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Response of Sulfur and Biofertilisers on Growth and Yield of Chickpea (*Cicer arietinum* L.)

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Abstract

Extensive application of agrochemicals has led to environmental and health issues. In order to minimise the usage of them, environmental friendly biofertilisers containing inoculants of beneficial microorganisms have been introduced. In the present study, we assessed the effect of growth- promoting rhizobacterial (PGPR) on growth indices and yield of chickpea. The experiment was carried out based on a completely randomised block design with three replicates. This study was performed at Agricultural Research Station, Ferdowsi University of Mashhad, Iran in 2019. Treatments include: 1- Powdered sulfur (Spow), 2- Pastel sulfur (Spa), 3- Sulfur-oxidising bacteria (SOB), 4- Free-living nitrogen fixating bacteria (NFB) + Phosphate solubilising bacteria (PSB) + Potassium solubilising bacteria (KSB), 5- Spa+SOB, 6- Spow+SOB, 7- Spow+SOB+NFB+PSB+KSB, 8- Spa+SOB+NFB+PSB+KSB, 9- SOB+NFB+PSB+KSB, 10- Control (without biological and chemical fertiliser). The crop growth parameters including leaf area index (LAI), crop growth rate (CGR), dry matter accumulation (DM) as well as its yield and its components were assessed. According to the results, the highest LAI (3.03) and DM (509 g.m⁻²) were obtained under Spow+SOB+NFB+PSB+KSB treatment and the highest CGR (12.07 g.m⁻².d⁻¹) were recorded under Spa+SOB+NFB+PSB+KSB treatments. The results indicated that application of biofertilisers had significant effect on chickpea yield and its components. Maximum yield was observed in Spow+SOB+NFB+PSB+KSB (186 g.m⁻²) treatment, increased by 52 % compared with the control. The highest number of pods per plant and number of seeds per pod were obtained in the Spow+SOB+NFB+PSB+KSB treatment, increased by 87 and 23 % compared with the control, respectively. Also, seed yield was significantly positively correlated with number of pods per plant ($r=0.67^{**}$) and number of seeds per pod ($r=0.53^{**}$). This result indicates that these traits have a direct effect on the yield. As a result biofertiliser has been identified as an alternative to chemical fertiliser to increase crop production in sustainable farming and healthy food for the world's expanding population.

Keywords: Accumulation dry matter, leaf area index, number of pods plant, number of seeds pod