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Effect of Intercropping on the Performance of Maize and Cow Pea

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Abstract

The present study was carried out at the Experimental Farm of Agricultural Research Center, Al-Azhar University, Assiut Governorate, Egypt during 2017 and 2018 seasons to study the effect of intercropping maize {*Zea mays,* L.} cv. Tri hybrid cross Nefertiti - 3 as main crop with cow pea {*Vigna unguiculata* (L.) Walp} cv. Carem-1 as secondary crop at nine treatments, three planting dates: T_1 cow pea planted on the same day with maize, T_2 cow pea planted after 15 days of maize planting and T_3 cow pea planted after 30 days of maize planting as well as three cutting dates of cow pea taking one cut on different dates: D_1 cutting after 45 days from sowing or D_2 cutting after 60 days from sowing or D_3 cutting after 75 days from sowing, beside of pure stands for maize and cow pea as a recommended. The performed experiment was designed as a randomized complete block using split plot arrangement with three replications.

The results could be summarized as follows; treatment of T_1D_3 significantly increased plant height of maize as compared with pure stand and other treatments. The treatment of T_3D_1 maize produced the greatest mean values of 100-grain weight (g), grains weight /plant (g) and grain yield (ardab /fad.). Significant increase in plant height and leaf area index of cow pea at all treatments were detected as compared with the pure stands, while number of leaves/plant were of cow pea decreased at all treatments as compared with pure stands.

The pure stands of the cow pea produced the maximum forage yield/fad. as compared with other treatments in both seasons. Meanwhile, growing cow pea under the treatment of T_2D_3 produced the highest values of forage yield/fad. as compared with the other treatments in both seasons. The protein ratio/plant and total ash/plant of grown cow pea under treatment of T_3D_3 produced the maximum as compared with all the other treatments in both seasons. The highest value of crude fibers for the cow pea was recorded treatment of T_3D_1.

Treatment of T_3D_1 was the best for land utilization from land equivalent ratio (LER) and relative crowding coefficient (RCC). Maize (dominant) and cow pea had the lowest values for aggressivity.

All treatments of cow pea with maize achieved higher economic return than pure maize and the most profitable pattern was T_3D_3.

Keywords: *Maize, Cow pea, Intercropping, planting dates, Cut date.*

Introduction

In Egypt, maize is one of the most important cereal crops for human consumption and animal feeding. In addition, several industries are based on products and by products of maize. Cultivated area of summer forage crops in Egypt is not sufficient for meat animal's requirements. Farmers used to defoliate maize plants as green fodder for cattle which resulted in reducing maize yield. The need for an intensive cropping system to raise the production

per unit of land area is a great target. Intercropping is becoming one of the most popular phenomena among the small young farmers in Egypt. Reasons for this popularity results in more profit and resource maximization and efficient water and soil utilization. Among the many intercropping companions adopted successfully are those of maize and bean varieties. Because of the importance of legumes in human and animal nutrition, in summer, we have no land to grow any of these legumes. Akbar *et al*. (2012) mentioned that in conclusion, to get better yield of quality fodder (crude protein – crude fibers - total ash), forage maize should be intercropped with forage legumes, preferably cow pea, under the planting pattern of 30 cm spaced lines in alternate rows. El - Aref *et al.* (2013) indicated that the P_5 system was the best for land utilization from land equivalent ratio (LER) and the most efficient intercropping system was obtained from relative crowding coefficient (RCC), although, it was more aggressive on maize. Mahdy and El-Said (2015) results of the economic return per fed. for intercropping forage crops with sesame revealed that all intercropping patterns under testing realized more net income and relative net income than the pure stands of forage crops or pure stand of sesame during the two experimental seasons, reaching their maximum with P_2 cropping system in both seasons. Mahdy and El-Said (2017) indicated that growing guar under the intercropping pattern of P_9 produced the highest values of forage yield/fad (Ton) as compared with the other intercropping patterns in both seasons. All intercropping patterns of guar with soybean achieved higher economic return than pure soybean and the most profitable system was (P_2). Therefore, the main objective of this study was undertaken to examine the effect of intercropping and planting dates for cow pea on maize growth and yield.

Materials and Methods

The present study was carried out at the Experimental Farm of Agricultural Research Center, Al-Azhar University, Assiut Governorate, Egypt during 2017 and 2018 seasons to study the effect of intercropping maize {*Zea mays,* L.} cv. Tri hybrid cross Nefertiti - 3 as main crop with cow pea {*Vigna unguiculata* (L.) Walp} cv. Carem-1as secondary crop yield and yield components, chemical analysis, competitive relationships and the economic return. The preceding crop was field bean {*Vicia faba*, (L.)} for all experiments in the two seasons. The performed experiment was designed as randomized complete block with split plot arrangement of treatments with three replications.

(A) The main plots: were devoted to the following at three planting dates of cow pea.

1- First date (T_1): cow pea planted on the same day with maize.

2- Second date (T_2): cow pea planted after 15 days of planting maize.

3- Third date (T_3): cow pea planted after 30 days of planting maize.

(B) The sub – plots were assigned to taking one cut in different cutting dates of cow pea as follows:-

1- First cutting date (D_1): Cut-

ting after 45 days from sowing.

2- Second cutting date (D_2): Cutting after 60 days from sowing.

3- Third cutting date (D_3): Cutting after 75 days from sowing.

In all treatments and pure stand, maize (cv. Tri hybrid cross Nefertiti – 3) was planted at 25 cm apart and growing one plant / hill on one side of the ridges, as well as In all treatments cow pea (Local variety) which was planted at 15 cm apart and growing two plants / hill on the other side of the ridges of maize while pure stands of cow pea which was planted at 15 cm apart and growing two plants / hill on two side of the ridges.

Sub - plot area was 10.5 m^2 (3.5 m. width and 3 m. length).The plot consisted of 5 ridges spaced 70 cm apart of pure stands and the all treatments.

The soil type was clay with PH value of 7.4 and 29% organic matter. Maize was planted on May 17th and 24th in 2017 and 2018 seasons, respectively.

Calcium super phosphate (15% P_2O_5) at the rate of 150 kg/fad. was applied during land preparation. Nitrogen in the form of ammonium nitrate (33 % N) at the rate of 120 kg N /fad. was added in two equal doses, before the first and second irrigation. Other normal practices were adopted as usually done as a recommended.

Characters studied

(1) Maize (main crop): At harvesting, the panicles were harvested from the middle ridge of each experiment unit in the two seasons and the following data were recorded:

A- Plant height in cm was measured from soil surface to the top of the plant.

B - 100-grain weight (g).

C- Grains weight/plant (g).

D-Grain yield (ardab/fad): ardab = 140 kg.

(2) Cow pea (secondary crop):

Five plants were chosen at random from each plot at plant ages of 45 or 60 or 75 days from sowing to account the following growth characteristics:

A- Plant height in cm was measured from soil surface to the top of the plant.

B- Number of leaves/plant.

C- Leaf area index (LAI) as recorded for cow pea by disk method which recommended by Johanson (1967).

D- Forage yield (Ton/fad.) cutting after 45 or 60 or 75 days from sowing**.**

(3) Chemical analysis:

A- Determination of crude protein (C P): Total nitrogen content in plant was estimated by using microkjeldahl method as described by A.O.A.C (1980) and percentage of protein was calculated by multiplying the nitrogen percentage by 6.25.

B- Determination of total ash content (TAC): The total ash content was determined by heating the samples (0.5 – 2.0g) in an about 600 + 10 ^{0}C for 3 hr until they were completely ashes A.O.A.C (1975).

C- Determination of crude fibers (C F): The crude fibers content was determined according to the official method A.O.A.C (1975).

4 - Competitive relationships and yield advantages of intercropping:

A- Land equivalent ratio (LER) was estimated according to Willey (1979).

B- Relative crowding coefficient (RCC) was calculated as described by Hall (1974).

C- Aggressively (A) was determined according to Mc-Gilchrist (1965).

5 - The Economic return:

Net income in Egyptian pounds/fad. for pure stands of maize and cow pea as well as intercropping patterns cow pea with maize was estimated. Price of the yield and the cost of agricultural practices were considered according to the Ministry of Agriculture, Agricultural Research Center, Central Admen of Agric. in 2017 and 2018.

Statistical analysis:

The data were statistically analyzed according to procedures outlined by Steel and Torrie (1980). Least significant difference (L.S.D) at 5% level of probability was used to compare, means.

Results and Discussion

1. The effect of intercropping on maize crop:

The effect of applied treatments on yield and yield attributes of maize during 2017 and 2018 seasons is presented in Table 1.

Maize grown under the treatment of T_1D_3 resulted in the tallest plant as compared to the pure stand or the other treatments during the two growing seasons. On the other hand, the shortest maize plants were produced from cultivating of pure stand during the two seasons. Results in Table 1 show that the treatment of T_3D_1 produced the greatest values of 100-grain weight (g), grains weight /plant (g) and grain yield (ardab /fad.) as compared to all the treatments during 2017 and 2018 seasons. The competition between maize and cow pea was high because of close distances between cow pea. As the number of increased cow pea sides, the competition was not too much to reduce 100-grain weight (g), grains weight /plant (g) and grain yield (ardab /fad.) of maize.

The pure stand of maize had the greatest 100-grain weight (g), grains weight / plant (g) and grain yield (ardab /fad.) in both seasons.

Generally, the results in Table 1 clarify that the maize planting under the treatment of T_1D_3 led to decrease the values of 100-grain weight (g), grains weight / plant (g) and grain yield (ardab /fad.) as compared with the pure stand or all the other treatments during in both seasons. These results are in agreement with Haruna *et al.* (2013), Abdel – Galil and Abdel – Chany (2014), Dube *et al*. (2014), Puste *et al.* (2014), Oyeogbe *et al.* (2015) and Alemayehu *et al*. (2017).

Table 1. Effect of intercropping on yield and some agricultural characteristics of maize

Treatments		Plant height cm.		100-grain weight (g)		Grains weight / plant (g)		Grain yield (ardab/fad.)	
		2017	2018	2017	2018	2017	2018	2017	2018
T_1	D_1	276.52	279.17	45.69	45.11	188.30	186.51	21.11	21.24
	D_2	280.64	281.96	43.51	44.32	183.19	184.80	20.98	20.60
	D_3	284.22	287.11	39.55	40.94	180.95	181.20	20.35	19.82
T_2	D_1	266.15	265.55	50.43	51.66	199.14	201.15	22.89	22.96
	D_2	268.71	269.38	48.82	47.00	194.77	197.36	22.15	22.37
	D_3	271.47	273.80	46.18	46.72	191.11	189.84	21.75	21.54
T_3	D_1	258.00	257.92	55.31	57.43	214.95	215.60	24.05	24.25
	D_2	260.95	263.26	53.94	53.14	211.61	209.72	23.60	23.91
	D_3	261.64	260.43	52.75	51.80	203.94	205.17	23.14	23.37
Sole		252.11	250.71	59.25	62.49	218.25	222.51	24.52	24.95
L.S.D. 5%		2.29	2.43	1.70	1.92	2.90	2.82	2.34	2.81

2. The effect on cow pea:

A- Growth characters and forage yield (Ton/fad.):

Results in Table 2 show that the effect of applied treatments on average plant height, number of leaves/plant and leaf area index of cow pea during 2017 and 2018 seasons. Results in Table 2 show that the treatments had a significant effect on cow pea plant height during 2017 and 2018 seasons. The cow pea grown under the treatment of T_3D_3 gave the tallest plants as compared with all the other treatments during in both seasons. Regarding the number of leaves/plant, results in Table 2 indicate that treatments had a significant effect on number of leaves per plant of cow pea during both seasons. Generally, it is clear that number of leaves/plant of cow pea tended to decrease when grown under the all treatments as compared with the pure stands. The cow pea crop sowing under the treatment of T_1D_3 resulted in the highest number of leaves/plant as compared with the other treatments during 2017 and 2018 seasons. On the other hand, the treatment of T_3D_1 resulted in the lowest number of leaves/plant as compared with the other treatments. Concerning the effect of the studied treatments on leaf area index, results recorded in Table 3 show a significant effect on the leaf area index (LAI) for cow pea plants during 2017 and 2018 seasons. The treatment of T_1D_1 of cow pea produced the greatest values of LAI as compared with the pure stands or the other treatments in both seasons, while the treatment of T_3D_3 of cow pea led to reduction in the LAI of cow pea as compared with other treatments during 2017 and 2018 seasons. The lowest values of LAI were recorded for pure stands of cow pea as compared with all the other studies treatments in both seasons. The effect of applied treatments on forage yield (Ton/fad.) of cow pea as grown with maize during 2017 and 2018 seasons is presented in Table 2. The pure stands of the cow pea plants produced the maximum forage yield (Ton/fad.) as compared with the all treatments in both seasons. Meanwhile, the cow pea grown under the treatment of T_1D_3 produced the highest values of forage yield (Ton/fad.) as compared with the other treatments in both seasons. On the other hand, the cow pea plants grown under the treatment of

T_3D_1 produced the lowest forage yield (Ton/fad.) as compared with the pure stands and the other treatments in both seasons. Similar results were obtained by Dahmardeh *et al. (*2010), Adeniyan *et al.* (2011), Akbar *et al*. (2012), Ewansiha *et al*. (2015), Mahdy and El-Said (2015), Moriri *et al*. (2015), Muoneke *et al*. (2015) and Mahdy and El-Said (2017).

Table 2. Effect of cow pea – maize intercropping on growth character and yield of cow pea during 2017 and 2018 seasons.

Treatments		Plant height (cm)		Number of leaves / plant		Leaf area index (LAI)		Forage yield (Ton/fad.)	
		2017	2018	2017	2018	2017	2018	2017	2018
T_1	D_1	55.17	53.94	35.48	37.18	3.71	3.79	11.560	11.830
	D_2	72.06	73.75	44.37	45.61	2.99	2.89	13.750	13.924
	D_3	81.65	83.16	54.66	53.25	2.54	2.61	15.657	15.561
T_2	D_1	58.11	60.49	32.17	34.88	3.45	3.51	11.112	11.378
	D_2	75.84	73.23	41.92	43.50	2.87	2.79	13.324	13.190
	D_3	88.16	91.50	51.25	51.94	2.39	2.32	14.936	14.700
T_3	D_1	62.70	65.36	30.11	28.60	3.22	3.10	10.947	11.043
	D_2	79.51	77.81	38.19	39.22	2.64	2.66	12.863	12.419
	D_3	94.23	97.27	47.82	46.15	2.17	2.27	14.140	14.385
Sole 45 days		51.40	48.75	40.35	42.71	1.13	1.21	12.300	12.530
Sole 60 days		67.34	64.90	51.80	50.94	1.48	1.45	14.450	14.300
Sole 75 days		75.53	78.12	59.11	57.67	1.90	1.82	16.745	16.411
L.S.D. 5%		2.13	2.36	1.51	1.94	0.45	0.33	2.60	2.78

B- Chemical analysis:

Concerning the protein ratio/plant, total ash /plant of cow pea, results in Table 3 reveal that the above mentioned characters were decreased significantly by intercropping as compared with the pure stands during the two seasons. The cow pea crop grown under the treatment of T_3D_3 results produced the maximum mean values of protein ratio/plant and total ash/plant as compared with all the other treatments during both seasons.

The highest mean values of crude fibers for the cow pea was obtained at treatment of T_3D_1. Similar results were obtained by Elena and Roman (2010), Dahmardeh *et al. (*2010), Akbar *et al*. (2012) and Mahdy and El-Said (2017).

Table 3. Effect of intercropping on protein ratio/plant, total ash ratio/ plant and crude fibers ratio / plant of cow pea.

Treatments		Protein ratio / plant		Total ash ratio / plant		Crude fibers ratio / plant	
		2017	2018	2017	2018	2017	2018
T_1	D_1	22.50	22.91	23.21	23.77	11.75	11.50
	D_2	24.89	24.46	27.10	27.25	10.25	10.04
	D_3	26.85	26.18	28.22	28.01	8.64	8.37
T_2	D_1	23.77	23.35	24.16	24.33	12.16	12.45
	D_2	25.11	25.29	27.53	27.65	10.59	10.81
	D_3	27.22	27.64	28.41	28.54	8.81	8.92
T_3	D_1	24.25	24.13	24.64	24.90	12.92	13.39
	D_2	25.67	25.80	27.80	27.49	11.14	11.28
	D_3	28.50	28.16	29.74	29.14	9.30	9.71
Sole 45 days		26.11	26.95	25.77	25.55	8.11	8.33
Sole 60 days		28.53	29.16	27.64	27.83	9.31	9.95
Sole 75 days		31.25	31.70	30.33	30.97	10.47	10.25
L.S.D. 5%		0.62	0.47	0.31	0.21	0.17	0.32

Competitive Relationships of Intercropping Cow pea With Maize:

1. Land Equivalent Ratio (LER):

Results in Table 4 show that there was a considerable yield advantage as results of intercropping cow pea with maize during 2017 and 2018 seasons. Results in Table 4 show that land equivalent ratio (LER) was increased over one by intercropping cow pea with maize in treatments during 2017 and 2018 seasons. The highest LER mean values were obtained by treatment of T_3D_1 in both seasons. These results are in agreement with those obtained by Ahmad *et al*. (2010), Dahmardeh *et al. (*2010), Chivas *et al*. (2011), Addo–Quaye *et al.*(2011) and Quainoo1 *et al*. (2012), El - Aref *et al.* (2013) and Mahdy and El-Said (2017).

Table 4. Land equivalent ratio (LER) of maize and cow pea during 2017 and 2018 seasons.

Treatments		Land equivalent ratio (LER)					
		2017			2018		
		Main crop	Secondary crop	LER	Main crop	Secondary crop	LER
T_1	D_1	0.86	0.93	1.79	0.85	0.94	1.79
	D_2	0.85	0.95	1.80	0.82	0.97	1.79
	D_3	0.82	0.93	1.75	0.79	0.94	1.73
T_2	D_1	0.93	0.90	1.83	0.92	0.90	1.82
	D_2	0.90	0.92	1.82	0.89	0.92	1.81
	D_3	0.88	0.89	1.77	0.86	0.89	1.75
T_3	D_1	0.98	0.89	1.87	0.97	0.89	1.86
	D_2	0.96	0.89	1.85	0.95	0.87	1.82
	D_3	0.94	0.84	1.78	0.93	0.87	1.80

2. Relative Crowding Coefficient (RCC):

Results in Table 5 show that the relative crowding coefficient (RCC) was also influenced by intercropping this measurement took treatments imposed in a similar trend as land equivalent ratio (LER) behavior during 2017 and 2018 seasons. The RCC values exceeding the unity indicating that net grain in yield was more than accepted from both components. The results also evidenced that increasing the plant density of maize and cow pea led to increase the total (RCC), i. e., the highest total (RCC) was resulted at T_3D_3 treatment. The same trend was reported by Chivas *et al*. (2011), Quainoo1 *et al*. (2012), El - Aref *et al.* (2013) and Mahdy and El-Said (2017).

3. Aggressivity (A):

Results in Table 5 show that in both growing seasons of this study, maize was dominant at all treatments. Aggressivity values were the highest when cow pea was intercropped with maize at T_1D_1 treatment. It is also indicated that maize was dominant and cow pea dominated. However, it could be concluded that the inter specific competition between maize and cow pea were pronounced in all treatments because of the differences in morphology of both crops. These results were also supported by Chivas *et al*. (2011), Quainoo1 *et al*. (2012), El - Aref *et al.* (2013) and Mahdy and El-Said (2017).

Table 5. Relative crowding coefficient and Aggressivity of maize and cow pea crop during 2017 and 2018 seasons.

Treatments		Relative crowding coefficient						Aggressivity			
		2017			2018			2017		2018	
T_1	D_1	1.93	52.17	100.68	1.64	56.44	92.56	26.03	26.03	26.31	26.31
	D_2	1.57	65.60	102.99	1.58	72.6	114.70	26.54	26.54	27.73	27.73
	D_3	1.26	69.34	87.36	1.32	61.13	80.69	26.20	26.20	27.12	27.12
T_2	D_1	4.40	31.23	137.41	3.33	32.98	109.82	23.82	23.82	24.14	24.14
	D_2	3.11	39.51	122.87	2.36	39.68	93.64	24.87	24.87	24.96	24.96
	D_3	2.16	27.57	59.55	2.01	28.69	57.66	23.91	23.91	24.32	24.32
T_3	D_1	6.90	27.02	186.43	8.00	24.80	198.4	22.76	22.76	22.53	22.53
	D_2	5.74	27.04	155.20	5.23	22.04	115.26	22.98	22.98	22.19	22.19
	D_3	6.08	18.12	110.16	3.82	23.66	90.38	21.45	21.45	22.75	22.75

Economic Return Per Fed. (L.E.)

The economic return evaluation for either intercropping maize + cow pea at different treatments compared with pure stand of maize were recorded in Table 5 during 2017 and 2018 seasons. It is clearly that all treatments for cow pea as companion crop with maize, although they were expensive but they achieved higher relative net profit than the pure stand of maize during the experimental seasons.

Results of the economic return per fad. for intercropping cow pea with maize revealed that all treatments under testing realized more net income and relative net income than the pure stand of maize or pure stands of cow pea during the two experimental seasons. In general the comparison between, the treatment which realized the greatest grain yield of maize under intercropping cow pea with maize of treatment T_3D_3 also, realized the highest net income per fad. during the two experimental seasons. The results are in agreement with those obtained by Egbe and Idoko (2012), Mahdy and El-Said (2015) and Mahdy and El-Said (2017).

Table 6. Effect of intercropping of cow pea with maize on the economic return/fad. (Egyptian pounds) during 2017 and 2018 seasons.

Treatments		2017			2018			Relative net income	
		Price of the yield	Cost	Net income	Price of the yield	Cost	Net income	2017	2018
T_1	D_1	15105	9275	5830	16460	10160	6300	105.40	110.89
	D_2	15664	9275	6389	16822	10160	6662	115.51	117.26
	D_3	15890	9275	6615	16942	10160	6782	119.59	119.38
T_2	D_1	15.923	9830	6093	17299	10917	6382	110.16	112.33
	D_2	16179	9830	6349	17591	10917	6674	114.78	117.47
	D_3	16444	9830	6614	17638	10917	6721	119.58	118.30
T_3	D_1	16512	9830	6682	17930	10917	7013	120.08	123.44
	D_2	16839	9830	7009	18214	10917	7297	126.72	128.44
	D_3	16.970	9830	7140	18589	10917	7672	129.09	135.04
Sole maize		13.486	7955	5531	14471	8790	5681	100.00	100.00

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تأثير التحميل على أداء الذرة الشامية ولوبيا العلف

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الملخص

نفذت تجربة حقلية خلال موسمي ٢٠١٧ و ٢٠١٨ بالمزرعة البحثية لمركز البحوث الزراعية جامعة الأزهر فرع أسيوط لدراسة استجابة لوبيا العلف للتحميل مع محصول الذرة الشامية وعلاقة ذلك بالمحصول ومكوناته والتحليل الكيميائي لكل من المحصولين وكذلك العلاقات التنافسية والعائد الإقتصادي وكانت أصناف الذرة الشامية ولوبيا العلف المستخدمة في الدراسة هي هجين ثلاثي نفرتيتي - ٣ و الصنف كريم -١ على الترتيب. وقد إشتملت الدراسة خلال كل موسم زراعة الذرة الشامية على جميع الخطوط فى الفدان بالمعدلات الموصى بها والمسافة بين الجور ٢٥سم وزراعة نبات بالجورة على ريشة واحدة وزراعة لوبيا العلف على الريشة الأخرى للذرة الشامية بمواعيد زراعة مختلفة نفس الميعاد ، بعد ١٥ يوم من زراعة الذرة الشامية و بعد ٣٠ يوم من زراعة الذرة الشامية ومواعيد حش لأخذ حشة واحدة من لوبيا العلف بعد ٤٥ يوم من الزراعة أو ٦٠ يوم من الزراعة أو ٧٥ يوم من الزراعة. وأستخدم تصميم القطاعات كاملة العشوائية في قطع منشقة مرة واحدة فى ثلاث مكررات حيث وزعت مواعيد الزراعة في القطع الرئيسية بينما وزعت مواعيد الحش في القطع المنشقة.

تفوقت الزراعة في كل المعاملات لمحصول الذرة الشامية معنويا في طول النبات مقارنة بالزراعة المنفردة خلال موسمي ٢٠١٧ ، ٢٠١٨ على النقيض أظهرت النتائج أن الزراعة المنفردة لمحصول الذرة الشامية قد أدت إلى إعطاء أعلى القيم لوزن المائة حبة ومحصول النبات من الحبوب ومحصول الفدان من الحبوب مقارنة بجميع المعاملات خلال الموسمين. كما أدى تطبيق المعاملة T_1D_3 لمحصول الذرة الشامية إلى نقص في وزن المائة حبة ومحصول النبات من الحبوب ومحصول الفدان من الحبوب خلال الموسمين مقارنة بالمعاملات المختلفة وعلى النقيض أدى النظام T_3 D_1 إلى إعطاء أعلى القيم للذرة الشامية خلال الموسمين لهذه الصفات مقارنة بالمعاملات الأخرى.

أعطت المعاملة T_3 D_3 للوبيا العلف أعلى قيمة لطول النبات مقارنة بالزراعة المنفردة والمعاملات الأخرى و تفوقت الزراعة المنفردة للوبيا العلف معنويا في عدد الأوراق/ نبات مقارنة بجميع المعاملات خلال الموسمين بينما أعطت المعاملة T_1 D_1 أعلى قيمة لدليل مساحة الأوراق خلال الموسمين مقارنة بالزراعة المنفردة والمعاملات الأخرى كما أدت الزراعة تحت المعاملة T_2D_3 الحصول على أعلى محصول علف أخضر/فدان للوبيا العلف مقارنة بالمعاملات الأخرى خلال الموسمين بينما تفوقت الزراعة المنفردة للوبيا العلف معنويا لنسبة البروتين والرماد/ نبات على جميع المعاملات بينما أعطت المعاملة T_3 D_3 خلال موسمي ٢٠١٧ ، ٢٠١٨ أعلى قيمة لنسبة البروتين والرماد للوبيا العلف بينما أعطت المعاملة T_3 D_1 أعلى قيم لنسبة الألياف الخام لمحصول لوبيا العلف مقارنة بالمعاملات الأخرى خلال موسمي ٢٠١٧، ٢٠١٨.

أثبتت النتائج أن تحميل لوبيا العلف على الذرة الشامية أدى إلى زيادة كفاءة استغلال وحدة المساحة في كل المعاملات حيث حققت المعاملة T_3 D_3 أكبر استفادة من وحدة المساحة مقارنة بزراعة الذرة الشامية منفردة بينما نجد أيضا نفس الاتجاه سائدا عند تطبيق معامل الحشد النسبي لكلا المحصولين وقد أعطى محصول الذرة الشامية أكبر قيم للعدوانية (سائد) بينما أعطى محصول لوبيا العلف أقل قيم للعدوانية (مسود) كما أظهرت النتائج أيضا أن الزراعة المحملة لكل من الذرة الشامية + لوبيا العلف لجميع المعاملات كانت أكثر تكلفة إلا إنها حققت أعلى عائد إقتصادي مقارنة بالزراعة المنفردة لمحصولي الذرة الشامية ولوبيا العلف.