GROWTH AND YIELD RESPONSE OF HORSE BEAN TO PLANT POPULATION AND NITROGENOUS FERTILIZER

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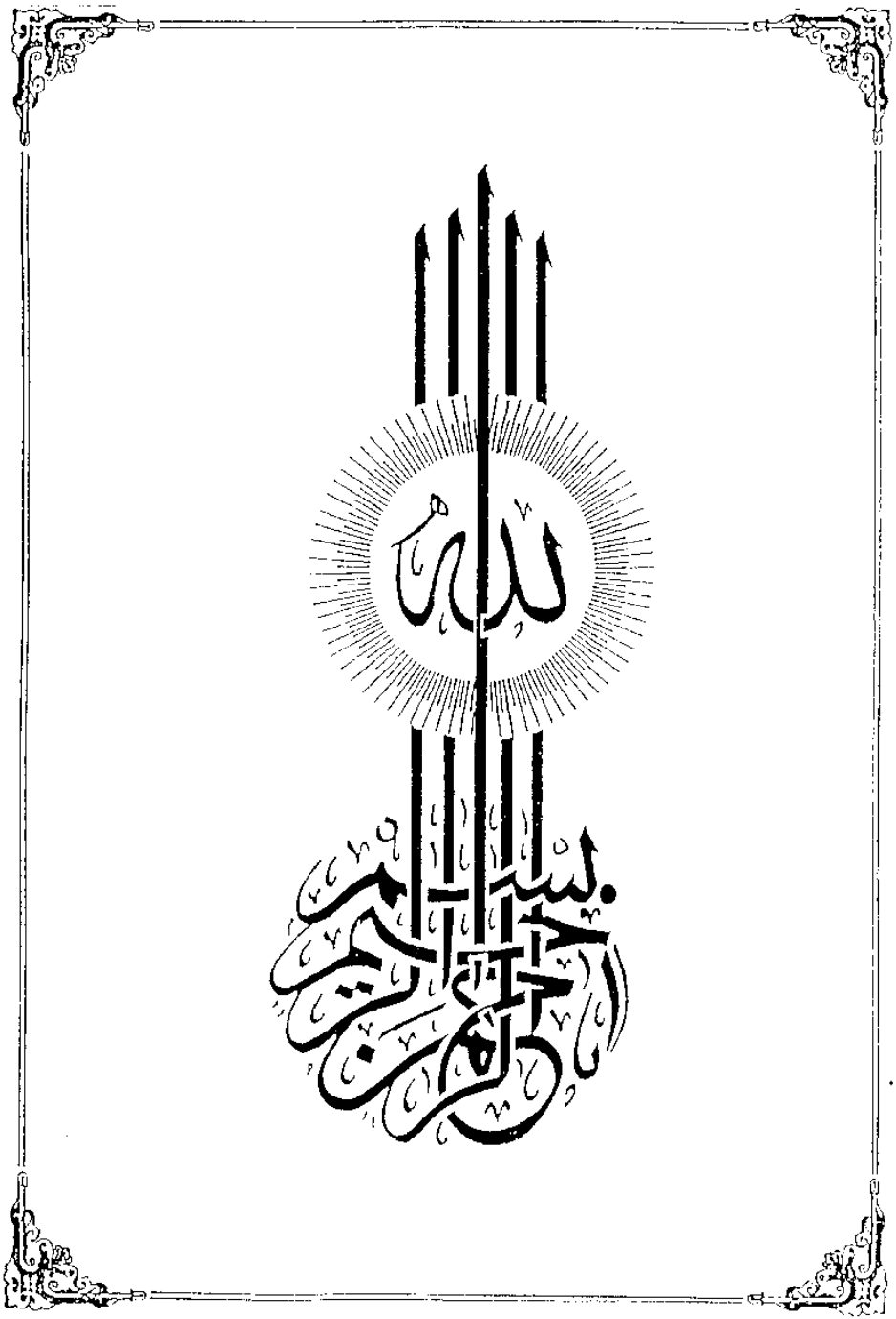

A C K N O W L E D G E M E N T

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I N T R O D U C T I O N

Horse bean (*Vicia Faba*, L.) is one of the most important field crops grown in E.A.R. It supplies well the people with a cheap source of nitrogen in their diet.

The experience of farmers vary considerably with regard to cultural treatments of *Vicia faba*, L. The ridge width, number of horse bean rows per ridge, number of plants per hill and the distance between hills govern the plant population. Egyptian farmers plant different populations. The recent trend is to grow dense plantings to get greatest yield. This is practised in many crops.

Horse bean plant is a leguminous crop. It can get its nitrogen requirements from nitrogen in the soil air by the aid of nodule bacteria. Farmers used not to apply nitrogen fertilizer to this crop in ordinary conditions.

This work was designed to study the effect of distance between hills, number of rows per ridge, number of plants per hill and the amount of calcium nitrate

on the growth and yield of horse bean plants. Due consideration was given to the influence of the above factors on the nitrogen, phosphorus and potassium uptake by horse bean plants.

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REVIEW OF LITERATURE

Field bean is one of the most important field crops growing in Egypt. For the diversity of the work reported in this thesis, the literature of the growth and chemical contents of different parts of field bean plant, and yield is reviewed under the following main headings:

(1) Effect of nitrogenous fertilizer.
(2) Effect of distance between plants.
(3) Effect of number of plants per hill.
(4) Effect of number of rows per ridge.

(A) G r o w t h

Effect of nitrogenous fertilizer

Kenneth (1940), studying the effect of mineral nutrient deficiencies and excesses upon the vegetative growth and flowering of sweet peas, reported that the greatest stem length was produced when a medium amount of nitrogen was present in the nutrient solution during the major portion of the early growing period. He added that branching of sweet peas was less where nitrogen was lacking, and that the most vigarous growth occured where nitrogen was medium in concentration.

Kenneth (1943) indicated that high nitrate levels ranging from 75 to 100 parts per million resulted in an increase in the stem length of sweet peas.

Soper (1952) working on Vicia faba pointed that a high level of soil fertility increased significantly pods/acre, owing to better plant survival and increased branching and podding. He added that under conditions favouring vegetative growth, there appears to be some competition between stem production and pod production, for the correlation between stems/plant and pods/plant was found on low fertility land.

Marth et al. (1953) in their studies on the response of Black Valentine bean plants to ammonium 1618 found that nitrogen fertilizer induced the plant to develop shorter internodes, thicker stems and darker green leaves and it delayed maturity.

Dallyn and Sawyer (1959) demonstrated that Fordhook lima beans responded favourably to high nitrogen, particularly in the presence of high potassium. The differences in variety response to nitrogen may have been due to differences in rate of fruit development. No benefit was obtained from 100 lb. of nitrogen as compared to a 50 lb. application.

Hollis (1959) found that the vegetative growth of peas increased as the nitrogen content of a mixed fertilizer was increased and that the growth was directly related to the total amounts of nitrogen present throughout the season in the root zone. If the available nitrogen was limited just before harvest, growth was maintained by an accelerated, redistribution of nitrogen from other plant parts, and this resulted in faster maturation.

Mochaleva (1960) studying the effect of mineral fertilizers on beans found that feeding nitrogen to the vegetative organs at a time when the rudiments of the reproductive organs were being laid down in the Rannyaya belozernaya 1118 variety of beans sharply increased the number and raw weight of the beans.

Klacan (1962) working on peas demonstrated that at very low nitrogen concentrations, plants produced fewer pods and fewer peas perpod than plants supplied with adequate nitrogen. Reducing the nitrogen supply at any stage before pod swelling began greatly reduced seed development. Seed production was higher, and vegetative growth was lower, when the nitrogen supply was reduced at the swelled-pod stage than when plants received a continuously high supply of nitrogen. A combination of high potassium and low nitrogen supplies during

reproductive development decreased pea number per pod more than pod numbers.

Seed size in the bean variety Saluggia was increased by nitrogen particularly when applied in the basal fertilizer mixture containing 70 lb nitrogen, 50 lb. P_2O_5 and no potassium per acre as shown by Mitchell (1965).

Badawi (1965) on soy bean plant showed that adding ammonium sulphate tended to increase the height of plant, but the difference failed to reach the 5% level of significance. Nitrogenous fertilizers enhanced the production of the different parts of soybean plant, i.e. leaves, branches and pods and added that the dry matter content of the whole plant and its different parts, i.e. leaves, branches and pods became great by adding ammonium sulphate up to the highest level i.e. 250 kg per feddan. Moreover, ammonium sulphate tended to increase the dry matter content of roots.

Behairy (1965) working on peas indicated that calcium nitrate had no statistical significant effect on height of pea plants although it tended to increase the plant height very slightly. She added

that applying calcium nitrate enlarged the number and the dry matter content of the diffrent parts of pea plant, i.e. leaves, branches and pods.

Cartwright (1967) showed that growth of the roots was not affected by the level of combined nitrogen. Nitrate in the mineral salt solution markedly reduced nodule numbers. This was confirmed by Stephens (1968) who reported that bean roots were weakly nodulated.

Ellis (1969) noticed that high rates of nitrogen fertilizer resulted in a greener foliage and, to a lesser extent, greater vigour.

Effect of distance between plants

Seed production studies with legumes in Hawaii by Wilsie (1935) demonstrated that wide spacing caused an increase in the branching of legumes.

Konold (1940) on Vicia faba found that on plant basis the number of pods was inversely correlated with density.

Clare & Standberry (1951) reported that the number of pods per lima bean plant increased as the distance between plants in the row increased.