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EFFECT OF INTERCROPPING SYSTEMS AND NITROGEN LEVELS ON CERTAIN CHARACTERS OF SNAP BEAN AND PEPPER. II. EFFECT ON YIELD AND YIELD COMPONENTS

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ABSTRACT

This research was carried out to study the effect of some intercropping systems (snap bean intercropped with pepper) and different nitrogen levels on yield and yield components of two crops. The obtained results revealed that the IS_5 intercropping system (planting pepper on top of the ridge and snap bean between pepper plants on top of the ridge) produced the highest yield of pepper in both seasons and produced high yield of snap bean compared with solid crops (IS_0). The IS_5 also produced the highest fruit length and fruit diameter of pepper in both seasons, while the IS_4 system (Planting pepper on one side of the ridge and snap bean on the two sides of the ridge with leaving one row for hoeing, 20 cm in width) produced the highest pod length and the highest pod weight of snap bean in both seasons.

With respect to the effect of nitrogen level applied, total yield in both crops, pod length and pod width of snap bean were not significant affected by the addition of nitrogen up to the level of 100 kg N/fed in both seasons.

Plants of both studied crops grown under the combination between IS_0 (solid crops) and IS_1 (planting pepper on one side of the ridge with spacing of 30 cm between plants and one snap bean hill between every two pepper plants) intercropping systems and received 100 kg N/fed produced the highest total yield of both crops in both seasons. The highest record of pepper fruit length and fruit diameter was obtained from IS_5 intercropping system with zero nitrogen level, while the highest record of snap bean pod length was obtained from IS_4 intercropping system with 50 Kg N level. The highest record for snap bean pod weight resulted by 50 kg N/fed under IS_4 system in both seasons.

INTRODUCTION

The superiority of cultivation intercropping systems over monoculture ones was previously proved by different investigators (Ashoub, 1978; El-Shamma, 1980 and Moursi *et al.*, 1983), they all reported that the use of such systems greatly increased land productivity by increasing the total yield per unit area.

Abd El-Razik (1974) found that planting snap bean at two plants per hill resulted in an increase in total yield of snap bean, while wide spacing 22.5 and 30 cm between plants increased the total yield per plant.

El-Gazar *et al.* (1988b) showed that the highest yield of both kidney-bean and okra was obtained from interaction between the high level of nitrogen and I_4 and I_2 intercropping systems, respectively. They added that the interaction between I_2 system and medium nitrogen level gave significant high average pod fresh weight of kidney bean.

El-Moursi (1999) found that the total yield of both garlic and snap bean was increased with increasing nitrogen level. The highest yield was obtained from applied 150 kg N/fed. He added that pod weight, pod length and pod width were increased with increasing nitrogen level up to 150 kg N/fed.

El-Gizy (2001) indicated that intercropping bean with pepper or egg plant on the other side of the ridge was the best treatment for total yield as well as for the highest economic gain.

The present part of these studies aimed to investigate the effect of intercropping systems (snap bean with pepper) and different nitrogen levels on yield and yield components.

MATERIALS AND METHODS

The materials and methods followed in this work were previously described in paper number (1) of these series. In addition, the following data was collected:-

1. Pepper:

a. Total yield: Total yield was recorded as the total weight in Kg of the picked fruits per plot, then calculated to ton per feddan.
b. Fruit characters: These characters involved fruit length, fruit diameter in centimeter and average fruit weight in gm.

2. Snap bean:

a. Total green yield: The effect of the treatments was quantitatively and qualitatively on the pods yield. The pods were harvested at one week intervals for six harvesting times in both seasons. Plants of three ridges in each sub-plot were chosen and harvested to determine the total pod yield per plot in kilograme, then calculated per feddan in tons.
b. Pod characters: Characters studied included pod length, pod width in centimeter and average pod fresh weight in gm.

RESULTS AND DISCUSSION

I. Effect of intercropping systems:

Data presented in Table (1) demonstrated clearly that the IS_3 system produced the highest yield of snap bean and the least yield of pepper in both seasons because such system of cultivation allowed the highest competition among plants because of increasing number of plants of snap bean in this system. This conclusion agreed with Abd El-Razik (1974), Ashoub (1978), El-Shamma (1980) and Moursi *et al.* (1983). They all reported that the use of such systems increased land productivity by increasing the total yield per unit area. The IS_5 intercropping system produced high yield of snap bean compared with solid crop (IS_0). The IS_5 also produced the highest yield, fruit length and fruit diameter of pepper in both seasons, while the IS_4 system produced the highest pod length and the highest pod weight of snap bean in both seasons. These results could be ascribed to more light intensity and

nutrients available for plants from the surrounding media under the IS_5 system (planting pepper on top of the ridge and snap bean between pepper plants on top of the ridge) compared with the IS_4 system (planting pepper on one side of the ridge and snap bean on the two sides of the ridge with leaving one row for hoeing, 20 cm in width), where there are high intensity of snap bean plants. Similar results were reported by El-Gazar *et al.* (1988b) in kidney-bean and okra.

Table 1: Yield and yield components of pepper and snap bean as affected by intercropping system in the 2000 and 2001 seasons.

Inter-cropping System	Total Yield (Ton/fed.)		Fruit Length (cm)		Fruit diameter (cm)		Average fruit weight (gm)	
	2000	2001	2000	2001	2000	2001	2000	2001
Pepper								
IS_0	4.21	4.43	6.40	6.73	2.88	3.02	39.00	41.11
IS_1	3.19	3.35	5.57	5.84	3.69	3.88	37.56	39.56
IS_2	3.71	3.90	6.74	7.09	4.02	4.22	36.89	38.78
IS_3	2.42	2.55	4.84	5.09	3.34	3.51	35.22	37.00
IS_4	3.09	3.26	5.82	6.11	3.48	3.64	34.11	36.00
IS_5	4.39	4.64	7.54	7.92	4.13	4.36	34.56	36.33
LSD 5%	1.50	0.42	0.98	0.67	0.52	0.35	NS	NS
Snap bean								
IS_0	7.41	7.13	13.33	13.67	0.87	0.79	6.22	6.26
IS_1	7.09	7.52	13.72	14.39	0.87	0.93	6.28	6.58
IS_2	6.78	7.21	12.84	13.48	0.86	0.92	5.50	5.76
IS_3	15.57	16.00	13.44	14.10	0.80	0.87	5.83	6.11
IS_4	11.32	11.74	13.86	14.52	0.89	0.96	6.56	6.87
IS_5	7.31	7.74	12.93	13.53	0.79	0.86	5.67	5.93
LSD 5%	2.74	2.36	0.66	0.69	NS	0.06	NS	0.79

II. Effect of nitrogen levels:

Data presented in Table (2) revealed that the addition of nitrogen up to the level of 100 kg N/fed had no significant effect as for total yield or pod characters. These results might be attributed to the low requirement of snap bean plants to nitrogen fertilizers, since these plants have a strong ability to fix the atmospheric nitrogen through their root nodules. The present result is in agreement with those of Ahmed and Tullach-Reid (1967), Saimbhi and Pabba (1970), Verma *et al.* (1974) and Leela *et al.* (1975) with okra.

III. Effect of intercropping systems-nitrogen levels interactions:

The results in Table (3 and 4) demonstrated that pepper and snap bean plants cultivated under IS_0 and IS_1 intercropping systems and received 100 kg N/fed produced the highest total green yield of both crops in both seasons. Such findings may be due to less competition between pepper and snap bean plants under IS_0 and IS_1 systems of cultivation, on sunlight and nutrients in the surrounding media. The addition of the high nitrogen level helped in that respect. This is in line with the results of Chand (1980), Moursi *et al.* (1983) and El-Gazar *et al.* (1988b).

Table 2: Yield and yield components of pepper and snap bean as affected by nitrogen level in the 2000 and 2001 seasons.

Nitrogen level	Total yield (Ton/fed.)		Fruit length (cm)		Fruit diameter (cm)		Average fruit weight (gm)	
(kg/fed)	2000	2001	2000	2001	2000	2001	2000	2001
Pepper								
0	3.53	3.72	6.28	6.60	3.73	3.92	36.39	38.39
50	3.48	3.66	6.32	6.63	3.51	3.69	38.22	40.17
100	3.50	3.68	5.86	6.16	3.53	3.71	34.06	35.83
LSD 5%	NS	NS	NS	NS	NS	NS	NS	NS
Snap bean								
0	9.41	9.62	13.37	14.03	0.84	0.88	6.03	6.29
50	8.59	8.87	13,24	13.82	0.84	0.88	5.97	6.19
100	9.75	10.18	13.46	13.99	0.85	0.91	6.03	6.26
LSD 5%	NS	NS	NS	NS	NS	NS	NS	NS

In the IS_2. IS_3 and IS_4 intercropping systems and zero nitrogen level produced the highest total yield of both crops in both seasons comparing with other levels in these systems. These results could be attributed mainly to the increasing number of plants resulted from unit area of the cultivated land under IS_2, IS_3 and IS_4 intercropping systems comparing with the other systems, this means that higher rates of nitrogen were fixed, which led to synthesize more metabolites. Such results agreed with those obtained by Leela *et al.* (1975) with okra and El-Gazar *et al.* (1988b) with kidney beans and okra. Whereas the highest total yield in IS_5 system of both crops in both seasons obtained from 50 kg N level.

Generally, the highest total yield of pepper obtained from the IS_0 system with 100 kg N level in both seasons, followed by IS_5 intercropping system with 50 kg N level in both seasons also. While, the highest total yield of snap bean obtained from the IS_3 intercropping system with zero nitrogen level in both seasons.

Concerning with fruit length and fruit diameter of pepper, the highest record was obtained from IS_5 intercropping system with zrto nitrogen level. While the interaction between intercropping systems and nitrogen levels cleared insignificant effect on pepper fruit weight in both seasons. The highest record of snap bean pod length was obtained from IS_4 intercropping system with 50 kg N level. The interaction between intercropping systems and nitrogen levels indicated insignificant effect on snap bean pod width in both seasons. The highest record for snap bean pod weight resulted by 50 kg N/fed under IS_4 system in both seasons.

Table 3: Yield and yield components of pepper as affected by intercropping system-nitrogen level interaction in the 2000 and 2001 seasons.

Treat IS	N level (kg/ fed)	Total yield (Ton/fed.)		Fruit Length (cm)		Fruit diameter (cm)		Average fruit weight (gm)	
		2000	2001	2000	2001	2000	2001	2000	2001
IS_0	0	2.69	2.84	7.00	7.37	3.33	3.50	36.00	38.00
	50	4.30	4.52	7.63	8.03	1.87	1.97	38.00	40.00
	100	5.65	5.94	4.57	4.80	3.43	3.60	43.00	45.33
IS_1	0	3.34	3.51	4.90	5.13	3.23	3.40	44.33	46.67
	50	2.81	2.96	5.83	6.13	3.87	4.07	38.67	40.67
	100	3.41	3.58	5.97	6.27	3.97	4.17	29.67	31.33
IS_2	0	4.17	4.38	6.40	6.73	3.50	3.67	30.33	32.00
	50	3.05	3.22	6.87	7.20	4.07	4.27	47.33	49.67
	100	3.92	4.11	6.97	7.33	4.50	4.73	33.00	34.67
IS_3	0	2.86	3.00	5.87	6.17	3.80	4.00	36.33	38.33
	50	2.42	2.55	4.17	4.37	3.33	3.50	35.33	37.00
	100	1.98	2.08	4.50	4.73	2.90	3.03	34.00	35.67
IS_4	0	3.92	4.13	4.87	5.10	4.07	4.27	35.67	37.67
	50	3.11	3.28	6.93	7.27	3.60	3.77	37.00	39.00
	100	2.26	2.37	5.67	5.97	2.77	2.90	29.67	31.33
IS_5	0	4.21	4.43	8.67	9.10	4.43	4.67	35.67	37.67
	50	5.16	5.46	6.47	6.80	4.33	4.57	33.00	34.67
	100	3.81	4.03	7.50	7.87	3.63	3.83	35.00	36.67
LSD 5%		1.30	0.93	1.65	1.29	0.90	0.78	NS	NS

Table 4: Yield and yield components of snap bean as affected by intercropping system-nitrogen level interaction in the 2000 and 2001 seasons.

Treat IS	N Level (kg/ fed)	Total yield (Ton/fed.)		Pod length (cm)		Pod width (cm)		Average pod weight (gm)	
		2000	2001	2000	2001	2000	2001	2000	2001
IS_0	0	6.35	5.50	12.33	13.00	0.83	0.73	5.67	5.83
	50	7.20	6.77	13.33	13.67	0.97	0.73	6.33	6.27
	100	8.68	9.10	14.33	14.33	0.90	0.90	6.67	6.67
IS_1	0	7.39	7.82	13.40	14.07	0.83	0.90	5.83	6.10
	50	5.62	6.04	14.00	14.67	0.87	0.93	6.67	7.00
	100	8.27	8.70	13.77	14.43	0.90	0.97	6.33	6.63
IS_2	0	7.54	7.97	13.57	14.23	0.90	0.97	7.00	7.33
	50	5.51	5.94	11.53	12.10	0.77	0.83	4.33	4.53
	100	7.30	7.72	13.43	14.10	0.90	0.97	5.17	5.40
IS_3	0	18.32	18.74	14.10	14.77	0.80	0.87	5.67	5.93
	50	12.38	12.81	13.57	14.23	0.87	0.93	5.83	6.10
	100	16.02	16.45	12.67	13.30	0.73	0.80	6.00	6.30
IS_4	0	11.75	12.18	13.57	14.23	0.87	0.93	6.17	6.47
	50	10.59	11.01	14.33	15.00	0.90	0.97	7.00	7.33
	100	11.62	12.04	13.67	14.33	0.90	0.97	6.50	6.80
IS_5	0	5.08	5.51	13.23	13.90	0.80	0.87	5.83	6.,10
	50	10.24	10.66	12.70	13.27	0.80	0.87	5.67	5.93
	100	6.62	7.05	12.87	13.43	0.77	0.83	5.50	5.77
LSD 5%		6.17	5.67	1.34	1.02	NS	NS	NS	1.09

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

٢- التأثير على المحصول ومكوناته

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أجرى هذا البحث فى المزرعة البحثية بالبرامون بمحافظة الدقهلية فى الموسم الصيفى ٢٠٠٠ ، ٢٠٠١ وذلك بهدف دراسة تأثير بعض نظم التحميل (الفاصوليا على الفلفل) ومستويات مختلفة من التسميد الأزوتى على المحصول ومكوناته فى كلا المحصولين.

ويمكن تلخيص النتائج المتحصل عليها فيما يلى:-

١- تأثير نظم التحميل: أدى إتباع نظام التحميل الخامس إلى الحصول على أعلى إنتاج من الفلفل فى كلا الموسمين وإلى الحصول على إنتاج عالى من الفاصوليا مقارنة بالزراعة المنفردة. كما أدى هذا النظام أيضا إلى الحصول على أعلى طول وقطر ثمرة للفلفل فى كلا الموسمين. بينما أدى إتباع نظام التحميل الرابع إلى الحصول على أعلى طول قرن وأعلى متوسط وزن قرن للفاصوليا فى كلا الموسمين.

٢- تأثير التسميد الأزوتى: أدى زيادة التسميد الأزوتى حتى معدل ١٠٠ كيلو جرام أزوت للفدان إلى زيادة طول وعرض القرن فى الفاصوليا فى كلا الموسمين ولكن الزيادة غير معنوية.

٣- تأثير التفاعل بين التحميل ومستويات التسميد الأزوتى: أدى إتباع نظام التحميل الأول وكذلك الزراعة المنفردة لكلا المحصولين مع إضافة ١٠٠ كيلوجرام أزوت للفدان إلى الحصول على أعلى إنتاج لكلا المحصولين فى كلا الموسمين.

أدى إتباع نظم التحميل الثانى والثالث والرابع مع مستوى تسميد أزوتى صفر إلى الحصول على أعلى إنتاج من كلا المحصولين فى كلا الموسمين بالمقارنة بمستويات التسميد الأخرى فى هذه النظم . بينما أدى إتباع نظام التحميل الخامس مع تسميد ٥٠ كيلوجرام أزوت للفدان إلى الحصول على أعلى إنتاج من كلا المحصولين فى كلا الموسمين.

عموما فإن أعلى إنتاج من الفلفل تم الحصول عليه من التفاعل بين الزراعة المنفردة للفلفل ومستوى تسميد ١٠٠ كيلو أزوت للفدان فى كلا الموسمين ، يليها التفاعل بين نظام التحميل الخامس مع مستوى تسميد ٥٠ كيلوجرام أزوت للفدان أيضا. بينما تم الحصول على أعلى إنتاج من الفاصوليا من التفاعل بين نظام التحميل الثالث ومستوى تسميد أزوتى صفر فى كلا الموسمين.

بالنسبة لطول وقطر الثمرة فى الفلفل فإن أعلى قيم تم الحصول عليها من التفاعل بين نظام التحميل الخامس ومستوى تسميد أزوتى صفر. بينما كان التفاعل بين نظم التحميل ومستويات التسميد الأزوتى غير معنوى بالنسبة لمتوسط وزن الثمرة فى الفلفل فى كلا الموسمين.

تم الحصول على أعلى طول قرن فى الفاصوليا من نظام التحميل الرابع مع مستوى تسميد ٥٠ كيلوجرام أزوت للفدان.

كان التفاعل بين نظم التحميل ومستويات التسميد الأزوتى غير معنوى بالنسبة لعرض القرن فى الفاصولسا فى كلا الموسمين. بينما أدى التفاعل بين نظام التحميل الرابع ومستوى تسميد ٥٠ كيلوجرام أزوت للفدان إلى الحصول على أعلى متوسط وزن قرن للفاصوليا فى كلا الموسمين.