Effect of phosphorus fertilizer, some micronutrients and plant density on growth and yield of broad beans

Mahady Abd El-Aziz Mahady

SUMMARYTwo field experiments were carried out at the experimen-tal farm of the Faculty of Agriculture to Zagazig Univ. Sharkiya Governorate , Egypt. Experiment were conducted for two suc-cessive seasons of 1984/ 1985 and 1985/ 1986 to study the effect of plant density phosphorus and some micronutrients(Fe and Zn) on the growth and yield characters of faba beanplants, (Vicia faba L.).Giza 2, faba bean cultivar was cultivated in thisstudy. The preceeding crop was cotton in the two growingseasons.Each experiment included 24 treatments which were the possible combinations of 3 density x 2 levels of phos-phorus x 2 levels of zinc x 2 levels of iron fertiliza-tion.A split plots design with four replications was used. Thetreatments were as follows :The main plots were occupied by plant population densities, whereas the sub-plots were devoted to fertili-zation treatments.Main plot : Plant population density :a-Density of 20 plants/ m2 (84,000 plants/ fad•)* as lower plant density*.b-Density of 30 plants/ m2 (126,000 plants/ fad.),as medium plant density.c-Density of 40 plants/m2 (168,000 plants/ fad. as higher plant density. Sub- plot :Fertilization treatments :1-Control (without any fertilizers):2-Iron (Fe) as FeEDTA at the concentration 0.04 9.3-Zinc (Zn) as ZnSO4 at the concentration 0.4 %.4-Fe (0.04 %)+ Zn (0.4 %).5-P2O5 30 kg/ faddan.6-P2O5 30 kg/ fad. + Fe (0.04 %).7-P2O5 30 kg/ fad. + Zn (0.4 %).8-P2O5 30 kg/ fad. + Fe (0.04 %) + Zn (0.4 %).After 55 days from sowing ten plants were uprooted at random from each plot of the four replicates, plantswere separated to shoots and roots, trey were dried at 70°C ior 24 hrs, to determine the dry weight and the fine grounddry material tissues were used for chemical analysis.After 160 days from sowing ten plants were takenfrom each plot of the four replicates to determine the yieldcomponents.Seeds and straw yields were calculated from the whole plot yield :Data recorded :A- Growth characters and yield components :1-Plant height (in cm.).2-Number of branches per plant.3-Number of pods per plant.4-Number of seeds per pod.5-Number of seeds per plant.6-Seeds weight per plant (in gm.).7-100 -seeds weight (in gm.).B-Yield :I- Seed yield kg per faddan. 2- Straw yield kg per faddan.C- Chemical contents :1-Dry matter yield (at 55 days from sowing).2-Mineral contents (N.P.Fe and Zn).Results could be summarized as follows :A- Growth characters and yield components :1- The plant height was increased by increasing the plant density, under applied ZnSO4 0.4 96. The application ofP+ Zn, spraying Zn and P+ Fe+ Zn recorded the highest plant heights 103.54, 102.51,and 100.91 cm., respectively.2-The number of branches per plant was significantly affected at medium (126,000 plants/ fad.),and higher (168,000 plants/fad.), plant densities. Applying P° Zn, Zn and P+ Fe+ Zn caused significant increase in the average number of branches which were 3.86, 3.5 and 3.2 branche per plant, respectively.3-The minimum number of pods/ plant was obtained by the lowest plant density (84,000 plants/ fad.), as compared with the medium (126,000 plants/fad.) and higher (168,000 plants/ fad.) plant population. Data show significant in- creases in the number of pods per plant (17.31, 16.28 and 15.75) by applying P + Z, Zn and P+ Zn, respectively.4-The maximum number of seeds/ pod was recorded from the lowest plant density with applying P+ Zn (3.65) followed by Zn (3.31) and P+ Fe+ Zn (2.93), respectively.5-Number of seeds per plant was signifiantly inc-reased with reducing plant density. The higher averagevalues of number of seeds (42.73, 39.58 and 36.93) wereobtained

by applying P+ Zn, Zn and P+ Fe+ Zn.6-The results show that weight of seeds per plant was in-creased by using medium plant density. The maximum average of seed weight per plant (33.44) was obtained by applying P+ Zn followed by applying Zn and P+ Fe + Zn (29.96 and 27.49), respectively.7-100- seeds weight of faba bean was increased signi-ficantly at lower and medium plant densities. The highest averages of 100 - seed weight (71.39 and 69.31 gm.) were obtained by applying P+ Zn and Zn treatment's, respectively.B- Yield :1-Increasing plant population densities caused the increase in seed yield per faddan. The highest yields were (2045.60, 1878.30 and 1805.00 kg/ fad.), resulted from fer-tilization by P+ Zn, Zn and P + Fe + Zn , respectively.2-The straw yield (kg/ fad.) was significantly inc-reased by increasing the plant population densities. The results showed that that straw yield of faba bean was signifi-cantly increased by P, Fe and Zn. The fertilization with P+ Zn gave the highest straw yield per faddan (2734.40 kg/fad.).C- Chemical content :1- The dry weight of roots and shoots was significantly increased by reducing the plant population, the lower plant density caused an increase in the dry weight of roots andshoots of faba bean. Zn- applied caused a higher signifi-cant increase in dry weight of 0.69 and 4.23 gm. for roots and shoots, respectively. whereas, no significant differen-ces between various plant population on dry weight of nodules. The higher increase of dry weight of nodules was 0.07, 0.06 and 0.06 gm./plant by fertilization with Zn, Fe+ Zn and P, respectively.2-The nitrogen content of roots and shoots of faba bean plant was reduced by increasing plant densities. Fertili-zing by Zn, P+ Zn and P+ Fe+ Zn caused higher average of nit-rogen content 14.42, 13.2 and 12.34 mg/ plant of roots as well as 150.4, 123.9 and 113.0 mg of shoots, respectively .3-Results showed that the crude protein percentage in seeds of faba bean was reduced by increasing plant population. The maximum crude protein content in seeds was obtained by applying Zn, Fe, P° Zn and P+ Fe+ Zn, respectively.4-By decreasing plant density, the phosphorus content of roots, shoots and seeds of faba bean was significantly in-creased. The phosphorus content of was roots significantly increased by applying P+ Zn, P+ Fe+ Zn and Zn, respectively. The phosphorus content of shoots was increased significantly by applying Zn, P+ Zn and P+ Fe+ Zn, respectively. The phos-phorus content of seeds was hie?oased by fertilization by P+ Fe, P+ Fe + Zn and P + Zn, respectively.5-The iron uptake of roots, shoots and iron contents in seeds of faba bean was significantly increased by reducing the plant density. The maximum iron uptake of roots and shoots was obtained by applying P + Fe + Zn, while , the treatment of P + Fe caused maximum iron content in seeds.6-The Zn uptake by roots, shoots and zinc content in seeds of faba bean were s igni f i cant ly increased by decreasing the plant density. The highest average of zinc uptake by rootsand shoots was obtained by fertilization by Zn and P + Zn, res-pectively, whereas the treatment P + Fe + Zn caused the highest average value of zinc content in seeds.