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Elumle Priyanka
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Badnapur, Maharashtra, India

Darade GA
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Badnapur, Maharashtra, India

Kutawal MM
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Badnapur, Maharashtra, India

Patel CB
Department of Agronomy, College of Agriculture, Badnapur, Maharashtra, India

Correspondence
Elumle Priyanka
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Badnapur, Maharashtra, India

Study of foliar nutrient management on economics of pigeonpea (*Cajanus cajan*)

Elumle Priyanka, Darade GA, Kutawal MM and Patel CB

Abstract
An experiment entitled "Study of foliar nutrient management in pigeonpea (*Cajanus cajan*)" was conducted at Agriculture Research Station, Badnapur (Maharashtra), Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during the kharif season July, 2018-19 with the main emphasis to study the effect of foliar nutrition on growth, yield and economics of pigeonpea.
The experimental field was laid out in a Randomized Block Design with ten treatments and three replications and the variety was BDN-716. Results revealed that application of RDF + (2% DAP and Multimicronutrient @ 2ml/litre foliar spray) at 50% flowering of pigeonpea produced maximum plant height (150 cm), branches (14.33), no of functional leaves (96.67), dry matter accumulation (143.33), no of pods (73.67), weight of pods /plant(52.67 g), seed yield/plant (38.67 kg/ha), 100 seed weight (14 g), as well as maximum seed yield (1650 kg/ha), straw yield (4100 kg/ha), biological yield (5750 kg/ha), harvest index(28.69), maximum net returns (57199 kg/ha) and B:C ratio(3.10) followed by RDF + 2% urea + Multimicronutrient spray @ 2ml/litre.

Keywords: Pigeonpea, urea, DAP, borax, multimicronutrient, $ZnSO_4$, foliar nutrientmanagement

Introduction
Pigeonpea also known as red gram, arhar and tur [*Cajanus cajan* (L.) Millsp.] it is the most important *kharif* grain legume. It belongs to the family Leguminoseae, sub-family papilionaceae, originated from the Africa. It has the lowest harvest index 19% but a rich source of protein (21-24%) and amino acids like lysine, tryosine, cysteine and arginine It accounts for about 11.8% of the total pulse area and 17%of the total pulse production of the country. Maharashtra, Uttar Pradesh, Madhya Pradesh, Karnataka, Gujarat and Andhra Pradesh accounts for 87% area of the country and 83.8%of total production. Bihar has the highest productivity 1702 kg ha^{-1} (Anonymous, 2017). In India, the area under pigeonpea was 5.4 million hectares. Production and productivity were 4.78 million tones and 885 kg ha^{-1} respectively and in Maharashtra, the area under pigeonpea was 15.33 lakh hectares and production was 14.6 lakh tonnes and productivity is 951kg during the year 2017-18 (Anonymous, 2017). In Marathwada region area under pigeon pea was 5.95 lakh hectars. Production and productivity were 4.47 lakh ton and 759 Kg/ha.
Plant nutrition is key input to increase the productivity. Fertilizer is an important option that should be adopted in order to improve crop yield. Considering low yield, agronomic practices of pigeonpea are required to be standardized for realizing yield potential. Among the different agronomic practices, foliar spray of micronutrients is most important factor in determining the yield (Reddy *et al.*2010). In almost all the pulses, flower drop determines the yield and yield attributing characters. Retention of flowers produced by the plant helps to get more yield than expected.

Materials and Methods
The present field experiment was conducted during kharif season of 2018-2019 at the Experimental Farm of Agronomy at Agriculture Research Station, Badnapur, Jalna (Maharashtra), Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani.
The soil of experimental was leveled, well drained and the soil was medium black in color with clayey, fairly deep, low in nitrogen, medium in available phosphorus, high in potash and alkaline in reaction. The experimental field was laid out in a Randomized Block Design with ten treatments and three replications and the variety was BDN-716. The treatments were Recommended dose of fertilizers (25:50:00 NPK kg/ha), RDF + 2% urea spray, RDF + 2% DAP spray, RDF + 0.5% Borax spray, RDF + 1% urea spray + foliar spray of 0.25% $ZnSO_4$ + 0.25% borax spray, RDF + Multimicronutrient spray @ 2ml/litre,RDF+2% urea spray + Multimicronutrient spray @ 2ml/litre, RDF + 2% DAP spray + Multimicronutrient spray @

@ 2ml/litre, RDF + soil application of $ZnSO_4$ @ 15kg/ha. An uniform dose of RDF was applied to all plots as basal.

Result and Discussion

Effect of different nutritionon Economics of pigeonpea cultivation

The results regarding Gross monetary returns, net monetary returns and B:C ratio of pigeonpea were presented in table 1. Significantly maximum Gross monetary returns (89019), net monetary returns (26346) and B:C ratio (3.1) were recorded due to application of T_9: RDF + 2% DAP+ Multimicrontrient @ 2ml/litresprays at 50% flowering.

Gross Monetary Returns (Rs ha^{-1})

The gross monetary returns were significantly influenced due to various treatments. The maximum gross monetary returns was obtained in treatment T_9: RDF + 2% DAP + Multimicronutrient@2ml/litresprays (Rs 89019 ha^{-1}). The next higher gross monetary returns obtained in treatment RDF+2% urea spray + Multimicronutrient spray @ 2ml/litre, at 50% flowering (Rs 78578 ha^{-1}). However lowest gross monetary returns were obtained in T_1 (RDF 25:50:00 NPK kg ha^{-1}) (Rs 58901ha^{-1}) and in T_{10} (RDF + soil application of $ZnSO_4$ @ 15kg/ha) (Rs 63069ha^{-1}). Similar results were obtained by Reddy *et. al.* (2007) [2]

Net monetary returns (Rs ha^{-1})

The net monetary returns were significantly influenced due to various treatments. The maximum net monetary returns was obtained in treatment T_9: RDF + 2%DAP+Multimicronutrient@2ml/litresprays (Rs57199ha^{-1}). The next higher net monetary returns obtained in treatment RDF+2% urea spray + Multimicronutrient spray @ 2ml/litre at 50% flowering (Rs 50656ha^{-1}). However lowest net monetary returns were obtained in T_1 (RDF 25:50:00 NPK kg ha^{-1}) (Rs 33360 ha^{-1}) and in T_{10} (RDF + soil application of $ZnSO_4$ @ 15kg/ha) (Rs 36854 ha^{-1}).

Benefit: Cost ratio

Highest B:C ratio of 3.10 was found with treatments T_9: RDF + 2%DAP+Multimicronutrient@2ml/litresprays. The next best B:C ratio (2.93) and (2.74) were recorded in treatment RDF+2% urea spray + Multimicronutrient spray @ 2ml/litre and T_3: T1 + 2%DAP spray. However, lower B:C ratio found in T_1 (RDF 25:50:00 NPK kg ha^{-1}) (2.30) and in T_{10} (RDF + soil application of $ZnSO_4$ @ 15kg/ha) (2.34).

The gross monetary returns, net monetary returns and B**:** C ratio were influenced due to the treatments of foliar sprays. The mean GMR, NMR and B**:** C ratio were 68372 Rs.ha^{-1}, 41657 Rs.ha^{-1} and 2.60 respectively.

The treatment of RDF + 2% DAP + Multimicronutrient spray @ 2ml/litre (T_9) @ 50% flowering recorded significantly the highest GMR, NMR and B**:** C ratio over the treatment of RDF (25:50:00NPK). These results are in conformity with the results of Sharma, *et al*. (2010) [3]

Table 1: Economics of pigeonpea cultivation as influenced by various treatments

Treatment	Gross Monetary Return (Rs Ha^{-1})	Cost of Cultivation	Net Monetary Return (Rs Ha^{-1})	Benefit Cost ratio
T_1: RDF	58901	25541	33360	2.30
T_2: T1 + 2%urea spray	64832	25594	39238	2.53
T_3: T1 + 2%DAP spray	70754	25766	44988	2.74
T_4: T1 + 0.5% borax spray	64080	26441	37639	2.42
T_5:T1 + 0.5% $ZnSO_4$ spray	65863	25653	40210	2.56
T_6: T1 + 1% urea + 0.25% $ZnSO_4$ + 0.25% borax	65253	26074	39179	2.50
T_7:T1 + Multimicronutrient @ 2ml/litre	63374	26121	37254	2.42
T_8:T2 + Multimicronutrient @ 2ml/litre	78578	26174	50656	2.93
T_9: T3 + Multimicrontrient @ 2ml/litre	89019	26346	57199	3.10
T_{10} : T1 + soil application of $ZnSO_4$ @ 15kg/ha	63069	26216	36854	2.40
SE ± m	2977	-	2963	-
C.D. at 5%	8846	-	8806.	-
General Mean	68372	17118	41657	2.60

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