

EFFECT OF PHOSPHORUS AND SULPHUR ON ROOT NODULES IN CHICKPEA

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SUMMARY

The field experiment was conducted to study the effect of different levels of phosphorus and sulphur on number and dry weight of nodules per plant in chickpea at the Instructional Farm, Department of Agricultural Chemistry & Soil Science, Junagadh Agricultural University, Junagadh during **rabi** season of 2015-16. The results revealed that the number and dry weight of nodules were increased significantly with the progressive increase in phosphorus levels up to 60 kg/ha at 45 DAS. Likewise, the number and dry weight of nodules were also increased significantly with the progressive increase in sulphur levels up to 40 kg/ha at 45 DAS. However, the interaction between phosphorus and sulphur was found to be non-significant on number of root nodules per plant and dry weight of nodules per plant at 45 DAS.

Key words : Dry weight, nodules/plant, nutrient uptake, chickpea

Chickpea being a leguminous crop, major part of nitrogen requirement can be met through the fixation of atmospheric nitrogen. Besides nitrogen, phosphorus and sulphur are also essential for getting optimum crop yield and better quality. Phosphorus (P) and sulphur (S) are major nutrient elements for grain legumes (Yadav *et al.*, 2016). Among the nutrients, phosphorus deficiency is considered to be major cause for low pulse yield and responses to phosphorus application. Sulphur is one of the essential plant nutrients and its importance in Indian agriculture is being increasingly emphasized (Singh and Nariya, 2017). Its role in the crop production particularly in oilseeds and pulses is well developed. About 17 per cent soils in Saurashtra have been reported to be deficient in sulphur. The medium black calcareous soils also face the problem of phosphorus availability. At present DAP is major fertilizer used as source of phosphorus, followed by SSP to some extent. The SSP though supplies sulphur inadvertently, but is in limited supply. Considering the significant role of phosphorus and sulphur nutrition in chickpea production, the present investigation was carried out.

The field experiment was conducted at Instructional Farm, Department of Agricultural Chemistry & Soil Science, Junagadh Agricultural University, Junagadh during **rabi** 2015-16. Geographically, Junagadh is situated at 21.50 N latitude and 70.50 E longitude with an altitude of 60

m above the mean sea level under South Saurashtra Agroclimatic region of Gujarat state and enjoys a typically sub-tropical climate characterized by fairly cold and dry winter, hot and dry summer and warm and moderately humid monsoon. Weekly weather data pertaining to the period of present investigation recorded are depicted in Fig. 1. The soil of the experimental plot was silty loam in texture and slightly alkaline in reaction with pH 8.1 and EC of 0.36 dS/m. The soil was low in available nitrogen (242.6 kg/ha) and medium available phosphorus (34.50 kg/ha). The chickpea variety GG 5 (GJG 0809) was selected for this study. Factorial randomized block design with total 16 treatment combinations replicated thrice was employed in this study. The treatments were assigned to each replication by randomization process.

The chickpea crop variety GG-5 was sown on 20 November 2015 using recommended seed rate of 60 kg/ha. The seeds were placed at 7-8 cm depth, keeping inter-row spacing of 45 cm and covered with the soil. Nitrogen, phosphorus and sulphur will be applied in the form of urea, DAP, COSAVET (90% WG) sulphur, respectively, at the time of sowing of the crop. The recommended dose of nitrogen in chickpea by university was 20 kg/ha, but due to treatment adjustment a common dose of 25 kg/ha applying to all treatments as basal application. During crop growing period, five irrigations, each of 5 cm depth were given at different time of period as and

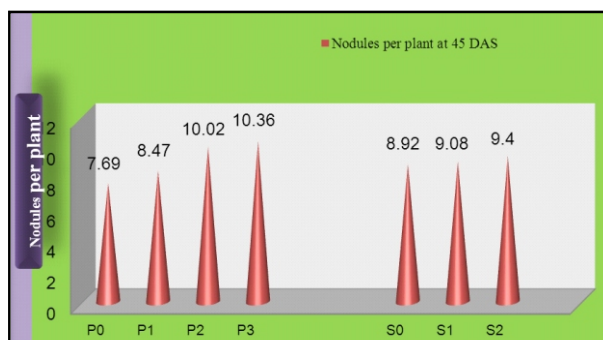


Fig. 1. Effect of varying levels of phosphorus and sulphur on no. of nodules per plant at 45 DAS of chickpea.

when required by crop. After establishment of plants, thinning was done along with gap filling to maintain the plant to plant distance of 10 cm within row in each plot. One hand weeding and interculturing were carried out throughout the season to keep experiment field weed free. The number of nodules per plant and dry weight of nodules per plant were recorded and statistical analysis was done.

Number of Root Nodules/Plant

Data pertaining in Fig. 1 show that application of 40 kg P_2O_5 /ha had significant influence on number of root nodules per plant over control at 45 DAS. Maximum number of root nodules per plant (8.48) at 45 DAS was recorded with the application of 60 kg P_2O_5 /ha which was significantly higher over control and 20 kg P_2O_5 /ha but remained at par with 40 kg P_2O_5 /ha. The application of 20, 40 and 60 kg P_2O_5 /ha⁻¹ increased the number of root nodules per plant to the tune of 10.14, 30.29 and 34.72 per cent, respectively, over control. It is obvious from data presented in Fig. 1 that the increasing levels of sulphur up to 40 kg/ha significantly increased the number of root nodules per plant over control and 20 kg S/ha, respectively, at 45 DAS. Highest number of root nodules per plant (9.40) at 45 DAS was recorded with the application of 40 kg S/ha but found at par with 20 kg S/ha. The increase in number of root nodules per plant by the application of 20 and 40 kg S/ha was 1.79 and 5.38 per cent, respectively, more as compared to control. The interaction between phosphorus and sulphur was found to be non-significant on number of root nodules per plant at 45 DAS. Bhatt and Jain (2012) also studied the response of sulphur in chickpea.

Dry Weight of Root Nodules/Plant

An assessment of data in Fig. 2 indicated that

the dry weight of root nodules per plant increased significantly with increasing levels of phosphorus up to 60 kg/ha over control and 20 kg/ha at 45 DAS. Further increase in level of P_2O_5 up to 60 kg/ha significantly increased the dry weight of root nodules per plant over control and 20 kg/ha at 45 DAS but remained at par with 40 kg/ha. The per cent increase in dry weight of root nodules per plant due to application of 40 and 60 kg P_2O_5 /ha was 7.76 and 8.95, respectively, over control. The data revealed that the increasing levels of sulphur up to 40 kg/ha increased the dry weight of root nodules. The application of 20 and 40 kg S/ha increased the dry weight of root nodules per plant to the tune of 3.29 and 7.43 per cent, respectively, over control. Effect of P x S interaction was found to be non-significant in case of dry weight of root nodules per plant at 45 DAS. Shukla and Yadav (1982) also observed the increase in nodulation, N-fixation and plant growth with increased application of P and Zn.

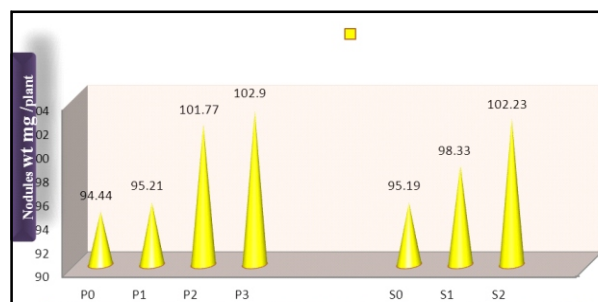


Fig. 2. Effect of varying levels of phosphorus and sulphur on dry weight of nodules per plant at 45 DAS of chickpea.

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