Effect of Different Levels of Uptake Stimulants on the Yield of Dolichos Bean (*Lablab purpureus*)

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Authors' contributions

This work was carried out in collaboration between both authors. Author SD conceived the project, conceptualization, Investigation, performed the experiments, analyzed the data and supervised the work. Both authors read and approved the final manuscript.

Short Research Article

ABSTRACT

This case study investigates the impact of different levels of uptake stimulants on the growth and yield of a leguminous vegetable crop Dolichos bean (*Lablab purpureus*). The field experiment was conducted during the Rabi season of 2024 at agricultural land of ASPEE Foundation based in Palghar, Maharashtra. The study utilized a Randomized Block Design (RBD) with three replications and seven treatments. Each treatment received drenched well-formulated nutrients in different concentration. The highest pod yield was recorded 2.187 ton/ha with the application of 2 ml P star used per liter of water(T_2).

For the considered Bauni variety of Dolichos bean, the soil parameters of experimental field are as follows: pH 7.28, Organic Carbon (OC) 0.17%, Electrical Conductivity (EC) 0.84 dS/m, Nitrogen (N) 85.29 kg/ha, Phosphorus (P) 92.19 kg/ha, and Potassium (K) 394.17 kg/ha.

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This indicates that the application of appropriate treatments using appropriate crop protection equipment with integrated nutrient management (INM) significantly enhanced both growth and yield parameters of Dolichos bean such as number of pods per cluster, pod weight, number of seeds per pod, pod yield per plant and pod Yield (kg/ha).

Keywords: Dolichos bean; INM; leguminous crop; plant protection equipment; growth; yield.

1. INTRODUCTION

Mainly in South Asian countries like India, Nepal, Pakistan, Bangladesh, Sri Lanka, where the green and tender pods are highly popular and commonly consumed as vegetables, while their dry seeds are used as pulses. Dolichos bean (*Lablab purpureus* L.) is a leguminous belongs to family Fabaceae with 2n=22 chromosomes [1,2]. It is identified by many different names across the world. In India, it is popularly known as Sem, Wal, Avare, Avarai, etc., whereas in Western countries, it is referred to as the Bonavist bean, possibly due to its ornamental effect when in full bloom (Ramesh and Byregowda, 2016).

It is also known as Lablab bean, Hyacinth bean, or Egyptian kidney bean or sem and it is a versatile leguminous vegetable that can be consumed both as green beans and dry seeds [3].

In recent years, fast growing population has increased the demand for pulses and vegetables along with staple food grains.

It could be one of the best solutions for meeting the continuously rising demands. It is mostly cultivated in the tropical regions of Asia, Africa, and Australia. Dolichos bean is renowned for its nutritious pods and seeds, with protein content ranging from 10-19% in pods and 15-25% in seeds. Additionally, the plant's foliage serves as hay, silage, and green manure, contributing to sustainable agricultural practices. It is photo-sensitive and grows both short-day and long-day types (Ramesh and Byregowda, 2016).

Due to its adaptability and drought resistance, Dolichos bean can thrive under various environmental conditions, making it a vital crop in regions such as Karnataka, Tamil Nadu, Andhra Pradesh, and Maharashtra. The crop's ability to fix nitrogen enriches soil fertility, enhancing subsequent crop yields. Effective soil nutrient management, particularly the application of nitrogen, phosphorus, and potassium, is crucial for optimizing the growth, yield, and quality of Dolichos bean crops.

In the present study, two different proprietary herbal stimulants namely P Star and Drip K Plus were used under well-designed treatment plans. P Star stimulates plants to absorb the required phosphorus from the soil, whereas Drip K Plus is used to stimulate plants to absorb essential nutrients such as Potassium (K), Calcium (Ca), Magnesium (Mg), Zinc (Zn), Boron (B), Iron (Fe), Silica (Si), and other micro- and macronutrients available in the soil (farmsons.in).

This study aims to evaluate the effectiveness of different levels of uptake stimulants drenching in enhancing the yield of Dolichos bean, focusing on identifying the most effective treatment for improving growth and yield parameters.

2. MATERIALS AND METHODS

2.1 Experimental Site

The experiment was conducted during the Rabi season of 2024 at the ASPEE Foundation, Palghar, North Konkan region in the state Maharashtra, India. This region experiences a tropical climate, characterized by moderate temperature range (40.6^{o}C max.-8.3^{o}C min.) and average rainfall is about 2458 mm. which are conducive to the cultivation of Dolichos bean.

2.2 Experimental Design

The study employed a Randomized Block Design (RBD) with seven treatments following by T_1 to T_7 and three replications. The treatments involved varying levels of two commercially available organic proprietary formulations based on active herbal and natural ingredients namely P star and Drip K plus, alongside a control group (farmsons.in). The Dolichos bean variety 'Bauni' was considerd for this experiment.

2.3 Treatment Details

The following treatments were experimented to assess the growth and yield parameters of Dolichos bean.

Treatment No. Treatment Details

T$_1$: P star @ 1 ml per liter water
T$_2$: P star @ 2 ml per liter water
T$_3$: P star @ 3 ml per liter water
T$_4$: Drip K plus @ 1 ml per liter water
T$_5$: Drip K plus @ 2 ml per liter water
T$_6$: Drip K plus @ 3 ml per liter water
T$_7$: Control

For the considered experimental field, the various soil parameters are obtained as follow: pH 7.28, Organic Carbon (OC) 0.17%, Electrical Conductivity (EC) 0.84 dS/m, Nitrogen (N) 85.29 kg/ha, Phosphorus (P) 92.19 kg/ha, and Potassium (K) 394.17 kg/ha. Accordingly, a recommended dosage of 60 kg each of N, P, and K is applied.

2.4 Experimental Layout

The following matrix shows the description of experimental layout.

Spacing: 60 cm x 45 cm
Plot size: 4.5 m x 1.2 m

2.5 Data Collection

Growth parameters such as plant height, number of branches per plant, pod length, and pod girth were recorded periodically. Yield parameters including the number of pods per cluster, pod weight, number of seeds per pod, pod yield per plant, and overall pod yield (kg/ha) were also measured. Statistical analysis was performed using analysis of variance (ANOVA) and the results are presented in Table 1.

3. RESULTS AND DISCUSSION

Refer to Table 1, The study revealed that the significant variations were observed in growth and yield parameters across different treatments. Treatment T$_2$, which involved the application of P star at 2 ml per liter of water, consistently outperformed other treatments in terms of both growth and yield.

3.1 Growth and Yield Parameters

Dolichos bean crops are highly photoperiod sensitive. They have a significant effect on days to flowering and requires long nights and short-days for switching over from vegetative to reproductive phase (Ramesh and Byregowda, 2016).

Plant Height: The highest plant height (100.6 cm) was recorded in treatment T$_2$. It has a direct or indirect effect on the magnitude of many traits such as branches per plant, number of clusters per plant, number of pods per plant, pod yield per plant etc.

Number of branches per plant: Treatment T$_2$ also led to the average highest number of branches per plant (8.8).

Pod length and girth: The longest pods (10.6 cm) and the greatest pod girth (1.87 cm) were observed again in treatment T$_2$.

Number of pods per cluster: Treatment T$_2$ resulted in the highest number of pods per cluster (8.7).
Pod weight: The highest pod weight (8.6 gm) was recorded in treatment T$_2$.

Number of seeds per pod: Treatment T$_2$ had the most seeds per pod (8.4).

Pod yield per plant: Treatment T$_2$ achieved the highest pod yield per plant (573.5 kg).

Pod yield (kg/ha): Treatment T$_2$ recorded the highest overall yield of 21.87 q/ha.

Similar results were reported by Kumar et al. [4], Jaisankar and Manivannan [5], Ananth and Kumar [6], Ullasa et al [7]. Jaisankar and Manivannan [5] observed increasing levels of N significantly increased the growth and yield parameters of Dolichos bean.

Ananth and Kumar [6] studied the effect of organic and inorganic sources of nutrients in combination with consortium biofertilizers on growth, yield and quality of Dolichos bean.

Ullasa et al [7] described the prolonged effect of INM practices on the growth and yield of Dolichos bean along with the soil properties.

Recently, Mishra et al. [8], Sajjan et al. [9], Dalai et al. [10], Sahu et al (2022) and most recently, Venkatesan et al. [11] studied the effect of nutrient levels, season, and genotypes, and found that the season of sowing had a significant influence on green pod yield, crude fiber, crude protein, and total dry matter production in Dolichos bean [12,13]. Appropriate sprayers have also played a significant role in plant protection against insects and weeds [14].

Table 1. Effect of different levels of stimulants drenching on the yield of Dolichos bean

	Plant height (cm)	No. of branches per plant	No. of pods per cluster	Pod length (cm)	Pod Girth (cm)	Pod weight (g)	No. of seed per pod	Pod Yield per plant	Pod Yield (q/ha)
T_1	92.6	8	7.9	9.13	1.4	7.81	7.7	504.6	19.55
T_2	100.6	8.8	8.7	10.6	1.87	8.6	8.4	573.5	21.87
T_3	95.8	8.4	8.3	9.7	1.53	8.17	8.1	528	20.62
T_4	88.9	7.5	7.5	8.83	1.3	7.55	7.3	475	17.45
T_5	86.1	7.1	7.1	8.53	1.17	7.27	6.9	447.2	16.33
T_6	82.4	6.8	6.5	8.13	1.07	6.89	6.5	424.1	15.14
T_7	77.2	5.3	5.5	7.13	0.8	6.06	5.7	332.2	12.52
S.Em.±	1.04	0.12	0.15	0.16	0.05	0.11	0.07	8.85	0.37
C.D.	3.22	0.36	0.45	0.51	0.14	0.35	0.21	27.27	1.13

4. CONCLUSION

The obtained results revealed that the application of uptake stimulants significantly influenced the growth and yield of Dolichos bean. Among all the treatments, the herbal stimulant P star at 2 ml/ liter of water (T_2) proved to be the most effective, leading to superior growth and yield parameters. This indicates that a well-formulated concentration of active herbal and natural ingredients can be recommended as an effective stimulant, not only for enhancing Dolichos bean productivity but also for many other similar crops. The use of appropriate crop protection equipment (CPE) also plays an important role in spraying and weeding.

INM suggest that environmental concerns must be placed on top priority while managing any crops.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc have been used during writing or editing of this manuscript. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology.

Details of the AI usage is given below:

1. Chat GPT (open source)

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COMPETING INTERESTS DISCLAIMER

Authors have declared that they have no known competing financial interests or non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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