Soil enzymatic activity, nutrient dynamics and biplot analysis under varied plant population and nutrient management in machine-planted chickpea

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Soil dehydrogenase (14.2, 11.3 mg TPF g^{-1} day^{-1}), alkaline phosphatase (109.5, 86.7 mg PNP g^{-1} soil h^{-1}), acid phosphatase (69.7, 51.6 mg PNP g^{-1} soil h^{-1}) and urease activity (60.4, 39.9 mg NH_4 g^{-1} 2 h^{-1}) in chickpea at flowering and harvest with seed rate @ 105 kg ha^{-1}. Among, nutrient management the corresponding activity (14.9, 11.7 mg TPF g^{-1} day^{-1}), (120.7, 96.7 mg g PNP g^{-1} soil h^{-1}), (70.5, 52.7 mg g PNP g^{-1} soil h^{-1}) was higher with 75% RDF + microbial consortia (MC). Contrarily, urease activity (62.3, 38.7 mg g NH_4 g^{-1} 2 h^{-1}), soil available soil nitrogen (181.3, 179.0 kg ha^{-1}) and phosphorus (78.3, 76.5 kg ha^{-1}) were higher under 125% RDF + MC. PCA indicated that among nutrient management, first principal component explained 71.37% variability to urease activity, available soil potassium and dehydrogenase activity and second component (22.34%) to available soil phosphorus and nitrogen. Among planting density, first component explained variability (66.87%) to acid phosphatase and second component (32.11%) to available phosphorus.

Keywords: Enzyme activity, nutrient management, PCA-biplot, planting density, soil nutrient dynamics.

activity is one of the most important and sensitive bio-indicators related to soil fertility[4].

In India, per capita availability of pulses is much lower (45 g person^{-1} day^{-1}) against recommendation of National Institute of Nutrition (80 g person^{-1} day^{-1})[5]. A huge gap between demand and supply of pulses can be overcome by increasing productivity. Chickpea is predominant *rabi* pulse crop grown by peasants under rainfed conditions on marginal soils with sub-optimal plant density and poor nutrient management with resultant low productivity (806 kg ha^{-1}). In the present scenario of labour scarcity, farm mechanization helps to increase productivity of land and labour by ensuring timeliness of operations, precise seed placement and efficient utilization of inputs. Ideal agronomic management reduces cost of production[6] and ensures higher yields. Recommended seed rate differs for mechanical sowing over manual sowing and depends on cultivars. Fertilizer application needs to be redesigned according to seed rate; hence, standardization of plant population and fertilizer dose is crucial for realizing optimum yield. Estimation of soil enzymatic activity is pivotal for sound knowledge on nutrient dynamics to tailor nutrient schedules in accordance