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ENHANCED VEGETATIVE GROWTH OF *JUSTICIA ADHATODA* (L.) NEES UNDER THE STIMULATORY EFFECTS OF BIOFERTILIZERS

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ABSTRACT

The experiments were carried out to deduce the effect of biofertilizers on sporophytic growth and development of *Justicia adhatoda* (L.) Nees. In the conducted experimentation Phosphobacterium, Azotobacter, Vermicompost and control set were run. Observations were noted for number of branches, leaf length and width, shoot length, number of leaves and leaf area. Results confirmed the influence of biofertilizers, i.e. maximum in vermicompost and least in control set. From this it can be concluded that integration of biofertilizers has significant role to play in growth and development of *Justicia adhatoda* (L.) Nees.

KEYWORDS: Biofertilizers, Vermicompost, *Justicia adhatoda* (L.) Nees, nutrition.

INTRODUCTION

Indian forests are biodiversity hub for many medicinal plants and some of them are cultivated too. Due to over exploitation of land resources it is now mandatory to use fertilizers, in particular biofertilizers, for better yield and performance of plants. The reproducibility of plants yield depends on refilling nutrients utilized from the soil by plants, maintaining physicochemical condition of the land, preventing a hyperacidity and rise in toxic elements of soil resources. Advantages in using biofertilizers and vermicompost are well established and are documented.[1]

Biofertilizers offer an additional benefit over other chemical fertilizers being economic and ecologically suitable. Biofertilizers increases the sustainability of soil with respect to biological and physical-chemical properties. An appropriate delivery of nitrogen is linked with healthy growth and finally leads to elevated production. India being agricultural land exhaustive farming is practiced, so the bulk use of organic fertilizer had increased the shipping and employment charges and therefore, greater than before the cost of production. So, finding out alternative to massive organic matter is demand of time. This searches now a day's ends with biofertilizer and NPK fertilizer by certain level. Application of nitrogen fixing bacteria decreases the use of chemical fertilizers and has proven to remove harmful agrochemicals.[2] Another advantage in using free-living nitrogen fixing bacteria like *Azotobacter chroococcum, Azospirillum lipoferum*, etc. is the ability to release gibberellic acid and indole acetic acid like phytohormones, which could encourage plant development, nutrients absorption and photosynthesis. Application of proper nutritional sources as biofertilizers, the development and yield of therapeutic plants can be enhanced.

Justicia adhatoda (L.) Nees (family Acanthaceae) is a shrub cosmopolitan in distribution in tropical regions of Southeast part of Asia.[3] It is also known by vernacular name as Vasaka or Malabar nut. It is an evergreen, highly branched shrub and perennial, (1.0 m to 2.5 mm height) with bitter taste. The branching is opposite ascending and may bears white, pink or purple flowers. In Ayurvedic medicinal plant it has significant uses in treating cough, cold, tuberculosis and asthma.[4] and as well as in Unani medicines.[5] Along with that the plant has role to play in treatment of various diseases and disorders, specifically in the respiratory tract complaints. The drug 'Vasaka' is well recognized in the native system of medicine for its therapeutic effects, mainly in bronchitis.[6] This plant is also known as a source of Vitamin C and acts mainly in fever reducer, anti-bleeding, anti-inflammatory, antispasmodic, disinfectant, anti-diabetic, anti-jaundice and bronchodilator.[7] As per the literature survey *J. adhatoda* has been extensively premeditated for its pharmacological properties and considered as universal remedy in Ayurvedic medicines.

MATERIALS AND METHODS

The soil was collected from native area from Badnera (Railway) and analyzed for physiochemical properties of the soil in laboratory, Durgapur.[8]

The seeds of *Justicia adhatoda* (L.) Nees were bought from local Gayatri nursery and the biofertilizer i.e. *Azotobacter* and *Phosphobacteria* from Parikshit biotech

company, Amravati and the vermicompost were bought from local market. For the biofertilizer species identification the biochemical tests such as citrate utilization, Indole, catalase and carbohydrate fermentation test, methyl red voges proskauer were performed to confirm the strains of microbes involved.[9]

Green pouch experiments

The trial were carried out in underground pots of 12x12 cm in width, soil were filled in each pots,[10] and then following experimental sets were conducted for each plants.

E1- *Phosphobacteria* (*Pseudomonas* sp) (5g/ Kg).
E2- *Azotobacter chroococcum* (5g/Kg).
E3- Vermicompost (5g/ Kg).
E4- Control.

Experimental sets were carried in five pots each and the experiments were repeated five times. All pots were maintained in uniform conditions. The morphological measurements were taken after every 10 days from the beginning of experiments.

RESULTS AND DISCUSSION

The soil utilized for planting was evaluated for its physicochemical properties and the findings are reported in table 1.

Table I: Physicochemical properties of soil samples.

Sr. No.	Name of the parameter	Sample
1.	pH	7.4
3.	Organic Matter (%)	0.29
4.	Organic carbon (%)	0.13
5.	Available Phosphorus (Kg/ac)	4.01
6.	Available Nitrogen (Kg/ac)	99.56
7.	Available Potassium(Kg/ac)	121.30
8.	Available Iron (ppm)	6.01
9.	Available Zinc (ppm)	0.93
10.	Available Copper (ppm)	0.52
Exchangeable Bases (C. Mole Proton+/kg)		
13.	Sodium	1.19
14.	Calcium	11.0
15.	Potassium	0.29
16.	Magnesium	7.2

The present findings have shown that maximum yield in morphological growth parameters viz., number of branches, shoot length, shoot girth, leaf length, leaf area, leaf width and number of leaves was observed in pots where biofertilizers are applied than the untreated (control) pots (VC>PS >AC> control) as shown in table 2. From the present investigation it is clear that, vermicompost is best biofertilizer as compared to other two and control set has the lowest yield in all the parameters studied. Likewise, the similar findings were reported by Pal,[11] in *Centella asiatica*; Abbey and Kanton,[12] in *Allium cepa*; Shashidhar *et al*.,[13] in *Morus* sp. and Gupta *et al*.,[14] in *Hyoscyamus niger*. Similar kind of study was also reported in *Oryza sativa* L. for the effect on germination and growth using different biofertilizers[15] and specifically, the influence of phosphate biofertilizer on the development of *Tagetes* sp. was put forth by Fatemeh Zaradost.[16] Like studies were also conducted and similar kind of results were also noted on *Aloe barbadensis* and *Cuminium cyminum* using Cyanospray fertilizer by Krishnamoorthy[17] and Nimisha patel[18] respectively.

Table II: Morphological measurements of *Justicia adhatoda* (L.) Nees.

Sr. No.	Growth parameters	20 days (length in cm)				40 days (length in cm)			
		PS	AC	VC	C	PS	AC	VC	C
1	No. of branches	-	-	-	-	-	-	1	-
2	Shoot length	6.1	5.7	6.7	4.6	7.6	7.1	8.9	5.0
3	Shoot girth	0.5	0.4	0.6	0.4	0.5	0.5	0.6	0.4
4	Leaf length	4.2	3.5	4.8	3.3	5.8	5.2	6.9	4.9
5	Leaf width	1.6	1.1	2.0	0.9	1.9	1.5	2.5	1.2
6	No. of leaves	9	7	10	6	15	12	17	10
7	Leaf area (cm2)	3.6	3.0	4.1	2.7	6.7	5.8	7.9	5.1

It is noteworthy that better soil fertility executions guarantee enough nutrient accessibility of the plant and advances their development. Recent practices of inorganic fertilizers use in farming can't maintain plant growth. Similarly, nourishment supplied through organic

fertilizers or biofertilizers barely accomplish the plant requirement for growth.

CONCLUSION

Above results obtained from conducted experiments concludes that the application of bio-fertilizers and vermicompost in incorporation with soil is favorable in growth and development of *Justicia adhatoda* (L.) Nees. Where, vermicompost is best for plant development.

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