# POTENTIALITY OF SOME BERSEEM CLOVER (*Trifolium alexandrinum, L.*) VARIETIES AS AFFECTED BY VARIOUS LEVELS OF PHOSPHORUS FERTILIZATION.

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## ABSTRACT

Two field experiments were carried out at the Experimental Research Center, Faculty of Agriculture, Moshtohor, Benha University, Kalubia Governorate during two growing seasons (2010/2011 and 2011/2012) to evaluate the potentialities of five Berseem (*Trifolium alexandrinum, L*.) varieties (Gemaiza 1, Sakha 4, Helali, Giza 6 and Serw 1) fertilized with various phosphorus fertilization levels (0, 22.5 and 45 kg $P_2O_5$/fed). Experiments were designed and implemented to evaluate their fresh and dry forage yield as well as the vegetative growth behavior of the studied varieties.

Experiments were designed where phosphorus fertilization levels were randomly distributed in the main plots and Berseem varieties in the split plots. Five individual cuts were obtained during each of the two growing seasons and their total yield. Combined analysis of the two season was done after insuring the validity of partlet test (**Steel and Torrie ,1981).**Results could be concluded as follows:

Over the applied phosphorus fertilization levels, results of the combined analysis indicate significant differences in total fresh forage yield among the studied Berseem varieties. The highest productive fresh and dry forage was for Helali variety whereas, the lowest one was for Serw 1 variety with significant differences of different magnitudes.therefor, the highest number of shoots/$m^2$, leaf / stem ratio and the tallest plants were obtained for Helali variety.

Over the grown Berseem varieties, data clarified that total forage and dry yield, number of shoots/$m^2$, leaf:stem ratio and plant height were substantially increased as phosphorus fertilization levels increased from 0 to 22.5 and up to 45 kg $P_2O_5$ /fed, respectively.

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## INTRODUCTION

Among forage Berseem clover (*Trifolium alexandrinum, L.*) is considered one of the most widely grown multi-cut winter legume crop grown in Egypt. It is highly nutritious forage contains 15.8-26.7 % CP, 14.9-28.3 % crude fiber, 1.4-3.0 % ether extract, 1.4 - 2.58 % calcium and 2.22 - 2.46% and phosphorus content (0.14%). Berseem could be grown solely or mixed with other fodder cereal crops like Barley, oats. It is of great symbiotic activity in increasing soil nitrogen and organic matter full of useful soil microfloral activities which improve the physical and microbial soil activities. That in why Berseem clover is used as unique nutritive forage crop as an important agent in soil improvement in crop rotations for maintaining and substantially fertility status of the soil.

Shah *et al.* (1991) In Srinagar, mention that application of 90 kg $P_2O_5$ $ha^{-1}$ to Lucerne recorded highest plant height and dry matter accumulation as compared to control. Also, several workers (Rana *et al.*, 1992; Ranjhan, 1993;Mani and Singh,1997; Solanki and Patel,1999; Mahale *et al.*, 2004 and Marino and Berardo, 2005) reported that increasing phosphorus fertilization levels caused linear increases in fresh and dry forage yield, Plant height, number of shoots/ plant of Berseem.

The main target of this investigation is to test and evaluate the specific properties of growth and forage production of some Berseem clover varieties fertilized with various phosphorus levels.

## MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Research Center, Faculty of Agriculture, Moshtohor, Benha University, Kalubia Governorate during two growing seasons (2010/2011 and 2011/2012) to evaluate **forage potentiality assessment of some Berseem clover (Trifolium alexandrinum, L.) varieties as affected by various levels of phosphorus** which were:

**A- Common Berseem clover varieties** (*Trifolium alexandrinum, L.*): Five varieties were used (Gemaiza 1, Sakha 4, Helali, Giza 6 and Serw 1) were supplied from the Forage Department, Agriculture Research Center, Ministry of Agriculture at Giza, Egypt.

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**B- Phosphorus fertilization levels:** Three phosphorus fertilization levels of 0, 22.5 and 45 kg $P_2O_5$ /fed. as calcium super phosphate (15 % $P_2O_5$) were used during the appropriate soil preparation before sowing.

The recommended seeding rates of each of the above forage crops was followed. Seeds were sown on October, 24th in 2010/2011 and 2011/2012 seasons, respectively.

**Studied parameters:** Five cuts were obtained from each of the two growing seasons. The first cut was obtained at 50 days from sowing. However, the second cut was obtained after 45 days from the first one. The third cut was taken after 40 days from the second cut. Fourth cut was taken at 35 days from the third one, and the fifth cut was taken after 30 days from the fourth one.

The soil type of the experimental unit was clay with pH 8.0. The physical and chemical properties of the experimental soil units of Moshtohor Exp. Station are recorded in Table (1) for each of the two growing seasons.

**The studied vegetative growth characteristics:** Ten plants were randomly selected from each experimental unit for each of the obtained 5 cuts in each of the two seasons for studying the behavior of Plant height (cm); Leaf / stem ratio were estimated on fresh and dry matter basis and Number of shoots/$m^2$.

Fresh and dry forage yield in each experimental unit of the grown forage crop plants under study was determined for each of the subsequent cuts, for each of the two studied seasons and recorded in ton / feddan using field scale of 0.5 kg sensitivity then dry forage yield was estimate and recorded in ton / fed.

Dry forage yield productivity was estimated as follows: samples of about 200 gm of fresh forage were selected randomly from each experimental unit just before cutting and weighted accurately using an electric balance of 0.01 gm sensitivity. Such obtained fresh samples were dried in an air forced drying oven at 105°C for 3 hours till constant weight to determine the dry matter content. Then, dry yield per feddan was estimated, accordingly.

**Table (1): Physical and chemical properties of the experimental soil units at Moshtohor agric. Exp. Station during each of the two growing seasons.**

| Properties | Seasons | |
|---|---|---|
| | **2010/2011** | **2011/2012** |
| **Mechanical analysis** | | |
| Course sand % | 5.90 | 4.99 |
| Find sand % | 18.64 | 8.02 |
| Silt % | 27.19 | 34.48 |
| Clay % | 48.27 | 52.51 |
| Texture grade | clay | clay |
| **Chemical analysis** | | |
| pH (1: 2.5) | 7.9 | 8.1 |
| E.C. (ds/m) (1:20) | 0.16 | 0.22 |
| $CaCO_3$ (%) | **3.15** | **2.12** |
| O.M (%) | 1.91 | 1.93 |
| $HCO_3$ (meq/L) | 1.25 | 1.25 |
| $Cl^-$ (meq/L) | 0.54 | 0.55 |
| $Ca^{++}$ (meq/L) | 0.8 | 0.9 |
| $Na^+$ (meq/L) | 0.77 | 0.84 |
| $K^+$ (meq/L) | 0.24 | 0.17 |
| $Mg^{++}$ (meq/L) | 0.2 | 0.2 |
| N available (mg/kg) | **241** | **179** |
| P available (mg/kg) | **8.0** | **12** |
| K available (mg/kg) | **1485** | **1280** |

**Statistical analysis:** The analyses of variance for each of the two growing seasons and their combined analysis was conducted to study seasonal behavior, and each of the five cuts and total production in each season and over the combined analysis after insuring the validity of partlet test were carried out according to the procedure described by **Steel and Torrie (1981).** The **L.S.D**. test at 5% level was used in means comparison.

## RESULTS AND DISCUSSION

### Fresh forage yield:

Results in Table (2) represent fresh forage yield of the selective studied Berseem varieties at various phosphorus fertilization levels for each of the obtained cuts of two growing seasons and their combined analysis.

Over the applied phosphorus treatments, results of the combined analysis indicated significant differences in total fresh forage yield among the studied Berseem varieties. The Helali variety was of the highest significant total fresh forage production (56.61 ton/fed), whereas, Gemaiza 1and Giza 6 Berseem varieties produced almost similar fresh forage yield which was 55.53 and 55.50 ton /fed, respectively. Meanwhile, Sakha 4 and Serw 1were of the lowest production with almost similar magnitudes which was 52.98 and 52.85 ton/fed. respectively.

Results indicated that also, there was a slight differences between total fresh forage productivity of the studied Berseem varieties for each of the two growing seasons. The Helali, Giza 6, Sakha 4, Gemaiza 1 and Serw 1 varieties produced 56.36, 53.24, 51.86, 51.76 and 49.86 ton/fed, respectively with significant differences during the first growing season. Whereas, during the second season Gemaiza 1, Giza 6, Helali, Serw 1 and Sakha 4 which produced total forage yield of 59.30, 57.73, 56.84, 55.52 and 54.08 ton /fed., respectively with significant differences of various magnitudes.

Such obtained differences were noticed among each of the two seasons where the forage productivity in generally was relatively higher in the second than the first season. These variations could be due to the slight effect of the different ambient temperature during the two subsequent seasons. This result could give a signal of heat stimulation of vegetative growth for such grown Berseem varieties.

From the combined analysis, Berseem varieties was almost similar in fresh forage yield (ton /fed) within each of the obtained cuts, whereas,

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some varieties were slightly higher in forage yield for each of five cuts with almost similar magnitudes (Table 2).

The noticed differences in growth rate and forage productive among the studied Berseem clover varieties were due to the special unique of their genetical make up which interacted with the environmental conditions with various magnitudes.

Over the grown Berseem varieties, the combined analysis (over the two season) clarified that total forage yield of each B.varieties substantially increased as phosphorus fertilization levels increased with significant differences of different magnitudes. As phosphorus level increased from 0 to 22.5 and up to 45 kg $P_2O_5$/fed, total fresh forage yield was substantially increased with a respective production of 48.62, 55.87 and 59.57 ton/fed.

It looks to be true that the total increase in forage yield due to increasing phosphorus fertilization levels (from 0 to 22.5 and 45 Kg $P_2O_5$/fed.) was more pronounced in subsequent magnitudes during the second than the first season as it is clear for the following comparative set of data.

| **Kg $P_2O_5$/fed.** | **First season** | **Second season** |
|---|---|---|
| | **Obtained fresh forage yield (ton / fed)** | |
| **0** | 46.83 | 50.42 |
| **22.5** | 54.19 | 57.55 |
| **45** | 56.85 | 62.30 |

It should be pointed out that the slight fluctuation of the effect of phosphorus application levels in respect to the obtained yield between seasons and between the individual cuts could be due the well expected variations in soils content of phosphorus in forms and quantities (Table 1) and/or the variation in the environmental conditions within the two seasons. These factors could affect the fate and status of soils phosphorus either as leaching and/or fixing. These results are in harmony with those of **Mahale *et al.*(2004) and Marino and Berardo (2005) in Lucerne.**

Combined analysis (over the two growing season) also revealed significant differences in forage yield production among the grown Berseem varieties during cuts (Table, 2).Total forage yield of each variety substantially increased as cuts increased with significant differences of different magnitudes. The trend of the individual cuts for each Berseem varieties and the fertilization application were more or less similar to the seasonal total fresh forage yield and the combined analysis as well.

It could be generally concluded that the obtained increase in growth behavior and forage production potentialities (over the studied Berseem clover varieties) due to the substantial increase of phosphorus fertilization levels clarified and magnified the role of phosphorus element in posting and enhancing physiophotochemical activities of plants. Such stimulated effect in more likely to the adequacy of phosphorus levels for enforcing the metabolic activities of plants through the energetic functions of incorporating and coupling the inorganic phosphorus in the adenosine diphosphate(ADP) to adenosine triphosphate (ATP) which is the main source of energy motivated power in plants growth and development. This is especially more clear in the high PH in the Egyptian soils where phosphorus is usually turned to be in the unavailable form.

The interaction effect of Berseem varieties and phosphorus fertilization on fresh forage yield was significant for total fresh forage yield and the second cut of the first season as well as for the first, third and fourth cut of the second season and combined analysis of the two seasons. However, results generally indicate that the highest fresh forage yield was obtained for Helali variety when fertilized at the medium fertilizer level (22.5kg $P_2O_5$/fed). Meanwhile, the lowest forage yield was obtained from Sakha 4 variety, fertilized at the lowest fertilization level (0 kg $P_2O_5$/fed). But, it could be generally concluded that Helali variety was the best selected variety under study in forage production as compared with the other four varieties (Gemaiza 1, Sakha 4, Giza 6 and Serw 1).Also, it is generally noticed that interaction impact of the grown Berseem clover varieties and the application levels of phosphorus fertilization was clear on their growth and production potentialities. This was true on the majority of the subsequent individual cuts and the total fresh and dry matter production.

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**Table (2): Fresh yield productivity of some Berseem clover (*Trifolium alexandrinum, L.*) varieties as affected by various phosphorus fertilization levels (Combined over seasons).**

| Phosphorus Fe rtilization Levels (kg/fed.) (P) | Variety (V) | Subsequent individual cuts | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1st cut | 2nd cut | 3rd cut | 4th cut | 5th cut | Total |
| | | ……..(ton/fed.)…… | | | | | |
| Zero | Gemaiza 1 | 7.87 | 9.33 | 11.87 | 13.07 | 7.60 | 49.74 |
| | Sakha 4 | 7.33 | 8.67 | 10.87 | 11.47 | 8.20 | 46.54 |
| | Helali | 8.07 | 9.07 | 12.00 | 13.20 | 8.53 | 50.87 |
| | Giza 6 | 8.27 | 9.53 | 11.27 | 12.07 | 8.33 | 49.47 |
| | Serw 1 | 7.87 | 8.47 | 10.67 | 11.60 | 7.93 | 46.54 |
| **Mean** | | **7.88** | **9.01** | **11.33** | **12.28** | **8.12** | **48.62** |
| 150 | Gemaiza 1 | 8.67 | | 13.40 | 14.73 | 8.40 | 56.27 |
| | Sakha 4 | 8.20 | 10.40 | 13.00 | 14.87 | 8.73 | 55.2 |
| | Helali | 9.07 | 11.20 | 14.47 | 15.60 | 8.33 | 58.67 |
| | Giza 6 | 9.13 | 10.47 | 13.33 | 14.33 | 8.73 | 55.99 |
| | Serw 1 | 8.40 | 10.59 | 12.53 | 13.67 | 8.80 | 53.99 |
| **Mean** | | **8.69** | **10.59** | **13.35** | **14.64** | **8.60** | **55.87** |
| 300 | Gemaiza 1 | 8.93 | 12.53 | 14.87 | 14.93 | 9.33 | 60.59 |
| | Sakha 4 | 8.67 | 11.00 | 13.40 | 15.27 | 8.87 | 57.21 |
| | Helali | 9.13 | 12.00 | 13.80 | 15.53 | 9.80 | 60.26 |
| | Giza 6 | 9.33 | 12.00 | 15.00 | 15.47 | 9.20 | 61.00 |
| | Serw 1 | 9.13 | 11.53 | 14.33 | 14.80 | 9.00 | 58.79 |
| **Mean** | | **9.04** | **11.81** | **14.28** | **15.20** | **9.24** | **59.57** |
| **Gemaiza 1** | | **8.49** | **10.98** | **13.38** | **14.24** | **8.44** | 55.53 |
| **Sakha 4** | | **8.07** | **10.02** | **12.42** | **13.87** | **8.60** | 52.98 |
| **Helali** | | **8.76** | **10.76** | **13.42** | **14.78** | **8.89** | 56.61 |
| **Giza 6** | | **8.91** | **10.67** | **13.20** | **13.96** | **8.76** | 55.50 |
| **Serw 1** | | **8.47** | **9.93** | **12.51** | **13.36** | **8.58** | 52.85 |
| **Mean** | | **8.54** | **10.47** | **12.99** | **14.04** | **8.65** | **54.91** |
| **L.S.D at 5% for:** | | P=0.35<br>V=0.27<br>Pvy=0.66 | P=0.72<br>V=0.37<br>Vy=0.53<br>Pvy=0.91 | P=0.73<br>V=0.41<br>Vy=0.58<br>Pv=0.71<br>Pvy=1.00 | P=0.72<br>V=0.37<br>Pv=0.64<br>Pvy=0.91 | p=0.49<br>Pvy=0.81 | |

## Dry forage yield:

Data in Table (3) clarified the effect of the applied phosphorus fertilization levels on the dry yield of the five Berseem varieties. There was significant differences in dry matter yield among the winter legumes under study either on the individual cuts during each of the two growing seasons or the combined analysis with slight variable differences in trend or magnitudes.

Over the applied phosphorus fertilization treatments, results clarified significant differences among the five Berseem varieties under study in their total dry matter production.

Helali was superior in total dry matter yield (8.84 ton/fed), followed by Giza 6 (8.80 ton/fed), then Gemaiza 1 (8.75 ton/fed) followed by Serw 1 (8.41 ton/fed) then Sakha 4 (8.32 ton/fed) for the combined analysis of the two growing seasons with an ignorable differences (Table, 3).

It looks to be true that the descending rank order in total dry forage yield was: Helali (9.10) > Giza 6 (8.71)> Sakha 4 (8.55) > Gemaiza 1 (8.48) > Serw 1 (8.17 ton / fed) during the first season with an ignorable difference. The corresponding total dry yield was > Gemaiza 1 (9.02), Giza 6 (8.89), Serw 1 (8.65), Helali (8.59) and Sakha 4 (8.10 ton/fed in the second season.

Sakha 4 forage proved to be the least in dry yield production as compared with any of the other 4 varieties under study and Helali was of the top in dry forage production among the other varieties, and Gemaiza 1, Giza 6 and Serw 1 were almost similar in total dry yield and being half way in productivity between Sakha 4 and Helali (Table, 3).

It should be also noted that the individual cuts of each season were in similar trend regarding the total dry yield.

Such obtained variations in dry forage production of the various Berseem varieties under study are very well expected due to the specific unique genetic structure of each of the grown varieties which react differently with the prevailing environmental conditions in exerting its identified phenotype in growth and development.

It should be pointed out that, the combined analysis clarified significant increase in total dry forage yield as the phosphorus level increased from 0 to 22.5kg $P_2O_5$/fed was14%. Meanwhile, increasing phosphorus level from 22.5 to 45 kg $P_2O_5$/fed caused significant increase in total dry yield by 8%.

Moreover, it is worth noting to clarify that the benefit in total dry yield production when comparing between the lowest (0 kg $P_2O_5$/fed) and medium phosphorus level (22.5 kg $P_2O_5$/fed) was much higher. Whereas, the increase in phosphorus application from the medium (22.5 kg $P_2O_5$/fed) to the higher level (45 kg $P_2O_5$/fed) significantly produced higher total dry yield in both season and combined analysis as well. This result may indicate adequate satisfaction of total dry yield production when using the medium level of phosphorus in both seasons and the combined analysis (Table, 3).

However, it is important to clarify that the significant increase in total dry yield was 23% when increasing phosphorus level from 0 to 45 kg $P_2O_5$/fed in the combined analysis. This results indicate the benefit of applying the highest level of phosphorus (45 kg $P_2O_5$/fed) compared with the lowest (0 kg $P_2O_5$/fed) level from the combined analysis of the two growing seasons in respect of the obtained total dry yield.

It is well noticed that the response of total dry yield to the applied phosphorus levels was increased as the individual accumulated cuts increased with significant different magnitudes, which all represent the accumulated yield of the total cuts of dry yield. Such slight differences in each of the subsequent cuts may due to some variations within the environmental factors within cut-durations which are very well expected due to the subsequent changes in the environmental conditions within the extended season.

The obtained result may confirm the important and essential role of phosphorus fertilizer in enhancing the photosynthetic operations in the accumulation of carbohydrate and the other essential materials as well as storing enough quantities to be used in posting the energy power responsible for the growth and regrowth of the subsequent cuts. Similar results insuring the

role of phosphorus application increasing vegetative growth were reported by **Shah *et al.* (1991) in Lucerne, Rana *et al.*, (1992) in Berseem and Marino and Berardo (2005) in Lucerne.**

**Table (3): Dry yield productivity of some Berseem clover (*Trifolium alexandrinum, L.*) varieties as affected by various phosphorus fertilization levels (Combined over seasons).**

| Phosphorus Fertilization Levels (kg/fed.) (P) | Variety (V) | Subsequent individual cuts | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1st cut | 2nd cut | 3rd cut | 4th cut | 5th cut | Total |
| | | ……..(ton/fed.)…… | | | | | |
| Zero | Gemaiza 1 | 0.89 | 1.14 | 1.67 | 2.41 | 1.69 | 7.80 |
| | Sakha 4 | 0.77 | 1.06 | 1.51 | 2.16 | 1.82 | 7.32 |
| | Helali | 0.92 | 1.17 | 1.67 | 2.45 | 1.95 | 8.16 |
| | Giza 6 | 0.82 | 1.22 | 1.67 | 2.15 | 1.86 | 7.72 |
| | Serw 1 | 0.74 | 1.16 | 1.44 | 2.20 | 1.83 | 7.37 |
| **Mean** | | **0.83** | **1.15** | **1.59** | **2.28** | **1.83** | **7.68** |
| 150 | Gemaiza 1 | 0.90 | 1.38 | 1.82 | 2.75 | 2.02 | 8.87 |
| | Sakha 4 | 0.82 | 1.34 | 1.72 | 2.79 | 2.06 | 8.73 |
| | Helali | 0.96 | 1.29 | 1.89 | 2.76 | 2.02 | 8.92 |
| | Giza 6 | 1.02 | 1.35 | 1.77 | 2.62 | 2.05 | 8.81 |
| | Serw 1 | 0.85 | 1.21 | 1.73 | 2.50 | 2.14 | 8.43 |
| **Mean** | | **0.91** | **1.32** | **1.79** | **2.68** | **2.06** | **8.76** |
| 300 | Gemaiza 1 | 1.05 | 1.59 | 1.95 | 2.64 | 2.34 | 9.57 |
| | Sakha 4 | 0.82 | 1.33 | 1.74 | 2.83 | 2.23 | 8.95 |
| | Helali | 1.00 | 1.36 | 1.77 | 2.86 | 2.46 | 9.45 |
| | Giza 6 | 1.11 | 1.54 | 2.04 | 2.95 | 2.20 | 9.84 |
| | Serw 1 | 1.05 | 1.50 | 1.89 | 2.84 | 2.14 | 9.42 |
| **Mean** | | **1.01** | **1.46** | **1.88** | **2.82** | **2.27** | **9.44** |
| **Gemaiza 1** | | **0.95** | **1.37** | **1.81** | **2.60** | **2.02** | 8.75 |
| **Sakha 4** | | **0.80** | **1.24** | **1.66** | **2.59** | **2.03** | 8.32 |
| **Helali** | | **0.96** | **1.27** | **1.78** | **2.69** | **2.14** | 8.84 |
| **Giza 6** | | **0.98** | **1.37** | **1.83** | **2.58** | **2.04** | 8.80 |
| **Serw 1** | | **0.88** | **1.29** | **1.69** | **2.51** | **2.04** | 8.41 |
| **Mean** | | **0.91** | **1.31** | **1.75** | **2.59** | **2.05** | **8.62** |
| L.S.D at 5% for: | | P=0.05<br>V=0.06<br>Py=0.07 | P=0.11 | P=0.16<br>V=0.08<br>Vy=0.11 | P=0.20<br>Pv=0.18 | P=0.18 | |

The interaction effect from combined analysis of the applied factors on the produced total dry forage yield was significant as presented in Table (3). Highest total dry forage yield was noticed for Giza 6 variety fertilized with 45 kg $P_2O_5$/fed. This obtained total dry yield was 2.95 ton/fed. Whereas, the lowest total dry yield was for Serw 1 variety producing 0.74 ton/fed without phosphate application (0 kg $P_2O_5$/fed.) For more information in this respect other comparisons for the interaction effect of the applied studied factors on total and/or individual cuts are presented in Table (3).

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## Vegetative growth characteristics:

### Plant height:

Results clarify significant differences in plant heights between the grown Berseem varieties over the applied fertilization treatments (Table 4).

Over the applied phosphorus treatments, and on the average basis of the combined analysis, Helali variety was of the tallest plants, followed by Giza 6, then Serw 1 followed by Gemaiza 1 then Sakha 4 of the shortest plants with significant differences in between. Similar trend was noticed for the individual cuts and their average during the first and the second seasons with slight various magnitudes. Such results reflect the specific genetical structure of each of the grown varieties under study in exerting such plant features as affected by the prevailing environmental conditions.

Plant heights of Berseem varieties were substantially increased as phosphorus application levels increased (over Berseem varieties). Significant increase in plant height was obtained especially when comparing between the application of the lowest (0 Kg $P_2O_5$/fed) and the highest phosphorus fertilization level (45 Kg $P_2O_5$/fed). Similar trend was noticed for each of the individual cuts and their averages for the first and second seasons and their combined analysis as well with almost similar magnitudes (Table 4). Such results clarify the role of phosphorus in stimulating the vegetative growth of plants. Similar results were reported by **Mani and Singh (1997) in Berseem and Solanki and Patel (1999) in Lucerne.**

The significant interaction effect of the applied factors on the height of plants generally indicate that Serw 1 variety was of the tallest plants, due to the

increase in phosphorus especially at the highest level (45 Kg $P_2O_5$/fed). Whereas, Helali was of the shortest plants receiving the lowest phosphorus level (0 Kg $P_2O_5$/ fed). Other interactions effect for the applied factors on the height of plants were recorded in Table (4).

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**Table (4): Plant height of Berseem clover (*Trifolium alexandrinum, L.*) Varieties as affected by various phosphorus fertilization levels (Combined over seasons).**

| Phosphorus Fertilization Levels (kg/fed.) (P) | Variety (V) | Subsequent individual cuts | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1st cut | 2nd cut | 3rd cut | 4th cut | 5th cut | Mean |
| | | ……..(Cm)…… | | | | | |
| Zero | Gemaiza 1 | 43.77 | 53.37 | 59.00 | 75.83 | 57.17 | 57.828 |
| | Sakha 4 | 43.20 | 54.17 | 55.67 | 77.50 | 58.17 | 57.742 |
| | Helali | 42.33 | 57.53 | 61.33 | 80.17 | 58.17 | 59.906 |
| | Giza 6 | 44.67 | 55.93 | 59.17 | 76.00 | 65.00 | 60.154 |
| | Serw 1 | 45.40 | 53.43 | 59.17 | 80.83 | 58.33 | 59.432 |
| **Mean** | | **43.87** | **54.89** | **58.87** | **78.07** | **59.40** | **59.02** |
| 150 | Gemaiza 1 | 45.13 | 59.30 | 61.33 | 81.67 | 63.50 | 62.186 |
| | Sakha 4 | 43.50 | 55.20 | 62.50 | 82.00 | 63.00 | 61.24 |
| | Helali | 47.47 | 56.20 | 62.33 | 85.00 | 66.17 | 63.434 |
| | Giza 6 | 47.23 | 58.93 | 65.83 | 81.50 | 63.83 | 63.464 |
| | Serw 1 | 46.07 | 57.23 | 63.17 | 83.17 | 61.00 | 62.128 |
| **Mean** | | **45.88** | **57.37** | **63.03** | **82.67** | **63.50** | **62.49** |
| 300 | Gemaiza 1 | 47.50 | 59.83 | 66.00 | 86.00 | 63.83 | 64.632 |
| | Sakha 4 | 45.70 | 55.20 | 68.33 | 85.67 | 64.50 | 63.88 |
| | Helali | 47.70 | 59.67 | 67.83 | 85.33 | 67.17 | 65.54 |
| | Giza 6 | 47.87 | 59.00 | 67.00 | 78.67 | 66.67 | 63.842 |
| | Serw 1 | 49.87 | 58.07 | 65.17 | 87.33 | 64.50 | 64.988 |
| **Mean** | | **47.73** | **58.35** | **66.87** | **84.60** | **65.33** | **64.576** |
| **Gemaiza 1** | | **45.47** | **57.50** | **62.11** | **81.17** | **61.50** | 61.550 |
| **Sakha 4** | | **44.13** | **54.86** | **62.17** | **81.72** | **61.89** | 60.954 |
| **Helali** | | **45.83** | **57.80** | **63.83** | **83.50** | **63.83** | 62.958 |
| **Giza 6** | | **46.59** | **57.96** | **64.00** | **78.72** | **65.17** | 62.488 |
| **Serw 1** | | **47.11** | **56.24** | **62.50** | **83.78** | **61.28** | 62.182 |
| **Mean** | | **45.826** | **56.872** | **62.922** | **81.778** | **62.734** | **61.911** |
| L.S.D at 5% for: | | P=1.21 | P=1.75<br>Py=2.16 | P=1.25<br>Py=1.77<br>Vy=1.88<br>Pv=2.30<br>Pvy=3.25 | P=1.01<br>V=1.78<br>Vy=2.52<br>Pvy=4.37 | P=1.36<br>V=1.89 | |

## Leaf / stem ratio of plants:

Results in Table (5) show the effect of phosphorus application levels on leaf/stem ratio of the studied Berseem varieties. Over the applied fertilization levels (over the combined analysis), leaf/stem ratio of grown varieties could be ranked in the following descending order: Serw 1 > Helali > Gemaiza 1 = Sakha 4 > Giza 6. This trend was generally noticed on the basis of the individual cuts and their average for each of the two studied seasons. In other words, Serw 1 variety was of the highest leaf/stem ratio, while Giza 6 variety was of the lowest ratio. Whereas,

Gemaiza 1, Sakha 4 and Helali variety where in between. Such obtained behavior of leaf/ stem ratio was almost similar in the various cuts with some fluctuated ignorable magnitudes (Table, 5).

However, it is generally noticed that the above obtained significant differences in leaf/stem ratio were slightly varied but indicating similar trend. It could be generally noticed that leaf / stem ratio is very specific feature for each specific Berseem clover varieties which definitely depends on the unique genetic makeup within the environment.

**Table (5): Leaf: Stem ratio of some Berseem clover (*Trifolium alexandrinum, L.*) varieties as affected by various phosphorus fertilization levels (Combined over seasons).**

| Phosphorus Fertilization Levels (kg/fed.) (P) | Variety (V) | Subsequent individual cuts | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1st cut | 2nd cut | 3rd cut | 4th cut | 5th cut | Mean |
| | | ……..(% on fresh weight basis)…… | | | | | |
| Zero | Gemaiza 1 | 0.54 | 0.29 | 0.37 | 0.37 | 0.57 | 0.428 |
| | Sakha 4 | 0.58 | 0.36 | 0.32 | 0.37 | 0.50 | 0.426 |
| | Helali | 0.45 | 0.36 | 0.38 | 0.42 | 0.60 | 0.442 |
| | Giza 6 | 0.44 | 0.36 | 0.32 | 0.34 | 0.46 | 0.384 |
| | Serw 1 | 0.45 | 0.34 | 0.41 | 0.40 | 0.51 | 0.422 |
| **Mean** | | **0.49** | **0.34** | **0.36** | **0.38** | **0.53** | **0.420** |
| 150 | Gemaiza 1 | 0.41 | 0.30 | 0.34 | 0.39 | 0.54 | 0.396 |
| | Sakha 4 | 0.48 | 0.36 | 0.33 | 0.37 | 0.52 | 0.412 |
| | Helali | 0.45 | 0.32 | 0.43 | 0.35 | 0.47 | 0.404 |
| | Giza 6 | 0.44 | 0.34 | 0.31 | 0.37 | 0.49 | 0.390 |
| | Serw 1 | 0.50 | 0.33 | 0.38 | 0.40 | 0.56 | 0.434 |
| **Mean** | | **0.46** | **0.33** | **0.36** | **0.37** | **0.52** | **0.408** |
| 300 | Gemaiza 1 | 0.47 | 0.37 | 0.34 | 0.37 | 0.58 | 0.426 |
| | Sakha 4 | 0.41 | 0.35 | 0.38 | 0.37 | 0.55 | 0.412 |
| | Helali | 0.45 | 0.34 | 0.32 | 0.37 | 0.59 | 0.414 |
| | Giza 6 | 0.44 | 0.36 | 0.34 | 0.43 | 0.60 | 0.434 |
| | Serw 1 | 0.48 | 0.34 | 0.35 | 0.39 | 0.71 | 0.454 |
| **Mean** | | **0.45** | **0.35** | **0.35** | **0.39** | **0.61** | **0.430** |
| **Gemaiza 1** | | **0.48** | **0.32** | **0.35** | **0.37** | **0.56** | 0.416 |
| **Sakha 4** | | **0.49** | **0.36** | **0.34** | **0.37** | **0.52** | 0.416 |
| **Helali** | | **0.45** | **0.34** | **0.38** | **0.38** | **0.55** | 0.420 |
| **Giza 6** | | **0.44** | **0.35** | **0.32** | **0.38** | **0.52** | 0.402 |
| **Serw 1** | | **0.48** | **0.34** | **0.38** | **0.40** | **0.60** | 0.440 |
| **Mean** | | **0.468** | **0.342** | **0.354** | **0.380** | **0.550** | **0.418** |
| L.S.D at 5% for: | | V=0.05 | N. S | V=0.03<br>Pvy=0.07 | y=0.04 | Vy=0.08 | |

Also, results indicate slight tendency for increasing leaf/stem ratio of Berseem varieties as phosphorus levels increased especially from the lowest to the highest application levels (over Berseem varieties). This result was noticed for the individual cuts and their average in each of the two seasons with significant differences only during the first and fourth cuts of the first season (Table, 5).

The interaction effect of Berseem varieties x phosphorus application levels on leaf / stem ratio of plants did not exert significant differences during the two seasons and their combined analysis as well as for the individual cuts of the two seasons except for the first and third cuts of the second season. It is obviously clear that Serw 1 variety was of largest leaf/stem ratio fertilized with45 Kg. Other interactions were recorded in (Table, 5) on the individual cuts or on the combined analysis for each of the two seasons.

**Number of shoots/$m^2$:**

Results of the combined analysis (Over the applied phosphorus treatments) clarified significant differences between Berseem clover varieties in their number of shoots/$m^2$ as shown in Table (6).

Differences in number of shoot/$m^2$ did not reach the level of significant for the Berseem varieties (over phosphorus levels), whereas, the descending ranking order was as follows: Helali (394.4), Giza 6 (387.8), Gemaiza 1(382.2), Serw 1 (377.8) and Sakha 4 (371.4 shoots/$m^2$).Almost similar ranking order was noticed in the first and second season.

As phosphorus level increased (over varieties), the number of shoot/$m^2$ increased significantly as phosphorus fertilization levels increase, the respective number of shoots/$m^2$ was noticed when phosphorus levels were increased from 0 to 22.5 up to 45 kg $P_2O_5$/fed was 353, 384.4 and 415.2 shoots/$m^2$. Similar pattern was repeated for each of the two seasons. **Mani and Singh (1997) in Berseem clover** reported similar results

The interaction effect of the applied factors on the number of shoots/$m^2$ of plants was significant either on the basis of the individual cuts or their average and combined analysis as recorded in Table (6).

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**Table (6): Number of shoots per sq.meter of some Berseem clover (*Trifolium alexandrinum, L.*) varieties as affected by various phosphorus fertilization levels (Combined over seasons).**

| Phosphorus Fertilization Levels (kg/fed.) (P) | Variety (V) | Subsequent individual cuts | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1st cut | 2nd cut | 3rd cut | 4th cut | 5th cut | Mean |
| | | ……..(# of shoots/m²)…… | | | | | |
| Zero | Gemaiza 1 | 508 | 362 | 254 | 288 | 366 | 355.6 |
| | Sakha 4 | 485 | 367 | 251 | 254 | 352 | 341.8 |
| | Helali | 550 | 386 | 250 | 286 | 362 | 366.8 |
| | Giza 6 | 523 | 322 | 240 | 257 | 402 | 348.8 |
| | Serw 1 | 502 | 292 | 262 | 270 | 428 | 350.8 |
| **Mean** | | **514** | **346** | **252** | **271** | **382** | **353.0** |
| 150 | Gemaiza 1 | 536 | 373 | 274 | 309 | 420 | 382.4 |
| | Sakha 4 | 539 | 364 | 269 | 283 | 366 | 364.2 |
| | Helali | 618 | 316 | 264 | 300 | 427 | 385.0 |
| | Giza 6 | 639 | 360 | 263 | 268 | 425 | 391.0 |
| | Serw 1 | 533 | 334 | 279 | 284 | 467 | 379.4 |
| **Mean** | | **573** | **349** | **270** | **289** | **421** | **380. 4** |
| 300 | Gemaiza 1 | 673 | 340 | 280 | 312 | 441 | 409.2 |
| | Sakha 4 | 720 | 350 | 281 | 303 | 389 | 408.6 |
| | Helali | 737 | 400 | 271 | 296 | 452 | 431.2 |
| | Giza 6 | 784 | 356 | 276 | 286 | 420 | 424.4 |
| | Serw 1 | 576 | 355 | 302 | 292 | 490 | 403.0 |
| **Mean** | | **698** | **360** | **282** | **298** | **438** | **415.2** |
| **Gemaiza 1** | | **572** | **358** | **269** | **303** | **409** | 382.2 |
| **Sakha 4** | | **581** | **360** | **267** | **280** | **369** | 371.4 |
| **Helali** | | **635** | **367** | **262** | **294** | **414** | 394.4 |
| **Giza 6** | | **648** | **346** | **260** | **270** | **415** | 387.8 |
| **Serw 1** | | **537** | **327** | **281** | **282** | **462** | 377.8 |
| **Mean** | | **594.6** | **351.6** | **267.8** | **285.8** | **413.8** | **382.7** |
| L.S.D at 5% for: | | P=16.6<br>Py=23.5<br>V=28.8<br>Vy=40.8<br>Pv=49.9<br>Pvy=70.61 | V=12.97<br>Vy=18.33<br>Pv=22.46<br>Pvy=31.76 | P=8.88<br>V=9.66<br>Vy=13.66 | P=6.26<br>Py=8.86<br>V=11.03 | P=17.40<br>V=17.99 | |

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# تقييم بعض أصناف البرسيم المصرى تحت مستويات مختلفة من الفوسفور

**أحمد محمد سعد إبراهيم**

قسم المحاصيل – كلية الزراعة – جامعة بنها

أقيمت تجربتان حقليتان بمزرعة مركز البحوث والتجارب الزراعية بكلية الزراعة بمشتهر – جامعة بنها وذلك خلال موسمي الزراعة الشتوى 2011/2010 ، 2012/2011 م بهدف تقييم الإنتاجية المحصولية (المحصول الأخضر والجاف) وقياسات النمو لخمسة أصناف من البرسيم المصرى ( جميزة 1– سخا 4- هلالى- جيزة 6- سرو 1) تحت ثلاث مستويات من السماد الفوسفاتى (صفر- 22.5- 45 كجم فو$_2$أ$_5$/ف) واستخدم تصميم القطع المنشقة مرة واحدة بأربعة مكررات.

**ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلي :**

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1- أوضحت النتائج ان الصنف هلالى كان افضل الأصناف الخمسة فى محصول العلف الأخضر و الجاف، طول النبات ، عدد الفروع / م2 بينما كان الصنف سرو 1 افضل الأصناف الخمسة فى نسبة الاوراق للسيقان.

2- أدت إضافة السماد الفوسفاتى بمعدل 45 كجم فو$_2$أ$_5$/ف الى الحصول على أكبر محصول علف أخضر و جاف ، و كذلك أعلى نسبة من عدد الفروع / م2 .و كذلك الحصول على أطول النباتات و اعلى نسبة من الا وراق الى السيقان للنباتات.

بناء على ذلك فإنه يوصى بزراعة صنف البرسيم هلالى مع التسميد بمعدل 45 كجم فو$_2$أ$_5$/ ف تحت الظروف البيئية السائدة لجنوب الدلتا.

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