J. Plant Production, Mansoura Univ., Vol. 4 (2): 319 - 333, 2013

INFLUNCE OF GROWING FAHL BERSEEM ON IMPROVING SOME PROPERTIES AND THE PRODUCTIVITY OF NEWLY RECLAIMED SOILS

Salem, Azza Kh. ; F. A. Farag* ; Zeinab M. Abd El-Naby and N. M. Hamed

Forage Res. Dept., Field Crop Res. Inst., Agric. Res. Center, Giza, Egypt
Soil , Water and Environment Res .Inst. Agric. Res. Center, Giza, Egypt*

ABSTRACT

Two winter Fahl berseem field experiments were conducted in two newly reclaimed soils, at Ismailia and New valley Agricultural Research stations during (2009/10 and 2010/11) seasons.This was to study the effect of planting methods and seeding rates on improving some chemical , physical and biological soil properties, as well as its productivity. The treatments comprised (1) Three planting methods i.e., broadcast, 20 and 30 cm distance between rows . (2)Applied three seeding rates, i.e., 20, 25 and 30 Kg seed fad^{-1} the experiments were laid-out a split plot design with three replicates.

Results showed improvements for several soil chemical, physical and biological parameters ,i.e., soil pH , O.M, available N, P and K, bulk density, total porosity , available water. Dehydrogenase and nitrogenase activity as a result of the tested treatments refer to control (broadcast method under 20 kg seed fad^{-1}) treatment. Drilling on 20 cm apart as planting method was the best supporters in studied soil properties, particularly in the presence of 30 kg seed fad^{-1} treatment.

At 75^{th} days of sowing , a positive effect of either planting methods or seeding rates was noticed, on growth characteristics of Fahl berseem plants and its composition, i.e plant height, leaves/stem ratio (LSR), forage and dry yield, total nitrogen, protein and ash contents particularly in the presence of 30 kg seed fad^{-1} under drilling on 20 cm rows methods gave high values compared with control.

At harvesting stage, seed yield characteristics of Fahl berseem were enhanced in response to different methods of planting and seed rates, especially with 30 kg seed fad^{-1} in the presence of Rows A method achieving relatively high increases compared to broadcast method treatment amended with 20 kg seed fad^{-1}.

Keywords: Fahl berseem, seeding rate, broadcast, rows , chemical properties, physical properties, biological properties, Forage yield, Seed production.

INTRODUCTION

Large areas of Egypt are marginal desert soils, so cultivation of these soils is necessary to increase our agricultural production and solve the problems of increasing population and food shortage. However, these soil are, generally, lacking factors essential for fertility ; being generally characterized by a very low moisture holding capacity, poor plant nutrients and a scarcity of organic matter. Thus, introducing agricultural production of these soils requires development of both soil and water managements.

Berseem clover (*Trifolium alexandrinum* L.) is classified as a winter annual legume. It's a heavy N producer and the least winter hardy of all true annual clovers. Berseem clover draws down soil N early in its cycle. Once

soil reserves are used up, it can fix 45.36 to 90.72 kg. N/A or more. It establishes well with an oat nurse crop, making it an excellent cover for small grain, corn, soybean rotations in the Midwest. Clark, (2007).

Forage legumes, such as Berseem, were grown on a large number of acres. They differ markedly from grasses, cereals and other non-legume crops because much of the nitrogen they require is produced through fixation of atmospheric nitrogen by bacteria in nodules on their roots. Soil organic reserves declined due to cereal cropping and frequent fallowing. This resulted in an increase in green manure, thus an increase in the importance of legumes growing concerns about declining organic matter, soil fertility and rising energy and nitrogen fertilizer costs have led to renewed interest in legumes. Thus, the role of legumes as a nitrogen supplier in the rotation and as a builder of soil organic matter will likely gain importance in the future, Campbell and Souster, (1982). Organic fertilizers are very important for increasing agricultural production, reducing the application rates of chemical fertilizer and hence the prevention of environmental pollution Saleh *et al*., (2003). Reda, (2007) reported that the application of crop residues (as compost) in sandy soils increased soil total porosity and available water content.

Rawls *et al*.,(1992) studied the relationships between field capacity, wilting point and available water from side and some soil properties from the other one. They found that these constant could be determined by means of developed regression models. Any increase in organic matter by a unit cause a relatively large increase in the percentage of water retained in soil at the field capacity than at wilting point in coarse textured soils and the opposite was true in case of fine textured ones where showed increased in both EC and wilting point with increasing organic matter by a unit Bauer and Black, (1992).

The objective of this study was to: 1) determine the best seeding rate and planting methods on production of Fahl berseem and 2) role of Fahl berseem as a legume crop on sandy soil improvement.

MATERIALS AND METHODS

Two field experiments were performed at two locations of newly reclaimed soils, i.e., Ismailia and New valley Agricultural Research Stations, during two growing seasons (2009/10 and 2010/11), to evaluate some agricultural treatments of Fahl berseem and its impact on improving some soil properties and its productivity. Some physical and chemical properties of the two studied soils were shown in Table (1). Chemical characteristics of the irrigation water used in two studied locations were shown in Table (2).

Table (1) : Some physical and chemical properties in initial state of the two studied soil locations.

Soil locations	Sand	Silt	Clay	Textural class	Total $CaCO_3$ (%)	Organic matter (%)	pH (1:2.5 water suspension)	ECe (dSm^{-1})
Ismailia	82.9	10.7	6.4	Sandy loam	2.15	0. 26	7.72	1.04
New valley	65.0	22.8	12.00	Loamy sand	2.77	0.17	7.84	1. 70
Soluble ions (mmolc L^{-1})								
	Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	Cl^{-}	SO_4^{--}
Ismailia	4.24	1.08	4.40	0.75	0.00	1.65	2.90	5.92
New valley	8.08	2.11	6.57	0.26	0.00	2.20	5.76	9.06

Table (2): Chemical characteristics of the used irrigation water in both two studied soil locations.

Soil locations	pH	ECiw (dSm^{-1})	Soluble ions (mmolc L^{-1})								Sodium adsorption ratio (SAR)
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	Cl^{-}	SO_4^{--}	
Ismailia	7.71	0.32	1.63	0.25	0.27	1.09	0.00	1.65	0.43	1.16	0.28
New valley (well water)	7.45	4.12	9.31	5.01	28.44	0.50	0.00	5.02	32.09	6.15	10.61

Field experiments:

In a split plot design with three replicates, the plot area was 12 m^2 having two parts (3X2m), the first to evaluate agronomical characters and the second for seed production. The experimental soil ploughed twice and fertilized with 150 kg fad^{-1} Superphosphate (15.5% P_2O_5), 100 kg fad^{-1} Potassium Sulphate (48 % K_2O) and 15 kg N fad^{-1} as Ammonium Nitrate (33.5% N). Three planting methods, i.e., broadcast, the plot consisted of 15 rows with 20 cm spacing between rows (Rows A) and 10 rows with 30 cm spacing between rows (Rows B) were tested as main plots. Each main plot was divided into three seeding rates treatments as sub plots having 20, 25 and 30 kg fad^{-1}..

In the first part, growth characteristics; i.e., plant height (cm), leaves / stem ratio (L.S.R %) and fresh or dry forage yield (ton fad^{-1}) were recorded at 75^{th} days from sowing. While in the second part data of seed yield characteristics , i.e., number of heads $plant^{-1}$, number of seeds $head^{-1}$, seed weight $plant^{-1}$ (g), weight of 1000 seed (g) and seed yield (kg fad^{-1}) were recorded at harvesting stage. Seed yield characteristics were recorded by harvesting plants the whole sub plot and weighed (g m^{-2}) incase of broadcast method and then converted to (Kg. fad^{-1}), while in the other two sowing methods Rows A and B, the seed yield was calculated by harvesting plants of the central three rows and then converted to(kg fad^{-1}). Number of heads $plant^{-1}$ was recorded by counting number of heads in five randomly selected plants in each sub plot.

Plant analysis:

The shoot samples of Fahl berseem were collected from the two studied locations at 75th days from planting, dried at 70 ^{o}C, ground in a Willy mill, then they were digested with H_2SO_4 and H_2O_2 Parkinson and Allen,(1975). The digested samples were analyzed for nitrogen content according to Cottenie *et al*., (1982). Protein content was estimated by multiplying N-content by 6.25. Fiber and Ash contents were determined according to A.O.A.C ,(1990).

Soil analysis:

Represensive surface soil samples (0-30 cm) were collected from the treated plots after the second seasons of Fahl berseem harvesting, air dried and prepared for the following physical and chemical analyses:

1-EC and soluble ions were analyzed in the saturation soil paste extract , while soil pH was measured in the soil water suspension 1:2.5 Jackson, (1973).

2- Organic matter content was determined using the modified Walkely and Black method, Jackson,(1973).

3- Available N, P and K were determined according to the method of Cottenie *et al* ., (1982).

4-Soil bulk density which was determined for root zone using the core method Vomocil,(1957), total porosity was calculated as percentage from bulk and real densities from the relationship:- Tp= (1 - Bd/Pd) x 100.

Where T_P is total porosity, Bd is bulk density and Pd is density (2.65 g cm^{-3}).

5- Soil moisture characteristics i.e.,field capacity (FC), wilting point (WP) and available water (AW)) were determined according to the methods described by Black,*et al*., (1965).

6- Biological analysis were carried out for determining nitrogenase (N_2- ase) and dehydrogenase activity (DHA) in the rhizospheric soil of Fahl berseem plants at 75th days of sowing according to Hegazi *et al*., (1979) and Casida *et al*., (1964), respectively.

Statistically analyses:

The data were statistically analyzed using analysis of variance for split plot design according to Snedecor and Cochran (1980)

RESULTS AND DISCUSSION

A .Some soil chemical properties:

1- Soil pH , EC and O.M

Table (3) indicated that planting methods and seeding rates of Fahl berseem had favorable effect on soil pH and O.M contents at both two locations (Ismailia and New valley) after the second season of berseem harvesting. Opposite trend was noticed with EC. Obtained results showed that the planting method (Rows A) significantly exhibited pronounced effects on soil pH and O.M of both two soil locations, when compared with the broadcast method (control). Concerning the effect of seeding rate, the obtained results indicated that all the studied seeding rates significantly enhanced soil O.M, compared with control (20 kg seed.fad^{-1}). Rows A as a planting method treatment was being more effective in decreasing soil pH,

particularly at 30 kg seed fad^{-1} treatment, as compared with control and other treatments, mainly attained to the acidic effect from decomposition of the berseem roots residues as a soil organic matter and the soil buffering capacity. These results agreement with those of El- Sharawy *et al*., (2003) and Fawy & Ahmed (2009).

2-Available N, P and K in soil

Data presented in Table (3) showed that available N, P and K in soil exhibited the same response of the previous characters owing to different planting methods and seeding rates in both two soil location. It is important to mention that the highest available N, P and K in soil were obtained under Rows A method. The existence of significant differences between the planting methods of broadcast, Rows A and Rows B, in available N, P and K in soil, indicated the importance of planting methods with Rows A, especially when grown under sandy poor soil conditions, to obtain more productivity of newly reclaimed soils with marked available N, P and K in soil. Regarding the influence of seeding rates, the obtained results showed that seeding rates of Fahl berseem at all rates significantly increased all available N, P and K in soil.

Increasing seeding rates of Fahl berseem under different planting methods, led to an increase in the available nitrogen in both soil locations, i.e., Ismailia and New valley (Table 3). At Ismailia location, such increase were 56.8, 88.7 and 76.0 % for soil treated with a seeding rate of 30 kg fad^{-1} under broadcast, Rows A and Rows B treatments, respectively as compared with a seeding rate of 20 kg seed fad^{-1} under broadcast method treatment (control).The corresponding values at New valley location were 49.1, 77.6 and 70.7%, respectively. taking into consideration the total values of N added to the cultivated soil, either in biological or N organic forms which were equal, organic maturing plays a role for increasing N availability through microorganisms activities, beside decreasing N losses by leaching and volatilization (Metwally and Khamis, 1998). Micro flora can directly assimilate significant amounts of organic N compounds from plant residues or from dead biomass (Mary *et al*., 1996 and Reda 2007).

Data also showed that available P trend is almost similar to that of available N and the addition of 30 kg seed fad^{-1} resulted in the presence of height amounts of available P. Such increases reach 12.9, 29.3 and 17.1% in the treatments of broadcast, Rows A and Rows B in Ismailia location respectively, while they were 11.4,24.5 and 16.0% at New valley location, respectively, particularly at a seeding rate of 30 kg fad^{-1} treatment, as compared with the control (broadcast method with 20 kg seed fad^{-1}). Such results could be explained accordingly to the decomposition of organic residues and subsequent release of inorganic and organic acids which enhance the solubility and availability of P. Other possibilities could be: (a) effect of organic residues on lowering the fixation of phosphorus through several mechanisms such as chelating and formation of organic complexes relatively available for plants, (b) effect of organic matter through coating the $CaCO_3$ particles as proactive mechanism against precipitation and adsorption of various elements, and (c) carbon production from humus could exchange

the adsorbed anions such as phosphates thus should be available (Mohamed *et al*., 2011).

Concerning the values of available K, data showed a similar trend to the obtained previously for N and P. Generally, increasing seeding rate (30 kg fad^{-1}) increased the amounts of available K, particularly, in the presence of Rows A method (20 cm distance rows), was being more effective than the other studied two planting methods treatments. These results agreement with Mohamed *et al*., (2011).

Table (3): Effect of planting methods and seeding rates on some chemical properties of the two studied soil locations after the second season of Fahl berseem harvesting.

Planting methods	Seeding rates (Kg fad^{-1})	Ismailia location						New valley location					
		pH (1:2.5)	EC (dSm^{-1})	O.M (%)	N ($mgkg^{-1}$soil)	P ($mgkg^{-1}$soil)	K ($mgkg^{-1}$soil)	pH (1:2.5)	EC (dSm^{-1})	O.M (%)	N ($mgkg^{-1}$soil)	P ($mgkg^{-1}$soil)	K ($mgkg^{-1}$soil)
Broadcast	**20 (control)**	7.76	1.65	0.25	32.69	2.80	178	7.82	2.89	0.23	29.28	2.37	163
	25	7.69	1.77	0.28	47.15	2.98	194	7.73	2.92	0.26	40.60	2.39	181
	30	7.64	1.85	0.31	51.27	3.16	198	7.69	3.01	0.30	43.65	2.64	187
	Mean	**7.70**	**1.76**	**0.28**	**43.70**	**2.98**	**190**	**7.75**	**2.94**	**0.26**	**36.84**	**2.47**	**177**
Rows A	**20**	7.70	1.79	0.31	50.70	3.06	197	7.78	2.89	0.28	41.33	2.39	188
	25	7.63	1.82	0.36	51.77	3.29	219	7.70	2.93	0.31	47.39	2.52	209
	30	7.60	1.88	0.40	61.69	3.62	235	7.62	3.09	0.37	51.99	2.95	215
	Mean	**7.64**	**1.83**	**0.36**	**54.72**	**3.32**	**217**	**7.70**	**2.97**	**0.32**	**46.90**	**2.62**	**204**
Rows B	**20**	7.75	1.07	0.27	48.88	2.98	186	7.79	2.86	0.26	41.77	2.45	179
	25	7.66	1.78	0.32	55.09	3.10	197	7.73	2.90	0.29	45.10	2.56	186
	30	7.62	1.83	0.35	57.52	3.28	212	7.68	2.96	0.35	49.99	2.75	208
	Mean	**7.68**	**1.56**	**0.31**	**53.83**	**3.12**	**198**	**7.73**	**2.91**	**0.30**	**45.62**	**2.59**	**191**
L.S.D (0.05)	**a***	0.04	0.04	0.04	0.91	0.08	4.16	0.04	0.14	0.04	2.67	0.04	5.71
	b*	0.03	0.03	0.03	0.70	0.03	2.47	0.03	0.21	0.03	2.08	0.03	4.40
	aXb	N.S	0.06	N.S	1.21	0.06	4.28	0.06	0.11	0.06	3.61	0.06	7.62

a* Planting methods Rows A=20 cm distance between rows
b*Seeding rates Rows B=30 cm distance between rows

B .Some soil physical properties:

1- Bulk density

The obtained results (Table 4) indicated that, soil bulk density values were lower after the second season of Fahl berseem harvesting. This may be due to increasing the seeding rates, particularly with Rows A treatment, which reflects an accumulation of the more stable organic matter presented as humic fractions. These products improved soil physical conditions and enhance the formation of stable soil aggregates. In addition, humic substances are permanent aggregate-binding agents involved in the stabilization of soil micro-aggregates, >250μm (N' Daysegamiye and Angers 1993) and Mohamed *et al*., (2011)

2-Total porosity

Regarding the effect of planting methods and seeding rates on total porosity of newly reclaimed soils (Ismailia and New valley) after the second season of Fahl berseem harvesting, data in Table (4) showed that the values of total soil porosity were highly affected. It was increased with increasing the seeding rates under different planting methods treatments. Planting method 20 cm distance rows (Rows A) in the present of 30 kg seed fad^{-1} treatment was more effective, as compared with other treatments. It was noticed that the lowest bulk density value was corresponded the highest total porosity one. Organic matter plays as a cementing agent and creating addition pores (Abdel-Aziz *et al*., 1998) and Reda (2007).

3-Moisture retention

Results of soil moisture at both field capacity and wilting point as well as available water content in the two studied sandy soil locations, treated with planting methods of Fahl berseem under different seeding rates are listed in Table (4). Field capacity and wilting point were affected by the plant methods and the seeding rate treatments. Also,data showed that planting method (RowsA) treatment with 30 kg seed fad^{-1} was more effective than the other treatments. It is worthy to mention that the rate of increase in soil moisture content at field capacity was higher than wilting point, consequently, the best improvement in available water content was adjacent with the high rate of seeding rate (30 kg fad^{-1}) under the planting method (20 cm distance rows) treatment. In this connection, (El-Sharawy *et al*., 2003) found that organic materials increased the water holding capacity of soils, due to the increase in soil micro pores. (Shaheen *et al*., 2007) found that the addition of organic fertilizer had beneficial return to increase population of microorganisms, which produces exo-polysaccharide. This may increase total aggregates, aggregate size distribution and water storage (Mohamed *et al*., 2011).

C .Some soil biological properties:

1- Dehydrogenase activity

Dehydrogenase activity represents the overall measurement of microbial biomass in soil, data in Table (5) revealed that the application of seeding rates under consideration to the studied newly reclaimed soils (Ismailia and New valley), improved dehydrogenase activity, since it increased with increasing the rate of each seed addition, with superiority of 30 kg seed fad^{-1}, particularly under Rows A (20 cm distance between rows) method, as compared with other treatments of agricultural techniques. These results agree with those of Shaheen *et al*., (2007) and Massoud *et al*., (2009) who found that the addition of organic fertilizer had beneficial return to increase population of microorganisms in the surface layer-root rhizosphere that produce substances like polysaccharides, peptides, lipids, growth promoters and organic acids which stimulate plant growth.

2- Nitrogenase activity (N_2-ase)

Data, also in Table (5) showed a positive effect of agricultural techniques of Fahl berseem plants cultivated in both newly reclaimed soils (Ismailia and New valley). The values of this enzyme was highly affected with 30 kg seed fad^{-1} application, particularly in the presence of Rows A (20 cm distance between rows) method treatment, as compared with control (20 kg

seed fad^{-1} in the presence of broadcast method) treatment. Many researchers (Sainia *et al*., 2004 as well as Tilak and Reddy, 2006) agreed the addition of O.M increased the microbial diastrophic associations ,which markedly enhanced the biological activities in the rhizosphere of crop plants that are of ecological importance with implied agricultural significance.

Table (5): Effect of planting methods and seeding rates treatments on dehydrogenase and nitrogenase activity in the two studied rhizospheric soil locations, at 75th days of Fahl berseem sowing during two seasons (combined two seasons).

Planting methods	Seeding rats (kg fad^{-1})	Ismailia location		New valley location	
		Dehydrogenase activity (µ TPF g^{-1} dry soil day^{-1})	N $_2$ -ase activity (µmol C_2 H_4 g^{-1} dry soil hr^{-1})	Dehydrogenase activity (µ TPF g^{-1} dry soil day^{-1})	N_2-ase activity (µ mol C_2 H_4 g^{-1} dry soil hr^{-1})
Broadcast	20 (control)	188.0	18.70	180.0	18.00
	25	200.0	28.97	199.0	23.60
	30	220.0	36.50	208.0	30.10
	Mean	**202.67**	**28.70**	**195.67**	**23.90**
Rows A	20	220.0	28.63	215.0	24.80
	25	280.0	40.60	268.0	37.10
	30	332.0	56.80	309.0	47.60
	Mean	**277.33**	**42.01**	**264.00**	**36.50**
Rows B	20	210.0	22.90	200.0	20.60
	25	253.0	31.20	240.0	29.90
	30	295.0	44.80	280.0	35.40
	Mean	**252.67**	**32.97**	**240.00**	**28.63**
L.S.D (0.05)	a*	16.80	0.62	0.91	0.70
	b*	13.42	2.55	2.32	0.74
	aXb	23.25	4.42	4.02	1.29

a* Planting methods b* Seeding rates
Rows A=20 cm distance between rows Rows B=30 cm distance between rows

D . Growth characteristics, forage fresh and dry yields, seed yield and its composition.

Soil productivity is the result of the different soil characteristics as affected by different both planting methods and seeding rates treatments, and its out pot is growth and crop yield. Data in Table (6) reveled that growth characters, i.e., plant height, L.S.R, forage fresh yield and dry yield fad^{-1} of fahl berseem plants responded significantly to different planting methods and seeding rates treatments in both Ismailia and New valley locations after 75 days from sowing. The results showed that the best method was Rows A and the best seeding rate was 30 kg fad^{-1}. The highest responses for these growth characters of fahl berseem plants were at 20 cm distance between rows as a planting method under a rate of 30kg seed fad^{-1} treatments. These treatments were characterized by relative increase of plant height, LSR, fresh and dry yield after 75 days from sowing, equivalent to 36.8,14.7,46.2 and 69.8 % at Ismailia and 21.5,10.5 ,44.1 and 68.5 % at New valley, respectively, over the control (treated with 20kg seed fad^{-1} using broadcast

method). These results agree with those of Garza and Marquez (1994) and Pandy *et al*. (1997).

Data in Table (7) showed that at harvesting, No. of heads plants^{-1}, No. of seeds head^{-1}, seed weight plant^{-1}(g), weight of 1000 seeds (g) and seed yield kg fad^{-1} of fahl berseem plants were increased gradually with increasing the rats of seeds under all planting methods treatments. Concerning the effect of planting methods, the obtained results indicated that methods of Rows A significantly enhanced both No. of heads plants^{-1}, No. of seeds head^{-1}, seed weight plant^{-1}(g), weight of 1000 seeds (g) and seed yield(kg fad^{-1}) of fahl berseem plants , compared with control (broadcast). Insignificant interaction effect was recorded for No. of heads plant^{-1}, No. of seeds head^{-1} and weight of 1000 seeds in Ismailia location and for No. of seeds head^{-1}, seed weight plant^{-1}(g), weight of 1000 seeds (g) and seed yield (kg fad^{-1}) in New valley location.

The combined treatments were more effective in most cases than the control treatment (broadcast with 20 kg seed fad^{-1}), particularly the planting method Rows A (20 cm distance between rows) under 30 kg seed fad^{-1} treatment in both two locations Ismailia and New valley. The best data of No. of heads plants^{-1}, Number. of seeds head^{-1}, seed weight plant^{-1}(g), weight of 1000 seeds (g) and seed yield kg fad^{-1} were 13.00 , 65.40, 2.45, 3.63 and 339.33, respectively at 20 cm distance between row with 30 kg seeding rate in Ismailia location. Similar performances were recorded in New valley location at the same planting method and seeding rate. This might be due to the fact that more number of plants emerged m^{-2} with more branches, more well filled heads, sound and desirable seeds which in turn yielded into more seed yield. It means that rows sowing gave highest seed yield. The results are in the conformity with (Cazzato and Corleto, 1991 and Narwal and Sardans, 2000), they reported that reduced in the seed yield by increasing in row spacing.

This is possibly due to the beneficial effects of agricultural treatments of fahl berseem i.e. planting methods and seeding rates on physiochemical and biological properties affecting plant growth and yield, under newly reclaimed soils.,(Tables,3, 4 and 5). These results are in agreement with the conclusion of Reda (2007) and Hasina *et al*. (2011) they reported that increasing the yield of plants upon the increasing the application rates of composted plant residues, may be due to the decomposition organic material and release of its nutrients in available form rather than the beneficial effects of organic matter on soil chemical, physical and biological properties.

Such results are also in close agreement with Saleh *et al.* (2003) and (Gonzalez and Cooperband 2003) who indicated that the application of organic manures increased yield plants and their nutrients uptake. The increase of growth and seed yield depends on the rates of organic composition and the type. Massoud *et al*, (2009).

Such results are also in close agreement with (Saleh *et al*., 2003) and (Gonzalez and Cooperband 2003) who indicated that the application of organic manures increased yield plants and their nutrients uptake. The increase of growth and seed yield depends on the rates of organic composition and the type. (Massoud *et al*, 2009).

Table (6): Effect of planting methods and seeding rates treatments on growth characteristics of Fahl berseem in the two Studied locations , at 75th days of sowing, during two seasons (combined two seasons).

Planting methods	Seeding rate Kg fad^{-1}	Ismailia location				New valley location			
		plant height (cm)	L.S.R (%)	Forage yield (ton fad^{-1})	Dry yield (ton fad^{-1})	plant height (cm)	L.S.R%	Forage yield (ton fad^{-1})	Dry yield (ton fad^{-1})
Broadc-ast	**20 (control)**	81.67	43.27	16.11	1.92	80.80	40.74	8.61	1.24
	25	98.00	45.23	18.70	2.79	86.92	42.69	10.32	1.45
	30	104.17	47.13	20.11	3.06	95.17	44.14	10.94	1.53
	Mean	**89.00**	**45.21**	**18.31**	**2.59**	**87.63**	**42.52**	**9.96**	**1.41**
Rows A	**20**	89.00	45.60	18.11	2.83	85.33	42.43	10.31	1.77
	25	106.67	48.07	20.36	3.02	87.66	44.48	12.26	2.07
	30	111.71	49.63	23.55	3.26	98.17	45.01	12.41	2.09
	Mean	**102.46**	**47.77**	**20.67**	**3.04**	**90.39**	**43.97**	**11.66**	**1.98**
Rows B	**20**	78.17	44.77	17.67	2.65	82.00	42.19	9.19	1.28
	25	100.33	46.90	18.34	2.96	89.00	43.50	11.00	1.54
	30	109.33	47.30	21.33	3.17	92.00	44.59	11.20	1.57
	Mean	**95.94**	**46.32**	**19.11**	**2.93**	**87.67**	**43.43**	**10.46**	**1.46**
L.S.D (0.05)	**a***	5.88	1.34	1.64	0.30	2.14	n.s	1.02	0.19
	b*	4.38	1.28	1.41	0.23	2.08	1.37	0.77	0.14
	aXb	N.S	N.S	N.S	N.S	3.61	N.S	N.S	N.S

a* Planting methods b*Seeding rates
Rows A=20cm distance between rows Rows B= 30cm distance between rows
N.S not significant

Regarding the effect of the studied agricultural treatments on chemical composition of Fahl berseem plants, data in Table (8), also revealed that there was a marked increase in the contents of N, protein and ash over the control (broadcast method with 20kg seed fad^{-1}) treatment, by the application of seeding rates and different treatments of planting methods to newly reclaimed soils (Ismailia and New valley). The opposite trend was noticed by the fiber content. Protein % was the most important factor used to determine the best quality of forage as a feed uptake. The best data recorded for protein % was (17.20 and 17.90%) by Row A with 25 and 30 kg fad^{-1} rate of seeds in Ismailia location and 17.40% by Row A with 30 kg fad^{-1} seeding rate in New valley location.(Table 8)

Table (7): Effect of planting methods and seeding rates treatments on seed characteristics of Fahl berseem in the two studied soil locations at harvesting stage during two seasons (combined two seasons).

Planting methods	Seeding rate (Kg fad^{-1})	Ismailia location					New valley location				
		No. of heads Plant^{-1}	No. of seeds head^{-1}	Seed weight (g plant^{-1})	Weight of 1000 seeds (g)	Seed yield (kg fad^{-1})	No .of heads Plant^{-1}	No .of seeds head^{-1}	Seed weight (g plant^{-1})	Weight of 1000 seeds (g)	Seed yield (kg fad^{-1})
Broad-cast	**20 (control)**	11.17	55.28	1.32	2.90	258.67	5.17	38.50	0.92	2.90	226.0
	25	11.83	57.22	1.49	3.20	272.33	6.05	38.67	1.01	2.95	231.0
	30	12.67	58.40	1.83	3.37	281.33	6.17	45.33	1.06	3.03	247.0
	Mean	**11.89**	**56.97**	**1.55**	**3.16**	**270.78**	**5.80**	**40.83**	**1.00**	**2.96**	**234.78**
Rows A	**20**	11.67	60.71	1.87	3.52	327.00	8.40	37.50.	1.38	3.05	311.00
	25	12.83	63.57	2.04	3.55	330.00	10.06	45.50	1.41	3.08	333.00
	30	13.00	65.40	2.45	3.63	339.33	10.17	50.17	2.15	3.23	338.00
	Mean	**12.50**	**63.23**	**2.12**	**3.57**	**332.11**	**9.54**	**44.39**	**1.65**	**3.12**	**327.33**
Rows B	**20**	11.00	58.93	1.36	3.23	304.00	7.33	36.33	1.39	2.97	304.00
	25	12.32	61.54	1.81	3.45	325.00	7.60	45.83	1.51	3.02	317.00
	30	12.49	63.83	1.84	3.52	329.00	8.70	46.97	1.62	3.10	325.00
	Mean	**11.93**	**61.43**	**1.67**	**3.40**	**319.33**	**7.88**	**42.71**	**1.51**	**3.03**	**315.33**
L.S.D (0.05)	**a***	0.27	2.75	n.s	0.08	12.66	0.51	1.61	0.16	0.22	10.04
	b*	0.35	2.08	0.09	0.07	9.23	0.36	1.98	0.16	0.38	6.25
	aXb	n.s	n.s	0.13	n.s	15.98	0.62	n.s	n.s	n.s	n.s

a* Planting methods b*Seeding rates Rows A=20 cm distance between rows Rows B=30 cm distance between rows

Table (8): Effect of planting methods and seeding rates treatments on nitrogen, protein, fiber and Ash contents Of Fahl berseem plants in the two studied locations , during two seasons (combined two seasons).

Planting methods	Seeding rate Kg fad^{-1}	Ismailia location				New valley location			
		N (%)	Protein (%)	Fiber (%)	Ash (%)	N (%)	Protein (%)	Fiber (%)	Ash (%)
Broadcast	**20 (control)**	2.35	14.70	27.66	10.50	2.32	14.52	28.16	10.06
	25	2.49	15.53	25.46	10.60	2.42	15.13	25.60	10.26
	30	2.64	16.50	25.08	10.80	2.62	16.40	24.45	10.46
	Mean	**2.49**	**15.56**	**26.07**	**10.63**	**2.45**	**15.35**	**26.07**	**10.26**
Rows A	**20**	2.64	16.53	23.70	10.95	2.53	15.79	27.24	10.41
	25	2.75	17.20	22.40	11.31	2.67	16.66	24.70	11.01
	30	2.86	17.90	16.10	11.71	2.78	17.40	23.46	11.33
	Mean	**2.75**	**17.21**	**24.07**	**11.32**	**2.66**	**16.62**	**25.47**	**10.92**
Rows B	**20**	2.51	15.66	26.82	10.70	2.46	15.36	27.7	10.33
	25	2.61	16.30	24.10	10.96	2.54	15.89	24.69	10.42
	30	2.67	16.70	23.23	11.26	2.60	16.26	23.77	10.50
	Mean	**2.60**	**16.22**	**24.72**	**10.97**	**2.53**	**15.84**	**25.54**	**10.42**
L.S.D (0.05)	**a***	0.04	0.15	0.32	0.14	0.10	0.22	0.25	0.25
	b*	0.03	0.17	0.28	0.10	0.06	0.17	0.17	0.20
	aXb	n.s	0.29	0.48	0.18	0.11	0.29	n.s	0.34

a* Planting methods b*Seeding rates Rows A=20 cm distance between rows Rows B=30 cm distance between rows

Application of 30 kg seed fad^{-1} treatment was being more effective than the two other seeding rates, particularly in the presence of 20 cm distance between rows treatment. This increase was mainly due to one or more of the following reasons: (1) increasing the availability of nitrogen element in soil through improving its condition as a result of seeding rates applications as compared with the control, (2) increasing the CEC of the treated soil through the residues of fad roots as an organic maturing addition, (3) improving chemical, biological and fertility properties and (4) the improving soil physical properties, which is reflected on water behavior and decreasing nutrient losses by leaching and deep percolation El-Sharawy *et al*. (2003) and Reda (2007).

CONCLUSION

The results presented in this field trail conducted to assess the potential benefits to Fahl berseem plants from the treated newly reclaimed soils with different agricultural treatments; planting methods (broadcast,20 cm and 30 cm distance between rows) and seeding rates (20,25 and 30 kg seed fad^{-1}), revealed improving soil chemical, physical and biological properties as well as best growth, yield and quality were most apparent with an agricultural treatment of 20 cm distance between rows method with a rate of 30 kg seed fad^{-1} application. Results concluded that sowing of Fahl berseem in Rows A method at a rate of 30 Kg seed fad^{-1} gave best growth and seed production.

REFERENCES

A.O.A.C (1990). Official Methods of Analysis. 15th Ed., Association of Official Analytical Chemists, Washington, DC. USA.

Abdel-Aziz, S.M.; F.S. Salem; M.M.A. Reda and L.A. Hussien (1998). Influence of some amendements on the clayey soil properties and crop production. Fayoum J. Agric. Res. &Dev., 12: 196-204.

Bauer, A. and A.L. Black (1992). Organic carbon effects on available water capacity of three soil textural groups. Soil Sci. Soc. Am. J., 56: 248-254.

Black, C. A.; D.P. Evans, L.E. Ensminger, F. E. Clark and J.L. Whita (eds). (1965). Methods of soil Analysis. Amer. Soc. Agorn. Inc., Pub., Madison, Wisconsin, U. S. A.

Campbell C.A. and W. Souster, (1982). Present and Future Soil Nitrogen Trends Source. J. Soil Sci., 62: 651- 665.

Casida, L. E.; D.A.Klein and T. Santro (1964). Soil dehydrogenase activity. Soil Sci., 98:371- 376

Cazzato, E. and A. Corleto (1991). The effect of seeding rate and row spacing on seed yield and yield components of squarrosum clover and crimson clover in Southern Italy. CIHEAM - Options Mediterraneennes.389-393.

Clark,A.(2007). Managing cover crops profitably, 3rd ed. Sustainable Agriculture Network, Beltsville, MD.

Cottenie, A.; .M.Verloo; L. Kiekense; G. Velghe and R.Camerlynck(1982). Chemical analysis of plants and soils.State Univ.of Belgium-Gent,Hand Book,1-63

El-Sharawy, M.A.O; M.A. Aziz and Laila, K.M. Ali (2003). Effect of the application of plant residues composts on some soil properties and yield of wheat and corn plants. Egypt. J. Soil Sci., 43:421-434.

Fawy, H.A. and Kh. Ahmed (2009). Effect of natural soil conditioners and rice straw residues application on sandy soil properties and wheat production. Egypt. J. Soil Sci., 49:29-38.

Garza H. M. and J. J. Marquez (1994). Effect of dates, densities and methods of sowing on seed yield of berseem clover. J. Agric. Res. 90: 163-173.

Gonzalez, R.F. and L.R. Cooperband (2003). Compost effects on soil chemical properties and field nursery production. J. Environ. Hortic., 21: 38-44.

Hasina G, S.;S. Beena., Fida M. Ahmad and A. Ijaz (2011). Influence of late planting dates and planting methods on seed production of clovers. ARPN Agric and Biol. Sci., 6: 1-5.

Hegazi, N.A.; M.A. Eid; R.S. Forage and M. Monibe (1979). Asymbiotic N_2-fixation in the rhizosphere of sugar cane plants under semi – arid condition of Egypt . Rev. Ecol. Biol. Soil , 16; 23 – 37.

Jackson, M.L. (1973). Soil Chemical Analysis. Prentice- Hall ,Englewood Colills ,New Jersey.

Mary, B.; S. Recous; D. Darwis and D. Robia (1996). Interaction between decomposition of plant residues and nitrogen cycling in soil. Plant and Soil, 181:71-82.

Massoud, O.N.; Ebtsam, M. Morsy and Nadia, H. El-Batanony (2009). Field response of snap bean (*phaseolius vulgaris L.,*) to N_2-fixers, *Bacillus circulans* and Arabuscular mycorrhizal fungi inoculation through accelerating rock phosphate and feldsparweathering. Austr. J. of Basic and Applied Sci., 3:844-852.

Metwally, Sh. M. and M.A. Khamis (1998). Comparative effects of organic and inorganic sources applied to a sandy soil on availability of N and wheat yield. Egypt. J. Soil Sci., 38:35-54.

Mohamed, Faten M.; A. A. M. Mohamedin and M. M. A. Reda (2011). Sustainable improvement of AL- Arish soils , north Sinai condition by Shale with Bio-organic technique and the impact on corn crop . Egypt . J . Appl. Sci.,26: 16 - 35.

Narwal, S.S. and V. Sardana (2000). Effect of sowing dates and rates on the green forage, seed yield and quality of late sown berseem. J. of Maharashtra
Agric. Univ., 25: 181-184.

N' Daysegamiye, A. and D.A. Angers (1993). Organic matter characteristics and water-stable aggregation of a sandy loam soil after 9 years of wood-residue application. Can .J. Soil Sci., 73:115-122.

Pandy, T.D.; K.L. Nandeha and R. Saxena. (1997). Effect of seed rates and phosphorus levels on forage and seed yields of berseem (*Trifolium alexandrinum* L.). Forage Rese, 22: 239-242.

Parkinson, J.A. and S.E. Allen (1975). Ewer oxidation procedure suitable for the determination of nitrogen and mineral nutrients in biological material. Commun. Soil Sci. Plant Analysis, 6: 1-11.

Rawls, W.J., T; J. Gish and D.L. Brakensiek (1992). Estimating soil water retention from soil physical properties and characteristics. Adv. Soil Sci., 16: 213-234.

Reda , M. M. A (2007). Amelioration techniques for saline sodic soils in north Nile delta and its impact on sunflower productivity . J. Biol . Chem. Environ. Sci., 2: 139 – 155.

Sainia,V.K; S. C. Bhandarib and J.C Tarafdara (2004).Comparison of crop yield ,soil microbial C,N and P ,N-fixation ,nodulation and mycorrhizal infiction in inoculated and non-inoculated sorghum and chickpea crops. Fi.Cro.Res.,89;39-47.

Saleh, A.I., ; A. Abdel-Fattah and A.S. Taalab (2003). Yield response and nutrient uptake of cowpea following application of different organic compost mixture. Egypt. J. Soil Sci., 43:567-576.

Shaheen, A.M.; F.A. Rizk and M.S.Singer (2007). Growing Onion plants without chemical fertilization. Res. J. Agric.and Biol. Sci., 3:95-104.

Snedecor, G.W. and W.G. Cochran (1980). Statistical methods. 7 Edition. Iowa state Univ. th Press., Ames.,IA. U.S.A.

Tilak, K.V.B.Rand B.S.Reddy(2006). *Bacillus cereus and B.circulans* novel inoculants for crops..Sci.,90;642-644.

Vomocil, J. A. (1957). Measurements of soil bulk density and penetrability. A review of methods Adv. Agron., 9 : 159 – 176.

تأثير زراعة البرسيم الفحل علي تحسين بعض خواص وإنتاجية الأراضي حديثة الأستصلاح

عزة خليل سالم- فكرى عبد المنعم فرج* - زينب محمد عبد النبى- ناصر محمد حامد
معهد بحوث المحاصيل الحقلية – مركز البحوث الزراعية –الجيزة - مصر
***معهد بحوث الاراضى والمياة والبيئة – مركز البحوث الزراعية –الجيزة – مصر**

أجريت تجربتان حقليتان علي محصول لبرسيم الفحل في كل من محطة بحوث الإسماعيلية والوادي الجديد كأراضي حديثة الإستصلاح خلال الموسمين الشتويين ٢٠٠٩/٢٠١٠ و٢٠١٠/٢٠١١ لدراسة تأثير طرق الزراعة ومعدلات التقاوي لبرسيم الفحل علي تحسين بعض خواص الأراضي الكيمائية والطبيعية والحيوية وإنتاجيتها حيث تضمنت المعاملات ثلاث طرق للزراعة وهي الزراعة البدار والزراعة تسطيراعلي مسافة ٢٠ سم او ٣٠سم بين السطور تحت ثلاث معدلات من التقاوي ٢٠، ٢٥، ٣٠ كجم للفدان.

وقد تبين من النتائج تحسناً ملحوظاً في بعض الخواص الكيمائية للتربة تحت الدراسة مثل درجة حموضة التربة ومحتوي التربة من المادة العضوية ودرجة تيسر النيتروجين والفوسفور والبوتاسيوم وأيضاً تحسناً في بعض الخواص الطبيعية للتربة ممثلا فى الكثافة الظاهرية والمسامية الكلية وقدرة التربة علي حفظ المياه كما لوحظ تحسناً في بعض الخواص الحيوية للتربة ممثلا فى زيادة الأعداد الميكروبية ممثلة في زيادة نشاط إنزيم الدهيدروجينيز وكذا قدرة الميكروبات على تثبيت نيتروجين الهواء الجوى ممثلة فى زيادة نشاط إنزيم النيتروجينيز بمنطقة ريزوسفير التربة مقارنه بالكنترول (طريقة البدار بمعدل٢٠كجم تقاوي للفدان)

كما إنعكس تأثير النتائج السابقة والمعاملات تحت الدراسة علي كل من محصولى العلف والبذور فقد زاد طول النبات ونسبة الاوراق إلي السيقان والوزن الطازج والجاف وكذا محتوى المادة الجافة من النيتروجين والبروتين والرماد وعدد البذور لكل نورة ووزن البذور فى النبات الواحد ووزن الالف حبة ومحصول البذور بزيادة معدلات التقاوي تحت طرق الزراعة المختلفة مقارنه بالكنترول وكانت أفضل المعاملات هي طريقة الزراعة تسطيراعلي مسافة ٢٠سم بمعدل تقاوي ٣٠كجم/ للفدان.

قام بتحكيم البحث

أ.د / عبد الرحيم عبد الرحيم ليله	**كلية الزراعة – جامعة المنصورة**
أ.د / محمد رضا محمود	**مركز البحوث الزراعية**

Table (4): Effect of planting methods and seeding rates treatments on some physical properties of the two studied soil locations after the second season of Fahl berseem harvesting.

Planting methods	Seeding rates (Kg fad^{-1})	Ismailia location					New valley location				
		Total porosity (%)	Bulk density (Mgm^{-3})	Field capacity (%)	Welting point (%)	Available water (%)	Total porosity (%)	Bulk density (Mgm^{-3})	Field capacity (%)	Welting point (%)	Available water (%)
Broadcast	20(control)	29.50	1.70	11.89	5.71	6.18	27.60	1.78	10.39	5.20	5.19
	25	30.18	1.66	12.86	5.90	6.96	27.90	1.73	11.47	6.25	5.22
	30	30.90	1.63	13.68	6.55	7.13	29.02	1.69	12.28	6.47	5.81
	Mean	**30.20**	**1.66**	**12.81**	**6.05**	**6.76**	**28.40**	**1.73**	**11.38**	**5.97**	**5.40**
Rows A	20	32.70	1.58	12.97	5.01	7.94	29.93	1.68	11.44	5.22	6.22
	25	34.88	1.55	14.64	6.47	8.17	32.97	1.60	12.57	5.69	6.88
	30	37.98	1.52	14.92	6.54	8.28	34.77	1.56	13.98	5.79	7.19
	Mean	**35.19**	**1.55**	**14.18**	**6.01**	**8.13**	**32.56**	**1.61**	**12.66**	**5.57**	**6.78**
Rows B	20	31.63	1.65	12.10	5.04	7.06	29.39	1.72	10.88	5.41	5.47
	25	33.40	1.61	12.15	6.06	7.39	31.65	1.67	11.86	6.32	5.54
	30	35.99	1.60	13.84	6.93	7.91	33.44	1.60	12.91	6.42	6.49
	Mean	**33.67**	**1.62**	**12.70**	**6.02**	**7.45**	**31.49**	**1.66**	**11.88**	**6.05**	**5.83**
L.S.D (0.05)	a*	0.63	0.04	0.44	0.04	0.08	0.56	0.04	0.12	0.04	0.10
	b*	0.49	0.03	0.34	0.05	0.03	0.54	0.03	0.12	0.06	0.08
	aXb	0.84	N.S	0.58	0.08	0.06	0.94	N.S	0.21	0.11	0.14

a* Planting methods b* Seeding rates Rows A=20 cm distance between rows Rows B=30 cm distance between rows