

## 5. SUMMARY AND CONCLUSION

Two field experiments were carried out at Ras Sudr region in South Sinai Governorate, Egypt during the two successive winter growing seasons of 1999 / 2000 and 2000 / 2001.

This study was divided into two major experiments, the first one was to study the effect of three different organic manures and bio-fertilizers (microbial varieties) as well as their interaction on pea plant growth and productivity grown under saline conditions. The second one was carried out to determine the effect of three organic manures and their combination on growth and yield of pea plants grown under saline conditions.

### **I. The first experiment:**

This experiment included 18 treatments arranged in a split plot design with three replicates. Treatments were three sources of organic manures (farmyard, sheep dung and chicken manures) arranged in the main plots and 6 treatments of three microbial varieties and their mixed as well as the recommended dose of NPK fertilizer and the control treatment in the sub plots. The obtained results were as follows:

#### **1. Vegetative growth characteristics:-**

There were significant differences among the used organic manures on all studied vegetative growth characteristics.

The inoculation with mixed bio-fertilizers significantly produced the highest values in all studied parameters.

The inoculation by mixed bio-fertilizers combined with farm yard manure significantly increased most of vegetative growth characteristics.

## **2. Photosynthetic pigments:**

There were significant increments in a, b and total chlorophyll values actualized from chicken manure or mixed bio-fertilizers treatments compared with other manuring treatments, while the carotene pigments were significantly increased with farm yard manure or NPK in the two growing seasons.

## **3. Endogenous hormones:**

The highest values of gibberellins, indole acetic acid and cytokinins were recorded in plants treated with farm yard manure and microbial inoculation as individual or in combination treatments in the two growing successive seasons.

## **4. Foliage mineral content:**

Application of farm yard manure significantly increased phosphorus, potassium and calcium while nitrogen content were increased with chicken manure application. Moreover, the plants treated with sheep dung absorbed more quantity of Na.

The treatment of mixed bio-fertilizers increased N concentration in pea foliage while NPK fertilizers increased P, K and Ca concentration. Meanwhile,  $\text{Na}^{1-}$  significantly decreased sharply with inoculation in this case.

The significantly highest concentration of nitrogen in pea plants was resulted with chicken manure included with mixed

bio-fertilizers. The highest values of phosphorus, potassium and calcium increases were actualized from NPK or farm yard manure application compared with control and all other treatments.

#### **5. Yield and its component of peas:-**

The effects of different used organic manures as well as recommended dose of NPK or used bio-fertilizers either as single mixture or in combination with organic manures were as follows:

The application of chicken manure significantly increased the average of pod number per plant and the average of plant yield. Moreover, farm yard manure treatment significantly increased the average of pod weight and enhanced plant yield and the total green pod yield per feddan.

When plants were treated with farm yard manure and mixed bio-fertilizers or individual *Bacillus* treatment significant increases in the total green pods yield per feddan and its components were obtained compared with other treatments.

#### **6. Pea physical characteristic:**

The application of sheep dung manure or chicken manure as individual or in combination with mixed bio-fertilizers led to significant increase in average pod length, pod diameter, number of seeds / pod and weight of 100 seeds.

## **7. Nutritional value of seeds:**

### **7.1. Organic chemical composition in dried pea seeds:**

The application of chicken manure significantly increased crude protein while total carbohydrates were increased with sheep dung in both growing seasons. Meanwhile, the decrement of fiber percentage was achieved with sheep dung and chicken manure in the first and second seasons, respectively. Whereas, the increment of crude protein and carbohydrates and the lowest value of fiber percentage were significantly affected with recommended dose of NPK and bio-fertilizers either as single or in combination.

The highest crude protein contents in green pea seeds were achieved from the chicken manure in corporate with NPK fertilizers or with mixed bio-fertilizers while the fiber percentage was significantly decreased with the application of chicken manure and *Azospirillum* treatment.

### **7.2. Mineral composition in dried pea seeds:**

The seeds of plants treated with chicken manure contained the highest amount of nitrogen while the highest amounts of phosphorus, potassium and calcium were established in seeds of plants received farm yard manure, NPK and single or mixed bio-fertilizers. On the other hand, sodium content in seeds sharply decreased with application of farm yard manure, NPK and single or mixed bio-fertilizers.

## Conclusion

It may be generally concluded that fertilizing pea plants cv. Little Marvel with farm yard manure at rate of  $30 \text{ m}^3 / \text{fed.}$  + mixed bio-fertilizers (*Azospirillum*, *Azotobacter* and *Bacillus*) are recommended for the highest values of vegetative characteristics and green pod yield.

## II. The second experiment:

This experiment included eight treatments arranged in complete randomized block design with three replicates. The treatments were recommended dose of NPK fertilizers, farmyard manure (FYM) at rate of  $40 \text{ m}^3 / \text{fed.}$ , chicken manure (Ch.M.) at rate of  $10 \text{ m}^3 / \text{fed.}$ , sheep manure (Sh.D.) at rate of  $30 \text{ m}^3 / \text{fed.}$ ,  $20 \text{ m}^3$  of FYM plus  $5 \text{ m}^3$  Ch.M. / fed.,  $20 \text{ m}^3$  of FYM plus  $15 \text{ m}^3$  Sh.D. / fed.,  $5 \text{ m}^3$  of Ch.M. plus  $15 \text{ m}^3$  Sh.D. / fed. and  $20 \text{ m}^3$  of FYM, plus  $15 \text{ m}^3$  Sh.D. plus  $5 \text{ m}^3$  Ch.M. / fed.

The obtained results could be summarized as follows:

### 1. Vegetative growth characteristic:

The morphological characteristics were significantly increased when the soil was amended with  $20 \text{ m}^3$  FYM plus  $5 \text{ m}^3$  Ch.M plus  $15 \text{ m}^3$  Sh.D / fed.

### 2. Photosynthetic pigments:

Using the combination between the three different organic manures significantly increased chlorophyll a, b and total

chlorophyll and decreased carotenoid pigments in foliage of pea plants.

### **3. Endogenous hormones:**

Concerning the effect of different organic manures and their combinations on gibberellins, indole acetic acid and cytokinins, mixing the three used organic manures as farm yard manure, sheep dung and chicken manure each at half recommended dose was of superior effect in this respect.

### **4. Foliage mineral content:**

The highest values of nitrogen, phosphorus and calcium and the lowest values of sodium content were obtained with the combination of the three used organic manures. The highest potassium concentration in pea foliage was achieved from mineral fertilizers.

### **5. Yield and its component of peas:**

The highest values of total produced yield and its components were achieved from the application of the combinations between half amounts of farm yard manure plus half amount of sheep dung plus half amount of chicken manure.

### **6. Pod physical characteristic:**

The application of FYM at rate of 20 m<sup>3</sup>/fed + Sh.D at rate of 15 m<sup>3</sup>/fed + Ch.M at rate 5 m<sup>3</sup>/fed treatment accomplished the highest values for pods physical characteristics.

## **7. Nutritional value of green pea seeds:**

### **7.1. Organic chemical constituents:**

There were significant increase in crude protein and significant decrease for fiber percentage in seeds of plants fertilized with the mixture of 20 m<sup>3</sup> FYM + 15 m<sup>3</sup> Sh.D + 5 m<sup>3</sup> Ch.M / fed followed by 20 m<sup>3</sup> FYM + 5 m<sup>3</sup> Ch.M / fed treatment, while as total carbohydrates percentage was significantly increased when plants were fertilized with mineral fertilizer.

### **7.2. Mineral chemical constituents:**

The application of FYM at half amount + half amount of Ch.M + half amount of Sh.D significantly increased the concentration of nitrogen, phosphorus and calcium and significantly decreased sodium content in dried green pea seeds while the concentration of potassium in seeds was significantly increased with the application of NPK fertilizer.

### **Conclusion**

Generally, it could be concluded that under such conditions the application of 20 m<sup>3</sup> FYM + 15 m<sup>3</sup> Sh.D + 5 m<sup>3</sup> Ch.M / fed. to the pea plants cv. Little Marvel are recommended to give the most favorable growth characteristics, the highest green pod yield with best quality.