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Productivity of Grain Sorghum-Cowpea Intercropping System: Climate-Smart Approach

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Abstract : Grain sorghum and cowpea are important staple crops in many areas of South Africa, particularly the Limpopo Province. The two crops are produced under a wide range of unsustainable conventional methods, which reduces productivity in the long run. Climate-smart traditional methods such as intercropping can be adopted to ensure sustainable production of these important two crops in the province. A no-tillage field experiment was laid out in a randomised complete block design (RCBD) with four replications over two seasons in two distinct agro-ecological zones, Syferkuil and Ofcolacoin, the province to assess the productivity of sorghum-cowpea intercropped under two cowpea densities.LCi Ultra compact photosynthesis machine was used to collect photosynthetic rate data biweekly between 11h00 and 13h00 until physiological maturity. Biomass and grain yield of the component crops in binary and sole cultures were determined at harvest maturity from middle rows of 2.7 m2 area. The biomass was oven dried in the laboratory at 65oC till constant weight. To obtain grain yield, harvested sorghum heads and cowpea pods were threshed, cleaned, and weighed. Harvest index (HI) and land equivalent ratio (LER) of the two crops were calculated to assess intercrop productivity relative to sole cultures. Data was analysed using the statistical analysis software system (SAS) 9.4 version, followed by mean separation using the least significant difference method. The photosyntheticrate of sorghum-cowpea intercrop was influenced by cowpea density and sorghum cultivar. Photosynthetic rate under low density was higher compared to high density, but this was dependent on the growing conditions. Dry biomass accumulation, grain yield, and harvest index differed among the sorghum cultivars and cowpea in both binary and sole cultures at the two test locations during the 2018/19 and 2020/21 growing seasons. Cowpea grain and dry biomass yields werein excess of 60% under high density compared to low density in both binary and sole cultures. The results revealed that grain yield accumulation of sorghum cultivars was influenced by the density of the companion cowpea crop as well as the production season. For instant, at Syferkuil, Enforcer and Ns5511 accumulated high yield under low density, whereas, at Ofcolaco, the higher yield was recorded under high density. Generally, under low cowpea density, cultivar Enforcer produced relatively higher grain yield whereas, under higher density, Titan yield was superior. The partial and total LER varied with growing season and the treatments studied. The total LERs exceeded 1.0 at the two locations across seasons, ranging from 1.3 to 1.8. From the results, it can be concluded that resources were used more efficiently in sorghum-cowpea intercrop at both Syferkuil and Ofcolaco. Furthermore, intercropping system improved photosynthetic rate, grain yield, and dry matter accumulation of sorghum and cowpea depending on growing conditions and density of cowpea. Hence, the sorghum-cowpea intercropping system can be adopted as a climate-smart practice for sustainable production in the Limpopo province.

Keywords : cowpea, climate-smart, grain sorghum, intercropping
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