Effects of Seeding Density and Nitrogen Fertilizer on the Productivity of Egyptian Clover

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***Abstract*—The study was carried out to show the effect of different levels of nitrogen fertilizer 0, 20, 40 and 60 kg urea/ha, and two seeding rates 15 and 30 kg/ha. The study was conducted at Bakrajo research field during the winter season 2011-2012 to some growth characteristics of Egyptian clover, such as plant height, dry leaf weight percent, dry stem weight percent, leave stem ratio, fresh yield t/ha, dry yield t/ha and dry matter percent. The experiment was designed as (R.C.B.D). The results can be summarized as follow; significant differences were observed between all three cuts, and the third cut was superior in almost characters especially in the forage yield. The application of 40 and 60 kg urea gave maximum yield. Using 15 kg seeds/ha showed superior value due to fresh yield in compare to 30 kg for all cutting, while the dry yield responded non-significantly to seeding rates.**

***Index Terms*—Clover, Nitrogen fertilizer, Seeding density.**

I. Introduction

Berseem clover probably originated in Syria and was introduced into Egypt during the 6th century (Hannaway and Larson, 2004). Morocco adopted Berseem in the beginning of the 20th century and had about 50.000 ha, in the "Irrigated perimeters", in 2005 (Merabet, et al., 2005) Berseem sown in mixture with oats or ryegrass smothers weeds during establishment and regrowth after oats harvest (Clark, 2008). However, total replacement of animal protein with high Berseem protein concentrate levels 17.5% led to reduced performance even with aminoacids supplementation (Bhowal, Cherian and Das, 2011). Trifolium alexandrium L. commonly known as Berseem or Clover is an important leguminous winter fodder crop. It is appreciated as a forage crop due to its high protein content, soft leaves, tender stem, high leaf to stem ratio and also rapid growth. Berseem is an N-fixing legume. It may require rhizobium inoculation outside its native area (Hackney, Dear and Crocker, 2007). Berseem can be mixed with 20% ground corn and provide high quality silage (SuePea, et al., 2000) Berseem hay appears to have a nutritive value equivalent to alfalfa hay and may completely replace this classical forage in balanced diet (Gaafar, El-Lateif and El-Hady, 2011). First cutting is ready after about 45 days of sowing and subsequent cuttings may be taken at 30-35 days intervals during winter and at 25-30 days intervals in spring and summer. The seed yield of Berseem mainly depends upon the time of last cut for green fodder and leaving it for seed production. The last cutting should be taken relatively early in low humidity and late in high humidity conditions (Mohsen, et al., 2011). Optimum fertilizer-N rates depended strongly on target levels for NUE, amounts of unrecovered N, growth period and DM yield of herbage. Calculations showed that target DM yield of herbage and growth period per cut are essential in estimating the effect of applied N on marginal N response, NUE and amounts of unrecovered N. The highest yield of protein with a relatively low yield of fiber is obtained by cutting the plant at a height of about 40 cm (Chauhan, Gupta and Chopra, 1992). To obtain higher yield of good quality fodder, mix 2-3 kg seed of rye grass per acre with full seed rate of Berseem. Mix some moist soil with rye grass seed and broadcast it evenly. Then broadcast Berseem seed, rake the field and irrigate immediately (Dairy Farm Guide, 2013).

II. Material and Methods

The present study conducted at Bakrajo research field, Faculty of Agriculture of Science University in Sulamania, during the winter season of the year 2011-2012. The investigation was conducted to study the impact of four rates of nitrogen fertilizer 0, 20, 40 and 60 kg urea/ha under two seeding rates of 15 and 30 kg seeds/ha for Egyptian clover. The experiment was seeded on Nov. 13th, 2011. Three successive cutting were obtained across the season (5/4 – 15/4

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– 17/6). The experiment was laid out according to randomized complete back design with three replications (SuePea, et al., 2000). Each replication contains 8 plots of 8 rows with four meters long and 25 cm apart rows. Six rows were harvested for each cut. Study characters, plant height, and dry leaf weight percent dry stem percent, leave stem ratio, fresh yield t/ha, dry matter percent. All data were statically analyzed at %5 significant level for each cutting according to the methods of analysis various (ANOVAs). List significant difference (L.S.D) at 5% significant level was used to compare between mean characters. The aim of the study is determine the best plant density and nitrogen level application to produce maximum fresh and dry forage yield for Berseem clover.

III. Results and Discussion

Data in Table I confirms the presences of significant differences between fertilizer applications levels. The application of 40 and 60 kg urea/ha exceeded the treatment of control by 17.52 and 22.47% respectively, while no significant difference were represent between the levels 40 and 60 kg/ha, and also between the treatment of control no application and 20 kg urea/ha maximum fresh yield recorded by the application of 60 kg urea/ha, which was 6.185 t/ha. The minimum fresh yield value was 5.050 t/ha recorded by the treatment of control. The same trend was observed due to dry yields in which the application of 60 kg urea/ha produced maximum dry yield 0.763 t/ha and exceeded the application of 0 and 20 kg urea/ha by 36.0 and 20.15% respectively. All application levels predominated the treatment of control for dry yield characters no significant differences between the application of 40 and 60 kg urea/ha in dry yield. Maximum value recorded by the application of 60 kg urea/ha which was 0.763 t/ha, while the lowest value produced by the treatment of control which was 0.561 t/ha.

TABLE I
Effect of Fertilized (FER) Levels on Forage Yield in First cut

Fer.	Fresh yield t/ha	Dry yield t/ha	D.M %
0	5.050	0.561	11.107
20	5.285	0.635	12.037
40	5.935	0.734	12.380
60	6.185	0.763	12.367
L.S.D ($p \leq 0.05$)	0.288	0.038	0.325
L.S.D ($p \leq 0.01$)	0.400	0.053	0.451

From the same table significant differences between fertilizer application levels were observed due to the character dry matter percent. All application levels exceeded the treatment of control by 8.37, 11.46 and 11.34% respectively. There were not significant differences between the application of 40 and 60 kg urea/ha, maximum dry matter value was 12.380% recorded by the application of 40 kg urea/ha, while the lowest value was 11.107% showed by the treatment of control.

From Table II significant difference between fertilizer application levels was observed for fresh, dry yield and dry matter percent during the second cut. The application of 60 kg urea/ha showed maximum fresh yield 8.262 t/ha in which exceeded the treatment of control and 20 kg urea/ha significantly by 14.43 and 8.31 % respectively due to higher accumulation of dry matter by application nitrogen fertilizer. There was no significant difference between the levels 40 and 60 kg urea/ha, all application levels predominated the treatment of control in which produced the lowest value of fresh yield with 7.22 t/ha.

From the same table it was found that all application levels pre-dominated the treatment of control due to the character dry yield by 8.19, 16.76 and 22.47% respectively. Maximum dry yield value was 1.286 t/ha produced by the application level of 60 kg urea/ha, while the lowest dry yield value was 1.050 t/ha recorded by the treatment of control. Data in the same table explained the effect of fertilizer levels in dry matter percent, which affected significantly. The application of 60 kg urea/ha gave maximum dry matter percent 15.612%, while the treatment of control showed the lowest percentage of dry matter 14.542%. All applications pre-dominated the treatment of control by 3.06, 5.59 and 7.36% respectively (Al-Mohammad, et al., 2011).

TABLE II
Effect of Fertilizer Levels on Forage Yield of the Second Cut

Fer.	Fresh yield t/ha	Dry yield t/ha	D.M %
0	7.220	1.050	14.542
20	7.628	1.136	14.987
40	8.028	1.226	15.355
60	8.262	1.286	15.612
L.S.D ($p \leq 0.05$)	0.389	0.049	0.142
L.S.D ($p \leq 0.01$)	0.540	0.068	0.198

Data represented in Table III showed significant effect of fertilizer application in fresh, dry yield and dry matter percent. Regarding to fresh yield the application of 40 kg urea/ha gave maximum yield in which out yielded both 0 and 60 kg urea/ha significantly. There were no significant differences between 20 and 40 kg urea/ha in this character and between 0 and 60 kg urea/ha. Concerning to dry yield as shown in the same table the application of 40 kg urea/ha out yielded the rest significantly , with the exception of 20 kg urea/ha minimum dry yield recorded by the treatment of control with 1.394 t/ha.

As shown in the same table, maximum dry matter percent produced by the application of 40 kg urea/ha which was 18.733% and followed by 60 and 20 kg urea/ha with 18.497 and 18.407% respectively. All application levels exceeded the treatment of control significantly for this character. Minimum dry matter percent is exhibited by the treatment of control with 17.908%.

TABLE III
EFFECT OF FERTILIZED (FER) LEVELS ON FORAGE YIELD DURING THIRD CUT

Fer.	Fresh yield t/ha	Dry yield t/ha	D.M %
0	7.798	1.394	17.908
20	8.210	1.510	18.407
40	8.298	1.552	18.733
60	7.972	1.475	18.497
L.S.D ($p \leq 0.05$)	0.304	0.054	0.421
L.S.D ($p \leq 0.01$)	0.422	0.074	0.584

Data in Table IV explained the effect of fertilizer application level in some growth characters for the first cut. Regarding to dry leaf weight percent which respond significantly to fertilizer applications , the application of 40 kg urea/ha showed maximum percent with 71.833% in which exceeded both 0 and 20 kg urea/ha while it was differed with 60 kg urea/ha non significantly, the lowest dry leaf weight percent produced by the treatment of control with 68.5%.

Regarding to dry stem, weight percent as presently in the same table exhibited maximum value due to this character with 31.5% in which exceeded the rest significantly. Minimum value of dry stem weight percent produced by the application of 60 kg urea/ha, which was 28.167%. Leaf stem ratio, from the same table it was observed that the characters leaf stem ratio estimated as dry weight respond significantly to fertilizer application during the first cut . The application of 40 kg urea/ha produced maximum ratio which was 2.550 and followed by 60 kg urea/ha with 2.475 the lowest ratio exhibited by the treatment of control 1.818 (Mohsen, et al., 2011).

TABLE IV
EFFECT OF FERTILIZED (FER) LEVELS ON GROWTH CHARACTERS DURING FIRST CUT

Fertilizer	Plant height cm	Dry leaf wt.%	Dry stem wt.%	Leaves /stem ratio
0	23.167	68.500	31.500	1.818
20	27.167	70.167	29.833	2.188
40	2.873	71.833	28.167	2.550
60	37.667	71.167	28.833	2.475
L.S.D ($p \leq 0.05$)	1.549	0.721	0.721	0.692
L.S.D ($p \leq 0.01$)	2.150	1.001	1.001	n.s

As shown in Table V, the characters dry leaf weight, dry stem weight percent and leaf stem ratio were respond to fertilizer application significantly during the second cut. Regarding to leaf dry weight percent the application of 40 kg urea/ha produced maximum value 58.00% , and exceeded both 0 and 20 kg urea/ha significantly. While it differs none significantly with 60 kg urea/ha, the treatment of control showed the lowest value 53.33%. Concerning to dry stem weight percent the treatment of control gave maximum value 46.667% and exceeded both 40 and 60 kg urea/ha but there were no significant different between 0 and 20 kg urea/ha and also between 40 and 60 kg urea/ha. Regarding to the character leaf stem ratio for the second cut, the application of 40 kg urea/ha produced maximum ratio 1.407 in which out yielded both 0 and 20 kg urea/ha significantly no significant differences were represent between 40 and 60 kg urea/ha. The lowest ratio was 1.147 recorded by control.

TABLE V
EFFECT OF FERTILIZED (FER) LEVELS ON GROWTH CHARACTERS DURING SECOND CUT

Fertilizer	Plant height cm	Dry leaf wt.%	Dry stem wt.%	Leaves /stem ratio
0	47.833	53.333	46.667	1.147
20	55.500	55.500	44.500	1.253
40	5.873	58.000	42.000	1.407
60	70.167	57.167	42.833	1.373
L.S.D ($p \leq 0.05$)	2.449	2.362	2.362	0.152
L.S.D ($p \leq 0.01$)	3.399	3.278	3.278	0.211

From Table VI significant effect of fertilizer applications was observed in growth characters during the third cut. The application of 60 kg urea/ha gave maximum dry leaf weight percent 45.833%, and exceeded the treatment of control significant differences were recorded between 20, 40 and 60 kg urea/ha. The maximum value recorded by the treatment of control with 43.5%. Data on dry stem weight percent for the third cut represent in the same table the treatment of control with 56.05% gave maximum ratio while the application of 60 kg urea/ha showed the lowest ratio 54.05%. The character leaf stem ratio estimated during the third cut showed different values due to fertilizer application leaves. Maximum ratio was 0.843 recorded by the application of 60 kg urea/ha, while the treatment of control showed the lowest ratio 0.767.

TABLE VI
EFFECT OF FERTILIZED (FER) LEVELS ON GROWTH CHARACTERS DURING THIRD CUT

Fertilizer	Plant height cm	Dry leaf wt.%	Dry stem wt.%	Leaves /stem ratio
0	49.333	43.500	56.500	0.767
20	57.333	45.000	55.000	0.815
40	6.270	45.000	55.000	0.813
60	66.667	45.833	54.500	0.843
L.S.D ($p \leq 0.05$)	2.704	0.838	0.979	0.029
L.S.D ($p \leq 0.01$)	3.753	1.164	1.359	0.040

Data in Table VII explain effect of seed rate in forage yield during the first cut. The effect of seeding rate was found to be

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significant for fresh yield and dry matter percent only. Using 15 kg seeds predominated 30 kg in fresh yield, while using 30 kg seeds exceeded 15 kg in dry matter percent.

TABLE VII
EFFECT OF SEED RATES ON FORAGE YIELD IN FIRST CUT

Seeding Rates kg	Fresh yield t/ha	Dry yield t/ha	D.M
15	5.839	0.673	11.500
30	5.388	0.674	12.445
L.S.D (p≤0.05)	0.204	n.s	0.230
L.S.D (p≤0.01)	0.283	n.s	0.319

Data in Table VIII explains the effect of seeding rates in forage yield during the second cut. This effect was significant in fresh yield and dry matter percent only with the same trend as shown in the first cut (DAIRY FARM GUIDE, 2013).

TABLE VIII
EFFECT OF SEED RATES ON FORAGE YIELD IN SECOND CUT

Seeding Rates kg	Fresh yield t/ha	Dry yield t/ha	D.M
15	8.325	1.189	14.238
30	7.244	1.160	16.010
L.S.D (p≤0.05)	0.275	n.s	0.101
L.S.D (p≤0.01)	0.382	n.s	0.140

Table IX shows the effect of seeding rate forage yield during the third cut which showed the same trend with the first and the second cut (Mohsen, et al., 2011).

TABLE IX
EFFECT OF SEED RATES ON FORAGE YIELD IN THIRD CUT

Seeding Rates kg	Fresh yield t t/ha	Dry yield t/ha	D.M
15	8.413	1.505	17.892
30	7.726	1.460	18.881
L.S.D (p≤0.05)	0.215	n.s	0.298
L.S.D (p≤0.01)	0.298	n.s	0.413

Data represented in Table X explains in the effect of seeding rate in some growth characters. During the first cut the effect of seeding rate was significant weight only for the character dry leaf weight percent, exhibiting the predominance of 15 kg seeds in compare to 30 kg seeds.

Table XI shows a significant effect in all study characters. Using 15 kg seeds recorded maximum value for dry leaf weight percent and leaf stem ratio 59.58% and 1.492% respectively, while the seeding rate of 30 kg exceeded 15 kg in dry stem weight percent recording 47.583%.

TABLE X
EFFECT OF SEED RATES ON GROWTH CHARACTERS FIRST CUT

Seeding Rates kg	Plant height cm	Dry leaf wt.%	Dry stem wt.%	Leaves / stem ratio
15	28.083	70.833	29.167	2.170
30	31.000	70.000	30.000	2.346
L.S.D (p≤0.05)	1.096	0.510	0.510	n.s
L.S.D (p≤0.01)	1.521	n.s	n.s	n.s

TABLE XI
EFFECT OF SEED RATES ON GROWTH CHARACTERS SECOND CUT

Seeding Rates	Plant height cm	Dry leaf wt.%	Dry stem wt.%	Leaves / stem ratio
15	56.250	59.583	40.417	1.492
30	61.333	52.417	47.583	1.098
L.S.D (p≤0.05)	1.732	1.670	1.670	0.107
L.S.D (p≤0.01)	2.403	2.318	2.318	0.149

Data in Table XII shows significant effect of seeding rates in all growth characters for the third cut with the same trend of the second cut.

TABLE XII
EFFECT OF SEED RATES ON GROWTH CHARACTERS THIRD CUT

Seeding Rates	Plant height cm	Dry leaf wt.%	Dry stem wt.%	Leaves / stem ratio
15	57.250	45.833	54.333	0.843
30	62.333	43.833	56.167	0.776
L.S.D (p≤0.05)	1.912	0.593	0.692	0.020
L.S.D (p≤0.01)	2.654	0.823	0.961	0.028

TABLE XIII
EFFECT OF INTERACTION BETWEEN FERTILIZATION LEVELS AND SEED RATES IN FORAGE YIELD CHARACTERS SEEDING RATES/FERTILIZER FIRST CUT

F x S	Fresh yield t/ha	Dry yield t/ha	D.M
0 x 15	5.260	0.571	10.840
0 x 30	5.540	0.649	11.707
20 x 15	5.933	0.705	11.887
20 x 30	6.623	0.766	11.567
40 x 15	4.840	0.550	11.373
40 x 30	5.030	0.622	12.367
60 x 15	5.937	0.764	12.873
60 x 30	5.747	0.760	13.167
L.S.D (p≤0.05)	0.407	n.s	0.460
L.S.D (p≤0.01)	n.s	n.s	n.s

Data in Table XIII explains the effect of interaction between fertilization levels and seed rate in some forage yield characters, confirming significant interaction on the characters fresh yield and dry matter percent only at level 5% (Das and Singh, 1999). Regarding the characters fresh yield, maximum value recorded by the interaction between the application of 20 kg urea/ha associated with 30 kg seeding rate which was 6.623 t/ha, while the lowest value recorded by the interaction between 40 kg urea/ha nitrogen application under 15 kg seeding rate. Concerning to dry matter percent , it was observed that the association between application of 60 kg urea/ha with 30 kg seeding rate recorded maximum dry matter percent which was 13.167% the minimum value was 10.840% recorded by the interaction between zero application under 15 kg seeding rate.

Data in Table XIV confirms the presence of significant effect of interaction between fertilization levels and seeding rate during the second cut on forage yield characters. Maximum fresh and dry yield were 8.917 and 1.338 kg/ha respectively recoded the association between application of 20 kg urea/ha with 30 kg/ha seeding rate, while the lowest value was 7.173 and 0.967 t/ha respectively. For the interaction between zero applications associated with 15 kg seeds/ha, maximum dry matter percent was 16.25 % recorded by the interaction between the application 60 kg urea/ha under 15 kg seeds/ha, while the lowest dry matter percent was 13.483% recorded by the interaction between zero application of nitrogen and 15 kg seeds/ha.

TABLE XIV
EFFECT OF INTERACTION BETWEEN FERTILIZATION LEVELS AND SEED RATES IN FORAGE YIELD CHARACTERS SEEDING RATES/FERTILIZER SECOND CUT.

F x S	Fresh yield	Dry yield	D.M
0 x 15	7.173	0.967	13.483
0 x 30	8.410	1.178	14.007
20 x 15	8.800	1.272	14.460
20 x 30	8.917	1.338	15.000
40 x 15	7.267	1.133	15.600
40 x 30	6.847	1.093	15.967
60 x 15	7.257	1.179	16.250
60 x 30	7.607	1.233	16.223
L.S.D ($p \leq 0.05$)	0.550	0.069	0.201
L.S.D ($p \leq 0.01$)	0.763	0.096	0.279

The interaction effect between fertilizer application and seeding rates was found to be significant for fresh and dry yield during the third cut, Table XV. The interaction between the application of 20 kg urea associated with 15 kg seeds/ha gave maximum fresh and dry yield 8.747 and 1.594 t/ha respectively , while the lowest fresh and dry yield was 7.190 and 1.319 t/ha respectively recorded by the interaction between the application 40 kg urea/ha with 15 kg seeding rates.

TABLE XV
EFFECT OF INTERACTION BETWEEN FERTILIZATION LEVELS AND SEED RATES IN FORAGE YIELD CHARACTERS SEEDING RATES/FERTILIZER THIRD CUT.

F x S	Fresh yield	Dry yield	D.M
0 x 15	8.407	1.468	17.477
0 x 30	8.633	1.555	18.007
20 x 15	8.747	1.594	18.233
20 x 30	7.867	1.404	17.850
40 x 15	7.190	1.319	18.340
40 x 30	7.787	1.465	18.807
60 x 15	7.850	1.510	19.233
60 x 30	8.077	1.546	19.143
L.S.D ($p \leq 0.05$)	0.430	0.076	n.s
L.S.D ($p \leq 0.01$)	0.597	0.105	n.s

Data in Table XVI confirms the presence of significant interaction between fertilizer application and seeding rate during the first cut for dry leave weight percent and dry stem weight percent.

TABLE XVI
EFFECT OF INTERACTION BETWEEN FERTILIZATION LEVELS AND SEED RATES IN GROWTH CHARACTERS FIRST CUT.

F x S	Plant height	Dry leaf wt.%	Dry stem wt.%	Leaves/ stem ratio
0 x 15	22.667	69.667	30.333	1.567
0 x 30	23.667	71.000	29.000	2.117
20 x 15	25.667	72.667	27.333	2.660
20 x 30	28.667	70.000	30.000	2.337
40 x 15	28.000	67.333	32.667	2.070
40 x 30	32.333	69.333	30.667	2.260
60 x 15	36.000	71.000	29.000	2.440
60 x 30	39.333	72.333	27.667	2.613
L.S.D ($p \leq 0.05$)	n.s	1.020	1.020	n.s
L.S.D ($p \leq 0.01$)	n.s	1.416	1.416	n.s

Data in Table XVII explains the interaction effect between fertilization and seeding rates during the second cut for some growth characters in which respond significantly to this effect. Regarding to dry leaf percent maximum value was 62.333% obtained by the association between both interactions 20 kg urea fertilizer with 15 kg seeding rate and the interaction 20 kg urea with 30 kg seeding rate, while the lowest value was 51.333% exhibited the interaction between 40 kg urea with 15 kg seeding rate.

Data in Table XVIII concerning to the interaction effect between fertilizer levels and seeding rate in growth characters for the third cut. The character dry stem weight responds significantly to interaction effect only. Maximum dry stem weight was found for the interaction effect between 40 kg urea coupled with 15 kg seeding rate which was 58.00% while the

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lowest value was 53.667 exhibited by the interaction between the treatment zero nitrogen and 30 kg seeding rate (Gaafar, El-Lateif and El-Hady, 2011).

TABLE XVII
EFFECT OF INTERACTION BETWEEN FERTILIZATION LEVELS AND SEED RATES IN GROWTH CHARACTERS SECOND CUT.

F x S	Plant height	Dry leaf wt.%	Dry stem wt.%	Leaves/ stem ratio
0 x 15	45.000	55.333	44.667	1.240
0 x 30	50.667	58.333	41.667	1.400
20 x 15	53.333	62.333	37.667	1.660
20 x 30	57.667	62.333	37.667	1.667
40 x 15	60.333	51.333	48.667	1.053
40 x 30	63.000	52.667	47.333	1.107
60 x 15	66.333	53.667	46.333	1.153
60 x 30	74.000	52.000	48.000	1.080
L.S.D ($p \leq 0.05$)	n.s	3.340	3.340	0.215
L.S.D ($p \leq 0.01$)	n.s	n.s	n.s	n.s

TABLE XVIII
EFFECT OF INTERACTION BETWEEN FERTILIZATION LEVELS AND SEED RATES IN GROWTH CHARACTERS THIRD CUT

F x S	Plant height	Dry leaf wt.%	Dry stem wt.%	Leaves/ stem ratio
0 x 15	46.000	45.000	55.000	0.813
0 x 30	52.667	46.333	53.667	0.860
20 x 15	53.667	45.667	54.333	0.837
20 x 30	61.000	46.333	54.333	0.863
40 x 15	63.667	42.000	58.000	0.720
40 x 30	68.000	43.667	56.333	0.770
60 x 15	65.667	44.333	55.667	0.790
60 x 30	67.667	45.333	54.667	0.823
L.S.D ($p \leq 0.05$)	n.s	n.s	1.384	n.s
L.S.D ($p \leq 0.01$)	46.000	n.s	n.s	n.s

IV. CONCLUSION

Clover forage yield was significantly greater at the third cut due to more plant growth such as plant height and more dry matter accumulation across the time, while at the first cut the forage yield was decreased due to more moisture content and the plants were not reached the suitable height for cut. There were not obvious trend of forage yield due to seeding rates because the space between plants within each rows were constant for each seeding rates. This makes the competition between plants will occurs within rows not between rows.

REFERENCES

Al-Mohammad, F.M.H and AL-Yonis, M.A., 2000. *Agriculture experimentation design and analysis*. Bagdad University. Ministry of Higher Education and scientific Research parts 1 and 2. Bagdad, IRAQ (In Arabic).

Bhowal M., Cherian K.J. and Das L., 2011. Direct organogenesis in fodder crop Trifolium alexandruim L., *Journal of Environmental Research and Development*, 5(4), pp.892-897.

Chauhan, T.R., Gupta, R., Chopra, A.K., 1992. Comparative nutritive value of legume hays fed to adult buffaloes. *Buffalo Journal*, 8 (3), pp.243-246.

Clark, A., 2008. Berseem. In: Clark (Ed.), *Managing cover crops profitably*, Diane Publishing.

Das, A. and Singh G.P., 1999. Effect of different levels of Berseem (Trifolium alexandrinum) supplementation of wheat straw on some physical factors regulating intake and digestion. *Animal Feed Science and Technology*., 81 (1–2), pp.133-149.

Diary Farm Guide, 2013. [online] Available at: <http://www.dairyfarmguide.com/> [Accessed September 2013].

Gaafar, H.M.A., El-Lateif, A.I.A.A. and El-Hady, S.B.A., 2011. Effect of replacement of Berseem (Trifolium alexandrinum L.) hay by Berseem silage on performance of growing rabbits. *Archiva Zootechnica*, 14 (4), pp.59-69.

Hackney, B., Dear, B. and Crocker, G., 2007. *Berseem clover*. New South Wales Department of Primary Industries, Primefacts, N°388.

Hannaway, D.B. and Larson, C., 2004. *Berseem Clover* (*Trifolium alexandrinum L.*). Oregon State University, Species Selection Information System.

Merabet, B.A., Abdelguerfi, A., Bassaid, F. and Daoud Y., 2005. Production and forage quality of Berseem clover according to the water supply in Mitidja (Algeria). *Fourrages*, 181, pp.179-191.

Mohsen, M.K., El-Santiel, G.S., Gaafar, H.M.A.; El-Gendy, H.M. and El-Beltagi, E.A., 2011. Nutritional evaluation of Berseem. 2. Effect of nitrogen fertilizer on Berseem fed as silage to goats. *Archive of Zootechnica*, 14(3), pp.21-31.

SuePea, S., ChiHsin, L., WenWei, K., RueyHshiung, B. and JengBin, L., 2000. Forage production and silage making for Berseem clover. *Journal of Taiwan Livestock Res.*, 33(1), pp.105-110.