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Nutrient Uptake of Pigeonpea [*Cajanus cajan* (L.) Millsp.] with Foliar Application of Water Soluble Nutrient Mixtures

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A B S T R A C T

Field experiment was conducted during *kharif*, 2018 at the KrishiVignana Kendra, Vijayapur, Karnataka on Vertisol having pH 8.34 and EC 0.33 dS m-1. The soil was medium in organiccarbon content (0.33 %) and available P_2O_5 (33.41 kg ha-1), andlow in available N (223.70 kg ha^{-1}) with available K content (680.33) and clay content (57.1). The experimental site was located at a latitude of 160 49' North, longitude of 750 43' Eastand an altitude of 593.8 meters above mean sea level. The experimental site comes under the Northern Dry Zone of Karnataka (Zone 3) there were 15 treatments. Treatment six with Pulse wonder as foliar applications @ 1 % at flower initiation stage + at pod formation stage recorded significantly higher nutrient uptake (126.00, 22.38 and 95.04 NPK kg ha^{-1}). Higher nitrogen and potassium use efficiencies (38.42 kg ha^{-1} N nutrient appliedand 135.03 kg ha^{-1} K nutrient applied, respectively) were recorded with Pulse wonder as foliar applications @ 1% at flower initiation stage + at pod formation stage and foliar applications @ 1% at pod formation stage, respectively.

Introduction

Pigeonpea (*Cajanus cajan* Millsp.) is an important crop amongst pulses. It plays a major role in the house hold economy of farmers by providing protein rich food, firewood and income to the resource poor small/marginal farmers in tropics and subtropics and has long been recognized for its attributes of high leaf fall and consequent contribution to the carbon and nitrogen economy of the soil (Rego and Rao,2000).

Pigeonpea represents 6.22 million ha of world pulse's area and 4.74 million tonne of world's pulse production. (Indiastat, 2015-16). In India pigeonpea occupied an area of 3.96 million ha with production of 2.56 million tonne. Pigeonpea is cultivated in larger part of the area is in states such as Maharashtra, Uttar Pradesh, Madhya Pradesh, Karnataka, Gujarat, Andhra Pradesh and Tamil Nadu, which together hold 87.89 per cent and 86.10 per cent area and production, respectively.

Pigeonpea is regarded as a subsidiary crop, like other pulses. It is mostly grown on marginal lands and is usually intercropped or planted on bunds with other pulses. It gets little or no purchase of high-cost inputs as a crop of secondary significance in many of these schemes. The farmers of rainfed Agroecosystems are growing pigeonpea as sole crop due to its mechanized harvesting and encouraged market price especially in Gulbarga, Raichur and Bidar districts of Karnataka. In recent years Vijayapur is also occupying more area due to its mechanized cultivation and economic stability.

It improves the soil by adding leaf fall and its profound, powerful root system crushes the plough pans and increases the soil structure which facilitates better moisture retention. Therefore, pigeonpea is often called a "biological plough". Due to the tap root system, it is able to resist drought for a longer period when there is uncertainty and inadequate accessibility of rainwater.

The low yield of pigeonpea is mainly attributed to their cultivation on poor soil with inadequate and imbalanced nutrient application without the application of organic manures and micronutrient like boron, zinc and iron sulphate. According to several experiments conducted in different crops by different scientists around the world, flowers can be retained through foliar nutrition at flower initiation and pod development stages along with soil application of micronutrients (Chaurasia *et al.,* 2005). There is very less data available on the reaction of pigeonpea to macro and micro nutrient foliar spray along with soil implementation. In recent years the area under pigeonpea is being increasing in northern Karnataka. The average productivity is low in this region (368 kg ha^{-1}).To enhance the productivity with the application of nutrients through foliar sprays in addition to soil application, there are many benefits to augmenting crop dietary demands. Foliar fertilizer is intended to remove issues such as fixation of nutrients and immobilization. Therefore, foliar nutrition is identified as an important fertilization strategy in present agriculture (Chaurasia *et al.,* 2005).

Further, changing climatic scenario demands technologies that will help crop to overcome them without significant yield loss.

The moisture deficit situations in dry land tracts of India results in less productivity due to less availability of nutrients. This technique results in a more efficient use of nutrients and a rapid correction of deficiencies. Special fertilizers of the current generation have recently implemented exclusively for foliar feeding and fertilization. This method results in utilization of nutrients more efficiently and immediately correct flaws. Special fertilizers of the present generation have recently incorporated solely for foliar spray and fertilization. The increased supply of nutrients and good response by plants resulted in enhanced translocation of nutrients to reproductive structures *viz*., pods, grains etc. (Geetha and Velayutham, 2009).

Materials and Methods

Field experiment was conducted during *kharif*, 2018 at the KrishiVignana Kendra, Vijayapur, Karnataka on Vertisol having pH 8.34 and EC 0.33 dS m-1. The soil was medium in organic carbon content (0.33 %) and available P2O5 (33.41 kg ha-1), and low in available N (223.70 kg ha-1) with available K content(680.33) and clay content (57.1).

Results and Discussion

The experimental site was located at a latitude of 160 49' North, longitude of 750 43' East and an altitude of 593.8 meters above mean sea level. The experimental site comes under the Northern Dry Zone of Karnataka (Zone 3). There were 15 treatments as detailed in Table 1 *i.e.* foliar application of water soluble nutrient mixtures *viz.* pulse wonder and pulse magic @ 1 per cent sprayed at grand growth, flower initiation and pod formation stage.

Table.1 Influence of foliar application of water soluble nutrient mixtures on Nutrient uptake (kg ha^{-1}) in pigeonpea

Treatment		Nutrient uptake by plant (kg ha^{-1})		
		N	**P**	**K**
T_1	Pulse wonder as Foliar application @ 1 % at grand growth stage	83.08	15.12	85.96
T_2	Pulse wonder as Foliar application @ 1 % at flower initiation stage	89.35	16.92	83.19
T_3	Pulse wonder as Foliar application @ 1 % atpod formation stage	92.90	19.17	91.45
T_4	Pulse wonder as Foliar applications @ 1 % at grand growth stage + at flower initiation stage	106.67	21.45	91.48
T_5	Pulse wonder as Foliar applications @ 1 % at grand growth stage + atpod formation stage	110.00	20.47	90.82
T_6	Pulse wonder as Foliar applications @ 1 % at flower initiation stage + atpod formation stage	**126.00**	**22.38**	**95.04**
T_7	Pulse wonder as Foliar applications @ 1 % at grand growth stage + at flower initiation stage + atpod formation stage	91.57	20.22	82.48
T_8	Pulse magic as Foliar application @ 1 % at grand growth stage	96.88	18.12	89.38
T_9	Pulse magic as Foliar application @ 1 % at flower initiation stage	92.61	16.15	85.19
T_{10}	Pulse magic as Foliar application @ 1 % atpod formation stage	118.00	18.84	87.92
T_{11}	Pulse magic as Foliar applications @ 1 % at grand growth stage + at flower initiation stage	118.67	21.92	85.22
T_{12}	Pulse magic as Foliar applications @ 1 % at grand growth stage + atpod formation stage	120.67	21.16	83.90
T_{13}	Pulse magic as Foliar applications @ 1 % at flower initiation stage + atpod formation stage	105.33	22.08	89.09
T_{14}	Pulse magic as Foliar applications @ 1 % at grand growth stage + at flower initiation stage + atpod formation stage	123.22	20.85	93.49
T_{15}	RPP (control)	54.31	12.28	75.92
	S.Em. ±	**3.7**	**0.62**	**2.84**
	C.D. at 5%	**10.96**	**1.80**	**8.23**

The experiment was laid out in randomized complete block design with three replications in plot size of 8.4 x 6 m.

Crop was planted and recommended doses of fertilizers were applied to crop as per the recommended package of the region at the time of sowing in the form urea and DAP. The crop was sown on 24th July 2018.

The growth and yield observations were recorded from the net plots and grain yield was converted to hectare basis in kilograms. The economics of each treatment was computed with prevailing market prices of that year. The yield was further computed for gross and net returns as well BC ratio to assess the productivity.

Nutrient+uptake

Total nitrogen, phosphorus and potasium uptake of pigeonpea as influenced by foliar application of water soluble nutrient mixtures.

The various treatments differed significantly for nutrient uptake of N, P_2O_5` and $K_2O$ by the crop. Significantly higher nutrient uptake of N, $P_2O_5$` and K_2O by the crop was recorded in Pulse wonder as foliar applications @ 1 % at flower initiation stage + at pod formation stage (126.00, 22.38 and 95.04 kg ha^{-1}, respectively) (Table 13 and Fig. 8).

Pulse wonder as foliar applications @ 1 % at flower initiation+stage + at pod formation stage recorded+significantly higher nutrient uptake (126.00, 22.38 and 95.04 NPK kg ha^{-1}). Higher nitrogen and potassium use efficiencies (38.42 kg ha^{-1} N nutrient applied and 135.03 kg ha^{-1} K nutrient applied, respectively) were recorded with Pulse wonder as foliar applications @ 1% at flower initiation stage + at pod formation stage and foliar applications @ 1% at pod formation stage, respectively.

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