Minufiya J. Agric. Res. Vol. 33 No.6: 1305-1320 (2008) "http://www.mujar.net"

EFFECT OF CROP SEQUENCE ON THE INFECTION OF SAGE PLANT WITH ROOT ROT AND WILT PATHOGENS

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(Received: Oct. 7, 2008)

ABSTRACT: ***This research was conducted at El- Sheike Zowaied Experimental Station (El Aresh) and in green house of Desert Research Center to investigate the allelopathic effects of substance released from onion and canola roots and shadow effect with sunflower on the productivity and incidence of root rot and wilt diseases of sage. Fungal causal diseases were isolated from diseased sage plant grown at El- Sheike Zowaied Experimental Station and identified as Pythium aphanidermatum, Fusarium solani, Fusarium oxysporum and Rhizoctonia solani. The isolated fungi alone or in mixture, significantly affected sage seedlings, where the highest root rot and wilt infection and severity were caused by fungal mixture, P.aphanidermatum, R. solani and F. solani respectively.***

In vitro, allelochemical substances extracted from sage soil was the most effective released root substances for reducing and inhibiting radial growth of the four tested fungi especially R. solani isolate, as well as canola and onion released root substances. While, radial growth of P. aphanidermatum was not affected greatly by canola root substances extracted from soil infested with F. oxysporum or fungal mixture. The total counts of fungi were decreased in the rhizosphere of different crops under investigation on the green house experiment On the other hand, the total count of bacteria was decreased in the first four weeks from transplanting then starting to increase from 6 weeks up to 8 weeks in the rhizosphere of different tested crops.

In the filed experiment conducted at El-Sheike Zowaied Experimental Station, there were no significant differences of sage stand counts among all treatments in both seasons (2005 - 2006 and 2006-2007). Moreover, plant fresh and dry weight of all traits was decreased significantly compared with treatment of sage alone over two successive seasons.

Generally, growing sage crop as monoculture or in multi-cropping system with canola, onion and sunflower didn't increase sage stand counts and oil percentage significantly under field conditions, but growing more than one crop added more yield over the essential crop.

Key Words: ***Sage, Salvia officinalis, L., root rot diseases, crop sequence. allelopathy and allelochemical substances.***

INTRODUCTION

Sage (*Salvia officinalis,* L.); is one of the important aromatic plants in many countries. It is indigenous to the Mediterranean countries of Europe, but it has become established elsewhere in the Mediterranean region and also in southern Germany. It has been commonly cultivated in central Europe as an annual herb since early mediaeval times (Bailey, 1996). The cultivated area in Egypt is still at small scale because of the diseases and insect pests which can adversely affect their market quality. Damping off, crown and root rot are a common diseases of germinating seeds and young seedlings. Several fungi such as *Rhizoctonia, Alternaria, Sclerotinia* and Oomysetes, *Phytophthora* and *Pythium*, causes damping-off as well as Fusarium wilt caused by *Fusarium oxysporum* reducing plant stand as much as 40 to 50%. (Horst 2001 and Gaeten and Madia 2006)

Herbs can be marketed for their culinary, fragrance, medicinal and ornamental uses. However, they are considered to be a minor or specialty food crop and there are few pesticides registered for use on them. The laws controlling the use of pesticides are stricter for food crops than for ornamentals. (Reuveni. *et al.*1998 and Wick 1999).

The importance of the phenomena of allelopathy in nature has attracted world wide attention (Rizvi and Rizvi 1992). Allelopathic interactions between plants and other organisms have been recognized by scientists worldwide because they offer alternative uses in agriculture, such as decreasing our reliance on synthetic herbicides, insecticides, and nematicides for disease and insect control. The recognition of the role that allelopathy can have in producing optimum crop yields is of fundamental importance (Waller 1986). However, cultivating a system with allelopathic crops plays an important role in the establishment of sustainable agriculture. The introduction of allelopathic traits from accessions with strong allelopathic potential to the target crops will enhance the efficacy of crop allelopathy in future agricultural production. Moreover crops including alfalfa, buckwheat, maize, rice, rye, sorghum, sunflower, wheat, etc. are affected either by their own toxicity or phytotoxin exudates when their residues decompose in the soil, that show strong suppression on weed emergences. Allelopathic crops when used as cover crop, mulch, smother crops, green manures, or grown in rotational sequences are helpful in reducing noxious weeds and plant pathogen, improve soil quality and crop yield. (Khanh, *et al.* 2005). It is worthy to mentioned that sunflower plant contain 28-33 levies, leaf area for any leaf equivalent 88 cm^2, so that it can be used for plant shadow over sage in the summer. Also, the total essential oil concentration in sage was highest in the plants grown at 45% of full sunlight. (Yanli *et al.*1996).

The purpose of this study was to investigate the allelopathic effects of substance released from roots of some plants such as onion and canola and effect of shadow with sunflower on the productivity and incidence of sage root rot and wilt diseases at El- Sheike Zowaied Experimental Station of the

Desert Research Center (DRC), at Eastern North Costal of Sinai during summer seasons of 2005-2006 and 2006-2007.

MATERIALS AND METHODS

Isolation and identification of the causal fungi:

Samples of naturally infected sage plants were obtained from El- Sheike Zowaied experimental station, Desert Research Center (DRC). Infected sage plants showing wilt or root rot symptoms were collected in paper bags, and transferred to the laboratory for isolating the pathogens. Small pieces (2-5mm) were cut from each sample which sterilized with sodium hypochlorite (1%) for 2 min and dried between sterilized filter papers and placed on potato dextrose agar plats (PDA) supplemented with streptomycin-sulfate (100 µg/ml). Petri dishes were incubated at 25 ^{0}C for 48-72 hours. Single spore or hyphal tips were taken from developed colonies and transferred, onto potato dextrose agar media (PDA).

Identification of the isolated fungi were carried out in the Plant Pathology Dept., Ain Shams University, Cairo, Egypt by kindly help of Dr. A.A.Mosa, according to the following references: Barnett and Hunter (1987) for the genera of imperfect fungi, Booth (1971) for *Fusarium* species, Sneh *et al*. (1992) for *Rhizoctonia solani* and Plaats-Niterink, (1981) for Pythium species

Preparation of pathogen inocula:

Inoculum of each fungal isolate was prepared using ground corn or barley-grain medium in polyethylene pages, each contains 200g medium as described by Singleton *et al.* (1993). The sterilized medium was inoculated using agar discs obtained from the edge of 5 days old colony of the isolated fungi. Then inoculated medium were incubated at 25 ^{0}C for 15 days and used for soil infestation.

Testing fungi for root-rot or wilt incidence:

Plastic pots (30 cm diam.) containing autoclaved sterilized sandy-loam soil, were used. The soil was infested with inoculum of each fungal isolates, prepared as previously mentioned, at the rate of 5g /kg soil. Inoculum of each pathogen was mixed separately with soil. Infested pots were irrigated and kept for 5 days before transplanting. Healthy sage seedlings, 30 days old, were transplanted, and five seedlings per pot and four pots were used for each treatment. The pots were irrigated periodically. The percentage of infected plants with root-rot or wilt was recorded after eight weeks from transplanting as well as disease severity.

Allelopathic Effects of sage, onion and canola plants on the isolated fungi:

A pot experiment was conduced to investigate the role of allelochemical substances released from sage, onion and canola roots on soilborne pathogenic fungi, as well as total count of fungi and bacteria in soil. Plastic

pots (30 cm diam.) containing autoclaved sandy-loam soil previously infested with inoculum of each *R. solani*, *F. solani and Fusarium oxysporum* isolates or mixture of them were used. One week after inoculations pots were transplanted with healthy 30 day's old sage seedlings alone, or/with canola, onion and canola and onion.

For root exudates extraction:

One hundred gram of soil from each treatment in three replications were collected and extracted with 150 ml of methanol: water (3:1) using mechanical shaker. The extracts were filtrated through two layers of cheeth cloth and methanol was allowed to be evaporated according to (Fayed *et al* 2006).

Effect of allelochemical substances on fungal growth:

Two ml of each extract were added to each 10 ml of PDA medium. The media were poured into Petri dishes and inoculated with equal discs (9mm in diameter) of each tested pathogenic fungus. The reduction of growth was calculated as a percent reduction in fungal colony diameters as affected with different root extracts relative to control one.

Effect of allelochemical substances on the soil total microbial count:

Soil-dilution plating technique was used by adding a suspension of 10g of soil from the above mentioned treatments in 90 ml sterilized deionized water. Serial dilutions (up to 10^6 were obtained) and 0.1ml of 10^3 or 10^6 dilutions was plated into three plates of different selective media as follows:

Potato dextrose agar medium (PDA) containing 50mg of chlortetracycline hydrochloride per liter of medium (Marois *et al.*1981) was used to count fungi and modified Bunt and Rovira medium (AbdEL-Hafez 1966) was used to count bacteria.

Plates were incubated at 28^0C for 2-4 days, when the developed individual colonies were examined and counted. Total count of general fungi and bacteria were recorded including target isolated fungi prior to soil inoculation (control treatment) then one week after inoculation and each two weeks up to 8 weeks.

Field experiments

Two field experiments were established at El- Sheike Zowaied Experimental Station of DRC, during summer season of 2005 - 2006 and 2006-2007, to investigate the allelopathic effects of substance released from certain plants onion: (*Allium cepa*) var. Giza 20 and canola (*Brassica napus* L.) by root exudation and shadow effect with sunflower (*Carthamus tinctorius* L.) var. Vidoc on sage (*Salvia officinalis*, L.) diseases and production.

The experimental unit area was 480 m^2. Each treatment include two rows with 20 cm space, each two rows ware 20 m in length and 2m width Consist as a replicate and 3 replicate were used for each treatment

The two rows were cultivated as follow:

A) First row: seeds cultivated for each dropper in the replica with one plant in two hills:

1. **Canola seeds were cultivated on 15 October in the field and harvested at April in both seasons.**
2. **Sunflower seeds were cultivated on 10 March in the field and harvested at September in both seasons.**

B) Second row:

1-Onion seedlings were transplanted on 15 October in the field with one plant in three hills around the row and harvested at the end of March in both seasons.

2- Sage seedlings were transplanted on 10 March in the field with 60 cm between plants and harvested at June 20 and September 25 in both seasons.

Treatments can be summarized as follow:

1. **Sage (S) Control**
2. **(S)+Onion (Oni)**
3. **(S) +Canola(Can)**
4. **(S)+Sunflower(Sun)**
5. **(S)+Oni+Can**
6. **(S)+Oni+Sun**
7. **(S)+Can+Sun**
8. **(S)+Oni.+Can+ Sun**

During the growing season, recomended cultural practices were followed. Drip irrigation system using GR droppers (4L/h). The plants were irrigated for ½ hour/day, divided in two equal doses, one half was given in the morning and the other one was supplied before sunset (at evening). Organic fertilizer (at the rate of 20 m^3/ feddan using compost) and NPK fertilizer rates (150 Kg ammonium sulphate, 100 Kg calcium superphosphate and 100 Kg potassium sulphate per feddan). Which were divided into eight equal doses added monthly for two rows.

Stand count of sage survival plant were recorded with each cut, As well as total fresh and dry weight (g) was determined. Also, sage essential oil percentage was determined for each cut.

Canola and sunflower seed yields (g/plant) as well as onion bulb yield (g/plant) were determined at the end of each season.

Diseases assessment:

The percentage of infected sage plants with wilt and /or root- rot was recorded up to 8 weeks after transplanting as follows:

$$\text{Infection percentage} = \frac{\text{No. of infected plants X 100}}{\text{Total plants}}$$

Severity of root rot disease (assessed using an arbitrary scale from 0-4 where 0 no symptoms to 4 severe root rot as described by Salt, (1983)

For wilt disease, number of symptomatic leaves and dead plants were recorded after about 8 weeks from transplanting. Wilt development on each plant was rated using the scale described by Gao *et al*.(1995) as follows: 5 = dead plant; 4 = 76 to 100% of leaves with symptoms, 3 = 51 to 75 % of leaves with symptoms; 2= 25 to 50% of leaves with symptoms, 1 = < 25% of leaves with symptoms; and 0 = no symptoms. The disease rating was calculated by the following formula:

$$\text{Disease index} = \frac{\text{(rating no. x no. of plants in the rating) x 100}}{\text{Total no. of plants x highest rate}}$$

Statistical analysis:

Statistical analysis was carried out according to "Anova" procedure reported by Snedecor and Cochran (1982). Treatment means were compared by Duncan's Multiple Range Test at 0 .05 level of probability.

RESULTS AND DISCUSSION

Isolation and identification of the causal organism:

Several fungal isolates were isolated, from sage plants (*Salvia officinalis,* L), from El- Sheike Zowaied Experimental Station of DRC, in Egypt. The most frequent isolates were identified according to their morphology and growth characters using specific keys for each genus. These isolates were identified as *Pythium aphanidermatum* (Edson) Fizp., *Rhizoctonia solani* Kühn*, Fusarium oxysporum* Schlecht*., Fusarium solani* (Mart.) *.*

Pathogenicity tests:

Pathogenicity tests of the isolated fungi as well as their mixture are present in Table (1). Results showed that, most isolated fungi as well as their fungal mixture significantly affected sage seedlings, relatively to untreated control. The highest root rot and wilt incidence as well as disease severity were caused by fungal mix, *P.aphanidermatum R. solani and F. solani*, eight weeks after transplanting. These results are in agreement with those of Harris *et al.* (1991&1995) and Turhan and Turhan (1989).

Effect of allelochemical substances on fungal growth:

The effect of different substances released from roots of sage or/and canola, onion and canola and onion grown in pathogens infested soil on the

growth of *R. solani, F. solani, P. aphanidermatum* and *F. oxysporum* are shown in (Fig.1)

Data indicated that, there is a different effectiveness for such crops on pathogen growth *in vitro*, where, sage allelochemical substances was the most effective released root substances in reducing radial growth of the four fungi especially *R. solani* isolate, (Fig.1) followed by canola and onion root substances . Results also illustrat that; *P. aphanidermatum* was not affected greatly by canola root substances on the soil inoculated with *F. oxysporum* or fungal mixture. In this respect, many investigators has been mentioned the effect of different released root substances on fungal growth (Rimonds 1990, Singh *et al.* 1992 and Pai and Palt 1995).

Effect of allelochemical substances on the total microbial count in soil:

Populations of bacteria and fungi in soil, including the pathogenic fungi *F. oxysporum, F. solani* and *R. solani* were determined after one week from soil inoculation, then 2, 4 and 6 weeks from transplanting in the rhizosphere of sage, canola, and onion seedlings or mixture of them grown in soil inoculated with *R. solani, F. solani, F. oxysporum and* fungal mixture were shown in Fig (2).

Total counts of fungi were decreased in the rhizosphere of different crops under investigation, after two weeks from transplanting and continue decreasing to the end of study. In some cases it started to increase again after 6 weeks then decreased again especially with canola rhizosphere. However, most of the pathogenic fungi under investigation decreased in the rhizosphere of sage, canola and onion plants.

These findings are in agreement with Smolinska, *et al*. (1997). Moreover, Regina (2007) reported that allelopathy involves fluctuating mixtures of allelochemicals and their metabolites as regulated by developmental stage of the producing plant, environment, cultivation and signaling effects, as well as the chemical or microbial turnover of compounds in the rhizosphere.

On the other hand, the total count of bacteria was decreased in the first four weeks from soil infestation and then starting to increase from 6 weeks up to 8 weeks in the rhizosphere of different crops under investigation. Other several studies demonstrated that, green manure with cruciferous crops have increased microbial population in treated soil (Grodzinsky 1992; Keinath 1996; Ramirez- Villapudua and Munnecke 1988).

Field experiments

Data presented in Tables (2 and 3) showed the average values of sage plants stand count as well as plant fresh and dry weight after 3 and 6 months from transplanting in the field experiments conducted at El- Sheike Zowaied Experimental Station over two successive seasons .

Table (1): Percentage of infection as well as disease severity of sage seedling inoculated with the isolated fungi and their mixture, eight weeks after transplanting, under green house conditions.

Pathogens	Disease severity		% Infection	
	Root rot	Wilt	Root rot	Wilt
P.aphanidermatum	2.9 a	4.3 a	20 b	50 b
F. solani	2.7 ab	3.6 b	30 a	40 c
F. oxysporum	1.0 c	3.3 c	0 c	10 d
R. solani	1.2 c	3.8 ab	20 b	40 c
Fungal mixture	2.5 b	4.3 a	30 a	60 a
Control	0 d	0 d	0 c	0 e

Means in each column followed by the same letter are not significantly different according to Duncan's Multiple Range Test (P=0.05).

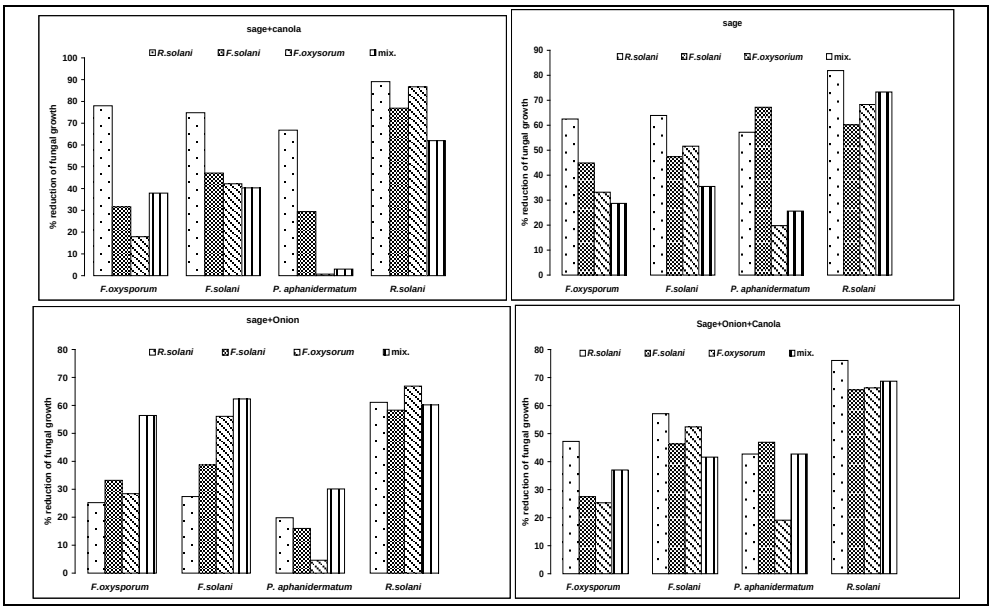

Fig. (1): Growth reduction (%) of soil fungi as affected by different released root substances of sage, canola, and onion or mixture of them, extracted from soil infested with *R . solani, F. solani, F. oxysporum and* fungal mixture.

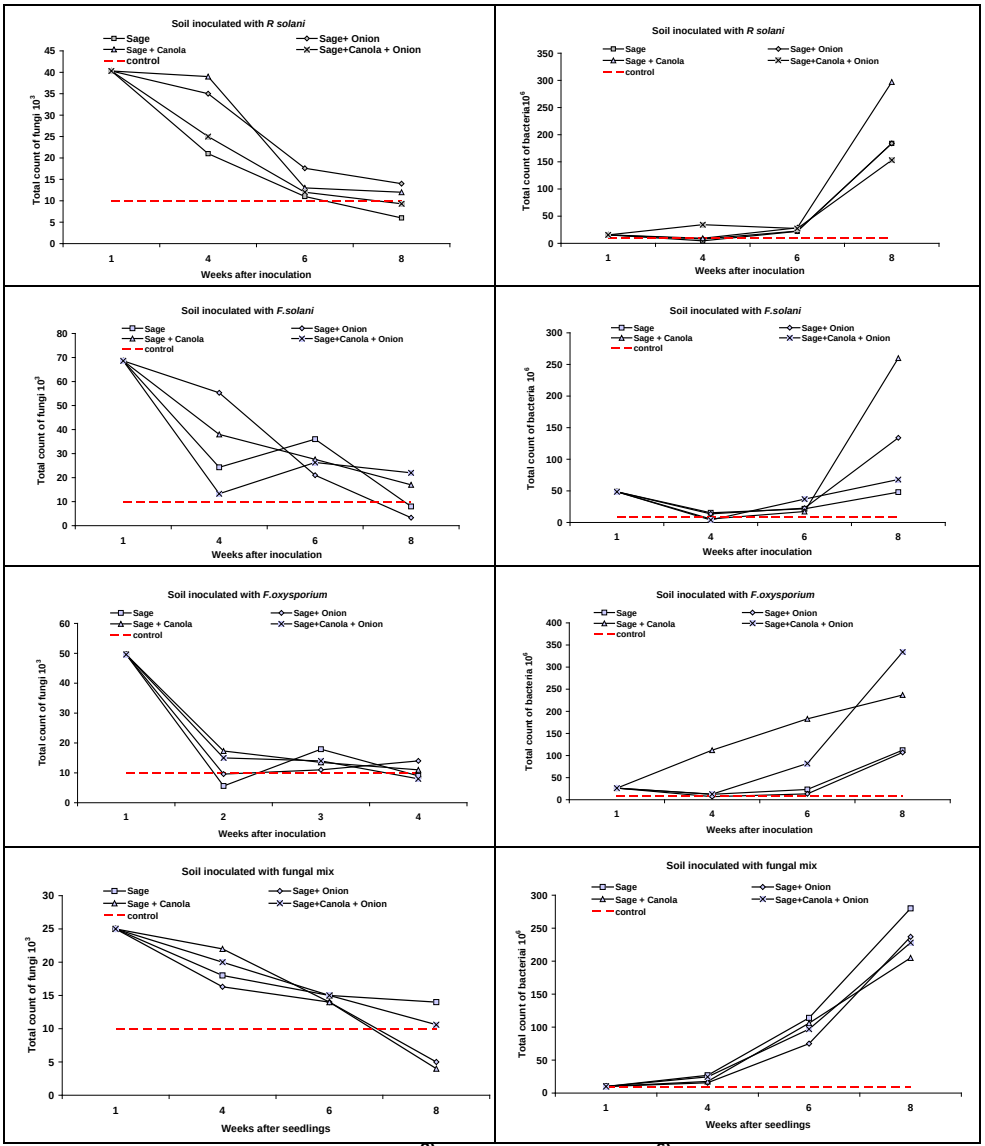

Fig. (2): Total count of fungi ($10^{3)}$ and bacteria ($10^{6)}$ as affected by different released root substances from rhizosphere of sage, canola, and onion seedlings or mixture of them at soil inoculated with *R. solani, F. solani, F. oxysporum* and fungal mixture.

*** Control treatment (starting count in non treated soil) shown as pointed line 10 (10^{3} cfu) of fungi and 9 (10^{6} cfu)of bacteria**

The results indicate that there were no significant differences of sage stand counts among all treatments in both seasons. Moreover stand count was decreased significantly after 6 months over all treatments compared with sage alone. Decreasing of stand count values by the time up to six months might be attributed to one or more of some factors including soil types, soil moisture content, inoculum density of the pathogens, other agricultural practices, cultivars, and interaction between the host and the pathogenic fungi (Satija and Indra Hoods,1987). Also differences in the expression of resistance in the field could depend upon the concentration or rate of production of constitutive antifungal components by the root (Stevenson *et al.* 1995). Moreover, pathogenesis of root rot fungi was greater in field having decomposing residues. Where pathogen infections always elicit an internal increase in allelochemicals, a response one might hypothesize would make the infected plant less tolerant of external allelochemicals that may be encountered (Patrick *et al.* 1964).

The early investigations into allelopathy were a result of crop phytotoxicity problems observed in agriculture (Putnam *et al.* 1990). Results also in Tables (2 and 3) revealed that plant fresh and dry weight of all traits were decreased significantly comparing with treatment of sage alone over two successive seasons three months from transplanting.

Also, after six months fresh and dry weight of all treatments were decreased compared with sage alone especially in case of growing sage with canola, onion and Sunflower where the reduction was highly significant. This may be attributed to the competition between different crops and the interference among different released root substances in the soil.. Many of crop rotation studies indicate the role of allelopathic effect which caused by previous plants producing allelochemicals from their living roots during their life stage (Kessavalou and Walters 1997). However, allelochemical accumulate and remain in the soil then affect the following crops and the agriculture systems. On the other hand, introducing sunflower to produce more shade over sage plant and increasing oil yield (Yanli, *et al.* 1996) was unsuccessful. Additionally, it caused harmful to other crops and severely reduced growth.

Generally, allelopathy plays a significant role in crop mixture or intercropping systems. It decrease the crop growth and yield in continues monocultures due to build up of autotoxicity and soil sickness thus crop rotation are practiced to overcome such harmful effects. Also, it plays a great role in crop mixture or intercropping systems due to inhibitory or stimulatory effects according to the crop. (Narwal *et al.*1998}.

Finally, growing sage crop as monoculture, or in multi-cropping system, with canola, onion and sunflower did not affect sage oil percentage significantly (Table 4) but growing more than one crop added more yield over the essential crop as shown in Table (5), where, canola gave average of 17.1 and 26.0 g seeds/ plant, sunflower gave 27.3 and 36.3 g seeds/ plant and

onion gave 33.1 and 45.2 g bulb/plant respectively at the first and second season.

Table (2): Stand count as well as plant fresh and dry weight (g) of sage plants three months after transplanting in the field experiments conducted at El Sheike Zowaied Experimental Station over two successive seasons (2005-2006 and 2006-2007).

TREATMENT	Stand Count			Fresh Weight(g)			Dry Weight (g)		
	S1	S2	Mean	S1	S2	Mean	S1	S2	Mean
Sage (S)	8.00	8.33	8.2	38.50	48.20	43.4	12.23	16.27	14.3
(S)+Onion (Oni)	7.00	6.00	6.5	14.37	17.07	15.7	4.17	4.80	4.5
(S) +Canola(Can)	7.00	6.33	6.7	18.33	19.00	18.7	4.83	8.73	6.8
(S)+Sunflower(Sun)	8.00	8.33	8.2	21.40	31.73	26.6	6.07	12.47	9.3
(S)+Oni+Can	7.00	7.00	7.0	10.43	16.47	13.5	3.07	4.83	4.0
(S)+Oni+Sun	6.33	6.67	6.5	22.20	22.20	22.2	6.13	6.80	6.5
(S)+Can+Sun	7.67	7.00	7.3	7.73	9.13	8.4	2.33	2.90	2.6
(S)+Oni.+Can+ Sun	7.67	7.67	7.7	10.37	16.80	13.6	3.17	4.63	3.9
Mean	7.3	7.2	7.3	17.9	22.6	20.3	5.3	7.7	6.5
LSD 0.05%	2.52	2.18	1.87	2.90	5.27	3.36	1.53	2.18	1.28

***Stand count calculated as a number of survival plants after 3 months**
S1=first season S2=second season

Table (3): Stand count as well as plant fresh and dry weight (gm) of sage plants six months after transplanting in the field experiments conducted at El- Sheike Zowaied Experimental Station over two successive seasons (2005-2006 and 2006-2007).

Treatments	Stand Count*			Fresh Weight(g)			Dry Weight (g)		
	S1	S2	Mean	S1	S2	Mean	S1	S2	Mean
Sage (S)	5.00	4.00	4.5	30.13	35.33	32.7	8.50	9.93	9.2
(S)+Onion (Oni)	4.67	3.33	4.0	25.83	22.60	24.2	8.00	6.57	7.2
(S) +Canola(Can)	5.33	3.67	4.5	31.07	33.77	32.4	8.50	9.47	8.9
(S)+Sunflower(Sun)	5.00	3.67	4.3	23.83	25.77	24.8	7.20	6.07	6.6
(S)+Oni+Can	5.67	3.67	4.7	24.10	25.07	24.6	7.37	8.80	8.1
(S)+Oni+Sun	4.33	5.00	4.7	22.73	26.37	24.6	7.50	7.90	7.7
(S)+Can+Sun	5.67	5.00	5.3	22.10	21.57	21.8	6.20	6.40	6.3
(S)+Oni.+Can+ Sun	5.67	3.33	4.5	16.60	14.23	15.4	4.60	3.93	4.3
Mean	5.2	4.0	4.6	24.5	25.6	25.1	7.2	7.4	7.3
LSD 0.05%	3.36	3.28	2.35	3.43	6.18	3.36	1.46	2.53	1.24

***Stand count calculated as a number of survival plants after 6 months.**
S1=first season S2=second season

Table (4): Oil percentage of sage plants three and six months after transplanting in the field experiments conducted at El- Sheike Zowaied Experimental Station over two successive seasons (2005-2006 and 2006-2007).

Treatments	Three months			Six months		
	S1	S2	Mean	S1	S2	Mean
Sage (S)	3.1	3.0	3.1	3.0	3.4	3.2
(S)+Onion (Oni)	2.9	3.3	3.1	2.6	2.8	2.7
(S) +Canola(Can)	3.3	3.8	3.6	2.3	2.5	2.4
(S)+Sunflower(Sun)	3.1	3.7	3.4	2.5	2.7	2.6
(S)+Oni+Can	3.4	3.9	3.7	2.5	2.8	2.7
(S)+Oni+Sun	3.0	3.3	3.2	2.6	2.8	2.7
(S)+Can+Sun	3.3	3.9	3.6	3.0	2.9	3.0
Mean	3.4	4.0	3.7	3.2	3.1	3.2

S1=first season S2=second season

Table (5): Yield /plant of onion, canola and Sunflower crops in the field experiments conducted at El- Sheike Zowaied Experimental Station over two successive seasons (2005-2006 and 2006-2007).

Treatment	Onion bulb (g/plant)		Treatment	Sunflower seed (g /plant)		Treatment	Canola seed (g /plant)	
	S1	S2		S1	S2		S1	S2
Onion (Oni)	48.8	72.5	Sunflower(Sun)	23.6	31.4	Canola(Can)	18.1	27.2
Oni+Can	20.4	28.3	Sun +Oni	34.7	46.0	Can +Oni`	18.0	28.0
Oni+Sun	43.1	76.4	Sun +Can	29.1	38.7	Can +Sun	13.7	20.8
Oni +Sun +Can	32.5	20.6	Sun + Oni +Can	21.7	29.0	Can+ Sun + Oni	18.6	27.9
Mean	33.1	45.2	Mean	27.3	36.3	Mean	17.1	26.0

S1=first season S2=second season

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تأثير التعاقب المحصولى على إصابة نبات المريمية بمسببات الذبول واعفان الجذور

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الملخص العربي

تم إجراء هذا البحث– تحت ظروف الحقل– في محطة بحوث الشيخ زويد بالعريش وكذلك في الصوبة بمركز بحوث الصحراء لدراسة التأثيرات الاليلوباثية لبعض النباتات مثل البصل والكانولا مع التظليل بعباد الشمس على إنتاجية ومقاومة نبات المريمية لمسببات امراض الذبول واعفان الجذور. ولقد تم عزل الفطريات المسببة للذبول واعفان الجذور من نباتات مريمية مصابة منزرعة بالمحطة وتم تعريف هذه الفطريات على انها:

Pythium aphanidermatum , Fusarum solani, F. oxysporum and Rhizoctonia solani

وقد اعطى مخلوط تلك الفطريات وكذلك فطر

Pythium aphanidermatum, Rhizoctonia solani and Fusarium solani كل على حدى أعلى تأثير على حدوث الإصابة على الترتيب فى اختبارالقدرة المرضية.

اوضحت نتائج الدراسة المعملية أن لإفرازات الجذورالمستخلصة من تربة منزرع بها نبات المريمية كانت ذات تأثير على نموالفطريات المدروسة *خ. ثغ.* ***Rhizoctonia solani*** وكذاك إفرازات الكانولا والبصل. بينما لم يتأثر نموالفطر ***Pythium aphanidermatum*** . وقد انخفض عدد الفطريات الموجود فى منطقة حول الجذور للنباتات المنزرعة فى الصوبة. وبالعكس انخفضت الاعداد الكلية للبكتريا بعد أربع أسابيع من زراعة النباتات فى الصوبة ثم بدأ العدد فى الزيادة تدريجيا من ٦–٨ اسابيع فى كل المحاصيل المختبرة .

وفى تجربة الحقل ،التي اجريت بمحطة بحوث الشيخ زويد لموسمين متتالين (٢٠٠٦/٢٠٠٥ و ٢٠٠٧/٢٠٠٦) لم يكن هناك اختلافات فى عدد النباتات المصابة خلال فترتى القطع

لموسيمين متتتالين. كما أن الوزن الغض والجاف للمريمية قد انخفض بالمقارنة بزراعة المريمية منفردة فى الموسيمين هذا ولم تتاثر نسبة الزيت الطيار فى المريمية بالمعاملات المختلفة.

وبصفة عامة، فإن زراعة المريمية مع عدد من المحاصيل الأخرى خاصة البصل والكانولا وعباد الشمس لم يكن لـة تـأثيرا معنويا فـى زيـادة اعداد نباتات المريميـة الحيـة بالحقل ولـم تتـاثر نسبة الزيت الطيار تحت ظروف الحقل، الا ان ذلك كـان اكثرفائدة حيث تزرع عدد من المحاصيل التـى يمكن الحصول منها على عائد من نفس قطعة الأرض.

Effect of crop sequence on the infection of sage plant with……..

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