{Ysp}{Yss \times Zsp} - \frac{Yps}{Ypp \times Zps}$$

4. Mean of net income:

Mean of net income was calculated as follows:

Net income = Total income - Total costs.

Where:

Total net income was counted according to the local price of pepper and snap bean (LE / ton). The price of pepper was 750 LE/ton in both seasons, while the price of snap bean was 600 LE/ton in both seasons.

Total costs included fertilizers, seeds, labours, rent, pesticide control, ... etc.

Data were statistically analyzed according to Snedecor and Cochran (1967). Treatment means were compared using Duncan's Multiple Range Test by Duncan (1955).

RESULTS AND DISCUSSION

1. Land equivalent ratio (LER):

The results of LER was obtained from pepper and snap bean yields as affected by the intercropping systems and nitrogen levels were presented in Table 1. It is evident from the results that the land equivalent ratio was

significantly increased in pepper and snap bean by the different intercropping systems in both seasons. The IS_5 intercropping system gave the best results of land equivalent ratio of pepper in both seasons, whereas with snap bean the IS_3 intercropping system gave the best results of land equivalent ratio in both seasons.

Land equivalent ratio (LER) of pepper and snap bean showed values of more than one in all treatments of the intercropping systems in both seasons. The IS_3 intercropping system gave the highest values of LER for both pepper and snap bean in both seasons. This means that the actual production of snap bean plants intercropped by IS_3 system was higher than the expected yield. This result is in harmony with those reported by Faris *et al.* (1983), El-Gazar *et al.* (1988c), Osman (1995), Askar *et al.* (1997) and El-Moursi (1999).

Table 1: Land equivalent ratio of pepper (Lp) and snap bean (Ls) as affected by intercropping system and nitrogen level in the 2000 and 2001 seasons.

Treatments	Land equivalent ratio (LER)					
	2000 season			2001 season		
	Pepper (Lp)	Snap bean (Ls)	Both crops (LER)	Pepper (Lp)	Snap bean (Ls)	Both crops (LER)
Intercropping system:						
IS_1	0.88 ab	1.00 c	1.88 b	0.86 bc	1.09 c	1.95 c
IS_2	1.03 ab	0.91 c	1.93 b	1.03 ab	1.10 c	2.12 bc
IS_3	0.70 b	2.28 a	2.98 a	0.69 c	2.43 a	3.12 a
IS_4	0.95 ab	1.63 b	2.58 ab	0.91 bc	1.74 b	2.65 ab
IS_5	1.26 a	1.10 c	2.35 ab	1.21 a	1.13 c	2.34 bc
N level (kg/fed):						
0	1.48 a	1.62 a	3.10 a	1.43 a	1.95 a	3.38 a
50	0.84 b	1.32 ab	2.16 b	0.82 b	1.38 b	2.,20 b
100	0.57 c	1.21 b	1.78 b	0.57 c	1.16 b	1.73 c

Means followed by a letter in common are not significantly affected according to Duncan's Multiple Range Test at the level 5%.

Concerning the effect of nitrogen level on land equivalent ratio, the results showed that the highest value was obtained at zero nitrogen level for pepper, snap bean and both pepper and snap bean in both seasons. By increasing nitrogen level, the land equivalent ratio was decreased in both seasons. Land equivalent ratio of pepper and snap bean showed values higher than one in all nitrogen treatments of both crops in both seasons. This result is in line with those reported by El-Gazar *et al.* (1988c).

With respect to the effect of interaction between intercropping system and nitrogen levels, the result in Table 2 showed that the land equivalent ratio of pepper, snap bean and both crops was significantly affected by the interaction in both seasons. The interaction between IS_3 system and zero nitrogen level gave the best results of land equivalent ratio of pepper, snap bean and both crops in both seasons. On the other hand, the interaction between any intercropping system and zero nitrogen level gave the best results in the same system, without the IS_5 intercropping system, where the

best results of land equivalent ratio gave from the interaction between the IS_5 system and 50 kg nitrogen level of both crops in both seasons.

Land equivalent ratio (LER) of pepper and snap bean showed values of more than one in all treatments in both seasons. This result is in line with those reported by Sultan *et al.* (1988).

Table 2: Land equivalent ratio of pepper (Lp) and snap bean (Ls) as affected by intercropping system and nitrogen level interaction in the 2000 and 2001 seasons.

Inter-Cropping system	N level (kg/fed)	Land equivalent ratio (LER)					
		2000 season			2001 season		
		Pepper (Lp)	Snap bean (Ls)	Both crops (LER)	Pepper (Lp)	Snap bean (Ls)	Both Crops (LER)
IS_1	0	1.33abc	1.23 b	2.56bcd	1.28 ab	1.43 bc	2.71bcde
	50	0.69 de	0.85 b	1.54 d	0.68 cd	0.90 c	1.58 ef
	100	0.60 de	0.94 b	1.54 d	0.61 d	0.95 c	1.56 ef
IS_2	0	1.62 ab	0.95 b	2.57bcd	1.61 a	1.49 bc	3.10 bc
	50	0.73 de	0.84 b	1.57 d	0.74 cd	0.89 c	1.63 ef
	100	0.74 de	0.92 b	1.66 cd	0.73 cd	0.91 c	1.64 ef
IS_3	0	1.09bcd	3.14 a	4.23 a	1.08 bc	3.58 a	4.66 a
	50	0.63 de	1.72 b	2.36bcd	0.61 d	1.90 bc	2.51cdef
	100	0.38 e	1.97 b	2.35bcd	0.38 d	1.81 bc	2.19cdef
IS_4	0	1.64 ab	1.93 b	3.57 ab	1.55 a	2.23 b	3.78 ab
	50	0.78cde	1.60 b	2.38bcd	0.77 cd	1.63 bc	2.41cdef
	100	0.42 e	1.37 b	1.79 cd	0.42 d	1.35 bc	1.77def
IS_5	0	1.71 a	0.84 b	2.55bcd	1.64 a	1.02 c	2.66bcdef
	50	1.37 ab	1.59 b	2.95 bc	1.28 ab	1.59 bc	2.88 bcd
	100	0.69 de	0.86 b	1.56 d	0.71 cd	0.79 c	1.50 f

Means followed by a letter in common are not significantly affected according to Duncan's Multiple Range Test at the level 5%.

2. Relative crowding coefficient (RCC):

Relative crowding coefficient values of pepper (Kp), snap bean (Ks) and the two crops (K) as affected by intercropping systems and nitrogen levels are recorded in Table 3. It is evident from data that the intercropping systems and nitrogen levels had no effect on this parameter in both seasons. This result is in line with those reported by Sarhan (1985). The same trend was produced by the interaction between intercropping systems and nitrogen levels in both seasons (Table 4), except relative crowding coefficient of snap bean (Ks) in the second season.

Table 3: Relative crowding coefficient of pepper (Kp) and snap bean (Ks) as affected by intercropping system and nitrogen level in the 2000 and 2001 seasons.

Treatments	Relative crowding coefficient (K)					
	2000 season			2001 season		
	Pepper (Kp)	Snap bean (Ks)	Both crops (K)	Pepper (Kp)	Snap bean (Ks)	Both crops (K)
Intercropping system:						
IS_1	7.18 a	-0.12 a	-0.86 a	29.21 a	0.39 a	11.39 a
IS_2	-42.44a	-0.50 a	21.22 a	7.65 a	-1.20 a	-9.18 a
IS_3	26.40 a	-0.38 a	=10.03a	21.13 a	-0.15 a	-3.17 a
IS_4	-2.87 a	-0.52 a	1.49 a	0.97 a	-0.19 a	-0.18 a
IS_5	3.21 a	-0.12 a	-0.39 a	-6.25 a	-0.34 a	2.13 a
N level (kg/fed):						
0	-3.98 a	-0.54 a	2.15 a	6.78 a	-0.56 a	-3.80 a
50	10.11 a	-0.26 a	-2.63 a	5.99 a	0.37 a	2.22 a
100	-11.24a	-0.17 a	1.91 a	18.87 a	-0.70 a	-13.21a

Means followed by a letter in common are not significantly affected according to Duncan's Multiple Range Test at the level 5%.

Table 4: Relative crowding coefficient of pepper (Kp) and snap bean (Ks) as affected by intercropping system and nitrogen level interaction in the 2000 and 2001 seasons.

Inter-cropping system	N level (kg/fed)	Relative crowding coefficient (K)					
		2000 season			2001 season		
		Pepper (Kp)	Snap bean (Ks)	Both crops (K)	Pepper (Kp)	Snap bean (Ks)	Both crops (K)
IS_1	0	-0.27 a	-0.35 a	0.10 a	70.08 a	-0.94 bc	-65.88 a
	50	14.82 a	-0.09 a	-1.33 a	10.93 a	4.48 a	48.97 a
	100	6.97 a	0.09 a	0.63 a	6.61 a	-2.38 bc	-15.73 a
IS_2	0	-18.33a	-1.57 a	2.88 a	-18.45a	0.54abc	-9.96 a
	50	-5.27 a	-0.04 a	0.21 a	-5.05 a	-1.41 bc	7.12 a
	100	-103.7a	0.12 a	-12.44a	46.46 a	-2.73 c	-12.68 a
IS_3	0	4.13 a	-0.29 a	-1.20 a	7.07 a	-0.14 bc	-0.99 a
	50	57.99 a	-0.05 a	-2.90 a	41.16 a	-0.15 bc	-6.17 a
	100	17.08 a	-0.78 a	-13.32a	15.17 a	-0.15 bc	-2.28 a
IS_4	0	-10.03a	-0.32 a	3.21 a	6.60 a	-0.11 bc	-0.73 a
	50	-11.23a	-0.99 a	11.12 a	-15.92a	-0.18 bc	2.87 a
	100	12.65 a	-0.25 a	-3.16 a	12.24 a	-0.29 bc	-3.55 a
IS_5	0	4.60 a	-0.19 a	-0.87 a	-31.40a	-2.16 bc	67.82 a
	50	-5.78 a	-0.13 a	0.75 a	-1.19 a	-0.90 bc	1.07 a
	100	10.81 a	-0.04 a	-0.43 a	13.85 a	2.04 ab	28.25 a

Means followed by a letter in common are not significantly affected according to Duncan's Multiple Range Test at the level 5%.

3. Aggressivity (A):

Data presented in Table 5 showed the effect of intercropping systems and nitrogen levels on aggression values of pepper (Aps) and snap bean (Asp). An aggression value of zero indicated that the component species

were equally competitive, this means that for any other situation, both species will have the same numerical value, but the sign of the dominant species will be positive (+) and that of the recessive one will be negative (-). The values in both crops were significantly affected by intercropping systems and nitrogen levels in both seasons. All intercropping systems gave a dominated aggression value for pepper (Aps) in both seasons. The highest aggression value of pepper (Aps) was obtained under the IS_4 intercropping system in both seasons. However, all intercropping systems gave recessive aggression values of snap bean (Asp) in both seasons. These results agreed with those obtained by El-Gazar *et al.* (1988c), Sultan *et al.* (1988), Osman (1995) and Farghly (1997).

Concerning the effect of nitrogen levels on aggressivity, data showed that aggression values of pepper (Aps) was positive in both seasons. The highest dominant value of aggression in pepper (Aps) was obtained by zero nitrogen level in both seasons. However, aggression values of snap bean was negative in both seasons.

Table 5: Aggressivity value (A) of pepper (Aps) and snap bean (Asp) as affected by intercropping system and nitrogen level in the 2000 and 2001 seasons.

Treatments	Aggressivity values (A)			
	Pepper (Aps)		Snap bean (Asp)	
	2000	2001	2000	2001
Intercropping system:				
IS_1	1.25 b	1.16 c	-1.25 a	-1.16 a
IS_2	1.41 b	1.50 bc	-1.41 a	-1.50 ab
IS_3	2.22 ab	2.15 b	-2.22 ab	-2.15 b
IS_4	3.38 a	3.22 a	-3.38 b	-3.22 c
IS_5	1.97 ab	1.85 bc	-1.97 ab	-1.85 ab
N level (kg/fed):				
0	3.37 a	3.23 a	-3.37 b	-3.23 c
50	1.75 b	1.68 b	-1.75 a	-1.68 b
100	1.02 b	1.03 c	-1.02 a	-1.03 a

Means followed by a letter in common are not significantly affected according to Duncan's Multiple Range Test at the level 5%.

The effect of interaction between intercropping systems and nitrogen levels on aggression was presented in Table 6. The superior aggression value of pepper resulted from the interaction between the IS_4 system and zero nitrogen level in both seasons, followed by the interaction between the IS_3 system and zero nitrogen level in both seasons. These findings may be attributed to nitrogen fixation process by plant root nodules of snap bean plants, which in case of IS_4 and IS_3 systems were higher than the same process under other systems as a result of higher snap bean density in unit area. Similar results were obtained by El-Gazar *et al.* (1988c), Sultan *et al.* (1988) and El-Moursi (1999).

Table 6. Aggressivity values of pepper (Aps) and snap bean (Asp) as affected by intercropping system and nitrogen level interaction in the 2000 and 2001 seasons.

Inter-cropping system	N level (kg/fed)	Aggressivity values (A)			
		Pepper (Aps)		Snap bean (Asp)	
		2000	2001	2000	2001
IS_1	0	2.05 bcd	1.84 cde	-2.05 abc	-1.84 abc
	50	0.96 d	0.91 e	-0.96 a	-0.91 a
	100	0.74 d	0.74 e	-0.74 a	-0.74 a
IS_2	0	2.15 bcd	2.47 bcd	-2.15 abc	-2.47 bcd
	50	1.03 cd	1.04 e	-1.03 ab	-1.04 a
	100	1.03 cd	1.00 e	-1.03 ab	-1.00 a
IS_3	0	3.55 b	3.41 b	-3.55 c	-3.41 d
	50	2.09 bcd	1.98 cde	-2.09 abc	-1.98 abc
	100	1.03 cd	1.06 e	-1.03 ab	-1.06 a
IS_4	0	6.09 a	5.66 a	-6.09 d	-5.66 e
	50	2.71 bcd	2.68 bcd	-2.71 abc	-2.68 bcd
	100	1.33 cd	1.32 de	-1.33 ab	-1.32 ab
IS_5	0	2.99 bc	2.77 bc	-2.99 bc	-2.77 cd
	50	1.95 bcd	1.77 cde	-1.95 abc	-1.77 abc
	100	0.96 d	1.01 e	-0.96 a	-1.01 a

Means followed by a letter in common are not significantly affected according to Duncan's Multiple Range Test at the level 5%.

4. Mean of net income:

This part of the research clearly showed a significant effect of intercropping systems on the mean of net income (Table 7). The highest net income was obtained from the IS_3 system followed by the IS_4 system in both seasons. Whereas, the least net income per feddan was obtained from the IS_0 system (planting pepper as a solid crop). These results cleared that all intercropping systems were superior on the solid planting system in the net income in both tested seasons. Similar results reported by Hasselbach and Nadegwa (1983), Abidin *et al.* (1986), Emarah *et al.* (1996) and El-Moursi (1999).

Concerning the effect of nitrogen level on the mean of net income, the results showed that nitrogen levels had no significant effect on net income per feddan. The highest net income per feddan was obtained from zero nitrogen level in both seasons.

With respect to the interaction between intercropping systems and nitrogen levels (Table 8), the obtained results showed that the mean of net income was significantly affected by the interaction. The highest net income per feddan (11480 and 11850 LE) was obtained from the IS_3 system with zero nitrogen level in the first season and second season, respectively. On the other hand, the IS_0 system combined with zero nitrogen level gave the least net income per feddan in both seasons.

Table 7: Mean of net income (LE per feddan) of pepper (Aps) and snap bean (Asp) as affected by intercropping system and nitrogen level in the 2000 and 2001 seasons.

Treatments	Mean of net income (LE) per feddan	
	2000	2001
Intercropping system:		
IS_0	1869.78 d	2044.89 d
IS_1	5007.78 c	5389.78 c
IS_2	5239.56 c	5646.44 c
IS_3	9480.67 a	9835.11 a
IS_4	7467.56 b	7854.00 b
IS_5	6103.33 bc	6553.78 bc
N level (kg/fed):		
0	6083.89 a	6442.67 a
50	5463.67 a	5826.89 a
100	6036.78 a	6392.44 a

Means followed by a letter in common are not significantly affected according to Duncan's Multiple Range Test at the level 5%.

Table 8: Mean of net income (LE per feddan) of pepper (Aps) and snap bean (Asp) as affected by intercropping system and nitrogen level interaction in the 2000 and 2001 seasons.

Intercropping System	N level (kg/fed)	Mean of net income (LE) per feddan	
		2000	2001
IS_0	0	652.0 f	769.3 g
	50	1937.0 ef	2116.0 fg
	100	3020 def	3249.0 efg
IS_1	0	5311.0 bcde	5701.0 bcdef
	50	3821.0 cdef	4189.0 defg
	100	5892.0 bcde	6279.0 bcdef
IS_2	0	6062.0 bcde	6484.0 bcde
	50	3945.0 cdef	4335.0 defg
	100	5711.0 bcde	6120.0 bcdef
IS_3	0	11480.0 a	11850.0 a
	50	7569.0 abcd	7927.0 abcd
	100	9395 ab	9732.0 ab
IS_4	0	8385 abc	8810.0 abc
	50	7040 abcd	7430.0 bcde
	100	6977 abcd	7322.0 bcde
IS_5	0	4615 cdef	5045.0 cdef
	50	8470 abc	8964.0 abc
	100	5225 bcdef	5652.0 bcdef

Means followed by a letter in common are not significantly affected according to Duncan's Multiple Range Test at the level 5%.

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تأثير نظم التحميل ومستويات مختلفة من التسميد الأزوتى على بعض الصفات فى الفاصوليا والفلفل المحملين معاً.

٣- التأثير على مقاييس المنافسة

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عليها فى كلا المحصولين عند إتباع نظام التحميل الثالث ، وكذلك كانت أعلى قيمة عند مستوى تسميد أزوتى صفر لكل من الفلفل والفاصوليا فى موسمى الزراعة.

تشير النتائج أيضا أن التفاعل بين نظم التحميل ومستويات النتروجين أثـرت معنويـاً علـى نسـبة المكافىء الأرضى للمحصولين معاً وكانت أعلى قيمة لنسبة المكافىء الأرضى للمحصولين معاً ناتجة عـن التفاعل بين النظام الثالث للتحميل ومستوى تسميد أزوتى صفر. وبزيادة مستوى التسميد الأزوتى عن صفر تقل نسبة المكافىء الأرضى تدريجيا حتى تصل إلى أقل قيمة عند مستوى تسميد ١٠٠ كجم أزوت للفدان فى كلا الموسمين.

٢- معامل الحشد النسبى Relative crowding coefficient:

تشير النتائج إلى أن نظم التحميل ومستويات التسميد الأزوتى لم يكن لها تأثيراً معنوياً علـى معـامل الحشد النسبى للمحصولين معاً فى كلا موسمى الدراسة. كما أن التفاعل بيـن نظـم التحميـل ومسـتويات النتروجين أخذ نفس الإتجاه فى كلا الموسمين ماعدا معامل الحشد النسبى للفاصوليا فى الموسم الثانى.

٣- السيطرة (العدوانية) Aggressivity:

أوضحت النتائج أن لنظم التحميل تأثير معنوى على قيم السيطرة لكل من الفلفـل والفاصوليـا ، وأن نباتات الفلفل تسود على نباتات الفاصوليا حيث سجلت قيما موجبة (+) مع كل نظم التحميل.

بالنسبة للتفاعل بين نظم التحميل ومستويات النتروجين فقد تأثرت قيم السيطرة معنوياً فى كلا موسمى الدراسة ، وكانت أعلى قيمة للسيطرة فى الفلفل عند إتباع نظام التحميل الرابع ومستوى تسميد أزوتى صفـر فى كلا موسمى الدراسة ، يتبعها نظام التحميل الثالث مع مستوى تسميد أزوتى صفر فـى كـلا موسـمى الدراسة.

٤- صافى العائد النقدى للفدان (بالجنيه المصرى):

كان لنظم التحميل تأثيراً معنوياً على صافى العائد النقدى من الفدان ، وقد حقق النظام الثـالث أعلـى عائد نقدى للفدان فى كلا موسمى الدراسة يلية النظام الرابع ، بينما حققت الزراعة المنفردة للفلفل أقل عـائد نقدى للفدان.

تشير النتائج أن مستويات التسميد الأزوتى ليس لها تأثير معنوى على صافى العائد النقدى للفدان. وقد حقق مستوى التسميد صفر أعلى عائد نقدى للفدان فى كلا موسمى الدراسة.

وكان للتفاعل بين نظم التحميل ومستويات التسميد أثره المعنوى على صافى العـائد النقـدى للفـدان بالجنيه المصرى. وكان أعلى عائد نقدى ناتجاً عن التفاعل بين النظام الثالث للتحميل ومستوى تسميد أزوتى صفر فى كلا الموسمين. بينما أقل عائد نقدى تم الحصول عليه من الزراعة المنفردة وتسميد أزوتى صفر.