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EFFECT OF BIOSTIMULANTS ON THE GROWTH OF BUSH BEAN (*Lablab purpureus* var. *typicus*) cv. Co (Gb)14

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ABSTRACT

A field experiment was conducted during the year 2019 in the month of August – November to study the application of biostimulants on the growth of bush bean (*Lablab purpureus* var. *typicus*) cv. Co (Gb) 14. The various biostimulants utilized for the study include seaweed extract, panchagavya, chitosan and effective microorganism. They were applied as foliar spray on 30th, 45th and 60th days after sowing. The field was laid out in randomized block design consisting of nine treatments replicated thrice. The biostimulants were included along with the recommended dose of fertilizers. The observations recorded on growth characters include plant height (cm), number of leaves, leaf area (cm^2), leaf area index, number of primary branches per plant^{-1}, fresh weight of plant (g) and dry weight of plant (g). It was observed that bush bean exhibited highly significant positive association with all its growth parameters when seaweed extract was applied at 5% concentration along with recommended dose of fertilizers.

Keywords: Bush bean, Biostimulants, Seaweed extract, Panchagavya, Chitosan, Effective microorganism, Growth.

Introduction

Bush bean or Dolichos bean or Hyacinth bean is a very important legume vegetable crop grown throughout India. Having a chromosome number of 2n=2x=22 it belongs to the family Fabaceae. It is grown throughout tropical regions of Asia, Africa and America. In India, it is grown as a field crop in Tamil Nadu., Andhra Pradesh, Karnataka, Madhya Pradesh and Maharashtra. Green pods are high source of protein in which 100 g of pods contain 3.8 g of proteins. This crop has good demand in market, yet it is cultivated in limited area due to its low productivity. One of the greatest challenge of today's agriculture is the fast growing population which is mounting tremendous pressure in food production. Modern agricultural practices purely depend on chemical fertilizers to increase crop production which adversely affects the soil efficiency and also have huge impacts on human health (Rengasamy *et al.,* 2015). Use of chemical fertilizers along with growth enhancing biostimulants increases the productivity of the crop as well as enhances the soil fertility and reduces the cost of production. In this context, liquid seaweed extract has gained popularity in the world where marked increase is observed in the commercial utilization of seaweed extract. Seaweed extract exhibit growth stimulating property, as they contain macro nutrients, trace elemets, organic substances like amino acids and plant growth regulators such as auxin, cytokinin and gibberellins (Spinelli *et al.,* 2010). Chitosan, extracted from the exoskeleton of crustaceans have fungicidal effects, elicitation in defense mechanism and regulates gaseous exchange (Shehata *et al.,* 2012). Panchagavya enhances the biological efficiency of crops, activates biological reactions and protects plants from diseases (Nileema and Sreenivasa, 2011). Effective microorganism improves the physical, chemical and biological environment of soil, suppresses soil borne pathogen and pest, enhance photosynthetic capacity of crops (Olle and Williams, 2013). Thus, an experiment was conducted to study the role of these biostimulants in combination with inorganic fertilizers in influencing the growth of bush bean.

Materials and Methods

The experiment on "Effect of biostimulants on growth of bush bean (*Lablab purpureus* var. *typicus*) was conducted in Poothurai village, Vanur taluk, Villupuram district of Tamil Nadu. It was carried out during August – November 2019. The experimental area was laid out in randomized block design comprising of 9 treatments, replicated thrice. The treatments comprised of T_1: RDF - control, T_2: RDF + Sea weed extract (3 ml/litre), T_3: RDF + Sea weed extract (5 ml/litre), T_4: RDF + Panchagavya (3%), T_5: RDF + Panchagavya (5%), T_6: RDF + Chitosan 100 ppm, T_7: RDF + Chitosan 150 ppm, T_8: RDF + Effective microorganisms (1:500) and T_9: RDF + Effective microorganism (1:1000).Foliar application of biostimulants was applied during three stages, i.e., 30th, 45th and 60th days after sowing. The recommended dose of fertilizers N: P: K were 25: 50: 0 kg/ha were applied as basal. Bush bean variety selected for study is Co (Gb) 14. They are photo-insensitive in nature, suitable for high density planting because of its erect and compact type. The seeds were sown after seed treatment with rhizobium at a spacing of 45 cm x 30 cm in ridges and furrows with a depth of 2 cm. The observations recorded for

growth parameters include, plant height (cm), number of leaves, leaf area (cm^2), leaf area index, number of primary branches per $plant^{-1}$, fresh weight of plant (g) and dry weight of plant (g). The data was recorded by taking five plants from each plot which was selected randomly. The statistical analysis of data was done by using DSAASTAT. For treatments showing significance, critical differences were worked out at five percent probability level.

Results and Discussion

Foliar application of biostimulants have shown significant influence on the growth attributes of bush bean (Table 1). Among the various treatments, T_3 – Recommended dose of fertilizer + seaweed extract @ 5% showed positive influence on all the growth characters. Plant height at 45^{th}, 60^{th} and 75^{th} days were recorded to be 48.28 cm, 71.98 cm and 98.64 cm respectively. The number of leaves at 75 DAS was 73.29. Other growth parameters like leaf area (16.94 cm^2), leaf area index (9.2), number of primary branches $plant^{-1}$ (8.15), fresh weight of the plant (246.21 g) and dry weight of the plant (47.31 g) were also tremendously affected due to the application of seaweed extract @ 5 % concentration (Table 2).

The effect of commercial seaweed extract on growth of plant is reminiscent of activity of phytohormones, they improved growth at lower concentration and inhibited growth at higher concentration with similar physiological effects to that of phytohormones (Provasoli and Carlucci, 1974). These hormones have an imperative role in cell size enhancement and cell division and their presence together complement each other (Kocira *et al*., 2019). Cytokinins are involved in shoot formation and auxin in root development. (Ramya *et al*., 2015). A significant increase was observed in the number of leaves, leaf area and leaf area index. This was because seaweed extract were found to exhibit very strong growth promoting activities. The presence of polysaccharides such as fucoidan and laminarin as sugars in these extracts were reported by Elansary *et al*. (2016). The growth enhancing potential of seaweed might be attributed to carbohydrates (Booth, 1965), phenyl acetic acid (Taylor and Wilkinson, 1977), micro elements like iron, zinc and macro elements like nitrogen, phosphorus, potassium, magnesium and calcium (Challen and Hemingway,1965).

Increase in the primary branches (Table 2) is mainly due to the absorption of nutrients causing additional and strong overall growth of plants (Crouch *et al*., 1990) and also due to the enhanced uptake and accumulation of nitrogen and sulphur (Jannin *et al*., 2013). Higher fresh weight and dry weight (Table 2) might be due to the presence of bioactive compounds such as alginates, organic osmolytes and hormone like substances that aid in plant growth (Uma Maheshwari, 2017). These may also be attributed due to the beneficial effects of seaweed extract which contain natural nutrients, plant growth hormones, amino acids and vitamins that could maintain photosynthetic rates, improves plant resistance, delay senescence and control cell division (Nour *et al.,* 2010).

From the above investigation, it may be concluded that application of seaweed extract as foliar spray at a concentration of 5 % along with recommended dose of fertilizers is efficient for improving the growth characters of bush bean, thereby improving the quality of the produce and reducing the cost of cultivation.

Table 1: Mean values on the effect of biostimulants over plant height, number of leaves, leaf area and leaf area index of bush bean

Treatments		Plant height (cm)			Number of leaves $plant^{-1}$	Leaf area (cm^2)	Leaf area index
		45 DAS	60 DAS	75 DAS			
T_1	RDF - Control	26.72	40.25	55.35	47.53	15.91	5.6
T_2	RDF + Seaweed extract (3ml/litre)	37.49	57.89	78.64	61.36	16.44	7.4
T_3	RDF + Seaweed extract (5ml/litre)	48.28	71.98	98.64	73.29	17.11	9.2
T_4	RDF + Panchagavya (3%)	45.39	68.72	92.92	70.30	16.94	8.8
T_5	RDF + Panchagavya (5%)	36.41	55.97	74.81	58.91	16.36	7.1
T_6	RDF + Chitosan 100 ppm	33.21	50.37	69.92	56.20	16.19	6.7
T_7	RDF + Chitosan 150 ppm	40.21	60.88	82.59	64.20	16.61	7.8
T_8	RDF + Effective microorganisms (1:500)	32.45	49.24	66.63	53.88	16.11	6.4
T_9	RDF + Effective microorganism (1:1000)	42.09	64.10	88.14	67.30	16.76	8.4
S.Ed		**0.86**	**1.30**	**1.99**	**2.42**	**0.07**	**0.17**
C.D (p=0.05)		**1.84**	**2.76**	**4.24**	**1.99**	**0.16**	**0.37**

Table 2 : Mean values for the effect of biostimulants on number of primary branches, fresh weight of plant and dry weight of plant of bush bean.

Treatments		Number of primary branches per plant	Fresh weight of plant (g)	Dry weight of plant (g)
T_1	RDF - Control	3.86	163.7	32.75
T_2	RDF + Seaweed extract (3ml/litre)	6.34	203.74	39.73
T_3	RDF + Seaweed extract (5ml/litre)	8.15	246.21	47.31
T_4	RDF + Panchagavya (3%)	7.85	235.65	45.19
T_5	RDF + Panchagavya (5%)	6.09	194.53	38.93
T_6	RDF + Chitosan 100 ppm	5.74	183.67	36.27
T_7	RDF + Chitosan 150 ppm	6.68	214.42	41.28
T_8	RDF + Effective microorganisms (1:500)	5.52	174.41	34.88
T_9	RDF + Effective microorganism (1:1000)	6.99	225.04	43.18
S.Ed		**0.12**	**4.47**	**0.86**
C.D (p=0.05)		**0.26**	**9.47**	**1.81**

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