Int.J.Curr.Microbiol.App.Sci (2016) *5*(4): 850-863

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 5 Number 4 (2016) pp. 850-863**
Journal homepage: http://www.ijcmas.com

Original Research Article http://dx.doi.org/10.20546/ijcmas.2016.504.097

Effect of Intercropping and Phosphorus Fertilizer Treatments on Incidence of *Rhizoctonia* Root-Rot Disease of Faba Bean

Abeer M. Mousa[1]* and Sahar A. El-Sayed[2]

[1]Soil and Water Research Department, Nuclear Research Center, Atomic Energy Authority, Cairo, Egypt
[2]Plant Pathology Institution, Agriculture Researcher Center, Egypt
**Corresponding author*

Keywords

Faba bean, Intercropping, phosphorus fertilizer, *Rhizoctonia solani* and root-rot

Article Info

Accepted:
25 March 2016
Available Online:
10 April 2016

A B S T R A C T

In greenhouse and field experiments, conducted in two successive winter seasons 2012/2013& 2013/2014 the effect of intercropping three cultivars of fababean (Giza3 Mohassan & Giza 40 and Sakha1) with wheat (Sakha 93). As well as the effect of phosphorus fertilizer treatments on incidence of root rot of three cultivars faba bean, as well as yield component three cultivars faba bean, as well as yield component was studied. Application of phosphorus fertilizer (100 and 200 Kg/fed) as superphosphate (15.5 % P_2O_5) before planting caused a reduction in incidence and disease severity on plants of the three cultivars of faba bean in greenhouse and field experiments. In field experiments, were intercropping and phosphorus fertilization at (100 and 200 Kg/fed) respectively, which reduced the root-rot diseases. Intercropping three cultivars of faba bean (Giza 3 Mohassan Giza 40 and Sakha 1) with wheat Sakha93 and phosphorus fertilizer significantly increased yield characters i.e., plant height, number of branches, number of pods plant, 100 seeds/weight and seed weight ardad/fed.

Introduction

Faba bean (*Vicia faba* L.) is used as an important human food in developing countries and as an animal feeds mainly for pigs horses, poultry and pigeons in industrialized countries. Feeding value of faba bean is high and this legume has beanconsiders a meat extender of substitute due to its high protein content (20-41 %) (Chavan *et al.*, 1989). Root-rot and wilt diseases caused by several soil borne fungal pathogens are wide spread and serious in many crop cultivated in different soil types.

Faba bean is subjected to attack by many pathogenic organisms wherever the crop grown. In This respect, root-rot disease is among the most important fungal diseases affecting faba bean production in Egypt. Omer (1986) tested several pathogens, and found that *Rhizoctonia solani* was the most pathogenic in causing root-rot disease. Metwely (2004) found that *Rhizoctonia solani isolated* from Kafr El- sheikh governorate was more virulent than that of Sharkia governorate. Several root-rot and

wilt pathogens such as *Rhizoctonia solani, Fusarium solani, Macrophomina phaseolina* are reported to attack faba bean roots and stem base causing serious losses in seed germination and plant stand as well (Adel-kader *et al.,* 2011). Intercropping can be defined as the growth of two or more crops in the same space at the same time (Andrews and Kassam 1976).

This technology may enable the intensification of a forming system, leading to increased general productivity and biodiversity in the intercropped fields as compared to monocultiveres of the individual intercropped species (Vandermeer *et al.,* 1998). Furthers, intercropping can be advantageous for controlling plant diseases such as common bacterial blight and fungal rust (Boudreau and Mundt 1992, Fininsa 1996). In organic field trials, a disease reduction has bean observed in intercrops of barley (*Hordeum vulgare L.*) with pea (*Pisum sativum L.*), faba bean disease reduction has been observed in intercrops of barley (*Hordeum vulgare L.*) with pea *(Pisum sativum L.*), faba bean (*Vicia faba L.*) and lupin (*Lupinus sp.*) Kinane and Lyngkjaer 2002). In addition increasing diversity through intercropping many reduce pest and disease incidence leading to less pesticide application increased habitat for beneficial insects and microorganisms, and an overall reduction in farm inputs (Kontturi *et al.,* 2011). Development of disease resistant variety was the most economical mean of control. Phosphorus has been called (the key to life) because it is directly involved in most life process. It exerts many and varied functions in plant metabolism and hence inadequate phosphate supply to the plant seriously affect numerous metabolic processes. Singh *et al.,* (1981) found that phosphorus applied at 60 and 90 Kg/ha significantly increased yields in comparison with 30 Kg P. When four level of P (0 , 30, 60 and 90 Kg/ha) were applied. Negm *et al.,* (1992) reported that phosphorus application increased the number of branches and flowers per plant. Jain *et al.,* (1999) and Khurana and Sharma (2000) showed that the combined inoculation of *Rhizobium* and phosphate solubilizing bacteria increased nodulation, yield of pea and total biomass of chickpea compared with either individual inoculation or the uninoculated control (Rudresh *et al.,* 2005). Rania *et al.,* (2010) found that the soil application of phosphorus fertilizer increased plant height, number of branches/plant, number of pods/plant, 100 seed weight/g and seed weight ardab/fed in both seasons of the three legume verities. Jafar (2014) found that, application of biological phosphorus fertilizer significantly increased the yield and yield components in faba bean plant.

Materials and Methods

This work has been combined out at experimental Farm of Sers El-layian Agricultural Research station (SEARS), Minufiya Governorate, Egypt. The mechanical and chemical properties of the experimental soil for the upper foot layer (0-30 cm) and available phosphorus of the experimental soil table (1) were determined before sowing in the two seasons according to the method described by (Chapman and Pratt 1961) and presented in table (1). Mechanical and chemical properties of the experimental sites revealed that the texture of the soil was sandy clay with a low P concentration the two growing seasons table (1)

Source of the Pathogen

A pathogenic isolate of *Rhizoctonia solani* was selected from the gene bank of the Plant Pathology Research Institute - Agricultural

Research Centre. The isolate was tested to confirm its virtence.

Greenhouse Experiments

Determination the Effect of Intercropping between Three Cultivars Faba Bean and Wheaton Root-rot Incidence

Three cultivars faba bean C.V. Giza 3 Mohassan, Giza 40 and sakha1 were intercropping with wheat (sakha 93) under greenhouse conditions atSers El-layian Agricultural Research station, in 2012 growing season. Pots (25 cm) were sterilized by dipping in 5% formalin solution for 5 min and then left in a pone air till dryness. Soil sterilization was accomplished with 50 % formalin solution mixed thoroughly, covered with plastic sheet for one week and then the plastic sheet was removed in order to complete formalin evaporation. Soil infestion with each individual fungus *R. solani*was carried out at the rate of the rate of 3.5 % of soil weight. Fungus was individually grown on sand-barley (SB) medium (25 clean sand 759 barley and enough water to cover the mixture).

Flasks contained sterilized medium were incubated with each particular fungus and incubated at 25^{o}C for two weeks. Potted soil was watered daily for week to enhance fungal growth. Soil of control pots was mixed with the same amount of sterilized sand- barley (SB) medium.

Five surface sterilized seeds of faba bean were sown in the opposite side with the transplanted wheat (Sakha 93) in each pot. While five faba bean seeds were sterilized and only treatment. Percentage of pre- and post-emergence damping –off and survival plant were recorded at 15 and 30 days. While disease severity was estimated at 45 days after sowing (Soleman *et al.,* 1988).

Determination the Effect of Different Rates from Phosphorus Fertilizer Treatments on Root-rot Incidence

Pots (25 cm) filled with 5 Kg clay soil were sterilized as mentioned before than the soil was infested with the inocula of the fungus (*R. solani*) at rate of 3.5 % w/w. as mentioned before. The phosphorus fertilizer rates (0,100 and 200 kg/fa) was mixed with the top later of the soil before sowing. Five seeds of fababean (Giza 3 Mohassan, Giza 40 and sakha1 were sown in each pot, and three replicates were used for each treatment. Percentages of pre-and post-emergence damping-off as well as healthy survival plants in each treatment were determined 15 days after sowing, respectively using the next formula according to El-Helaly *et al.*,(1970) and disease severity was estimated at 45 days after sowing.

Field Experiments

Determination the Effect of Intercropping between Three Cultivars of Faba Bean and Wheat (Sakha 3) in Naturally Infested Soil

These experiments were conducted in naturally infested soil at Sers El-layian Agriculture Research Station (SEARS),Munfiya governorate, Egypt, during two winter season (2012/2013). The experimental layout was in completely randomized block design. The plot of 3 m x 3.5 m was used in this study. Four plots contained five rows (apart) per each assembled treatment wheat Shakha93 was individually intercropping with each of the tested three cultivar of faba bean (c.v. Giza 3 Mohassan Giza 40 and sakha 1) were used: 2 row (faba bean with 2 row wheat), 3 row (faba bean with 3 row wheat) and 2 row (faba bean with 4 row wheat).

Control plot had five rows of faba bean plants only.

The recorded data were:-

Pre-emergence damping-off after 15 days from sowing.

Post-emergence damping-off and survival plants after 30 days from sowing.

Average plant height after harvest, number of branches, number of pods/plant, 100 seeds/weight and total yield/fed were recorded.

Determination of the effect of fertilization phosphorus treatments faba bean in naturally infested soilon root-rot disease

Two field experiments were carried out in the experimental Farm of SEARS,Munfiya governorate, Egypt, during two winter season (2012/2013) and (2013/2014). Each experiment included three cultivars of faba bean (Giza 3 Mohassan Giza 40 and Sakha 1) in the main plots extraction solution of phosphorus fertilizer was prepared by dissolved calcium superphosphate 15.5 % (P_2O_5). For each experiment, a spilt – split plots design with three replicates of five rows. The plot size was 6 cm consisting of five rows, each row 3 meter long spaced at 60 cm. the rates of phosphorus fertilization (0,100 and 200 kg/fa) were applied as super phosphate 15.5 % P_2O_5 before planting.

The recorded data were:-

Pre-emergence damping-off after 15 days from sowing.

Post-emergence damping-off and survival plants after 30 days from sowing.

Average plant height, fresh weight and dry weight after 45 days from sowing.

At maturity, plants were harvest and the following yield characters i.e. plant height, number of branches, number of pods/plant, 100 seeds/weight and total yield/fed were recorded.

Seed samples of each crops were taken and dried, then ground to powder for chemical analysis. Nitrogen content was determined using improving macro-kjeldahl method (A.O.A.C. 1980). The percentage of seed protein content was calculated by multiplying the percentage of nitrogen content was determined calorimetrically using spectrophotometer according to Chapman and Pratt (1961).

Statistical Analysis

All collected data were subjected to statistical analysis for each season and to combined analysis over years according to Gomez and Gomez (1984).

Results and Discussion

Effect of Intercropping between Three Cultivars of Faba Bean with Wheat Plants in Greenhouse Conditions

As shown in table (2) intercropping three faba bean with wheat significantly reduced both pre- and post-emergence damping-off root rot disease caused by the fungal pathogens. *Rhizoctonia solani* compared to untreated one (control). However all cultivars significantly reduced the disease severity of root-rot symptoms caused by *Rhizoctonia solani*.

Effect of Super Phosphate on Root-rot Incidence, under Greenhouse Condition

Data in table (3) clearly show the effect of super phosphate (0, 100, 200 Kg/fed) on the percentage of pre- and post- emergence damping-off, root-rot disease severity

caused by the fungal pathogens, *R. soloni*. All tested phosphorus fertilizer significantly reduced the development of root-rot disease, the highest percentage of survival plant in all three cultivars faba bean was resulted in soil fertilized with super phosphate at 200 Kg/ fed).

Effect of Intercropping between Three Cultivars of Faba Bean with Wheat on Root-rot Under Field Conditions

This experiment was conducted during two successive seasons (2012/2013) and (2013/2014) to study the effect of intercropping between three cultivars of faba bean with wheat on root-rot infestion and some related growth characters. In this respect data in table (4) show that the intercropping in form of row (faba bean X 4 row wheat), of the first season (2012/2013) inciteda significant reduction in pre-emergence and post-emergence damping off of three cultivars faba bean with wheat respectively.

In the second season similar trend of result was detected with minor variation in the rank. Healthy fababean survival plants were increased in case of three cultivars of faba bean with wheat than the corresponding faba bean with wheat than the corresponding faba bean grown alone.

As for the effect of intercropping between three cultivars of faba bean with wheat on disease incidence, growth and yield component of faba bean under field conditions, the obtained data in table (5) revealed significant positive effects of intercropping when compared with the control where they lowered the disease incidence while increased the plant height, number of branches, number of pods per plant, 100-seed weight and seed weight ardab/fed.

Effect of Phosphorus Fertilizers on the Incidence of Three Cultivars Faba Bean Root- rot under Field Conditions

Data in table (6) clearly show the influence of super phosphate (0, 100 and 200 kg/fed.) on pre- and post- emergence damping-off, three cultivars of faba bean under field conditions during two seasons. The results revealed that application of both fertilizer rates (100 and 200 kg/fed) significantly reduced pre- and post- emergence damping-off when compared to the untreated plants (control). Both fertilizer rates (100 and 200 kg/fed.) the highest level of the disease control with the highest number of survived plants. In general fertilizer applied degree offered by superphosphate fertilizer applied at rate of 200 kg/fed was much higher then untreated control.

Data in table (7,8) revealed of significant effect of fertilization with super phosphate over the control where these effect were shown in case of plant height, fresh weight, dry weight and plant height after harvest, number of branches, number of pods, 100 seed weight and seed weight ardab/fed. the obtained results were confirmed from the two experiments conducted in 2012/2013-2013/2014 seasons respectively. However, the great effect on plant growth and yield component was given by super phosphate at 200 kg/fed) application compared with non-fertilized control.

Effect of Intercropping Three Cultivars of Faba Bean with Wheat and Super Phosphate Fertilizers on Chemical Composition of Faba Bean Plants

The present results indicated that the intercropping three cultivars of faba bean and super phosphate fertilizers with different rates applied to soils (0,100 and 200 kg/fed) caused significant increase in phosphorus, nitrogen contents in there cultivars faba bean.

Table.1 Physical and Chemical Properties of the Experimental Soil for Upper Foot Layer (0-30 Cm) in the Two Growing Seasons

seasons	sites	Texture	Physical properties				Chemical properties												
			coarse	Fine	silt	clay	pH (1:2.5)	E.C.mmhas/cm 20 °C	$Caco_3$ %	Cations ml/100 g				Anions/ml/ 100 g				N %	P %	K %
										Ca^{++}	Mg^{++}	Na^{+}	K^{+}	Co_3^{--}	HCo_3^{-}	Cl^{-}	So_4^{--}			
2012/2013	1	Sandy clay	1.7	51.1	25	19	7.40	0.37	2.3	1.3	1.10	1.14	0.43	---	1.0	1.3	1.90	0.12	0.11	0.02
2013/2014	2	Sandy clay	1.9	50.9	26	20	8.10	0.38	2.5	1.6	1.25	1.20	0.50	0.5	1.4	1.6	1.21	0.18	0.13	0.04

Table.2 Effect of Intercropping Three Cultivars of Faba Bean and Wheat, Grown in Soil Infested with Specific Pathogen Species Of Rhizoctoniasoloni under Greenhouse Conditions

Cultivars	Pre-emergence damping-off	Post-emergence damping-off	Survival plant	Disease severity
Faba bean (Giza 3 Mohassan)+ wheat	13.33	13.33	73.34	40.00
Faba bean (Giza 40) + wheat	16.67	18.67	64.66	53.33
Faba bean (Sakha 1) + Wheat	10.0	13.33	76.67	30.00
Faba bean (Giza 3 Mohassan)	23.33	20.0	56.67	63.33
Faba bean (Giza 40)	26.62	23.33	50.05	68.88
Faba bean (Sakha 1)	18.86	13.33	67.81	43.33
L.S.D at 0.05	8.21	8.34	12.83	6.91

Table.3 Effect of Superphosphate on Root-rot Incidence, under Greenhouse Condition

Cultivars of faba bean	Concentrations of superphosphate as kg/fed	fungus	Pre-emergence damping –off %	Post-emergence damping off %	Survival plant %	Disease severity %
Giza 3 Mohassan	10	*R. solani*	20.00	13.33	66.67	55.55
	100		10.00	10.0	80.0	40.00
	200		6.67	3.37	89.96	29.99
	Mean		12.22	8.9	78.88	41.85
Giza 40	10	*R. solani*	23.33	16.67	60.0	67.77
	100		20.00	13.33	66.67	55.55
	200		13.33	10.00	78.67	36.66
	Mean		18.99	13.33	67.78	53.32
Sakha 1	0	*R. solani*	10.00	10.00	80.0	40.00
	100		6.67	6.67	86.66	28.88
	200		3.34	3.33	93.33	20.00
	Mean		6.66	6.67	86.66	29.63
L.S.D at 0.05			7.53	7.15	11.23	5.89

Table.4 Effect of Intercropping Three Cultivars of Faba Bean with Wheat Incidence of Root-Rot Disease during Two Seasons Under Field Conditions

cultivars	Intercropping	2012/2013			2013/2014		
		Pre-emergence damping –off %	Post-emergence damping off %	Survival plant %	Pre-emergence damping –off %	Post-emergence damping off %	Survival plant %
Giza3 Mohassan	2 rowX 2 row (wheat)	0.0	6.67	93.33	3.33	6.67	90.0
	3 rowX 3 row (wheat)	3.33	3.33	93.34	6.67	6.67	86.66
	2 rowX 4 row (wheat)	0.0	10.0	90.0	3.33	10.0	86.67
	Faba bean alone	16.67	16.67	66.66	16.67	20.00	63.33
	mean	5.00	9.17	85.83	7.5	10.84	81.67
Giza 40	2 rowX 2 row (wheat)	3.33	10.0	86.67	6.67	6.67	86.66
	3 rowX 3 row (wheat)	10.00	10.0	80.00	6.67	10.0	83.33
	2 rowX 4 row (wheat)	6.67	10.0	83.33	13.33	10.0	76.67
	Faba bean alone	20.0	16.67	63.33	20.0	13.33	66.67
	mean	10.0	11.67	78.33	11.67	10.0	78.33
Sakha1	2 rowX 2 row (wheat)	0.0	3.33	96.67	3.33	3.34	93.33
	3 rowX 3 row (wheat)	3.33	0.0	96.67	3.33	6.67	90.0
	2 rowX 4 row (wheat)	0.0	0.0	100.0	0.0	3.33	96.67
	Faba bean alone	10.0	20.0	70.0	13.33	10.0	76.67
	mean	3.33	5.83	90.87	4.99	5.84	89.17
	L.S.D at 0.05	3.15	2.91	6.00	4.35	4.83	8.55
		6.11	6.18	8.91	6.73	4.00	10.23
		8.27	6.33	10.14	8.20	7.38	14.41

Table.5 Effect Intercropping Three Cultivars of Faba Bean with Wheat on Some Yield Component Plant during Two Seasons under Field Conditions

cultivars	Intercropping	2012/2013					2013/2014				
		Plant height after harvest	Branches plant	No seeds pods	100 seed weight g	Seed weight ardab/fed	Plant height after harvest	Branches plant	No seeds pods	100 seed weight g	Seed weight ardab/fed
Giza3 Mohassan	2 rowX 2 row (wheat)	100.0	3.00	19.05	83.00	3.31	103	2.90	18.0	81.0	3.00
	3 rowX 3 row (wheat)	101.0	3.05	21.00	89.00	3.55	105	3.11	20.0	85.0	3.30
	2 rowX 4 row (wheat)	98.0	3.95	23.00	92.00	4.00	101	3.50	22.0	88.0	3.50
	Faba bean alone	90.1	2.99	14	75.00	3.00	93	2.75	12.0	73.0	2.88
	mean	97.28	3.25	19.26	84.75	3.47	100.5	3.07	18	81.75	3.17
Giza 40	2 rowX 2 row (wheat)	90.0	2.90	17.0	70.0	2.90	85.0	2.33	16.0	68.0	2.70
	3 rowX 3 row (wheat)	93.0	3.0	19.0	72.0	2.95	89.0	2.67	18.0	70.0	2.90
	2 rowX 4 row (wheat)	90.0	3.0	20.0	75.0	3.00	93.0	2.77	19.0	75.0	3.15
	Faba bean alone	85.0	2.33	12.0	60.0	2.55	81.0	2.10	11.0	58.0	2.40
	Mean	89.5	2.81	17.00	69.25	3.09	87	2.47	16.00	67.75	2.97
Sakha1	2 rowX 2 row (wheat)	109.0	3.55	22.0	90.0	4.30	110.0	3.14	23.0	88.0	4.00
	3 rowX 3 row (wheat)	113.0	3.95	24.0	95.0	4.40	115.0	3.31	24.0	93.0	4.30
	2 rowX 4 row (wheat)	108.0	4.00	26.0	98.0	4.60	112.0	3.50	25.0	95.0	4.50
	Faba bean alone	101.0	3.40	16.0	80.0	3.90	105.0	3.00	17.0	78.0	3.73
	Mean	107.75	3.73	22.00	90.75	4.3	110.5	3.24	22.25	88.5	4.13
L.S.D. at 0.05		1.08	0.15	0.43	0.32	0.61	1.22	0.11	0.47	0.35	4.13
		2.91	0.21	1.33	1.00	0.88	1.98	0.28	1.09	1.19	0.12
		3.50	0.53	1.52	1.24	1.18	3.67	0.57	1.58	1.40	0.22

Table.6 Effect of Different Rates (0,100,200 Kg/Fed) of Superphosphate Soil Fertilizer on Incidence of Root-Rot Disease of Cultivars of Faba Bean during Two Seasons under Field Conditions.

Cultivars	Concentrations of superphosphate as kg/fed	Disease incidence					
		2012/2013			2013/2014		
		Pre-emergence damping – off %	Post-emergence damping-off %	Survival plant %	Pre-emergence damping – off %	Post-emergence damping off %	Survival plant %
Giza3 Mohassan	0	16.67	10.0	73.33	16.67	13.33	70.0
	100	6.67	3.3	90.0	10.00	13.33	76.67
	200	3.34	3.33	93.33	3.34	6.67	89.99
	Mean	8.89	5.55	85.55	10.00	11.11	78.89
Giza 40	0	20.0	16.67	63.33	23.34	18.33	58.33
	100	16.67	13.33	70.0	20.00	16.67	63.33
	200	10.0	10.00	80.0	16.67	13.33	70.00
	Mean	15.56	13.33	71.11	20.00	16.11	63.89
Sakh1	0	10.0	3.34	86.66	13.34	10.0	76.66
	100	0.0	3.34	96.66	6.67	3.33	90.0
	200	0.0	0.00	100.0	3.34	3.33	93.33
	Mean	3.33	2.22	94.44	7.78	5.55	86.66
cultivars treatment		4.95	4.01	5.83	5.10	4.87	8.76
interaction		6.73	7.13	8.85	8.23	4.92	11.18
L.S.D. at 0.05		8.96	8.20	10.18	9.13	7.95	14.90

Table.7 Effect of Different Rates (0,100 and 200 Kg/Fed) of Superphosphate on Some Growth Characters of Three Cultivars of Faba Bean Grown during Two Seasons under Field Conditions

Cultivars	Super phosphate (Kg/fed)	Crop parameters of faba bean plant					
		2012/2013			2013/2014		
		Plant height (cm)	Fresh weight plant (g)	Dry weight plant (g)	Plant height (cm)	Fresh weight plant (g)	Dry weight plant (g)
Giza3 Mohassan	0	29.13	9.88	0.91	28.12	9.00	0.86
	100	32.55	10.00	0.94	33.18	10.35	0.89
	200	33.00	10.13	0.95	35.15	11.00	0.91
	mean	31.56	10.0	0.93	32.15	10.12	0.89
Giza 40	0	24.0	7.66	0.78	25.21	8.65	0.80
	100	26.0	9.33	0.89	27.19	10.17	0.90
	200	29.0	10.00	0.91	28.67	10.30	0.90
	mean	26.33	8.99	0.86	27.02	9.71	0.87
Sakha1	0	32.28	10.35	1.13	33.08	11.00	1.23
	100	34.00	11.67	1.16	35.07	12.65	1.29
	200	37.00	12.00	1.20	38.13	12.90	1.33
	mean	34.43	11.34	1.16	35.43	12.18	1.28
cultivars treatment		0.69	0.21	0.01	0.79	0.31	0.12
interaction		0.98	0.13	0.12	1.10	0.29	0.09
L.S.D. at 0.05		1.43	0.36	0.16	1.32	0.70	0.18

Table.8 Effect of Superphosphate on Some Yield Component of Three Cultivars of Faba Bean under Field Conditions

Cultivars	Superph-osphate Kg/fed	2012/2013					2013/2014				
		Plant height (cm)	Branches/ plant	No seeds pods	100 seed weight (g)	Seed weight ardab/fed	Plant height (cm)	Branches/ plant	No seeds pods	100 seed weight (g)	Seed weight ardab/fed
Giza3 Mohassan	0	92.0	2.65	18.00	65	3.35	89	2.50	17	70	3.10
	100	95.0	2.95	23.0	75	3.80	93	2.65	22	75	3.50
	200	98.0	2.98	24.0	80	4.00	95	2.70	22	80	3.80
	Mean	95	2.86	21.67	73.33	3.72	92.33	2.62	20.33	75	3.47
Giza 40	0	85	2.00	13	65	3.13	83	2.00	11	60	3.00
	100	89	2.20	16	76	3.20	88	2.23	15	65	3.25
	200	90	2.33	17	70	3.17	89	2.33	16	70	3.35
	Mean	88	2.18	15.33	68.33	3.27	86.67	2.19	14	65	3.20
Sakha1	0	95	2.55	19	80	3.90	93	2.60	20	85	3.70
	100	100	2.60	26	90	4.25	99	2.70	26	90	4.00
	200	103	2.65	27	95	4.40	101	2.70	28	95	4.50
	Mean	99.33	2.60	24	88.33	4.18	97.67	2.67	24.67	90	4.07
L.S.D. at 0.05		1.50 3.04 3.55	0.15 0.31 0.63	0.54 1.31 1.59	0.40 0.98 1.35	0.66 1.00 1.60	1.27 2.13 3.80	0.11 0.34 0.65	0.61 1.14 1.68	8.35 1.42 1.32	0.11 0.31 0.91

Table.9 Effect of Superphosphate and Intercropping Three Cultivars of Faba Bean with Wheat Treatments on Chemical Composition of Three Cultivars of Faba Bean under Field Conditions

Cultivars	Treatments	2012/2013			2013/2014		
		P %	N %	Protein %	P %	N %	Protein %
Giza3 Mohassan	0	0.40	4.15	25.94	0.37	4.10	25.63
	100	0.50	4.50	28.13	0.47	4.40	27.50
	200	0.57	4.80	30.0	0.54	4.75	29.69
Giza 40	0	0.33	3.99	24.94	0.32	3.88	24.25
	100	0.40	4.15	25.94	0.38	4.12	25.75
	200	0.45	4.30	26.88	0.43	4.25	26.56
Sakha1	0	0.44	4.66	29.13	0.41	4.63	28.94
	100	0.52	4.90	30.63	0.49	4.85	30.31
	200	0.59	5.00	31.25	0.55	4.90	30.63
Giza3 Mohassan	2 row X 2 row (wheat)	0.36	4.00	25.63	0.33	4.00	25.00
	3 row X 3 row (wheat)	0.45	4.40	27.50	0.44	4.35	27.19
	2 row X 4 row (wheat)	0.53	4.60	28.75	0.50	4.55	28.44
	Faba bean alone	0.35	4.00	25.00	0.32	3.95	24.69
Giza 40	2 row X 2 row (wheat)	0.32	3.91	24.43	0.31	3.77	23.56
	3 row X 3 row (wheat)	0.36	4.00	25.00	0.32	3.98	24.88
	2 row X 4 row (wheat)	0.40	4.10	25.63	0.36	4.00	25.00
	Faba bean alone	0.30	4.88	24.25	0.30	3.70	23.13
Sakha1	2 row X 2 row (wheat)	0.42	4.13	25.81	0.38	4.20	26.25
	3 row X 3 row (wheat)	0.46	4.50	28.13	0.44	4.45	27.81
	2 row X 4 row (wheat)	0.55	4.70	29.38	0.53	4.68	29.25
	Faba bean alone	0.40	4.00	25.0	0.36	4.10	25.63

The present results in table (9) are agreed with those obtained by Mengle and Krikby (1987). They found that, in seeds and grains, P contents in the range of 0.4 to 0.5 % in the dry matter.

Faba bean (*Viciafaba L.*) is one of the most important legume crops. It is infested with many fungal pathogens causing considerable yield losses where damping-off, root-rot, wilted diseases affecting faba bean production in Egypt Abdel-Kader *et al.,* (2011). In this study induced resistance against root-rot were shown when intercropping and fertilization also decreased the fungal growth of *R. soloni* in vivo. The greenhouse results indicate that such intercropping reduce the percentage of pre-emergence and post-emergence damping-off. This results are agreement with the finding of (Boudreau and Mundt 1992, and Fininsa 1996) and (Kinane and Lyngkjaer 2002). It seems that intercropping affected positively to somewhat faba plant height. Meanwhile, the results revealed that intercropping three cultivars of faba bean (Giza 3 Mohassan, Giza 40 and sakha 1) with wheat sakha 93 increased significantly plant height after harvest, number of branches, plant number of pods/plant, 100 seed weight/g and seed weight ardab/fed in both seasons of the three cultivar of faba bean.

In green house and field condition, super phosphate treatment significantly reduced pre and post-emergence damping off as well as root-rot disease, consequently increased germination percentage and healthy plants. In addition, super phosphate treatment increased significantly vegetation growth parameters and yield component. Such enhancement

effect of super phosphate on the vegetative growth parameters might be attributed to its effect on nodulation and yield parameters (Jain *et al.*, 1999, Khurana and Sharma 2000, Rudresh *et al.*, 2005 and Rania *et al.*, 2010). Application of phosphorus fertilizer increased plant height harvest, number of branches / plant. Number of pods/plant, 100-seed weight/g) and seed weight ardab/fed in both seasons of the three cultivars of faba bean. These results are in agreement with Ahmed *et al.*, (1992),they found the, the application phosphorus fertilizer increased significantly protein content and carbohydrate content in seed and different plant parts.

References

AOAC (Association of Official Analytical Chemists) (1980) Official methods of analysis of the Association of Official Analytical Chemists. 13th ed. Washington, DC.

Abdel-Kader M.M., El-Maugy N.S., and Lashin S.M., (2011) Essential oils and *trichodermaharzianum* as an integrated control measure against faba bean root-rot pathogens. Journal Plant Protection Research 51:306-313

Ahmed S. A., Abdel-Mottaleb S. A., Ismail S. A., and El-Gendi F.H.(1992). Response of broad bean (Vicia Raba L.) to application of phosphorus of phosphorus and zinic. Egyptian Journal of Applied Sciences 7,11:418-426

Andrews D.J., and Kassam A.H., (1976) The important of multiple cropping in increasing world food supplies .In:papendick R.I., Sanchez A., Triplett G. B.(eds): Multiple cropping. As a special publication 27. American Society of Agronomy, Madison 1-10

Boudreau M.A.,and Mundt C.C. (1992) Mechanisms of alterations in bean rust epidemiology due to intercropping with maize. Phytopathology 82:1051-1060

Chapman H.D. and Pratt P.P., (1961) Methods of analysis for soils plants and waters PP. 201-203. University of California, Division of Agricultural science, Barkely, USA.

Chavan J. K., Kute L.S., and Kadam S.S.,(1989) Soybean In: Salunkhe DD, Kadam SS, editors. CRC handbook of world food legumes. Boca Raton: CRC Press; 1989. pp. 223–245.

El-helaly A. F., Elarosi H. M., Assawah M.W. and Abol-Wafa M. T., (1970) Studies on damping-off and root-rots of bean in UAR (Egypt). Egypt. J. Phytopathol., 2: 41 – 57.

Fininsa, C. (1996) Effect of bean and maize intercropping on bean common bacterial blight and rust diseases. International Journal Pest Management, 42: 51-54.

Gomez, K.A. and Gomez, A. A. (1984) Statistical Procedures for Agricultural Research pp. 424-452. John wily and Sons. Inc. New York

Jafar Nakhost Majid Ashoori (2014) Effect of biologic fertilization, mineral phosphorus and nitrogen on faba bean yield and yield components in northern Iran. Indian Journal of fundamental and applied Life Science.(4):3 2231-6345

Jain, P. C., Kushawaha P. S., Dhakal U. S., Khan H. and Trivedi S. M., (1999). Response of chickpea (*Cicer arietinum L.*) to phosphorus and biofertilizer. Legume Res 22: 241–244.

Khurana, A. S., and Sharma, P. (2000) Effect of dual inoculation of phosphate solubilizing bacteria, *Bradyrhizobium sp.* (Cicer) and phosphorus on nitrogen fixation on yield of chickpea. Indian journal Pulses Research 13: 66-67.

Kinane, J. Lyngkjaer M. F. (2002) Effect of barley-legume intercrop on disease frequency in on organic farming system 6. Conference of European Foundation for Plant Pathology (EFFP 2002), Prague (CZ) 8-14 Sep 2002. Plant Protection Science. 38: 227-231

Kontturi, M., Laine A., Niskanen M., Hurme T., Hyovela M., and Peltonen-Sainio P. (2011) Pea–oat intercrops to sustain lodging resistance and yield formation in northern European conditions. Acta Agriculturae Scandinavica, Section B-Soil & Plant Science. 61:612-621

Metwaly M.M.M. (2004) Resistance induction against diseases of faba bean crop .Ph D. Thesis plant pathology Dept. Fac. Agric. Suez Canal Univ. Egypt.2231- 6345

Negm, M. A., Abdel-Reham M. A., and Montasser S. Y. (1992)Effect of different rates and frequencies of foliar applications of phosphorus on sunflower growing on calcareous soils. Egypt journal soil Science. 32:513-512

Omar S. A. (1986) Pathological studies on root-rot disease of faba bean (Viciefaba L.) 11 Int. Conference Society and Dem. Res. Cairo, Egypt, PP 33-48

Rania Z. El-shennawy, Omran M. M. and Abd El-Motteleb (2010) Effect of phosphorus fertilizer treatments on incidence of *Fusarium* root-rot/ wilt disease complex, and yield components of lupine, chick pea and lentil crops. Arab university Journals Agricultural Science Ain Shams University, Cairo 18(1) 193-202

Rudresh D. L., Shivaprokash M. K. and Prasad R.D.,(2005) Effect of combined application of *Rhizobium*, phosphate solubilizing bacterium and *Trichoderma spp*. On growth, nutrient uptake and yield chicpea (*Cicer arietinum L*.). Applied Soil Ecology 28:139-146

Singh, K. N., Prased R. D. and Tomar V. P. S. (1981) Response of French been to different levels of nitrogen and phosphorus in Nil Giri-Hills under rainfed conditions. Indian Journal of Agronomy 26:101-102

Soleman N.K., Mikhail M. S., HarbP.k. and Khalil E. M. (1988) Response of bread bean plants infected with *Rhizoctonia solani* of growth regulators and calcium. Egypt Journal Phytopathology. **20**(1): 1-11

Tripathi R. D., Srivastava G. P., Misra M. S. and Pandey S. C. (1971) Protein content in some varieties of legume, The Allah Abad Farmer. 16:291- 294

Vandermeer J., Van-NoordwiJk M. Anderson J., Ong C.,and Perfecto I.,(1998) Global change and multi-species agroecosystems : concepts and issues. Agriculture, Ecosystems Environment 67: 1-22.

How to cite this article:

Abeer M. Mousa and Sahar A. El-Sayed. 2016. Effect of Intercropping and Phosphorus Fertilizer Treatments on Incidence of *Rhizoctonia* Root-Rot Disease of Faba Bean. *Int.J.Curr.Microbiol.App.Sci.*5(4): 850-863.
doi: http://dx.doi.org/10.20546/ijcmas.2016.504.097