Effect of Organic Fertilization on Root Rot wilt Diseases complex, Yield, Alkaloid and Protein Contents of Lupine, *Lupinus termis* (Forsk)

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ABSTRACT

Two pot experiments were carried out in the greenhouse at Sabahia Horticulture Research Station, Alexandria during the two successive seasons 1999/2000 and 2000/2001 to investigate the effect of organic fertilization on root rot wilt diseases complex and yield of lupine plants. Also, the effect of organic fertilization was evaluated on alkaloidal and protein seed contents. Bio MAB chicken manure compost was chosen for this study and five levels (0,1,2,3,4%) of soil weight were applied. The following results were obtained: Organic fertilizer at levels 2% and 3% reduced significantly percentages of pre, post- emergence damping-off and wilted plants at first and second seasons compared to the control treatment (0 organic fertilizer). Percentage of healthy plants increased about 2 and 2.5 folds more than control at the first season with 2% and 3% organic fertilizer levels and about 1.2 and 1.5 fold with 1% and 2% at the second season. There were gradual increasing in the tested growth and yield parameters (i.e., plant height, number of branches, number of pods and seeds/plant, pods dry weight/plant and yield of seeds/plant) with increasing the levels of organic fertilizer in either infected and uninfected lupine plants in the two seasons. The increases were significant in some cases especially with uninfected plants as compared to the control. The alkaloid percentages of lupine seeds of infected and uninfected plants slightly increased in the same manner with increasing the organic fertilizer levels in the two seasons, but these increases were insignificant. The protein percentages of lupine seeds either in infected or uninfected plants significantly affected by 2% and 3% levels of organic fertilizer in the two experimental seasons as compared to the control treatment. Generally, the best results of growth and seed yield characters, as well as alkaloid and protein percentages of infected or uninfected lupine plants were obtained after applying the organic fertilizer at 2% and 3% levels.

INTRODUCTION

Lupinus termis (Forsk) is one of the oldest legumes in the world. It was known to the Egyptian Pharaohs. It is one of the most important alkaloidal plants. The lupine alkaloids, which belong to the group of quinolizidine alkaloids are undesirable due to their bitter taste and toxicity when administrated in high doses. Ashoush (1989) found that there were 4 major alkaloids of *Lupinus termis*, namely lupanine, 13 hydroxy-lupanine, spartine and isospartine. Lupine seeds are widely used in Egypt and Middle East as a food after having been debited by leaching out the alkaloids by soaking the seeds for several days in a flow of water. Lupine is an important source of dietary protein, its importance lies not only in its high nutritive value but also in its relatively cheap price. The quality of protein in lupine seeds is similar to soybean protein (Withers, 1973). Lupine has been also used as a green manure, stock feed and for industrial purposes. Lupine can grow in poor soil improving its fertility and considered drought tolerant, Gladstones (1970) . Also some medicinal uses of the plant are reported. Al-Zaid *et al.* (1991) found that *L.termis* exerted a significant hypoglycemic effect. Also, he mentioned that the seeds of *L.termis* are edible and used in traditional medicine and to treat diabetes and eczema.

Several soil-borne fungi attack lupine causing damping-off, root-rot and wilt. Among the fungi frequently reported in this concern are *Fusarium* spp,. Ibrahim *et al.* (1964). Fahim *et al.* (1983b) found that, *F.oxysporum* was the sole causal agent of lupine wilt in Egypt. Wilt is reported to cause great losses to lupine, Armstrong and Armstrong (1962) found that *F.oxysporum* cause 60-100% wilt of lupine, Toth (1967) reported that up to 91% of the lupine plants were infected with *F.oxysporum F.sp. lupini* but only 50% died. Osman *et al.* (1983) recorded that, the wilt disease occur at any stage of plant growth.The disease was noticed to spread in Egyptian lupine fields in recent years which would partly explain the reason for the decrease in area cultivated with lupine Osman *et al.* (1983).

Organic fertilization is a very important method not only for providing the plants with their nutritional requirements but also used to suppression plant diseases without having an undesirable impact on the environment. For many years organic fertilization and other methods of biodynamic agriculture (including preventive disease and pest control) have been used basically as a means of alleviation of the problem of chemical residues in export market commodities.

Many investigators have examined the response of different plants yield, including lupine to the organic fertilization, Maheshwari *et al.* (1991) on Cymbopogon and Buchner (1995) on beans and peas. Sidky *et al.* (1997) showed that the pure poultry manure gave higher fruit and sepals yield of roselle plants, while the taller plants were obtained from pure cattle manure. El-Mewafy (1998) recommended that spearmint and marjoram plants should be fertilized with 30 m^3/feddan of poultry manure to produce the highest fresh and dry herb yields, as well as the highest oil yield/fed. Takunov *et al* (1998) found that addition of 50 tons organic manure/ha increased the yield and protein content of lupine, and increased the humus levels in the soil. Winiarska (1998) recorded that lupine yield increased after application of sawdust-grass compost at rate of

50 to 200 tons/ha. Also, P,K and Mg availability, organic matter content and sorption capacity of soil were increased. Bachhav and Sabale (1998) reported that seed yield, seed protein and oil contents of soybean were the highest with 50% each of urea and farmyard manure. El'Kina and Konstantinova (1999) found that application of compost consisted of tree bark, poultry dropping and peat with 200 or 500 tons/ha increased humus content, soil porosity and yield of peas. Also, compost affected contents of N,K,P,Ca and Mg in plants. The effect of farmyard manure on faba bean was studied by Attia and El-Dsouky (2001). They suggested that application of farmyard manure at 20 m^3/fed resulted in significant increase in straw, seed yields and total content of N,P and K in faba bean seeds.

Regarding the effect of organic fertilization on alkaloids, Moskov and Tachenko (1970) found that alkaloids content of *Atropa belladonna* and *Datura stramonium* increased as a result of adding 20 tons/ha of organic manure+ P and K. Arambewela and Ranatunge (1994) suggested that application a mixture of micronutrient and cattle manure on *Catharanthus roseus* resulted in the highest plant dry matter yield and highest root ajmalicine (an alkaloid) content. Czabajski (1989) confirmed that mineral as well as the organic fertilization did not show any remarkable influence on the percentage of scopolamine and atropine in the crude drug of *Datura innoxia*.

With respect to the role of compost and organic manure in suppression of plant diseases, many researchers studied in this concern. Adams *et al.* (1968), Papavizas *et al.* (1968), Hurber and Watson (1970), Linderman (1970), Fahim *et al.* (1983a), Schuler *et al.* (1989), Hoitink *et al.* (1997), Tilippi *et al.* (1998) and Ehart *et al.* (1999). It is recognized that control of such root rots with composts can be as effective as that of obtained with fungicides, Hoitink *et al.* (1991) and Ownley and Benson (1991). While, Hoitink *et al.* (1997) and Ceuster and Hoitink (1999) used compost and biocontrol agents as replacement of methylbromide for protected plants from diseases.

Therefore, this study was conducted with the aim of determining the effect of organic fertilization (chicken Bio Mab manure) on the root-rot and wilt diseases as well as yield, alkaloids and protein contents of lupine plants.

MATERIALS AND METHODS

Two pot experiments were carried out in the greenhouse at Sabahia Horticulture Research Station, Alexandria, through successive seasons of 1999/2000 and 2000/2001. Seeds of lupine, *Lupinus termis*, (Forsk) variety Giza 1 were obtained from the Seed Production Department, Agricultural Research Center, Giza, Egypt. The seeds were sown on October 24th in the two seasons.

A virulent isolate of *Fusarium oxysporum* isolated from diseased lupine grown in Agriculture Research Farm, Faculty of Agriculture Alexandria University was used in this study.

Bio-MAB chicken manure compost is manufactured by Mab Complex Food Production Company, El-Nahda, Egypt. Its analysis were shown in Table (1).

Inoculum for greenhouse tests, was prepared by growing fungus on autoclaved sand-barley medium (25 gm clean sand, 75 gm barley grain and enough water to cover mixture) in 500 ml bottles. Inoculated bottles were incubated at 25°C for two weeks. Pots, 40 cm diameter were sterilized by immersing in 5% formalin solution for 5 minutes, then left to dry. The sandy-clay soil used for planting was also sterilized with 5% formalin solution and covered with polyethylene sheets for two days to retain gas, then left uncovered for two weeks to allow for formaldehyde evaporation. The physical and chemical properties of the soil were determined according to Westerman (1990) and illustrated in Table (2). Chicken manure compost was added and mixed thoroughly with soil before planting. Tested levels of the compost were 0,1,2,3,4% of the soil weight. Two sets of pots, 20 pots each were used, the first was infested with the fungus *F.oxysporium*, and the second non infested. The inoculum was thoroughly mixed with the soil at a rate of 5% of soil weight. The infested soil was watered every two days for one week before sowing. Each pot contains 10 kg soil was planted with five lupine seeds. The pots were placed in the greenhouse and watered at two days intervals regularly. The experiments were laid out in factorial in a complete randomized block design with four replicates. Each replicate contained ten treatments, five treatments for infested soil and the other for non infested soil. Number of infected and uninfected plants were recorded throughout the growth period in the greenhouse. Pre- and post-emergence damping-off and wilted plants were recorded 15, 30 and 120 days after sowing respectively. The normal cultural practices were followed as usual in lupine plants for all pots of the experiments.

At the harvest time, the following characters were determined; plant height, number of branches per plant, number of pods per plant, number of seeds per plant, dry weight of pods and seed yield per plant. Also, seed alkaloids percentage (James and Wendell, 1987) and protein content, (A.O.A.C, 1996) were determined. The data were statistically analyzed according to Snedecor and Cochran (1982).

Table 1. Some physical and chemical characteristics of organic chicken manure compost (Bio-MAB)

Parameter	Fertilizer characteristics	Parameter	Fertilizer characteristics
Bulk density, kg/m^3	760.00	Ash content %	47.90
Moisture content %	33.40	C/N ratio	11.80
pH (1:10)	7.61	Total phosphorus (T-P)%	2.88
EC (dsm^{-1}, 1:10)	8.20	Total potassium (T-K)%	0.59
Total nitrogen (T-N)%	2.57	Total micronutrients ppm	
N-NH_4^+ ppm	626.00	Fe	2227.00
N- NO_3^-	23.00	Mn	408.00
Organic matter %	52.10	Cu	59.00
Organic carbon%	30.22	Zn	415.00

Table 2. Some physical and chemical characteristics of a soil sample from the experimental site.

Parameter	Soil characteristics	Parameter	Soil characteristics
pH (1:5)	7.90	Soluble anions mg/l (cont)	
EC (dsm^{-1}, 1:5)	1.49	HCO^-_3	3.00
		Cl^-	4.50
Soluble cations, meg/l		SO_4^{-2}	7.49
Ca^{2+}	4.00	Particle size distribution,%	
Mg^{2+}	5.00	Sand	48.40
Na^+	5.60	Silt	11.40
K^+	0.30	Clay	40.20
Soluble anions mg/l		Texture class	Sand clay
CO^{2-}_3	0.00		

RESULTS AND DISCUSSION

Effect of organic fertilizer on disease development

The application of chicken manure compost to soil before cultivation with affected considerably the percentage of infection with *F.oxysporium* in the plant roots (Table 3 a and b). In the first season, data showed that adding organic fertilizer at 2% and 3% resulted in the lowest pre-emergence damping-off percentages (24.14%, 15.80%), post-emergence damping-off (12.07%, 7.90%) and wilted plants (7.76%, 5.35%), respectively. While 1% and 2% levels were the best at the second season, it produced the lowest percentage of pre and post emergence damping-off (26.31%, 28.57%) and (13.16, 13.34%), respectively. The 2% organic fertilizer gave the lowest wilted plants percentage (4.99%) at the second season. It is noticed also that 2% and 3% of chicken manure were the best treatments at the first season, produced healthy plants 65.3% and 75.73%, respectively, while levels of 1% and 2% were the best with 52.63% and 65.0% at the second season. The organic fertilizer at levels (2% and 3%) and (1% and 2%) increased number of healthy survival plants with ratios about (2 and 2.5) and (1.2 and 1.5) folds at the first and second seasons, respectively. These results were agreed with those obtained by Fahim *et al* (1983,a), who found that application of organic manure reduced wilted lupine plants at the rate of 2% of soil weight. Yehia *et al* (1986) found that addition decomposed mature of wheat and cotton led to the decrease of *Fusaroium* root rot disease severity index in broad bean, while it was greater in case of clover and broad bean residues. Papavizas *et al* (1968) found that organic amendments applied to soil reduced *Fusarium* root rot of beans. Linderman (1970) mentioned that under certain of decomposition of plant residue, materials may be released into soil which stimulate germination and growth of fungus pathogens in the soil. If this stimulation occurred before a susceptible host was present and lysis of resulting hyphae followed, the pathogen might be reduced in numbers. If it occurred in the presence of susceptible host roots, disease might be increased. These possibilities were studied with several soil bome pathogenic fungi. Toussous *et al* (1963) reported that residue extracts stimulated germination of clamydospores of *Fusarium solani* f.sp. *Phaseoli* in soil and bean root rot caused by this organism increased following treatments with such extracts. Dissanayake and Hoy (1999) mentioned that the microbial community associated with organic materials was capable of suppressing *Pythium*-root rot disease of sugercan and thereby enhancing plant growth and suggested that the severity of root rot in sugercan may be reduced by amending soil with organic materials. Lewis and Papavizas (1977) mentioned that the inhibitory effect of decomposing mature rye and corn residues on germination of *F.solani* clamydospores was caused by the production of a fungitoxicants as well as by nutritional fungistasis.

Table 3a. Effect of different organic fertilizer levels on pre-, post -emergence damping-off wilt diseases and survival of *Lupinus termis* during first season (1999/2000)

Fertilizer level %	Pre-emergence %			Post-emergence %			Wilted plants %			Healthy survival %		
	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*	I	II	Mean
0	50.00a	0.00f	*25.00A*	5.25b	0.00d	*2.63B*	12.95a	0.00e	*6.48A*	31.81e	100.00a	65.91D
1	28.95c	0.00f	*14.48C*	3.40c	0.00d	*1.74BC*	10.50b	0.00e	*5.25A*	57.07d	100.00a	78.54C
2	24.14d	0.00f	*12.07CD*	2.89c	0.00d	*1.45C*	7.76c	0.00e	*3.88B*	65.30c	100.00a	82.65B
3	15.80e	0.00f	*7.90D*	3.12c	0.00d	*1.56C*	5.35d	0.00e	*2.68C*	75.73b	100.00a	87.87A
4	38.80b	0.00f	*19.45B*	8.33a	0.00d	*4.17A*	11.30ab	0.00e	*5.65A*	29.48e	100.00a	64.74D
Mean	*31.56A*	*0.00B*		*4.61A*	*0.00B*		*9.57A*	*0.00B*		*51.88B*	*100.00A*	

I = infested spoil II = non infested soil

Means followed by the same letter, in columns and rows for each character, are not significantly different at $p = 0.05$

Table 3b. Effect of different organic fertilizer levels on pre-, post-emergence damping-off wilt diseases and survival of *Lupinus termis* during second season (2000/2001)

Fertilizer level %	Pre-emergence %			Post-emergence %			Wilted plants %			Healthy survival %		
	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*
0	43.49a	0.00d	*21.75A*	0.00c	0.00c	*0.00C*	13.04b	0.00d	*6.52B*	42.47c	100.00a	*71.24C*
1	26,31c	0.00d	*13.16C*	5.27b	0.00c	*2.64B*	15.79a	0.00d	*7.90A*	52.63b	100.00a	*76.32AB*
2	26.67c	0.00d	*13.34C*	3.33b	0.00c	*1.67B*	4.99c	0.00d	*2.50C*	65.01b	100.00a	*82.51A*
3	28.57c	0.00d	*14.29C*	15.28a	0.00c	*7.64A*	9.53b	0.00d	*4.77B*	46.62c	100.00a	*73.31ABC*
4	36.67b	0.00d	*18.34B*	21.67a	0.00c	*10.84A*	4.16c	0.00d	*2.08C*	37.50c	100.00a	*68.75BC*
Mean	*32.34A*	*0.00B*		*9.11A*	*0.00B*		*9.50A*	*0.00B*		*48.85B*	*100.00A*	

I = infested spoil II = non infested soil

Means followed by the same letter, in columns and rows for each character, are not significantly different at $p = 0.05$

Effect of organic fertilization on vegetative growth and seed yield

Data recorded in Table (4 a,b) clearly showed that there were significant differences in the both experimental seasons between uninfected and infected lupine plants with *F.oxysporum* in all studied growth and yield characteristic (i.e., plant height, number of branches per plant, number of pods per plant dr weight of pods per plant, number of seeds and seeds yield per plant) with usin organic fertilizer. The difference was insignificant only in case of number of branches per plant in the two growing seasons.

The effect of different levels of organic fertilizer on infected an uninfected lupine plants are presented also in the same table. Generally, lupin plants either infected or uninfected, showed gradual increasing in the teste growth and yield parameters in response to increasing the concentrations of organic manure. The increases were significant in some cases as compared t the unfertilized plants (control treatment).

In general, the results indicated that applying the organic manure at 2% and 3% gave the highest values in the most of growth and yield characters under stud of infected and uninfected lupine plants in the two experimental seasons. Whereas the lowest values were obtained at zero organic manure (control treatment) fc uninfected plants, and at 4% level for infected plants.

The previous data clearly emphasized that plants fertilized with organi compost at 3% produced the heaviest seeds yield per plant in uninfected lupin plants during the first and second seasons (8.21, 6.43 gm/plant), respectively While the heaviest seeds per plant in infected lupine in the first and secon season were obtained at 2% (4.74, 2.98 g/plant), respectively.

Numerous studies on lupine plants and other legumes confirmed with our positive response for the application of organic nutrients, Takunov *et a* (1998) found that, addition of 50 tons organic manure/ha increased the yield an protein content of lupine and increased the humus levels in the soil. Winiarska (1998) recorded that lupine yield increased after application of sawdust-grass compost at rate of 50 to 200 tons/ha. Also, P,K and Mg availability, organi matter content and sorption capacity of soil were increased. Negm *et al* (1999 on peas, recorded that either manuring with 10 ton farmyard per feddan o fertilization with 30 kg N/fed, as calcium ammonium nitrate resulted in significan and positive effects on green pods yield and harvest index. Mahmoud *et a* (2000) on faba bean and peanuts pointed that the application of organi manure increased yield, N,P and K uptake. Similar results were also obtained by Attia and El-Dsouky (2001) on faba bean.

Table 4a. Effect of different organic fertilizer levels on growth and seed yield of *Lupinus termis* during 1999/2000 and 2000/2001 seasons

Fertilizer level %	Plant height (cm)						No. of branches / plant						No. of pods / plant					
	First season			Second season			First season			Second season			First season			Second season		
	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*
0	56.38 b	60.00ab	*58.19ABC*	47.50b	52.75ab	*50.13AB*	3.75ab	3.00b	*3.38A*	3.00a	2.75a	*2.88B*	6.50c	8.00c	*7.25c*	7.00c	6.50c	*6.75BC*
1	56.00b	56.5b	*56.25BC*	51.50ab	58.00ab	*54.75A*	3.75ab	3.50ab	*3.63A*	3.00a	3.35a	*3.13AB*	8.75c	12.50bc	*10.63AB*	7.75b	9.00b	*8.38B*
2	61.63ab	68.88a	*65.25A*	51.75ab	63.38a	*57.56A*	3.25ab	3.75ab	*3.50A*	3.50a	3.75a	*3.63A*	13.50b	12.00bc	*12.75A*	10.00b	13.75a	*11.88A*
3	62.13ab	64.75b	*63.44AB*	53.38ab	57.00ab	*55.19A*	3.25ab	4.00a	*3.63A*	3.75a	3.50a	*3.63A*	6.25c	20.50a	*13.38A*	8.75b	15.25a	*12.00A*
4	40.38c	69.63a	*55.00C*	42.00b	48.50b	*45.25B*	3.00b	3.25ab	*3.13A*	2.75a	3.50a	*3.13AB*	4.75c	14.00b	*9.38CB*	4.25c	8.00b	*6.13c*
Mean	*55.30B*	*63.95A*		*39.23B*	*55.93A*		*3.40A*	*3.50A*		*3.20A*	*3.35A*		*7.95B*	*13.40A*		*7.55B*	*10.50A*	

I = infested spoil II = non infested soil

Means followed by the same letter, in columns and rows for each character, are not significantly different at $p = 0.05$

Table 4b. Effect of different organic fertilizer levels on growth and yield of *Lupinus termis* during 1999/2000 and 2000/2001 seasons

Fertilizer level %	Dry weight of pods / plant						No. of seeds / plant						Yield of seeds / plant (gm)					
	First season			Second season			First season			Second season			First season			Second season		
	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*
0	4.64c	5.37c	*5.00C*	4.13c	4.23c	*4.18C*	18.25c	22.75bc	*20.50EC*	17.75c	18.00c	*17.88B*	2.45bc	2.62bc	*2.53B*	1.65d	2.29cd	*1.97B*
1	4.45c	5.99c	*5.22C*	4.61c	5.05c	*4.83C*	20.25c	29.25bc	*24.75ABC*	18.50c	22.00c	*20.25B*	2.32bc	2.69bc	*2.50B*	2.14cd	3.05c	*2.60B*
2	5.25c	10.16b	*7.71AB*	5.11c	8.63b	*6.87B*	24.00bc	28.75bc	*26.38AB*	21.00c	30.25b	*25.63A*	4.74b	5.98ab	*5.36A*	2.98c	5.62a	*4.30A*
3	3.17cd	14.93a	*9.05A*	4.98c	11.12a	*8.05A*	10.00cd	49.50a	*29.75A*	18.75c	35.75a	*27.25A*	1.28c	8.21a	*4.74A*	2.09cd	6.43a	*4.26A*
4	1.57d	9.76b	*5.66BC*	2.67d	5.42c	*4.04c*	6.75d	32.00b	*19.38c*	8.75d	27.00b	*17.88B*	0.62c	5.00b	*2.81B*	1.02d	4.22b	*2.62B*
Mean	*3.81B*	*9.24A*		*4.30B*	*6.89A*		*15.85B*	*32.45A*		*16.95B*	*26.60A*		*2.28B*	*4.90A*		*1.97B*	*4.32A*	

I = infested spoil II = non infested soil

Means followed by the same letter, in columns and rows for each character, are not significantly different at $p = 0.05$

Concerning the effect of organic compost on root-rot and wilt disease. Fahim *et al.* (1983,a) found that the weight of 100 seeds and dry weight of shoots of lupine plants increased after application of organic manure at 2% of soil weight in infected with *F.oxysporum* and uninfected plants compared to the control treatment. The same trend of the results were obtained by Filippi *et al* (1998) and Ehart *et al.* (1999).

The beneficial effect of organic manure on growth and parameters might be attributed to its content of macro- and micro-nutrients (N, P, K, Mg, Ca, Fe, Mn and Zn). Besides, this organic compost had also a great amount of organic matter, microbial populations and increasing water holding capacity of the soil. Organic compost nutrients can be readily released to the soil at the time of application. It also improved soil physical and chemical properties so that soil microorganisms can grow and decompose the organic materials and release their nutrient with time. This stimulation in soil properties surely reflected on enhancing growth of plants. This explanation is in close agreement with those reported by Attia and El-Dsouky (2001) on faba bean plants.

Furthermore, leguminous plants are known to need good and balanced nutrients to maintain vigorous growth. Well balanced growth protect plants from facultative parasites (Baker and Cook, 1974) as *F.oxysporum*. This explanation may also be applied for the good performance of plants grown in soil mixed with organic manure, other possibilities are provided by Huber and Waston (1970) who proposed the following mechanisms (a) increasing the biological buffering capacity of the soil, (b) reducing pathogen numbers as a result of anaerobic decomposition of organic matter and (c) affecting nitrification which influences the form of nitrogen predominating in the soil.

Effect of organic fertilization on alkaloidal and protein contents

The effect of different levels of organic fertilizer on alkaloid percentages of lupine plants are presented in Table (5) and Fig (1a). It was found that the difference between infected and uninfected lupine plants failed to reach the 5% level of significance in the first season, while it was significant in the second season.

Concerning the response of the alkaloids percentage of lupine seeds to the different levels of organic manure, it was observed that there were slight increases in the alkaloids percentage in either infected or uninfected lupine plants in both seasons in the same manner with increasing the organic fertilizer concentrations. These increases failed to reach the significant level at 5% when compared with unfertilized plants (control treatment).

Generally, the highest values of alkaloid percentages of lupine plants either infected or uninfected were obtained when the organic fertilizer at 2% and 3% were applied. The best results of uninfected plant alkaloids in the first and second seasons were (2.04, 1.81%) and produced from adding organic fertilizer at 3% and 2% levels, respectively. While applying 2% and 3% levels of organic fertilizer in the first and second season gave the highest values of infected plant alkaloid (1.69, 1.52%), respectively.

These results were in accordance with the findings of Kahar and Nigam (1993) on morphine alkaloid of opium poppy (*Papaver somniferum*) and Gorinova *et al* (1994) on galanthamine alkaloid of *Leucojum aestivum*. Another result were in a harmony with the previous results, Rao *et al.* (1983) found that the alkaloid concentrations in roots and leaves of *Catharanthus roseus* showed a little response to farmyard manure. Meskov and Thachenko (1970) mentioned that fertilization with 20 tons/h with organic manure +P, K increased alkaloids content in *Atropa* belladonna and *Datura stramonium*.

These results might be attributed to the presence of various nutrients in organic fertilizer which directly influences the enzymes concerned in alkaloid biosynthesis in the plant (Khan and Harborne, 1992).

Data in Table (5) and Fig (1,b) also obviously showed significant differences in the protein percentages between infected and uninfected lupine plants in both seasons as a result of adding organic fertilizer.

The protein percentage of infected and uninfected lupine plants significantly affected by different levels of organic manure in some cases in the two experimental seasons as compared to the control treatment.

The best values of protein percentage of uninfected plants in the first and second seasons were (32.30, 32.70%) due to applying 2% and 3% levels of organic fertilizer, respectively. Whereas the infected lupine plants fertilized with 3% produced the highest values of protein percentage (29.1, 28.30%) in the first and second seasons respectively.

Table 5. Effect of different organic fertilizer levels on the alkaloidal and protein contents of *Lupinus termis* during 1999/2000 and 2000/2001 seasons

Fertilizer level %	Alkaloids %						Protein %					
	First season			Second season			First season			Second season		
	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*	I	II	*Mean*
0	1.45b	1.59ab	*1.52B*	0.97b	1.56ab	*1.27B*	24.50c	26.50c	*25.50B*	22.70d	25.80cd	*24.25c*
1	1.52b	1.68ab	*1.60AB*	1.30b	1.62ab	*1.46AB*	24.80c	27.30bc	*26.05B*	23.10d	27.66bc	*25.36c*
2	1.69ab	1.93ab	*1.81AB*	1.46ab	1.81a	*1.63A*	2790bc	32.30a	*30.10A*	25.40cd	30.20b	*27.80B*
3	1.82ab	2.04a	*1.93A*	1.52ab	1.77ab	*1.64A*	29.10b	31.80ab	*30.45A*	28.30bc	32.70a	*30.50A*
4	1.57ab	1.71ab	*1.64AB*	1.27b	1.65ab	*1.46AB*	24.70c	26.30c	*25.50B*	24.00cd	26.60c	*25.30C*
Mean	*1.61A*	*1.79A*		*1.30B*	*1.68A*		*26.20B*	*28.84A*		*24.70B*	*28.58A*	

I = infested spoil   II = non infested soil

Means followed by the same letter, in columns and rows for each character, are not significantly different at $p = 0.05$

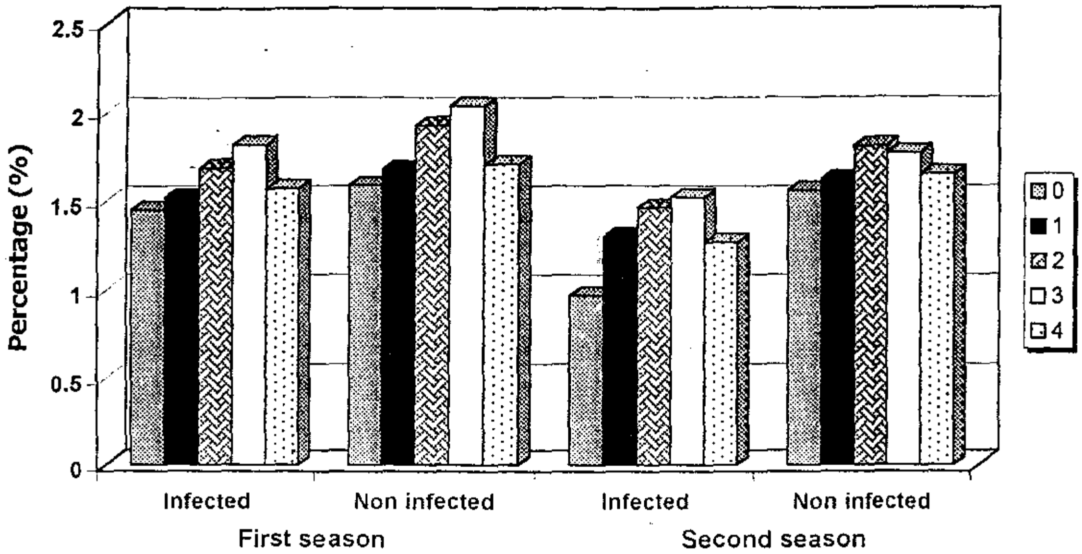

Figure (1a) : Alkaloid percentage of infected and uninfected *Lupinus termis* during 1999/2000 and 2000/2001 seasons

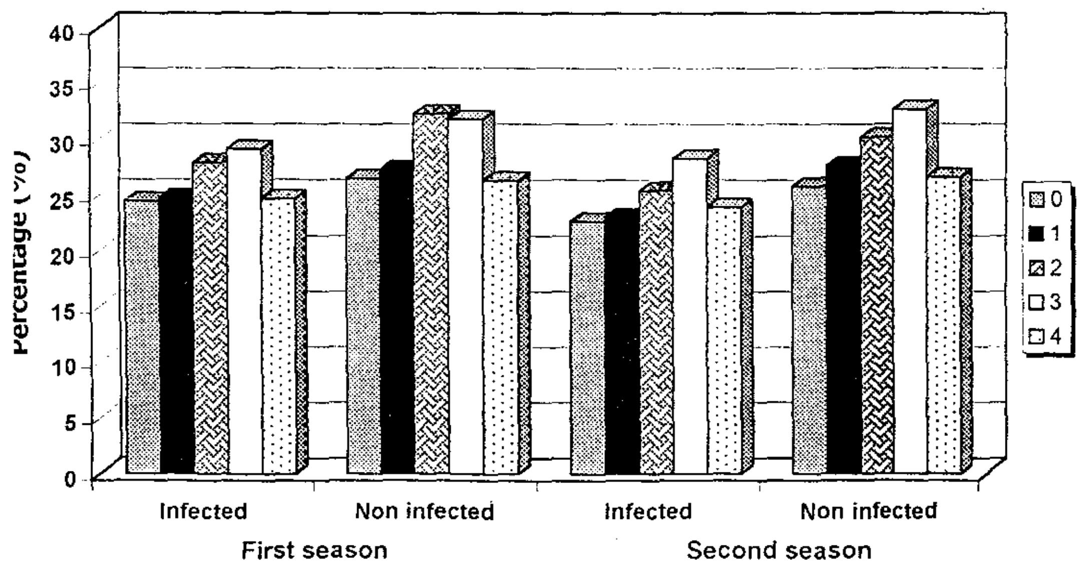

Figure (1b) : Protein percentage of infected and uninfected *Lupinus termis* during 1999/2000 and 2000/2001 seasons

0, 1, 2, 3 and 4 means the level (%) of organic fertilizer

The values of the protein percentage in Table (4) and Fig (1,b) were found in the same range that was mentioned by Nigam *et al.* (1994) on lupine plants. It ranged between (20.9-47.1%).

Many studies reached the same results, Bachhav and Sabale (1998) and Panneerselvam *et al* (1999) on soybean found that adding different combinations of farmyard manure and sheep manure gave the highest values of seed protein and oil contents. Negm *et al.* (1999) reported that organic manure raised the 100 seed weight and protein content of peas seeds.

It is noteworthy to mention that the increase of seeds protein by adding the organic fertilizer may be due to the role of its nutrients in plant metabolism especially N, P, K. Where nitrogen is essential for plant growth as it is constituent of all protein and nucleic acids and hence of all the protoplasm Russel (1973). Whereas, phosphorus is considered as a part of molecular structure of DNA and RNA forms, Russel (1973). Moreover, potassium is involved in a number of steps of protein synthesis, Edmond *et al.* (1977).

From the above mentioned results, it can be concluded that, addition of organic fertilizer (Chicken manure compost) at 2% or 3% levels to lupine plants not only increased yield, alkaloids and protein contents but also reduced the root-rot and wilt disease complex.

In general, organic fertilization is a good tool to reduce the rate of chemical fertilizers, fungicides and the cost of crops production and allow for a better environment.

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الملخص العربى

تأثير التسميد العضوى على مرض تعفن الجذور والذبول والمحصول وعلى المحتوى القلويدى والبروتينى في الترمس

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أجريت تجربتا أصص بصوبة محطة بحوث البساتين بالصبحية بالإسكندرية خلال الموسمين الزراعيين ١٩٩٩/٢٠٠٠ و ٢٠٠٠/٢٠٠١ وذلك لدراسة تأثير استخدام السماد العضوي على مرض تعفن الجذور والذبول فى الترمس وأيضا تأثير السماد العضوي بيوماب على نمو وإنتاجية نبات الترمس بالإضافة إلى محتوى البذور القلويدى والبروتينى. وقد اختير لهذه الدراسة كومبوست سماد الكتكوت B io-MAB الناتج من زرق الدواجن البياض بتركيزات صفر، ١، ٢، ٣، ٤% من وزن التربة وقد أوضحت النتائج ما يلى:استخدام السماد عند مستوى ٢% و٣% أدى إلى خفض نسبة الإصابة معنويا فى الموسمين الأول والثاني مقارنة بالكونترول. وكانت أفضل النتائج المتحصل عليها في الموسم الأول نتيجة إضافة المستويين ٢% و٣% بينما أدى إضافة المستويين ١% و٢% إلى أفضل النتائج من النباتات السليمة في الموسم الثاني. وقد وجد أن السماد العضوي أدى إلى زيادة أعداد النباتات السليمة بنسبة ٢ و ٢,٥ وحوالي ٢ و ١,٥ أضعاف الكونترول في الموسمين الزراعيين الأول والثاني على الترتيب. استخدام السماد العضوي أدى إلى زيادة تدريجية فى كل الصفات المدروسة على النمو وإنتاجية الترمس (طول النبات وعدد الفروع/نبات وعدد القرون والبذور/نبات والوزن الجاف للقرون/نبات ومحصول البذرة/نبات) وذلك مع زيادة تركيز السماد وذلك فى النباتات الغير معدية وأيضا المعدية بفطر فيوزاريوم أوكسيسبورم وذلك خلال موسمي التجربة. وكانت هذه الزيادات معنوية فى بعض الحالات خاصة مع النباتات الغير معدية وذلك مقارنة بمعاملة الكونترول (النباتات الغير مسمدة). وزاد المحتوى القلويدى لبذور الترمس سواء للنباتات المعدية أم غير المعدية زيادة طفيفة مع تركيزات السماد فى كلا الموسمين. ولكن هذه الزيادة لم تصل إلى مستوى المعنوية مقارنة بمعاملة الكونترول. تأثرت النسبة المئوية للبروتين في بذور الترمس للنباتات المعدية والغير معدية تأثرا معنويا بزيادة تركيزات السماد وذلك في معظم الحالات خلال الموسمين الزراعيين مقارنة بمعاملة الكونترول. وعموماء نستخلص من النتائج السابقة ما يلي: أن استخدام السماد العضوي عند مستوى ٢% و٣% أدى إلى خفض معنوي في نسبة الإصابة بمرض عفن الجذور والذبول المتسبب عن الفطر فيوزاريوم أوكسيسبورم كما أدى إلى تحسين معظم صفات النمو والإنتاجية والمحتوى القلويدى والبروتينى لنباتات الترمس سواء كانت معدية أم غير معدية بالفطر.