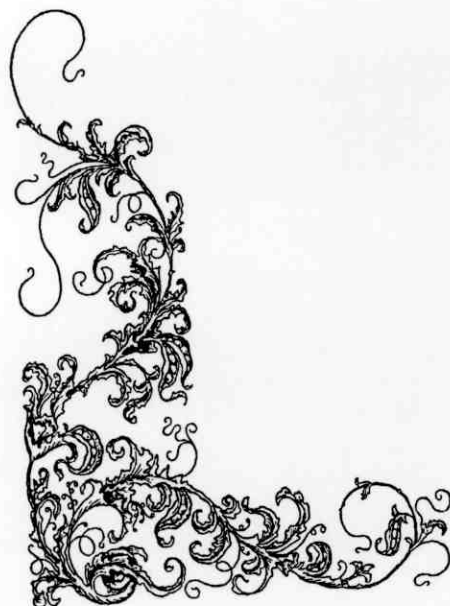


SUMMARY AND CONCLUSIONS



5- SUMMARY AND CONCLUSION

Two field experiments were conducted at the Experimental Farm of the Faculty of Agriculture, Moshtohor, Zagazig University (Benha Branch) during the summer season of 2001 and 2002.

This study was then divided into two major experiments; the first field experiment was done to study the response of common bean (*Phaseolus vulgaris* L.) cv. Bronco plants to biogas manure, some bio-fertilizers and mineral fertilizers on the vegetative growth characters, yield and its components as well as the criteria of nodules formation which was done in pot experiment. The second experiment was carried out to determine the effect of mycorrhizal fungi, Phosphorine and mineral fertilizer on two cultivars of common bean (Bronco and Paulista).

The obtained results could be summarized as follows:

First experiment:

This study was conducted to investigate the effect of organic manure as (biogas manure 40 kg N/fed.) and inoculation with bio-fertilizer, i. e. Rhizobacterin and Phosphorine both at rate of 1 Kg/fed. either in a single form or combined with or recommended dose of mineral fertilizers (40 kg N + 48 kg P_2O_5 + 48 kg K_2O /fed.) or half of the mentioned dose. It included ten treatments in addition to the control treatment (nothing applied).

Treatments were as follow; Rhizobacterin at rate of 1 kg/fed., Phosphorine at rate of 1 kg/fed., Rhiz. + Phos. , Biogas manure (40 kg N/fed.), Biogas manure (20 kg/fed.) +Rhiz. + Phos., Biogas manure (40 kg/fed.)+Rhiz. + Phos. , Full dose of mineral fertilizers (40 kg N +48 kg P_2O_5 + 48 kg K_2O /fed.), Rhiz. + Phos. + Half dose of mineral fertilizers, Rhiz. + Phos. + Full dose of mineral fertilizers. Biogas manure (20 kg/fed.) +Rhiz. + Phos. + Half dose of mineral fertilizers.

A completely randomized block design with four replicates was adopted in this experiment. Obtained results revealed the following:-

- 1- Vegetative growth characteristics expressed as plant height, number of branches and leaves, leaf area as well as fresh and dry weight per plant were significantly increased when the plants were fertilized with bio-fertilizer, organic manure or mineral fertilizers compared with the control treatment during the tow seasons of this study. In this respect, application of biogas manure (20 kg N /fed.) + Rhiz. + Phos. +Half recommended dose of mineral fertilizers (20 kg N +24 kg P_2O_5 + 24 kg K_2O /fed.) or biogas manure (40 kg N/fed.) + Rhiz. + Phos. showed the highest values for all vegetative growth characteristics when compared with the other treatment or control.
- 2- Snap bean plant that fertilized with biogas manure (20 kg N/fed.) + Rhiz. + Phos. + Half recommended dose of mineral fertilizers (20 kg N +24 kg P_2O_5 + 24 kg K_2O /fed.) showed a significant increment in chemical composition of plant foliage expressed as photosynthetic pigments (chlorophyll a, b and

total carotenoids), N, P and K percentage. This was true during both seasons of growth.

- 3- Green pods yield and its components expressed as average pod length, diameter, weight, pods yield per plot and total green pods yield per feddan as well as dry matter percentage in pods were significantly increased when the plant were fertilized with bio- fertilizer, organic manure or mineral fertilizers compared with the control treatment during the two seasons of this study. In this respect, the treatment at which biogas manure (20 kg N /fed.) + Rhiz. + Phos. + Half recommended dose of mineral fertilizers (20 kg N + 24 kg P_2O_5 + 24 kg K_2O /fed.) proved to be the most effective treatment in improving green pods yield and its components.
- 4- Using biogas manure (20 kg N /fed.) + Rhiz. + Phos. + Half recommended dose of mineral fertilizers (20 kg N + 24 kg P_2O_5 + 24 kg K_2O /fed.) gave the highest values of nitrogen percentage in pod in both seasons and potassium percentage in the second one. Where as, using biogas manure (40 kg N /fed.) gave the highest values of phosphorus percentage in both seasons and potassium in first one.
- 5- Crude protein, reducing, non-reducing and total sugars percentage were significantly increased and fiber percentage in pods was decreased when the plants were fertilized with bio-fertilizer, organic manure or mineral fertilizers compared with the control treatment. In this respect, the treatment at which biogas manure (20 kg N /fed.) + Rhiz. + Phos. + Half recommended dose of mineral fertilizers (20 kg N + 24 kg P_2O_5 + 24 kg K_2O /fed.) gave the highest values of crude

protein, reducing, non-reducing and total sugars as well as the lowest values of fiber percentage in pods. These results were true in both seasons of this study.

6- Nodules formation expressed as number and dry weight of nodules per plant as well as plant fresh weight were significantly increased when plants were fertilized with bio-fertilizers, organic manure or mineral fertilizers compared with control treatment during the two seasons of this study. In this respect, fertilizing snap bean plants with biogas manure (40 kg N /fed.) + Rhiz. + Phos. gave the highest values of nodules dry weight, while Rhiz. + Phos. treatment gave the highest value of nodule number per plant in the first season. Meanwhile, biogas manure (20 kg N /fed.) + Rhiz. + Phos. gave the highest values for nodule number and nodules dry weight in the second one. Moreover, biogas manure (20 kg N /fed.) + Rhiz. + Phos. + Half recommended dose of mineral fertilizers (20 kg N +24 kg P_2O_5 + 24 kg K_2O /fed.) gave the highest values for plant fresh weight, during both seasons.

Conclusion:

Under such condition of the experiment, fertilizing snap bean plants cv. Bronco with biogas manure (20 kg N /fed.) + Rhiz. + Phos. + Half recommended dose of mineral fertilizers (20 kg N +24 kg P_2O_5 + 24 kg K_2O /fed.) were recommended for obtaining the highest values for all vegetative growth characteristics and green pods yield with best quality.

Second experiment:

This study was undertaken to conceive the effect of phosphorus and bio-fertilizer (Phosphorine and vesicular arbuscular mycorrhizal (VAM) fungi) application as well as their combination on vegetative growth and chemical composition of plant foliage, green pods yield and its components as well as its quality. This experiment included 22 treatments, which were the combination of two common bean cultivars i. e. Bronco and Pualista within 11 treatments of phosphorus fertilization, i.e. 48 kg P_2O_5 /fed., vesicular arbuscular mycorrhizal (VAM), Phosphorine at 1kg /fed. , VAM + Phos. , VAM + 24 or 48 kg P_2O_5 /fed. , Phos. + 24 or 48 kg P_2O_5 /fed., VAM + Phos. +24 or 48 kg P_2O_5 /fed. in addition to the check treatment, forming the eleven treatments.

A split plot design with four replicate was adopted where the two cultivars were distributed in the main plots and fertilization treatments in sub plots. Obtained results revealed the following:

- 1- There were significant differences between the used cultivars, i. e. Bronco and Paulista in all the studied vegetative growth characteristics expressed as plant height, number of branches and leaves per plant, leaf area as well as fresh and dry weight per plant, during both seasons of the experiment, except that for the number of branches in the first season and plant dry weight in both seasons which showed non significance in this respect. Also, in this regard, cv. Bronco reflected the highest values for the most studied growth aspects.

- 2- Application of Phosphorine at 1 kg /fed. + 48 kg P_2O_5 /fed. led to a significant increase in all the measured growth aspects of snap bean plants in comparison with the other treatments and that of control, followed by VAM + Phos. + 24 kg P_2O_5 /fed. and followed by VAM + Phos. + 48 kg P_2O_5 /fed.
- 3- The interaction effect between cultivars and fertilization treatments showed a significant differences between all treatments in all studied growth parameters during both seasons of the experiment. In general, application of Phos. + 48 kg P_2O_5 /fed. to both cultivars under study resulted in the maximum values of plant growth.
- 4- Paulista cultivar gave the highest values of chlorophyll a, b, total carotenoids and K percentage in first season and N percentage in the second one. Meanwhile, cv. Bronco gave the highest values of N and P percentage in the first season and chlorophyll a, b, total carotenoids as well as P and K percentage in the second one.
- 5- Application of Phos. + 48 kg P_2O_5 /fed. Led to a significant increase in chlorophyll a, b, total carotenoids and N percentage in comparison with the other treatments and control. Meanwhile, treatment with VAM + Phos. + 48 kg P_2O_5 /fed. Gave the highest values for P and K percentage. These results were true during both seasons of study.
- 6- The interaction effect between cultivars and fertilization treatments indicated a significant difference between all treatments in chlorophyll a, b, total carotenoids as well as N,

P, and K percentage in plant foliage of snap bean during both of the experiment. In general, application of Phosphorine at 1 kg/fed. + 48 kg P_2O_5 /fed. or VAM + Phos. + 24 kg P_2O_5 /fed. to both cultivars under study (Bronco and Paulista) resulted in the highest values of chemical composition of plant foliage,

- 7- Bronco cultivar recoded the highest values for pod length, pod diameter, pod fresh weight, total yield per plant and total green pods yield per feddan than those of Paulista during both seasons of study. Meanwhile, cv. Paulista gave the highest values for dry matter percentage in pods than those of Bronco. These results were true in both growing seasons.
- 8- Green pods yield and its components expressed as average pod length, diameter, and fresh weight, as well as total green pods yield per plant and per feddan and the dry matter percentage in pods were positively affected due to the application of different fertilization treatments compared with the control treatment. In this respect, the application of Phosphorine + 48 kg P_2O_5 /fed. Led to a significant increase in green pods yield and its components followed by VAM + Phos. + 24 kg P_2O_5 /fed. And VAM + Phos. + 48 kg P_2O_5 /fed.
- 9- Concerning the interaction effect between snap bean cultivars and fertilization treatments, there were a significant difference between all treatments in green pods yield and its components during both seasons of the experiment. In general, application of Phosphorine at 1 kg + 48 kg P_2O_5 /fed. to both cultivars (Bronco and Paulista) resulted in the highest

values for pod length, pod diameter, pod fresh weight, total yield per plant and total green pods yield per feddan as well as dry matter percentage in pods.

10-Bronco cultivar gave the highest values for N percentage in the first season and P percentage in the second one. Meanwhile, Paulista gave the highest values for P and K percentages in first season and N and K percentage in the second one.

11-Concerning the effect of phosphorus, Phosphorine and vesicular arbuscular mycorrhizal fungi (VAM) on N, P and K percentage in green pods of snap bean. In this regard, the application of Phosphorine + 48 kg P_2O_5 /fed. Led to a significant increase in N percentage in comparison with the other treatments and control. Meanwhile, treatment with VAM + Phos. + 48 kg P_2O_5 /fed. gave the highest values for P and K percentages. These results are true during both seasons of study.

12-According to the effect of the interaction between cultivars and fertilization treatment. Application of Phos. + 48 kg P_2O_5 /fed. or VAM + Phos. + 48 kg P_2O_5 /fed. to both cultivars under study (Bronco and Paulista) resulted in the highest values for N, P and K percentages.

13-There were significant differences between the used cultivars, i.e. Bronco and Paulista in crude protein, reducing, non-reducing and total sugars as well as fiber percentage during both seasons of experiment, except that crude protein and

non-reducing sugars in the first season which failed to reach the level of significance.

14-The application of Phos. + 48 kg P_2O_5 /fed. led to a significant increases in crude protein, reducing, non-reducing and total sugars. On the other hand, there was significant decrease in fiber percentage compared with the other treatments and that of control followed by VAM + Phos. + 24 kg P_2O_5 /fed. and VAM + Phos. + 48 kg P_2O_5 /fed.

15-Regarding the interaction effect between cultivars and fertilization treatments on organic chemical constituents in pods. Plants of the used cultivars that received Phos. + 48 kg P_2O_5 /fed. showed maximum values for crude protein, reducing, non-reducing and total sugars percentage and the lowest value for fiber percentage during both seasons.

Conclusion:

Generally, it could be concluded that under such condition the application Phosphorine at 1 kg /fed. + 48 kg P_2O_5 /fed. or VAM + Phos. + 24 kg P_2O_5 /fed. and VAM + Phos. + 48 kg P_2O_5 /fed. to the snap bean plants cvs Bronco and Paulista were recommended to gave the most favorable growth characteristics, the highest green pods yield with best quality.
