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EFFECT OF TILLAGE SYSTEMS AND SOME INTERCROPPING PATTERNS ON YIELD OF MAIZE AND SOYBEAN IN RECLAIMED LAND .

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ABSTRACT

Two Field Experiments were carried out at Nubaria Agric . Res . Station during the two successive seasons 1998 and 1999 to study the effect of tillage treatments and some intercropping systms (2 : 2, 2 : 4 , 1 : 3 and :3:3)for (soybean : maize) . Besides solid stand of soybean and solid stand of maize on yield of maize and its attributies of maize and soybean and competitive relations of soybean and maize . The obtained results indicated that tillage systems and intercropping patterns had significantly affected on seed yield of soybean and maize . The highest seed yield per / feddan was obtained from tillage systems in the two seasons to each two crops .Also , intercropping patterns had significant effect on all characters studied . Maximum seed yield of maize was obtained with sowing patterns of 2 row soybean : 4 rows of maize . The solid stand gave higher seed yield of soybean and grain yield of maize .

The results indicated that land equivalent ratio LER of maize and soybean valued more than one moreover , maize was always dominate crop whereas soybean was dominated .

INTRODUCTION

Intercopping is one of the most an important practice in many parts of the world ,especially in the developing countries .However, the main purpose is to obtain a full yield of the cereal crop plus the legume yield . Other conservation tillage system , may provide better germination and seedling growth under cool and wet spring soil conditions . Garcia and Pinchinat (1976) found that intercropped planting as (100 % maize + 50 % of soybean and 100 % soybean + 50 % of maize) did not reduce crop yield (maize and soybean yields) . But in planting (100% of soybean + 100 % of maize) maize and soybean were reduced . Beets (1977) reported that intercropping maize with soybean in different special arrangements i.e. (100 % + 0 % , 75 % + 25 % , 50 % + 50% , 25 % + 75 % , and 0 % + 100 % from maize ! soybean) ; reduced the grain and seed yields of both crops. Moallem (1979) noticed that soybean yields were 0.58 t / ha in the intercropping and were highest with lower fertilizer rate (N P K) 75:50:25 kg/ha. Galal, *et. al* (1980) studied soybean and maize grown together in different patterns at different sites in Egypt. They found that pod number and seed number/plant were 30.50 % higher and seed yield was 50% greater in soybean grown alone than with maize. Mohta and R.De (1980) found that seed yield of soybeans when intercropped was less than that of a solid crop .The combined seed / grain yield of the two crops in an intercrop was more than the individual

components . Galal and Metwally (1982) mentioned that the intercropping reduced seed yield by more than 40% of seed yield under monoculture . Other yield components such as number of pods, number of seeds and 100-seed weight were also significantly reduced .

Moursi *et. al* (1988) , found that planting maize at narrow speces gave positive aggressivity values for maize , whereas in the wide spaces that values were positive in favour of soybean. Tetiokagho (1988) found that soybean yields decreased with the increase , in maize density. El Gawad *et. al* (1989 a) found that the highest seed yield / fed of soybean was obtained by planting sunflower and soybean at 30 cm ridge width with 3 : 3 intercropping patterns . El Gawad *et. al* (1989 b) noticed that the highest value of (LER) amounted to 1.53 from intercropping pattern 3 : 3 with ridge width 60 cm . Relative crowding coefficient (RCC) for sunflower and soybean became great at 60 ridge width. Pattern 3 : 3 gave the highest (RCC) value for sunflower and soybean .Dhingra *et al* (1991) found that maize gave higher yields in intercrop in 1983 and 1985 only. Average yield of maize over 4 years were highest (3.69 t/ha) when grown in alternate row with mungbean. Also, several studies were made on intercropping soybean with maize. Ujjinaiah *et al* (1991) Weil *et al* and Cfadden (1991) , and El-Douby *et al* (1993) Chittapur *et al* (1994) noticed that net returns were highest when maize was intercropped with cowpeas and lowest when maize was grow alone . Varughese and Iruthayaraj (1996) showed that grain yield was unaffected by cropping system except in Kharif (monsoon), 1989 when it was highest with intercropping in a 2 : 2 row ratio . Zamar and Giambastiani (1997) found that Land equivalent ratio for soybean and maize reached 1.09 and 1.11 in the 1st and 2nd year, respectively.

Thus, this work was designated to study the effect of some intercropping patterns and tillage systems on yield and its attributes of maize and soybean plants and their competitive relations.

MATERIALS AND METHODS

Two field experiments were carried out at Nubaria Agric Res. Station during the two successive growing seasons i. e 1998 and 1999.The major objectives of this study were to investigate the effect of intercropping maize with soybean on yield and its attributes of maize and soybean and their competitive relations.

The study included 12 treatments divided into six planting patterns and two tillage systems.

1-The tillage systems were as follows: -

1- No, tillage.
2- Complete tillage.

2- The planting pattern were as follows:

1- Soybean in solid stand planted in hills 10 cm apart with two plants / hill .
2- Corn in solid stand was sown in hills 30 cm apart on one side of the ridge .
3- Soybean was sown in 2 : 2 rows. with maize .
4- Soybean was sown in 2 : 4 rows ratio with maize .

5- Soybean was sown 1 : 3 rows ratio with maize .
6- Soybean was sown 3 : 3 rows ratio with maize .

A split - plot design with three replications was used . The tillage systems occupied the main plots . The six planting patterns were arranged in the sub- plots. The plot area was 28.8 m^2 and included twelve rows each of 2.4x 12

Giza 2 open pollinated maize variety - was used as the overstory crop and Crawford as early soybean cultivar from I V Group was used. maize was sown on May 13 in the first season and in May 18th in the second season, whereas soybean was sown in May 17th in the first season and in May 22nd the second season. Pre-sowing super-phosphate (15.5 % P_2 O5) was applied as abase application at the rate of 100 Kg per feddan. Nitrogen fertilizer at 90 kg N/feddan as ammonium nitrate fertilizer (33,5 % N) was applied in two equal portions . The first was added after thinning for both two crops being just before the first irrigation, while the second part was applied just before the second irrigation. Other cultural practices were carried out as recommended.

At harvest 10 plants from soybean and maize plants were randomly taken from the middle rows of each plot to measure plant height, number of pods/plant, 100 - seed weight and seed yield / plant.

Seed yield/feddan of soybean and maize were record from the hole plot area.

The following two competitive relations were determined: -

1- Land equivalent ratio (LER) : It was determined according to De wit and Den bergh (1965) equation as follows:

$$L\ corn = \frac{ycs}{Ycc} \qquad L\ soybean = \frac{ysc}{yss}$$

$$LER = L\ corn + L\ soybean$$

2- Relative Crowding Coefficient [R. C. C] : It was determined according to De wit and Hall (1974) equations as follows :

$$Kab\ corn = \frac{ycs \times zba}{(ycc - ycs)\ zab}$$

$$Kba\ soybean = \frac{ysc \times zba}{(yss - ysc)\ zab}$$

$$R.C.C. = Kab \times Kba$$

3- Aggressivity (A) : It was determined according to Mc Gilchrist's (1965).

Formula as Follows :

$$Acs = \frac{ycs}{Ycc \times zab} - \frac{ysc}{yss \times zba}$$

$$Asc = \frac{ysc}{Yss \times zab} - \frac{ycs}{ycc \times zab}$$

Where:

A c s = aggressivity of maize.
A s c = aggressivity of soybean .
Y c c = pure stand yield of maize .
Y s s = pure stand yield of soybean
Y c s = Intercrop yield of corn [in combination with soybean] .
Y s c = Intercrop yield of soybean [in combination with maize] .
Z a b = Sown proportion of species a (in combination with b) .
Z b a = Sown proportion of species b (in combination with a) .
The collected data were statistically analyzed according to Snedecor and Cochran (1967) .

RESULTS AND DISCUSSION

A. Soybean:

Data presented in Table (1) indicated that tillage systems had significant effect on seed yield of soybean in the two seasons. Also, in the second season there were significant effect on plant height and number of pods/plant. The highest value of seed yield / fed. was obtained from tillage conservation compared to no tillage. The intercropping systems had significant effect on all characters studied of soybean plants. Also, the results indicated that soybean yield was the highest when grown alone compared to other intercropping patterns and in all characters which were studied. It was clear that sowing 1 row soybean; 3 row of maize gave the lowest yield than (2; 2) or (3;3) and (2;4) from soybean ; maize . Similar results were also reported by Garcia and Pinchinate (1976) and Beets (1974).

The interaction between tillage systems and intercropping patterns had significant effect on number of pods / plant and seed yield / fed. of soybean plants in the first season . The highest value of seed yield / fed. was obtained from plots with complete and tillage (2) rows of soybean. (2) rows of maize .

B. Maize

Table (2) shows that tillage systems, intercropping patterns and the interaction between tillage systems and intercropping patterns had significant effect on seed yield of maize plants in the two season . Data presented in table (2) showed that the highest value of grain yield / fed . was obtained from tillage conservation compared to no tillage . Also , the results indicated that sowing 2 rows of soybean ; 4 rows of maize gave the highest grain yield than (2:2) , (1:3) and (3:3) (from soybean .maize) The results of seed yield / fed . indicated that solid planting showed the greatest grain yield compared to those intercropped . This was true under intercropping patterns. Similar results were also reported by Dhingra *et al* (1991), and Varughese and Iruthayarai (1996).

Table 1: Average of plant height , No. of pods / plant , 100 - seed weight, seed yield / plant and seed yield per feddan of soybean plants as affected by tillage systems and intercrpping patterns of maize with soybean.

Tillage		Plant height cm		No. of pods per plant		100 - seed weight g m		seed yield/ plant g m		seed yield/ fed kg	
		98	99	98	99	98	99	98	99	98	99
no. Tillage	2 : 2	78.53	77.40	33.23	25.83	17.64	17.67	6.82	6.23	523.32	590.65
	2 : 4	64.13	63.60	28.20	27.76	18.09	17.93	6.28	6.21	360.78	413.85
	1 : 3	55.73	57.40	25.33	25.93	18.11	17.46	6.13	5.81	312.16	343.30
	3 : 3	78.10	76.43	33.13	28.30	17.43	17.79	6.50	6.76	510.00	605.81
	Solid	103.13	102.46	57.23	51.73	19.07	18.84	12.54	11.84	1019.49	1134.83
Means		75.92	75.47	35.42	31.91	18.07	17.94	7.65	7.37	545.15	617.69
Tillage	2 : 2	75.20	74.36	30.93	24.70	17.94	17.37	6.49	5.99	414.94	470.10
	2 : 4	66.60	60.46	27.66	28.43	18.05	17.59	6.12	6.25	298.91	362.23
	1 : 3	56.10	55.10	25.73	23.53	17.79	17.73	6.02	5.77	284.26	258.40
	3 : 3	77.73	71.20	31.80	26.40	18.16	17.66	6.68	6.55	451.56	473.82
	Solid	99.20	92.43	50.40	43.73	18.27	17.88	12.30	11.43	872.34	946.78
Means		74.96	70.71	33.31	29.36	18.04	17.65	7.52	7.20	464.40	508.26
L. S . D at 0.05 levels											
Tillage (T)		N S	1.87	N S	0.86	N S	N S	N S	N S	51.57	110.00
inter. Trceats (I)		5.36	6.22	3.51	2.82	0.76	N S	0.62	5.58	39.55	57.01
(Tx. I)		N S	N S	4.97	3.99	N S	N S	N S	N S	55.93	N S .

Table 2: Effect of tillage systems and intercropping system, on grain yield of maize plant .

System	Grain yield ard/fed 1998		Mean	Grain yield ard./fed 1999		Mean
Intercropping	Tillage	No-Tillage		Tillage	No Tillage	
2 : 2	10.43	10.21	10.32	10.43	9.08	9.75
2 : 4	16.41	14.64	15.52	15.80	12.00	13.90
1 : 3	15.00	12.31	13.65	14.26	12.28	13.27
3 : 3	10.00	9.31	9.96	10.81	8.85	9.83
pure	19.98	18.22	19.10	19.34	16.05	17.69
Means	14.36	13.06	13.71	14.13	11.65	12.89
L . S . D at 5 % Level For Tillage (T)			0.16			0.76
Intercropping systems (I)			0.49			0.63
(TxI)			0.96			0.90

C- Competition relations

The results indicated that in table (3) show that [L] of soybean which was always little than that of [L] of maize. Similar results were also reported by Moursi *et. al* (1983 a) . The results also indicated that {LER} of soybean and maize valued more than one. Also , the results indicated that maize was the dominant and soybean was dominated .Data listed in Table (3) showed that intercropping patterns had significant effect on land equivalent ratio (LER), relative crowding coefficient (R .C.C.) and aggressivity values for economic yields of soybean and maize in the two seasons .Sowing (2) row :

Table (3): Land equivalent ratio [LER], relative Crowding coefficient [R.C.C.] and aggressivity for grain and seed yields as affected by tillage systems and intercropping systems

Tillage Systems	Intercrorping Systems	LER		R.C.C		Aggressivity			
		1998	1999	1998	1999	1998 ACS	1998 ASC	1999 ACS	1999 ASC
Tillage	2:2	1.02	1.05	1.11	1.28	0.02	-0.02	0.02	-0.02
	2:4	1.18	1.18	2.79	2.61	0.43	-0.43	0.42	-0.42
	1:3	1.06	1.06	1.46	1.28	0.38	-0.38	0.41	-0.41
	3:3	1.02	1.09	1.10	1.45	0.03	-0.03	0.01	-0.01
Means		1.07	1.09	1.61	1.65	0.21	-0.21	0.21	-0.21
No tillage	2:2	1.02	1.05	1.06	1.32	0.04	-0.04	0.03	-0.03
	2:4	1.14	1.10	2.13	1.97	0.40	-0.40	037	-037
	1:3	1.07	1.03	1.01	1.21	0.34	-0.34	0.41	-0.41
	3:3	1.05	1.04	1.30	1.32	0.01	-0.01	0.02	-0.02
Means		1.07	1.05	1.37	1.45	0.20	-0.20	0.21	-0.21
L.S.D at (1) 0.05 Levels for									
Tillage (T)		NS	NS	NS	NS	NS	NS	NS	NS
Inter.systems (I)		0.04	0.04	0.28	0.52	0.23	-0.23	.03	-.03
(TX I)		0.50	0.05	0.40	0.73	0.05	-0.05	0.05	-0.05

(4) row from soybean : maize the gave highest value for (LER) ,R .C.C. and aggressivity. The interaction between tillage systems and intercropping patterns had significant effect on land equivalent ratio, relative crowding coefficient and aggressivity in the two seasons. Similar results were reported by moursi *et al.* (1983 a), Mohamed *et al.* (1985) El- Douby *et al.* (1993) and Weil *et al.* (1991).

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تأثيـــر طـــرق الخدمة وبعض نظم التحميل على محصول الذرة وفول الصويا فى الأراضى الجديدة

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*** قسم التكثيف المحصولى بمعهد بحوث المحاصيل الحقلية بالنوبارية**

**** قسم بحوث المحاصيل الزيتية بمعهد بحوث المحاصيل الحقلية بالنوبارية**

- أقيمت هذه الدراسة فى موسمى ١٩٩٨ / ١٩٩٩ فى محطة البحوث الزراعية بالنوبارية وذلك لدراسة تأثير طرق الخدمة وبعض نظم التحميل (٢ : ٢ ، ٢ : ٤ ، ١ : ٣ ، ٣ : ٣) لمحصول فول الصويا : الذرة الشامية بالاضافة الى الزراعة المنفردة ولكل من المحصولين وذلك على انتاجية فـــول الصويـــا والـــذرة الشامية ومكونات المحصول والعلاقات التنافسية بينهما فى الأراضى الجديدة .
- وأوضحت النتائج ما يلى :-
- أدت النتائج إلى أن طرق الخدمة ونظم التحميل لهما تأثير معنوى على كلا المحصولين وأدت طرق الخدمة الكاملة الى أعلى محصول بالمقارنة بدون الخدمة وذلك فى الموسمين
- أوضحت النتائج أن نظم التحميل له تأثير معنوى على كل الصفات الى درست وكان أعلى محصول للـذرة الشامية عند زراعة خطين فول الصويا : اربع خطوط ذرة شامية .
- وأدت الزراعة المنفردة إلى أعلى محصول بالمقارنة بالزراعة المحملة فى كلا المحصولين
- وأدت النتائج إلى أن قيمة المكافىء الأرضى لمحصول الذرة وفول الصويا أكثر من (١) وسيادة الذرة على فول الصويا عند تقدير العدوانية .