

Original Research Article

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Influence of Foliar Application of Pulse Magic on Seed Yield and Economics of Pigeon Pea

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ABSTRACT

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Pigeon pea is majorly grown in north-eastern dry zone of Karnataka and it carries a unique position in every cropping system of this zone. Crop Productivity of pigeonpea is being low in the north-eastern dry zone of Karnataka and this is due to several reasons. One of the main important reason is flower drop and poor seed setting. To overcome and reduce this problem and to enhance productivity of pigeonpea, the Krishi Vigyan Kendra (KVK), Kalburgi, has introduced a product known as Pulse Magic (consists of nutrients and Plant growth regulators) as foliar spray. Foliar spray was carried out during 50% flowering stage and 15 days after 1st Spray. The results obtained due to foliar spray of Pulse Magic were higher number of pods per plant (212.91), pod weight per plant (78.08g), pod length (5.63cm) and test weight (12.48g), compared to control (120.82, 48.70g, 3.9cm and 9.45g, respectively). Due to increase in yield attributes higher seed yield was obtained (1442 kg/ha), as compared to control (1182 kg/ha). Consequent upon higher yield, higher net returns (Rs.53903/ha) were obtained in Pulse Magic sprayed plot compared to control (Rs.35647/ha).

Introduction

Food legumes contribute significantly to dietary protein supply and fixation of atmospheric nitrogen (Ali, 2009). Pulses are important food crops due to their high protein and essential amino acid content. The seeds of pulse crops are usually made up of 20-25 per cent protein compared to 6-10% protein content in major cereal crops. Pulses are the important source of protein in the diet of vegetarians. Moreover, in recent years there is a change in the consumption of pulses in several developed countries where they are increasingly considered as healthy foods

(Allen *et al.*, 1998). Thus, the food legumes ensure nutritional security to the poor masses of the country (Chaturvedi *et al.*, 2002), also helps in solubilizing insoluble phosphorous in soil, improving the soil physical environment, enhances soil microbial activity, restoring organic matter and also have smothering effect on weeds (Ghosh *et al.*, 2016). Legumes contain certain phytochemicals such as polyphenols, flavonoids and phytosterols that possess health benefits (Sreerama *et al.*, 2010).

Among grain legumes, pigeon pea (*Cajanus cajan* L.) is grown extensively in North

Eastern Dry Zone of Karnataka. It can be cultivated in wide range of soils, from sandy to heavy soils. It tolerates drought conditions during dry seasons but not frost during any stage of its growth. It adapted better way to marginal climatic conditions than any other pulse crops (Choudhury *et al.*, 2008). Pigeon pea is a multipurpose crop, used for fodder, soil fertility enhancement, soil erosion control and for fuel. Deeper root system of the crop helps in breaking the plough pans and enhances soil structure and hence called as crop of “Biological plough”.

In India, major pigeonpea growing state includes Maharashtra, Uttar Pradesh, Madhya Pradesh, Karnataka, Gujarat, Telangana and Tamil Nadu. Pigeon pea occupies an area about 3.96 million hectares producing 2.56 million tonnes with an average productivity of 646 kg per hectare in India (Anon, 2016). Whereas, in Karnataka, it is cultivated over an area of 6.57 lakh ha. with a production of 2.42 lakh tonnes and having the average productivity of 368 kg per hectare (Anon, 2016).

Yield of pigeon pea is reducing and it is due to several reasons and one of the important reasons for low yield of pigeon pea is because of high level of flower abscission (70-96%), leading to a much-reduced realization of sink potential (Saxena *et al.*, 2006 and Tekale *et al.*, 2009). Therefore, it has realized that reduced yield in pigeon pea is due to more vegetative growth, indeterminate growth habit, poor source-sink relationship, poor pod set resulting from the high flower and pod drops. So, it is very necessary to compensate for the higher rate of flower abscission in pigeon pea to increase the pod yield.

Among several strategies to boost the productivity of pigeon pea, foliar spray of nutrients may serve as one of the important strategies. Nutrients play vital role in

increasing the seed yield in pulses (Chandrasekhar *et al.*, 2003). Foliar spray is having advantage of quick and efficient utilization of nutrients, elimination of losses through leaching, fixation and regulating the uptake of nutrients by plants (Manonmani *et al.*, 2009 and Rahman *et al.*, 2014). Application of nutrients through foliar spray at appropriate stages of crop growth favors better utilization of nutrients and better performance of the crop (Anandhakrishnaveni *et al.*, 2004). Keeping this in view, experiment is conducted to reduce flower drop and to enhance pod setting by using Pulse Magic spray. And it is conducted to demonstrate the productivity potential and economic benefit under farmer's conditions.

Materials and Methods

The field experiment was conducted during *kharif*2018 at Agricultural Research Station, Kalburgi, UAS Raichur under rainfed condition. It is located at a latitude of 17° 34' North, longitude of 76° 07' East and an altitude of 478 meters above mean sea level. The soil of the experiment plot is clayey (Soil pH 8.3; EC 0.21 ds-1). The available soil nitrogen, phosphorus and potassium were 241, 14.9 and 280 kg ha⁻¹ respectively. The experiment was carried out in Randomized Complete Block Design (RCBD) with 10 treatments. The treatments were foliar spray of NPK (19:19:19) mixture @ 2% (T1), 6 BAP @ 20ppm (T2), Salicylic acid @ 100ppm (T3), Pulse magic @ 10g/l(T4), Mono ammonium phosphate @ 2% (T5), Zinc sulphate @ 0.5%(T6),Boric acid @ 0.1% (T7),Water spray(T8),Control (RDF) (T9),Absolute control(T10) with 3 replications using TS3R variety and maintained spacing of 90×30 cm. Pulsemagic @ 10 g/l (Product developed and released by UAS, Raichur for enhancing the yield of pulse crops. It contains 10 percent nitrogen, 40 percent phosphorous, 3 percent micronutrient and 20 PPM plant

growth regulator. Foliar spray was carried out at flowering stage. The data were analyzed statistically using the ‘F’ test and critical difference (C.D) was calculated.

Results and Discussion

It was well known that seed yield finally depends on yield attributing characters. In the present demonstration, higher yield attributing characters viz., number of pods per plant (212.91) and pod weight per plant (78.08g) and pod length (5.63cm) were noticed in

Pulse Magic sprayed plots compared to control (120.82, 48.70g and 3.9cm, respectively). It may be attributed due to the application of nutrients and plant growth regulators at flowering and pod formation stage, has helped in more translocation of photosynthates to the developing pods which in turn results in better filling of grains, thus increasing the test weight (12.48 g) of the seeds compared to control (9.45 g). Our results of experiment are similar to the findings of Thakur *et al.*, (2017) due to foliar spray of Pulse Magic in blackgram.

Table.1 Effect of foliar application of pulse magic on yield attributes and Yield of Pigeon pea

Year	Treatments	No of pods/plant	Pod weight/plant(g)	Pod length (cm)	100 seed weight (g)	Seed yield (kg / ha)	% increase yield over control
2017-18	T ₁ - Pulse Magic spray	212.91	78.08	5.63	12.48	1442	22
	T ₂ - Control(RDF)	120.82	48.70	3.61	9.45	1182	-

Table.2 Effect of foliar application of pulse magic on economics of Pigeonpea

Year	Treatments	Cost of cultivation (Rs. ha ⁻¹)	Gross returns (Rs. ha ⁻¹)	Net returns (Rs. ha ⁻¹)	B:C ratio
2017-18	T ₁ - Pulse Magic spray	25395	78840	53903	3.10
	T ₂ - Control(RDF)	22895	58542	35647	2.55

T1: Recommended dose of fertilizers with Pulse Magic spray
 T2: Recommended dose of fertilizers only and NoPulse Magic spray

Direct positive effect of 100 seed weight (test weight) on seed yield was reported by Chandirakala and Raveendran (1998). In the present experiment, higher test weight was obtained in Pulse Magic sprayed plots, which further increased the final seed yield to the extent of 22% compared to control (Table 1). Similarly, foliar applied macro and micronutrients at critical stages of the crop were very effectively absorbed and translocated to the developing pods, producing a greater number of pods and improves better filling in soybean was suggested by Jayabel *et al.*, (1999).

yield to the extent of 22% compared to control plot is reduction of flower and pod drop, as it is well known that in pigeon pea around 70-96% flowers are abscised leading to poor yield and controlling that can help in achieving potential yield. Similar results of reduction in flower drop due to foliar spray of Pulse Magic have been reported by Teggelli *et al.*, (2016) in pigeon pea. Further, due to increment in seed yield in Pulse Magic sprayed plot there was higher gross returns (Rs78840/ha) and net returns (Rs. 53903/ha) compared to control (Rs. 58542/ha and Rs.35647/ha, respectively) (Table 2).

One of the main reasons for increasing seed

In conclusion it has been well-established fact

that in pigeon pea as much as around 70-96% of flowers are shed or abscised, leading to poor yield. If this major problem is minimized then there will be the attainment of the productive potential of the crop and ultimately there will be sustainability achievement. This major problem can be minimized by foliar spray of Pulse Magic during 50% flowering stage and then 15 days after first spray. The results obtained because of foliar application of Pulse Magic were higher yield attributes and due to higher yield attributes, there was an increment in yield to the extent of 22% in Pulse Magic sprayed plots as compared to control. Consequently, upon higher yield, higher income was obtained in Pulse Magic sprayed plots compared to control (check).

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