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EFFECT OF SALINE IRRIGATION AND NITROGEN APPLICATION ON GROWTH AND PRODUCTIVITY OF FODDER BEET GROWN UNDER INTERCROPPING

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ABSTRACT

Fodder beet grown under the present conditions, irrigated with brackish drainage water and saline soils, in the Fayoum Province proved to be adequately successful. Intercropping faba bean to cover the domestic needs and raise the profitability of the area/unit, with differing intercropping devices and nitrogen supply were investigated. Setting the faba beans on the opposite side of the ridge, mainly increased the fresh and dry weights of both foliage and roots as well as, the length and diameter of the roots. Anyhow, pure stands of fodder beet gave higher values, when receiving 45 kg N/feddan, being the highest level in the intercropping treatments providing the maximal values. At the harvest time, the yield of foliage remainder was slightly higher when growing faba beans on the same side of fodder beet, meanwhile significant increases were found for root yields, when growing faba beans on the opposite side when being in interaction with the raising nitrogen supplement reaching the maximal value at the level of 45 kg N/feddan.
Keywords: Fodder beet – Vicia feba – Intercropping - Fertilization

INTRODUCTION

In Egypt, the cultivated area is limited. Therefore, the country is in great need to increase the agricultural area to meet the high growth rate in population.

El-Fayoum area is one of regions planed to add further surfaces to the agricultural area in Egypt, depending upon differing sources for water supply; a part is provided with Nile water for raising the vegetations, and other parts can be only initiated if irrigated with drainage water, whose salinity is ranging between 1700- 1900 ppm, accumulated in the clay soil to reach 2200 – 2700 ppm.

Fodder beet is considered to be a crop of good tolerance in saline sites, and there why is now widely grown as a winter crop in various locations of El-Fayoum Province. Yet the farmers depend upon other winter crops to cover their alimentary needs from which faba beans are in the first place. Therewhy, intercropping was suggested to have both yields on the same surface and thus doubling the benefit of the unit/area. To attain the maximal potentiality of fodder beet under the introduced conditions, changing the intercropping devices and defining the appropriate nitrogen rate for optimal growth and maximal yield affected through the relevant index components.

Yield of sugar beet decreased when intercropped with bean, maize, wheat or cane (Roberston *et al*., 1965; Geric, 1966; Fasihi *et al*., 1970 and El-Geddawy *et al*., 1992). Mehrotra and Ali, (1970) recording that intercropping a non-legume with legume crops proved to be a successful system for better

use of plant nutrients, particularly in nitrogen deficient soils and under unfavourable environmental conditions due to different habits of the crops. Beletskil and Chasvitive, (1976) found that intercropping maize with fodder beet in the same row or in alternate rows decreased the fodder beet yield. Some workers, Sorour *et al*. 1992; Besheit *et al.* (1994), Sharif and Eghbal (1994), Toor and Bains (1994), Domska (1996), El-Maghraby *et al*. (1997), Ibrahim (1998) and Haake (1999) suggested that raising nitrogen rate increased root length and diameter, dry weight/plant, root and top yields of sugar beet. On the other hand Wysznski *et al*. (1988) on field experiments with sugar beet conducted to study different grown periods, sowing dates and N fertilizer rates. They found that yield was not significantly affected by N rates between 120 and 280 kg/ha.

This work aimed to study the effect of saline irrigation water and nitrogen supply on growth and productivity of fodder beet grown in a mixed culture with faba beans.

MATERIALS AND METHODS

The study was carried out in Tamiya/El-Fayoum Province during the two successive seasons 95-1996 and 96-1997. Irrigation depended upon water of agricultural drainage with salinity ranging between 1700 – 1900 ppm accumulated in the clay soil to reach 2200 – 2700 ppm (Tables 1 and 2). Fodder beet cultivar Voeroeshenger and faba beans Giza 674, both provided from Agricultural Research Centre/Egypt, were sown in both seasons 25 th of October and end of the second week of November, respectively on ridges 50 cm a part and in holes at 25 cm intervals. Faba bean seeds were inoculated with the specific rhizobia before planting. The used devices for intercropping were as follows :

I- Fodder beet growing on one side of the ridge (active side) and faba beans on the other side (opposite) letting two plants in every hole.

II- Fodder beet growing on one side of the ridge (active side) and faba beans between the holes of fodder beet letting two plants in every hole.

III- Fodder beet growing on one side of the ridge (active side) and faba beans between the holes of fodder beet and also on the other side (opposite) letting only one plant in every hole, and thus having the same faba population of the two foregoing treatments.

The added fertilizer/per feddan were 150 kg superphosphate (15.5% P_2O_5) when preparing the field for cultivation, 150 kg potassium sulphate after the thinning of fodder beet (45 days after sowing) and 50 kg two months later. The variable nutrient, nitrogen as ammonium sulphate (20.5 N %) was added as follows:

Control 1- applying the recommended level, from the Ministry of Agriculture to pure stand of fodder beet of 45 N kg/feddan divided in two equal doses, the first 45 days after sowing and the second two months later.

Control 2- applying 30 N kg/feddan to pure stand of fodder beet, divided in two equal doses, the first 45 days after sowing and the second two months later.

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Meanwhile, to the intercropping treatments as next :

A. Applying 15 kg N/feddan once 45 days after sowing (after fodder beet thinning) .
B. Adding 30 kg N/feddan once after beet thinning.
C. Adding 30 kg N/feddan in two equal parts, the first after beet thinning and the second one month later.
D. Adding 30 kg N/feddan in two equal parts, the first after thinning and the second two months later.
E. Adding 30 kg N/feddan in two equal parts, the first after thinning and the second three months later.
F. Adding 45 kg N/feddan in two equal parts the first after thinning and the second three months later.

Two samples were taken at 90 days after sowing and the harvest time to evaluate the foliage growth patterns, root development, quantitative and qualitative values of the yield.

RESULTS AND DISCUSSION

I. Fresh weight of foliage/plant 90 days after sowing :

The results from Table 3 showed that intercropping faba beans, in both seasons, on he opposite side gave higher values being with significant differences in the first season. Nitrogen application showed the highest values when applying 45 kg N/feddan equally divided in the two dates of application. The treatments to determine, the proper time for adding the second half of 30 kg N/feddan showed in both seasons the obviously higher values when being applied one month after thinning. The lowest values were obtained when adding once the rate of 15 kg N/feddan. The interaction showed, throughout, significant increases of the monoculture receiving 45 kg N/feddan over all other treatments, while the differences shown from the monoculture receiving 30 kg/feddan gave significant increases when compared with all intercropping treatments other than the once receiving 45 kg N/feddan showing a higher value in the first season when grown on the opposite side of the ridge, and the same in the second season with a lower difference. Authors, Noor and Farag (1984), El-Kassaby *et al*. (1985), and Abd El-Aal *et al*. (1989), confirmed the findings pointing to the superiority of beet growth with intercrops on the opposite side of the ridge. Nelson (1978), Badawi (1989) and Sherif andEghbal (1994) showed stimulating effects of increasing nitrogen additions, whereas mono cultures had higher values according to the absence of competition.

II. Dry weight of foliage/plant 90 days after sowing :

Concerning the cropping devices (Table 4) slight non significant differences were found favouring the intercropping on the opposite side in the first season and on both sides in the second season. Adding the progressive raise of the nitrogen level showed corresponding increases, being mostly with significant differences at the level of 45 kg N.

Table (3) : Effect of intercropping systems of faba bean with fodder beet under different dates of nitrogen application on foliage fresh weight/plant (g) of fodder beet at 90 days after sowing in 1995-1996 and 1996-1997 seasons.

Season	1995-1996				1996-1997			
Intercropping systems / Dates of nitrogen application	I	II	III	Mean	I	II	III	Mean
Control 1	457.843	457.843	457.843	457.843	382.876	382.876	382.876	382.876
Control 2	360.266	360.226	360.226	360.266	273.573	273.573	273.573	273.573
A	236.980	202.443	163.653	201.025	189.986	153.476	187.576	177.013
B	253.933	276.756	229.366	253.352	203.443	187.710	209.266	200.140
C	272.856	302.190	273.976	283.007	238.166	207.550	223.806	223.174
D	234.513	261.580	261.020	252.371	193.636	177.376	193.790	188.267
E	229.156	172.543	252.376	218.025	197.390	195.580	188.756	193.908
F	402.200	319.110	285.443	335.584	298.953	277.856	283.950	286.920
Mean	305.968	294.091	285.493		247.253	232.000	242.949	

L.S.D. at level 5%

Intercropping systems (I.S.)	**20.339**	**N.S.**
Dates of nitrogen application (N.A.)	**33.213**	**29.040**
I.S. X N.A.	**57.528**	**50.299**

Table (4) : Effect of intercropping systems of faba bean with fodder beet under different dates of nitrogen application on foliage dry weight/plant (g) of fodder beet at 90 days after sowing in 1995-1996 and 1996-1997 seasons.

Season	1995-1996				1996-1997			
Intercropping systems / Dates of nitrogen application	I	II	III	Mean	I	II	III	Mean
Control 1	49.656	49.656	49.656	49.656	41.350	41.350	41.350	41.350
Control 2	36.680	36.680	36.680	36.680	30.366	30.366	30.366	30.366
A	23.696	20.916	18.113	20.908	26.026	22.100	25.856	24.661
B	26.560	31.920	25.386	27.955	28.886	27.963	28.236	28.362
C	27.420	32.840	28.310	29.523	35.250	31.543	36.483	34.425
D	24.160	27.203	26.966	26.110	28.853	28.910	32.943	30.235
E	23.070	18.746	26.583	22.800	30.006	32.270	32.840	31.705
F	46.696	36.593	30.446	37.912	41.550	44.183	40.963	42.232
Mean	32.242	31.819	30.267		32.786	32.335	33.630	

L.S.D. at level 5%

Intercropping systems (I.S.)	**N.S.**	**N.S.**
Dates of nitrogen application (N.A.)	**3.780**	**3.956**
I.S. X N.A.	**6.548**	**6.853**

Appling the second half of the nitrogen level 30 kg N/feddan, proved to give the highest values when added one month after thinning, showing significant differences when growing faba bean on the opposite side of the ridge. Similarly, concerning the interaction the higher value was obtained when adding 45 kg N/feddan to the device where faba beans were grown on the opposite side. Meanwhile, cultivating pure stands of fodder beet gave the

higher values, when comparing every nitrogen level with the matches of intercropping with significant differences.Obtaining higher values when growing faba beans on the opposite side was confirmed by Noor and Farag (1984), El-Kassaby *et al*. (1985) and Abd El-Aal *et al*. (1989). The stimulative effect of nitrogen was often revealed; Pulkrabek (1985), Mahmoud *et al*. (1990) and Sharif and Eghbal (1994) being in agreement with the registered tendency. The interaction was mainly depending upon nitrogen application and mostly, obvious when combined with the device intercropping faba beans on the opposite side of the ridge.

III. Root length at harvest :

The registered results (Table 5) revealed that the monoculture showed the highest obvious values, followed under the intercropping devices with slight increases, with the treatment growing faba bean on the opposite side of the ridge. Raising the nitrogen rate, for intercropping, showed the highest values when adding 45 kg N/feddan , followed by 30 kg N/feddan with slight differences between applying the second half of the rate, either after two or three months after thinning. The interaction showed the most highest values when growing the monocultures, while combining both traits of the investigation registered the addition of 45 kg N/feddan on the opposite side in the first season slightly non significant increases and on the active side significant increases over the 15 and 30 kg N/feddan added as a sole application in the second season, whether grown on the active side or both sides of the ridge. Thus, it is clear that intercropping devices are of no main effectiveness other than the response to nitrogen. These results confirms the findings of El-Kassaby *et al*. (1985), Edris *et al*. (1992) and El-Maghraby *et al*. (1997).

Table (5) : Effect of intercropping systems of faba bean with fodder beet under different dates of nitrogen application on root length/plant (cm) of fodder beet at harvest in 1995-1996 and 1996-1997 seasons.

Season	1995-1996				1996-1997			
Intercropping systems / Dates of nitrogen application	I	II	III	Mean	I	II	III	Mean
Control 1	35.633	35.633	35.633	35.633	38.367	38.367	38.367	38.367
Control 2	30.477	30.477	30.477	30.477	32.700	32.700	32.700	32.700
A	27.290	25.397	26.110	26.266	29.753	24.679	25.867	26.766
B	27.863	27.763	28.110	27.912	29.213	24.977	26.390	26.860
C	27.977	27.577	28.163	27.906	29.863	28.720	28.287	28.957
D	29.833	28.810	28.223	28.956	30.110	29.220	29.577	29.636
E	28.400	27.600	28.657	28.219	30.497	29.657	29.000	29.718
F	30.490	30.477	26.977	29.314	31.167	30.833	32.067	31.356
Mean	29.745	29.217	29.044		31.459	29.894	30.282	

L.S.D. at level 5%

Intercropping systems (I.S.)	**N.S.**	**N.S.**
Dates of nitrogen application (N.A.)	**3.789**	**3.225**
I.S. X N.A.	**6.563**	**5.587**

IV. Root diameter at harvest :

Intercropping showed (Table 6) the highest increases when cultivating faba beans on the opposite side of the ridge, with significant differences in the second season. Nitrogen application under both monocultures showed an increase of 45 kg N/feddan over 30 kg N/feddan with no significant differences, from which the higher rate had higher values over all intercropping treatments in both seasons, except the one receiving 45 kg N/feddan, with significant differences in the second season. Otherwise, adding the second half of 30 kg N/feddan two and three months after thinning showed higher values for that rate.

Table (6) : Effect of intercropping systems of faba bean with fodder beet under different dates of nitrogen application on root diameter/plant (cm) of fodder beet at harvest in 1995-1996 and 1996-1997 seasons.

Season	1995-1996				1996-1997			
Intercropping systems Dates of nitrogen application	I	II	III	Mean	I	II	III	Mean
Control 1	18.477	18.477	18.477	18.477	19.213	19.213	19.213	19.213
Control 2	16.457	16.457	16.457	16.457	16.679	16.679	16.679	16.679
A	14.333	12.130	14.130	13.531	13.653	10.633	13.000	12.429
B	14.843	14.333	14.620	14.599	13.977	10.067	13.134	12.393
C	14.990	14.420	14.563	14.658	14.287	13.033	14.867	14.062
D	15.477	14.577	15.197	15.083	15.001	14.497	15.000	14.833
E	15.603	15.810	15.310	15.574	15.390	14.977	15.720	15.362
F	16.557	16.457	16.390	16.390	17.933	16.457	16.990	17.127
Mean	15.842	15.303	15.643		15.767	14.444	15.575	

L.S.D. at level 5%

Intercropping systems (I.S.)	**N.S.**	**1.22**
Dates of nitrogen application (N.A.)	**1.522**	**1.995**
I.S. X N.A.	**2.636**	**.456**

As usual for all registered patterns, showed 15 kg N/feddan as sole addition, the lowest values. The interaction showed the highest value when adding 45 kg N/feddan to the monoculture. Mostly, had nitrogen addition at every rate higher values, with no significance, when growing faba beans on the opposite side. The highest value was obtained, in both seasons, through applying 45 kg N/feddan on the opposite side of the ridge, with greater increases over the 15 and 30 kg N/feddan applied as one addition, specially in the second season. The results showing the superiority of growing faba beans on the opposite side, and thus allowing more space for the roots and less competition for water and nutrients are in accordance with the findings of El-Kassaby *et al*. (1985). Nitrogen addition, raise of rate and being in interaction with intercropping devices, was the most effective factor, confirming the results of Kamel *et al.* (1989), Badawi (1985), and Ibrahim (1998), specially when growing faba beans on the opposite side of the ridge allowing the uptake from a space without close competition.

V. Root fresh weight/plant at harvest :

The data in Table 7 showed that although no significant differences between intercropping devices were registered yet the highest value, slightly greater, was obtained from cultivating faba beans on the opposite side, in both seasons. The nitrogen application stimulated the highest value when adding 45 kg N/feddan whether to monoculture or intercropping, being significantly higher than other traits. Raising the nitrogen level increased, variably, the values. Changing the data of applying the second half belonging to the 30 kg N/feddan caused a raise two and three months after thinning without noticeable differences, inbetween. The interaction showed the superiority of both monocultures, with significant differences in the first season, when adding 45 kg N/feddan over all intercropping treatments, from which showed 45 kg N/feddan the greatest value when growing faba bean on the opposite side. El-Kassaby *et al*. (1985) stated an increase in the favour of growing faba beans on the opposite side, while Abd El-Aal *et al*. (1989) reported the contrary. Adding and raising nitrogen, increasing the obtained values, confirmed the findings of Vavilov and Novikov (1973), Strand and Vales (1987) and Ibrahim (1998). The interaction is mainly released through nitrogen application with higher values when growing faba bean on the opposite side.

Table (7) : Effect of intercropping systems of faba bean with fodder beet under different dates of nitrogen application on root fresh weight/plant (kg) of fodder beet at harvest in 1995-1996 and 1996-1997 seasons.

Season	1995-1996				1996-1997			
Intercropping systems / Dates of nitrogen application	I	II	III	Mean	I	II	III	Mean
Control 1	2.977	2.977	2.977	2.977	3.110	3.100	3.110	3.110
Control 2	2.453	2.453	2.453	2.453	2.783	2.783	2.783	2.783
A	1.922	1.511	1.722	1.718	1.644	1.019	1.347	1.337
B	1.956	1.778	1.837	1.857	1.837	1.493	1.750	1.693
C	2.105	1.828	1.956	1.963	1.983	1.943	1.889	1.938
D	2.161	2.017	2.316	2.165	2.373	2.201	2.557	2.377
E	2.222	2.062	2.065	2.116	2.415	2.400	2.664	2.486
F	2.510	2.493	2.485	2.496	2.747	2.617	2.663	2.676
Mean	2.288	2.140	2.226		2.362	2.196	2.343	
L.S.D. at level 5%								
Intercropping systems (I.S.)				**N.S.**				**N.S.**
Dates of nitrogen application (N.A.)				**0.302**				**0.405**
I.S. X N.A.				**0.5223**				**0.701**

VI. Root dry weight/plant at harvest :

In both seasons, the data in Table 8 showed higher values, with no significant differences, when growing faba bean on the opposite side of the ridge. Nitrogen application showed the highest values at the 45 kg N/feddan for both monoculture and intercropping. Adding nitrogen, as a sole dose, whether 15 or 30 kg n/feddan reduced obviously the values, whereas adding the second half of 30 kg N/feddan two or three months after thinning

increased markedly the dry weight of the root/plant over the addition one month later after sowing. As expected, for interaction, all increases are mainly depending upon the level of nitrogen, and pronouncingly in the case of monoculture. Anyhow, when combined if intercropping takes place, with setting faba beans on the opposite side the values show then a raise, mostly at all levels of nitrogen. From research of El-Kassaby *et al*. (1985) is in accordance with the increment resulting form growing faba bean on the opposite side, while Abd El-Aal *et al*. (1989), do not agree with. Several authors; Vavilov and Novikov (1973) till Ibrahim (1998) state the stimulative effect of nitrogen, whose effect dominates when accompanied with intercropping, yet being more expressed with faba beans on the opposite side of the ridge.

Table (8) : Effect of intercropping systems of faba bean with fodder beet under different dates of nitrogen application on root dry weight/plant (g) of fodder beet at harvest in 1995-1996 and 1996-1997 seasons.

Season	1995-1996				1996-1997			
Intercropping systems Dates of nitrogen application	I	II	III	Mean	I	II	III	Mean
Control 1	541.417	541.417	541.417	541.417	558.907	558.907	558.097	558.907
Control 2	416.147	416.147	416.147	416.147	480.277	480.277	480.277	480.277
A	353.073	259.910	267.817	293.600	277.277	186.793	249.690	237.920
B	332.413	317.403	321.363	323.727	337.217	280.513	305.993	307.908
C	367.843	313.500	345.477	342.273	400.893	372.780	332.777	368.817
D	383.933	344.327	389.140	372.467	429.053	392.293	435.630	418.992
E	391.480	381.757	383.417	385.551	434.237	408.203	460.373	434.271
F	484.383	447.143	468.323	466.617	474.970	466.895	445.850	462.570
Mean	409.211	377.700	391.637		424.104	393.333	408.687	

L.S.D. at level 5%

Intercropping systems (I.S.)	**N.S.**	**N.S.**
Dates of nitrogen application (N.A.)	**63.695**	**68.230**
I.S. X N.A.	**110.323**	**118.178**

VII. Fresh foliage yield in tons/feddan :

The results from Table 9 showed that although no significant differences, between the devices, were found yet slight increases resulted from intercropping faba beans on the active side of the ridge. Anyhow, apart from the followed treatments the yield could be considered as convenient, though markedly lower than the pure stands. Nitrogen application showed that higher values when adding 45 kg N/feddan whether as monoculture or for intercropping with significant increases of the monoculture and similarly caused the 30 kg N/feddan of monoculture a raise over the rates below than 45 kg N/feddan. Varying the date of application for 30 kg N/feddan when adding the second half two or three months after thinning. As for interaction, showed the monoculture receiving 45 kg N/feddan the highest significant increases, while otherwise half of the treatments in the first season and all of them in the second season had the higher values when growing faba beans on the active side with no relevance between the first and second season

when raising the rate from 30 to 45 kg N/feddan. El-Kassaby *et al*. (1985) and Abd El-Aal *et al*. (1989) reported contradicting responses to the ridge side of intercropping. As, usual several authors report from the stimulating effect of nitrogen addition and raise of the rate. Starting with Vavilov and Noviko (1973), over various authors, till Ibrahim (1998) are all stating the positive role of nitrogen, whose response was the main for interaction mostly when setting faba beans on the active side of the ridge.

Table (9) : Effect of intercropping systems of faba bean with fodder beet under different dates of nitrogen application on foliage yield tons/feddan of fodder beet at harvest in 1995-1996 and 1996-1997 seasons.

Season	1995-1996				1996-1997			
Intercropping systems Dates of nitrogen application	I	II	III	Mean	I	II	III	Mean
Control 1	11.276	11.276	11.276	11.276	10.732	10.732	10.732	10.732
Control 2	9.619	9.619	9.619	9.619	8.758	8.758	8.758	8.758
A	6.723	7.523	6.895	7.047	6.004	6.586	6.221	6.270
B	7.428	7.924	7.714	7.689	6.354	6.952	6.290	6.532
C	8.363	8.305	7.943	8.204	6.922	7.878	7.528	7.443
D	8.438	8.381	8.000	8.273	7.436	8.243	7.885	7.845
E	8.047	8.669	8.667	8.461	7.893	8.872	8.110	8.292
F	10.171	9.276	9.200	9.549	8.979	9.079	8.894	8.984
Mean	8.758	8.872	8.664		7.885	8.388	8.049	
L.S.D. at level 5%								
Intercropping systems (I.S.)			**N.S.**			**N.S.**		
Dates of nitrogen application (N.A.)			**0.860**			**1.188**		
I.S. X N.A.			**1.490**			**2.059**		

VIII. Fresh yield of root in tons/feddan :

The data in Table 10 showed that growing faba beans on either opposite side or on both sides of the ridge caused an increase over the active side, with significant differences in the case of the opposite side. The addition and raise of nitrogen rate increased correspondingly the yield of root, throughout with significant differences from the monoculture receiving 45 kg N/feddan over all other treatments, in both seasons. Adding the second half of 30 kg N/feddan two and three months after thinning were, more effective in both seasons. The interaction affected through setting devices and nitrogen application, presented the highest values from the monoculture receiving 45 kg N/feddan and for intercropping traits when adding 45 kg N/feddan on the opposite side of ridge, which otherwise showed at each nitrogen level the higher, being always significant. Robertson *et al*. (1965), Nour and Farag (1984) and El-Kassaby *et al*. (1985) reported increases through intercropping with faba bean, which in this study not the case if the comparison was with the monoculture receiving the same nitrogen rate and thus confirming the findings of Abd El-Aal *et al*. (1989). The role of nitrogen in this study confirmed all the findings of previous authors, and is for the favour of combinations, whereas faba bean are cultivated on the opposite side of the ridge through more free space in the rhizosphere with less competition for water and adopted nutrients of the crop.

Table (10) : Effect of intercropping systems of faba bean with fodder beet under different dates of nitrogen application on root yields tons/feddan of fodder beet at harvest in 1995-1996 and 1996-1997 seasons.

Season	1995-1996				1996-1997			
Intercropping systems Dates of nitrogen application	I	II	III	Mean	I	II	III	Mean
Control 1	44.683	44.683	44.683	44.683	51.520	51.520	51.520	51.520
Control 2	40.790	40.790	40.790	40.790	44.383	44.383	44.383	44.383
A	33.430	28.853	30.823	31.030	32.323	29.350	28.730	30.134
B	34.917	29.920	31.507	32.114	37.047	24.993	32.040	33.027
C	35.160	29.970	33.650	32.927	37.140	30.577	31.857	33.191
D	37.873	34.507	35.077	35.819	40.007	33.490	37.177	36.891
E	39.460	35.460	36.827	37.249	40.873	36.460	35.410	37.581
F	41.083	38.160	38.887	39.377	44.493	37.993	40.130	40.872
Mean	38.423	35.293	36.530		40.973	36.721	37.566	

L.S.D. at level 5%

Intercropping systems (I.S.)	**1.827**	**2.527**
Dates of nitrogen application (N.A.)	**2.984**	**4.126**
I.S. X N.A.	**5.169**	**7.148**

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تأثير مياه الرى المالحة والتسميد النيتروجينى على نموو انتاجية بنجر العلف النامى تحت التحميل

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**** قسم النبات – المركز القومى للبحوث – الدقى – مصر**

تهدف هذه الدراسة الى التعرف على تأثير ملوحة مياه الصرف الزراعى وملوحة الارض السائدة بمنطقة طامية – محافظة الفيوم على نبات بنجر العلف تحت ظروف تحميل نبات الفول البلدى لتغطية الاستهلاك المحلى وكذلك للاستغلال الامثل لوحدة المساحة باستخدام نظم تحميل مختلفة تحت معدلات ومواعيد مختلفة من التسميد النتروجينى .

واظهرت النتائج انه بتحميل الفول البلدى على الريشة البطالة لنبات البنجر ادى ذلك الى زيادة الوزن الطازج والجاف للعرش والجذر وطول وقطر الجذر وعموما فان الزراعة المنفردة لبنجر العلف اعطت اعلى القيم عند اضافة ٤٥ وحدة نتروجين للفدان يليها المعدل العالى ايضا تحت ظروف التحميل .

عند الحصاد كانت انتاجية العرش تميل الى الزيادة تقريبا عند زراعة الفول على ذات الريشة المنزرعة بنجر العلف, بينما كانت هناك زيادة معنوية بالنسبة لانتاجية الجذر عند زراعة الفول البلدى على الريشة البطالة وكانت اعلى القيم عند استخدام معدل ٤٥ وحدة نتروجين /فدان .

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Table (1) : Mechanmical and chemical soil analysis (depth 0 - 50 cm) of experimental site at El-Fayoum in 1995-1996 and 1996-199 seasons.

A. Mechanical analysis.

Soil	Particle size distribution analysis			Soil Texture
Seasons	Sand %	Silt %	Clay %	
1995/1996	29.0	18.0	53.0	Clay
1996/1997	24.4	23.0	52.6	Clay

B. Chemical analysis.

Soil Analysis Seasons	pH	E.C. mmhos /cm	$CaCO_3$ %	O.M. %	Macronutrients mg/100 g						Micronutrients p.p.m.				meq./L		
					N	P	K	Mg	Na	Ca	Fe	Mn	Zn	Cu	Cl	SO_4	HCO_3
95/96	8.65	3.41	5.2	0.8	24.6	0.65	61.5	139.4	92.7	297.3	12.5	6.16	2.15	1.64	17.3	16.2	3.5
96/97	8.80	4.22	3.44	1.06	21.8	1.2	57.8	145.8	97.9	288.4	14.8	7.2	2.6	2.4	18.7	14.9	2.3

Mechanical and chemical analysis was carried out according to (Jackson, 1958).

Table (2) : Chemical analysis of drainage water from the experimental site at El-Fayoum in 1995/1996 and 1996/1997 seasons.

Water analysis Seasons	E.C. mmhos	pH	meq./L								p.p.m.			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{-}	HCO_3^{-}	SO_4^{-}	CL^{-}	Fe	Mn	Zn	Cu
95/96	2.80	7.57	2.37	3.73	7.9	0.34	0.0	3.77	3.87	8.47	0.13	0.006	0.08	0.09
96/97	3.07	7.81	2.88	3.79	8.07	0.31	0.001	3.93	4.21	8.83	0.15	0.005	0.11	0.08

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