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EFFECT OF INDIVIDUAL PLANTING AND INTERCROPPING ON SOME SOIL FUNGAL DISEASES INCIDENCE OF SOYBEAN AND MAIZE PLANTS

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Abstract

Severity of root-rot and stalk-rot of maize and soybean plants as well maize late wilt diseases were higher under intercropping than sole cropping conditions. The percentage of infection and disease severity of soybean and maize plants as well as precentage of maize late wilt were high in some districts of El-Sharkia Governorate. It could be concluded that microbial-flora are increased in the rhizosphere of maize and soybean under intercropping compared with sole cropping conditions. The higher microbial densities could be easily observed 75 days after sowing under intercropping system.

Root exudates of maize and soybean plants under both sole and intercropping increased the growth of the pathogenic, fungal dry weight. Root exudates of soybean and maize plants under intercropping conditions increased dry weight of the pathogenic fungi compared with root exudates of both plants under sole cropping system. Root exudates of maize plants had four amino acids, while soybean root exudates had eleven amino acids. The root exudates of maize and soybean under intercropping system had eleven amino acids. Maize root exudates had a higher content of sugars compared with soybean root exudates.

INTRODUCTION

The cultivated area in Egypt is limited and the country is in a great need to increase the agricultural production to meet the increased rate of consumption. The

intercropping system as soybean with maize plants would be suitable way to increase the land productivity. Maize and soybean plants are affected by many diseases (damping-off, root-rot, stalk-rot as well as maize late wilt) which decrease maize and soybean production throughout their growing areas. These diseases are known to be caused by many different pathogenic fungi such as *Fusarium* spp., *Rhizoctonia solani*, *Cephalosporium* spp. and *Macrophomena phaseoli.*, (Botros 1988, Liu and Sinclair, 1991 and Pronezu *et al.,* 1992). In spite of beneficial use of intensive cultivation, very limited research work was conducted dealing with the effect of intercropping on soil borne fungal disease incidence. Sumner and Bell (1982), Litsinger and Mody (1983), and Blanquet *et al.* (1990). Comparative study on the rhizospheric and non-rhizospheric bacterial and fungal population of maize and soybean under sole and intercropping sytesms were conducted by many investigators. They found that intercropping increased the bacterial count in the rhizosphere soil (R/S) ratio of maize and soybean; while decreased fungal (R/S) ratio when compared with sole cropping condition. The dominant fungal species in the rhizosphere and non-rhizosphere soils were also affected by plant species and cropping systems (Keswani *et al.*, 1977).

Root exudates of maize reduced growth of *Rhizoctonia solani* and *F.oxysporum* f.sp. *Cepea* also increased the growth of *Bacliullus subtilis in Vitro.* The exudates of maize root contained maltose, raffinose, fructose and valine amino acids (Mohamed *et al.,* 1981).

Soybean root exudates contained higher amount of sugars, amino acids and phenols than seed exudates. The exudates of susceptible varieties showed more sugar contents than those of the resistant ones. Growth of *Cephalosporium maydis* and *F.solani* was enhanced by root rxudates of soybean plants. It contained galactose, maltose, fructose, surose, arabinose, glucose and raffinose sugars. The root exudates of soybean plants contained arginine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, lucine, lysine, serine, threonine and tyrosin amino acids. Root exudates of soybean increased fungal growth more than maize root exudates. (Ayoodunfa 1979, Mohamed *et al* 1981, Abd El-Al *et al.,* 1984, Arfa *et al.,* 1986 and Botros 1988).

This work was conducted to study the rhizospheric microflora under sole and intercropping maize and soybean plants. The root exudates of both plants and its effect on the growth of pathogenic fungi was also studied. The chemical components (sugars and amino acids) of the root exudates were considered.

MATERIALS AND METHODS

1. Survey studies :

A quantitative survey on the distribution of maize and soybean diseases under sole and intercropping conditions was done at different localities in El-Sharkia Govemorate during two successive growing seasons. Nine fields for each district were selected. Three fields of them were cultivated with maize, three cultivated with soybean and the last three fields resembled the intercropping between soybean and maize. After 90 days, representative samples were randomly collected from each field under sole and/or intercropping conditions. Plants were examined to determine the percentage of root-rot and salk-rot according to Gray (1971) as well as the percentage of maize late wilt according to Samra *et al.* (1966).

The disease severity of root-rot was determined according to the scale suggested by Kravea (1960), while the stalk-rot severity was determined as mentioned by Phillips (1971).

II. Rhizopheric microflora :

This experiment was conducted in the Experimental Farm of the Faculty of Agriculture, Zagazig University under naturally infested fields using randomized complete block design (Snedecar amd Cochran 1973) with three replicates. The rhizospheric microflora of sole and intercropping maize and soybean plants (two ridges of soybean plants alternated with two ridges of maize) were studied after 15, 30, 45, 60, 75, 90, 105 and 120 days from sowing. Plant samples were up-rooted with great care to obtain most of the root system intact as much as possible. The root system was then shaked gently to get rid of most of the adhering soil. The root system with the remaining adjacent soil particles was transferred to 150 ml bottles containing 99 ml sterile water. The bottles were shaked thoroughly on a mechanical shaker for 5 minutes, then adjusted to give an approximate 1/100 dilution. The root system was then discarded and 1 ml from 1/100 dilution was diluted to obtain serial dilutions till $1/10^6$ by sterile distilled water to study the microflora. The remaining solution (99 cc), in the bottle containing the rhizosphere soil was dried at 105^oC for 24 hours to determine the actual weight of rhizosphere soil adhered with the root system. From these figures, the counts of microbial flora/g dry weight were obtained by the decimal plate count technique descriibed by Benihashemi and Dezeeuw (1969). Also, 1.0 gm soil from the unplanted soil was used as a control to determine the non rhizospheric microflora using the same method as mentioned before.

A.Actinomycetes count :

Jensen's medium (Johnson et al 1960) was used for counting this group of microorganisms. One ml from $1/10^4$ dilution was plated on the medium and incubated at 28°C for 6 days. Results were recorded and corrected to the dilution of $1/10^6$.

B. Total fungal count :

Martin's medium (Martin, 1950) was used to obtain the total fungal count by adding 1.0 ml of $1/10^5$ dilution to the Martin's medium before solidification and incubated at 25°C for 5 days. The results were corrected to $1/10^6$ dilution.

C. Total bacterlal count :

For the total bacterial count, 1.0 ml from 10^6 dilution plated on Topping's medium (Allen, 1959) and incubated at 30°C for 3 days.

III. Root Exudates :

Plastic pots, 25 cm in diameter, were used to obtain the root exudates (Fig 1). Every pot had three holes in its bottom. Plastic dish was fixed to the bottom to receive the root exudates. By the aid of a pipette, root exudates were collected. Pots were sterilized by immersing them in 5% formalin solution for 15 minutes, then left 5 days to evaporate formaline. Every pot contained 2 kg washed autoclaved sand. Washing was carried out by tap water for 24 hours and then with HCL 50% and rewashed with sterilized distilled water. Sand was autoclaved at 121°C for 2 hours and stored for one week before used. Maize and soybean seeds were sterilized with 0.01% mercuric chloride solution. Five seeds from each crop were sown together in pots under intercropping condition while in sole cropping ten seeds from each crop were sown in each pot. Every pot was covered with sterilized polyethylene plastic bag. Four sterilized empty tubes 40 cm long were fixed in the sand of each pot to keep the bag raised up on pot. Plastic funnel was fixed in the top end of one of these tubes, sterilized filter paper was placed in the funnel. This was done to maintain pot under sterilized condition. Distilled sterilized water was used to irrigate pots until seeds germinated. As soon as seeds were germinated, Hagland (1944) solution was used instead of water. Root exudates for each particular treatment were collected after 30 days from planting.and kept in sterilized flasks and stored in refrigerator at 5°C for further study.

A. Effect of root exudates on fungal growth :

Ten ml portions of root exudates were added to 10 ml portions of Czapek's

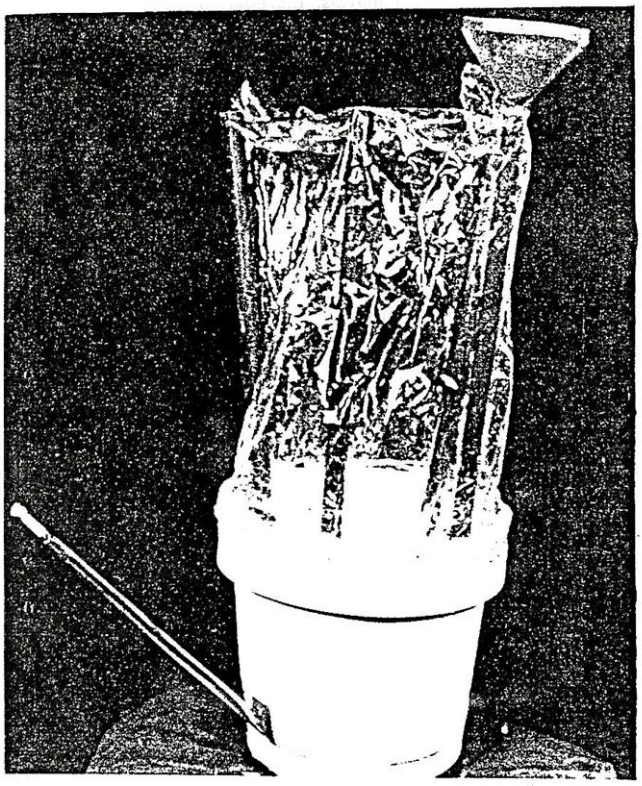

Fig. 1. Technique used to obtain root exudates.

medium in 100 ml conical flasks. In control treatment, root exudates were replaced by sterilized distilled water. Three replicates were used for each treatment. Flasks were inoculated with 5 mm agar discs bearing 3 days old growth of previously isolated fungi (*Fusarium oxysporum, F.solani, F.culmorum, F.moiliforme, F.graminearum, Cephalosporium maydis, C.gregatum, Macrophomina phasedi and Rhizoctonia solani*) individually and incubated at 28°C. After six days the fungal mat was gathered and dried at 70°C for 48 hours to obtain fungal dry weight.

B. Chemical components of root exudates :

Ten ml of root exudates were taken from each particular treatment and evaporated till dryness in a rotary evaporator at 45°C. The residues were dissolved in 6 ml of 10% isopropyl alochol and stored at 4°C until analyzed for amino acids and sugars.

1. Amino acids determination :

Amino acids were determined chromatographically according to the method described by Smith (1958) as well as Ambe and Toppel (1961).

2. Sugar determination :

Sugar content was determined according to Trevelan *et al.* (1950) and Block *et al.* (1958).

RESULTS AND DISCUSSION

Survey study indicated that, the highest percentage of root-rot disease incidence (infection and severity) of maize and soybean were recorded in El-Ebrahimia and Kafr Sakr districts, while the lowest percentage was in Fakous and Hehia. The percentage of sialk rot disease of maize and root rot of soybean and its severity was higher in Kafr Sakr (Tables 1 and 2) district, while the lowest percentage was in Fakous district. It is also clear that, the highest percentge of maize late wilt was recorded in Abo-Kabeer, while the lowest percentage was detected in El-Hesinia district. Variation in the percentage of disease incidence and severity in different districts and seasons might be attributed to one or more factors including temperature, soil moisture, relative humidity, differences in planting dates, agricultural practices used, fungal strains and interaction between hosts and pathogenic fungi and the environment. Disease severities of the above mentioned diseases were higher under

Table 1. Percentage of infection of maize root-rot, stem-rot and their severity under sole and intercropping conditions in El-Sharkia Governorate in two successive growing seasons.

El-Sharkia districts	Season	Sole cropping					Intercropping				
		Percentage of infection			Disease severity		Percentage of infection			Disease severity	
		Root rot	Stalk rot	Late wilt	Root rot	Stalk rot	Root rot	Stalk rot	Late wilt	Root rot	Stalk rot
El-Zagazig	1 st. season	17.00	10.00	19.33	29.00	16.67	19.67	12.00	19.00	25.00	30.00
	2 nd. season	20.33	14.00	20.67	14.67	23.33	20.67	12.00	19.33	13.33	23.33
Belbies	1 st. season	16.67	8.00	17.00	18.33	13.33	21.33	11.33	15.67	25.00	33.33
	2 nd. season	15.33	12.67	15.67	14.33	28.33	19.00	11.33	15.33	25.00	28.33
Menia El-Kamh	1 st. season	15.67	8.00	15.00	9.00	21.67	21.67	13.00	13.67	16.67	13.33
	2 nd. season	15.33	6.67	14.33	13.33	6.67	18.67	12.00	12.67	11.67	15.00
Mashtol	1 st. season	20.67	12.00	22.00	35.00	48.33	26.67	13.00	18.33	26.33	23.33
	2 nd. season	11.67	10.67	19.00	22.67	31.67	21.67	14.00	15.33	25.33	36.67
El-Kenaiat	1 st. season	10.33	5.00	14.33	20.00	28.33	18.33	8.00	17.33	6.67	10.33
	2 nd. season	21.33	5.67	13.33	5.67	27.00	25.00	12.00	13.33	10.00	21.67
Hehia	1 st. season	10.00	15.67	13.00	21.67	20.00	16.67	15.67	13.33	20.00	21.67
	2 nd. season	8.33	14.33	10.67	9.33	23.33	18.33	8.00	13.33	16.67	16.67
Abo-Kabeer	1 st. season	13.33	10.67	29.00	26.67	33.33	16.67	15.67	20.33	40.00	40.00
	2 nd. season	9.33	10.00	25.00	12.33	28.33	16.33	14.33	21.00	41.67	28.00
El-Ebrahmia	1 st. season	27.33	11.00	11.00	48.33	45.00	31.67	17.67	12.67	66.67	40.00
	2 nd. season	32.33	9.33	10.33	32.33	53.33	26.67	17.33	11.33	36.67	46.67
Kafr-Sakr	1 st. season	24.67	16.00	19.00	20.00	58.33	25.67	17.67	16.67	51.67	25.00
	2 nd. season	25.67	15.33	17.67	24.67	46.67	16.33	17.00	17.33	26.67	43.33
Fakous	1 st. season	8.00	6.67	4.67	21.67	16.67	13.33	9.00	12.00	13.33	11.67
	2 nd. season	11.00	9.67	4.67	7.33	13.33	11.67	6.67	11.33	15.00	13.33
Diarb-Nigem	1 st. season	19.00	11.33	14.33	25.00	23.33	22.00	13.33	13.67	35.00	3.33
	2 nd. season	14.00	8.67	14.67	15.33	25.00	18.33	10.67	14.67	15.33	18.33
Abo-Hamad	1 st. season	15.00	9.00	10.33	23.33	16.67	17.33	15.00	9.33	21.67	23.33
	2 nd. season	17.00	9.33	12.33	21.33	18.33	16.00	12.67	11.00	18.00	26.67
El-Hesinia	1 st. season	16.67	12.67	6.67	31.67	21.67	24.00	13.33	4.67	33.33	33.33
	2 nd. season	22.00	15.33	9.33	26.67	26.67	20.33	11.67	10.67	24.67	11.67

L.S.D. at 1% for	Percentage of			Severity of	
	Root-rot	Stalk-rot	Late wilt	Root-rot	Stalk-rot
Seasons (S)	N.S.	N.S.	N.S.	2.666	N.S.
Location (L)	2.410	1.679	6.400	6.027	7.156
Cropping system (C)	1.288	0.743	N.S.	2.403	1.758
S x L	0.911	2375	N.S.	6.390	7.586
S x C	N.S.	1.051	N.S.	N.S.	N.S.
L x C	3.284	2.680	N.S.	8.663	8.446
S x L x C	4.644	3.789	N.S.	12.250	11.940

Table 2. Percentage of infection of soybean root-rot, stem-rot and their severity under sole and intercropping conditions in El-Sharkia Governorate in two successive growing seasons.

El-Sharkia districts	Season	Sole cropping				Intercropping			
		Percentage of infection		Disease severity		Percentage of infection		Disease severity	
		Root rot	Stalk rot	Root rot	Stalk rot	Root rot	Stalk rot	Root rot	Stalk rot
El-Zagazig	1 st. season	20.33	14.00	23.00	16.67	23.00	17.00	27.33	33.33
	2 nd. season	24.33	11.33	22.67	31.67	23.67	16.33	26.67	29.33
Belbies	1 st. season	14.33	10.67	19.00	23.33	15.67	19.33	21.67	21.67
	2 nd. season	15.67	15.67	23.00	20.00	17.33	18.67	23.33	28.33
Menia El-Kamh	1 st. season	16.67	12.67	19.67	26.67	19.67	14.67	18.33	26.67
	2 nd. season	15.33	10.33	15.00	20.00	19.33	14.67	13.33	18.33
Mashtol	1 st. season	18.00	15.33	36.67	43.33	21.67	11.67	33.33	40.00
	2 nd. season	20.00	11.33	11.67	30.00	22.00	11.33	13.33	35.00
El-Kenaiat	1 st. season	10.67	7.00	35.00	53.33	13.33	16.33	36.67	56.67
	2 nd. season	12.33	15.33	20.00	50.00	14.00	16.33	23.33	51.67
Hehia	1 st. season	15.67	16.67	53.33	56.67	18.67	17.33	26.67	51.67
	2 nd. season	16.67	16.67	18.33	48.33	14.33	15.67	30.00	53.33
Abo-Kabeer	1 st. season	13.00	5.67	46.67	50.00	14.33	7.67	50.00	45.00
	2 nd. season	11.33	5.33	45.00	43.33	15.33	6.00	38.33	53.33
El-Ebrahmia	1 st. season	26.67	15.67	30.00	33.33	28.33	15.67	22.33	23.33
	2 nd. season	26.33	14.33	23.33	23.33	28.33	15.67	23.33	25.00
Kafr-Saker	1 st. season	24.67	20.67	56.67	36.67	26.67	23.67	21.67	16.67
	2 nd. season	24.33	22.33	13.33	23.33	26.67	22.00	23.33	16.67
Fakous	1 st. season	6.33	5.33	20.00	20.00	11.67	7.00	16.67	21.67
	2 nd. season	8.00	6.33	10.00	33.33	12.00	6.67	15.00	20.00
Diarb-Nigem	1 st. season	16.67	11.33	23.33	23.33	22.00	12.67	31.67	26.67
	2 nd. season	16.00	10.33	30.00	23.33	22.67	13.33	31.67	28.33
Abo-Hamad	1 st. season	15.67	14.33	16.67	30.00	18.00	14.67	31.67	25.00
	2 nd. season	14.33	12.33	28.33	20.00	18.67	15.33	35.00	26.67
El-Hesinia	1 st. season	17.00	16.33	26.67	33.33	25.00	19.33	31.67	43.33
	2 nd. season	16.67	15.67	16.67	36.67	25.00	19.33	30.00	41.67

L.S.D. at 1% for	Percentage of		Severity of	
	Root-rot	Stalk-rot	Root-rot	Stalk-rot
Seasons (S)	N.S.	N.S.	5.165	N.S.
Location (L)	2.264	1.485	4.777	7.492
Cropping system (C)	0.9840	0.488	N.S.	N.S.
S x L	N.S.	2.100	6.756	N.S.
S x C	N.S.	N.S.	3.068	N.S.
L x C	3.548	1.761	7.823	N.S.
S x L x C	N.S.	2.490	11.060	11.940

intercropping conditions than in sole cropping at all locations. Increasing disease incidence under intercropping than sole cropping system might be due to the higher density of plants in the field which prevent irradiation from arriving to the soil surface thus keeping high soil moisture. Also, increasing temperature and relative humidity between plants might be of relative importance in this respect. These results were in agreement with those obtained by Samra *et al.* (1966), Abd El-Kader (1983), Khaled (1987), Botros (1988) and El-Gantiry *et al.* (1993).

Data obtained during the course of rhizospheric study showed that total count of microflora in soil was lower than in rhizosphere. This indicated that rhizosphere positively affects the population of microorganisms around plant roots. The total counts of bacteria, fungi and actinomycetes were increased under intercropping conditions than sole cropping. Total mincrobial count increased after 75 days from sowing. However, these counts were lower at seedling stage and at maturity (Tables 3 and 4). Rhizosphers/soil (R/S) ratio was higher in intercropping and during vegetative growth period. This differences on count of microflora might be due to the activity of root exudates of maize and soybean on the microflora increasing under intercropping conditions, (Keswani *et al.,* 1977). Quantitative and qualitative study of root exudates under intercropping conditions indicates that root exudates contained higher amount of amino acids and sugars than sole cropping system. It may also contain some vitamins and growth regulators as mentioned by (Botors 1988) which increase the number and activity of soil microorganisms. Also, the increase of decomposing plant tissue under intercropping condition may increase the organic matter in the soil resulting in higher number of microorganisms in rhizosphere. Similar results were reported by (Keswani *et al.,* 1977., Abd El-Kader; 1983).

Comparison studies on fungal growth indicated that root exudates of intercropping maize with soybean increased fungal growth followed by individual soybean and maize sole cropping (Table 5). Stimulation effect of root exudates of maize and soybean plants under intercropping might explain the higher percentage of root-rot and stem-rot infection of maize and soybean plants. This effect was noticed also with maize late wilt disease. Root exudates liberated from maize and soybean plants under intercropping conditions may help dormant stages (Chlamydospores and sclerotia) of the pathogenic fungi which infect maize and soybean plants of germinate (Mohamed *et al.,* 1981 and Arafa *et al.,* 1986). The most effective root exudate of the tested fungi was found related to *Fusarium* spp., *Cephalosporium* spp., *Mocrophomina phaseoli* and *Rhizoctonia solani.* These root exudates encourage fungal multiplication until reaching the suitable inoculum concentration able to cause infection of

Table 3. Effect of sole cropping and intercropping of maize on the rhizosphere microfolora at different dates, from sowing to maturity, in 1.0 gm dry weight soil.

Cropping system	Days after sowing							
	15	30	45	60	75	90	105	120
Control, no cultivation								
Bacterial count	23.33	54.00	66.00	73.33	100.00	72.00	80.00	77.00
Fungal count	13.33	15.00	10.00	11.67	21.67	21.00	15.00	16.33
Actino. count	5.00	4.67	2.00	6.67	6.67	5.00	5.00	2.33
Maize sole cropping								
Bacterial count	66.00	92.00	146.67	261.00	261.00	210.00	164.00	110.00
R/S	2.82	1.70	2.22	2.61	2.61	2.91	2.05	1.42
Fungal count	25.67	36.00	43.33	54.00	54.00	41.67	24.00	22.00
R/S	1.93	2.40	4.33	2.49	2.49	1.98	1.60	1.38
Actino. count	3.67	5.33	8.33	6.00	6.00	8.33	10.00	8.00
R/S	0.73	1.14	4.16	0.90	0.90	1.66	2.00	3.42
Maize intercropping with soybean								
Bacterial count	147.00	184.00	291.67	357.00	357.00	235.67	180.00	161.67
R/S	6.30	3.40	4.42	3.57	3.57	3.27	2.25	2.09
Fungal count	54.00	66.00	78.33	53.33	53.00	46.67	20.00	18.33
R/S	4.05	1.22	1.18	0.73	0.53	0.65	0.25	0.24
Actino. count	3.67	5.33	8.33	8.67	6.00	8.33	10.00	8.00
R/S	0.73	1.14	4.17	1.73	0.90	1.67	2.00	3.43

L.S.D. at 1% for

Treatments (T)	5.321
Isolation dates (I)	4.977
Organisms (O)	3.455
T x I	8.621
T x O	5.984
I x O	9.772
T x I x O	4.660

Table 4. Effect of sole cropping and intercropping of soybean on the rhizosphere microflora at different dates, from sowing to maturity, in 1.0 gm dry weight soil.

Cropping system	Days after sowing							
	15	30	45	60	75	90	105	120
Control, no cultivation								
Bacterial count	22.00	31.67	68.00	85.00	92.00	72.00	79.00	73.00
Fungal count	10.00	11.67	17.33	23.33	20.00	20.00	13.00	8.00
Actino. count	2.00	0.00	2.67	1.67	4.00	2.67	2.00	1.00
Maize sole cropping								
Bacterial count	48.00	81.00	93.33	129.67	241.00	235.00	146.00	118.00
R/S	2.18	2.55	1.37	1.53	2.61	3.26	1.85	1.62
Fungal count	12.33	15.33	25.67	33.00	40.00	38.33	20.00	18.33
R/S	1.23	1.31	1.48	1.41	2.00	1.92	1.54	2.29
Actino. count	1.00	6.67	11.67	16.67	15.00	10.00	8.33	6.67
R/S	0.50	6.67	4.37	9.99	3.75	3.74	4.17	6.67
Maize intercropping with soybean								
Bacterial count	122.00	208.00	263.33	325.00	543.33	396.66	263.33	151.33
R/S	5.54	6.56	3.87	3.82	5.91	5.50	3.33	2.07
Fungal count	34.33	42.67	51.00	55.00	61.67	48.33	30.00	20.00
R/S	3.43	3.66	2.94	2.36	3.08	2.41	2.30	2.50
Actino. count	12.00	17.33	25.33	33.33	40.00	28.33	18.33	10.67
R/S	6.00	17.33	9.49	19.99	10.00	10.62	9.17	10.67

L.S.D. at 1% for

Treatments (T)	3.155
Isolation dates (I)	4.932
Organisms (O)	3.455
T x I	5.984
T x O	9.772
T x I x O	16.930

Table 5. Effect of root exudates on dry weight of certain pathogenic fungi.

Tested fungi	Days weight (gm)			
	Control	Maize root exudates	Soybean root exudates	Intercropping
Fusarium oxysporum	0.456	0.530	0.548	0.586
Fusarium solani	0.295	0.305	0.335	0.365
Fusarium moniliforme	0.486	0.569	0.504	0.613
Fusarium culmorum	0.466	0.583	0.546	0.598
Fusarium graminearum	0.395	0.488	0.536	0.495
Cephalosporium maydis	0.465	0.498	0.589	0.6654
Cephalosporium gregatum	0.403	0.508	0.536	0.595
Macrophomina phaseoli	0.489	0.449	0.475	0.588
Rhizoctonia solani	0.323	0.333	0.335	0.348

L.S.D. at 1% for

Treatments (T)	0.123
Fungi (F)	0.116
T x F	0.234

Table 6. Free amino acids contents of root exudates of maize and soybean seedlings (30 days old) under sole cropping and intercropping systems.

Amino acids	Root exudates		
	Maize	Soybean	Intercropping miaze with soybean
Glycine	-	+	+
Alanine	-	+	+
Serine	+	+	+
Proline	-	-	-
Valine	+	++	+++
Threonine	-	+	+
Leucine	+	++	+++
Aspartic	-	+	-
Lysine	-	-	++
Glutamic	+	+	++
Histidine	-	-	-
Phenylalanine	-	+	+
Tyrosine	-	+	+
Tryptophane	-	+	+

- not presented
+ Low concentration of sugars.
++ moderatly concentration of sugars.
+++ High concentration of sugars.

plants, (Arafa *et al.*, 1986). These interpretaions were reported by (Mohamed *et al.* (1988), Arfa *et al* (1985) and Botros (1988).

Chemical analysis of root exudates of maize with soybean under intercropping conditions revealed that, root exudates contained eleven amino acids namely glycine, alanine, serine, valine, threonine, leucine, lysine, glutamic acid, phenylalanine, tyrosine, and tryptophan (Tables 6 and 7). In case of root exudates of soybean only, the previously mentioned amino acids were detected, but at low concentration, while amino acids were different when maize root exudates were studied. As far as sugars in root exudates are concerned, data showed that kind and concentration of sugars differed from one system to another. Root exudates of maize and soybean plants under intercropping conditions contain six sugars, namely; ribose, fructose, arabinose, glucose, galactose and sucrose. In case of maize only, root exudates contain the same sugars, but at low concentration. However, root exudates and concentation of soybean plants contain different sugars namely; fructose, glucose, galactose and surcrose. Similar result were reported by (Mohamed *et al.*, 1981, Arafa *et al.*, 1986 and Botros, 1988). Increasing numbers of amino acids and sugars secreted from plants under intercropping condition were more than sole cropping and might explain their stimulative effect on fungal growth under *in vitro* conditions.

Table 7. Free sugars contents of root exudates of maize and soybean seedlings (30 days old) under sole cropping and intercropping system.

Amino acids	Root exudates		
	Maize	Soybean	Intercropping miaze with soybean
Ribose	+	-	+
Fructose	++	+	+++
Arbinose	++	-	+
Glucose	++	+	+++
Galactose	-	+	+
Sucrose	++	+	+++
Lactose	-	-	-
Raffinose		-	-

- not presented
+ Low concentration of sugars.
++ moderatly concentration of sugars.
+++ High concentration of sugars.

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تأثير الزراعة المنفردة والمحمله لمحصولى الذرة الشامية وفول الصويا على حدوث بعض الأمراض المتسببة عن الفطريات القاطنة بالتربة

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تم إجراء حصر لأمراض موت البادرات، عفن السوق والجذور لكل من الذرة الشامية وفول الصويا وكذلك الذبول المتأخر للذرة الشامية المتسببة عن بعض الفطريات مثل (أجناس الفيوزاريوم، ريزوكتونيا سولانى، ماكروفومينا فاسولاى وسيفالوسبوريم مايديز) تحت ظروف التحميل والزراعة المنفردة وجد أن هذه الأمراض تنتشر فى جميع مراكز محافظة الشرقية ولكن بدرجات متفاوتة، ولكن وجد أن نسبة الاصابة وكذلك شدة الإصابة تزداد تحت ظروف التحميل بالمقارنة بالزراعة المنفردة.

وجد أن العدد الكلى لكل من البكتريا والفطر والاكتينوميستات وكذلك الفطريات المسببة لعفن الجذور والسوق السابق تعريفها فى منطقة الريزوسفير تحت ظروف التحميل والزراعة المنفردة كانت قليلة فى بداية حياة النبات ثم ازدادت بزيادة عمر النبات حتى وصلت اقصاها بعد ٧٥ يوما من الزراعة ثم بدأت تنخفض بعد ذلك حتى وصلت الى اقل عددا لها قبل الحصاد. ووجد ان تلك الأعداد كانت كبيرة تحت ظروف التحميل عنها فى حالة الزراعة المنفردة.

وجد أن افرازات جذور الذرة الشامية وفول الصويا معا أدت الى زيادة الوزن الجاف للفطريات الممرضة مقارنة بكل من افرازات جذور كل من فول الصويا والذرة منفردين. ومن ناحية أخرى اتضح ان عدد الأحماض الامينية فى افرازات جذور فول الصويا (١١ حمض أمينى) اكثر من تلك الموجودة فى افرازات جذور الذرة (٤ حمض امينى فقط). وعلى العكس من ذلك فإن السكريات الكلية فى افرازات جذور الذرة اكثر منها فى حالة افرازات جذور فول الصويا.