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EFFECT OF BIOFERTILIZER ON *ANDROGRAPHIS PANICULATA*

C. Priyadharshini*, V. Amikapathy, and A. Panneerselvam

P.G Research Department of Botany and Microbiology, AVVM Sri Pushpam College (Autonomous), Poondi, Thanjavur.

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***Corresponding Author**
C. Priyadharshini
P.G Research Department of Botany and Microbiology, AVVM Sri Pushpam College (Autonomous), Poondi, Thanjavur.

ABSTRACT

In the present investigation, the pot experiment was conducted to find out the effect of biofertilizer for the vegetative growth and development on *Andrographis paniculata*. The different treatments were T_1- Control, T_2-*Azotobacter*, T_3-*Phosphobacteium*, T_4-Vermicompost and T_5-Chemical fertilizers (NPK) treated. The results indicated the maximum growth i.e plant height, number of branches; number of leaves, leaf length and width, leaf area were measured. From the analysis of result it has concluded that integrated use of biofertilizers, chemical fertilizers and vermicompost treatments were significantly increased the growth parameters of *A.paniculata*.

Keywords: Biofertilizers, Chemical Fertilizers, Vermicompost, *Andrographis paniculata*.

INTRODUCTION

India has a wide biodiversity of medicinal plants that grow in forest and uncultivated areas. In the current scenario of world trade organization and globalization that the demand of medicinal plants has increased many folds. Fertilizer application to crops is a necessary condition for good yield of crops due to inherent low fertility status of the soils. The developmental strategy of medicinal plant production in the present century must be through increased productivity of the land under cultivation, reduced costs of production and higher input use efficiency with no harm to the soil, ground water, environment and product quality. The stability of production depends on replenishing nutrients removed from the soil by crops, maintaining desirable physical condition of the soil, preventing an increase in soil acidity and

toxic elements and minimizing or preventing erosion. Use of fertilizers is reported to be responsible for over 50% yield increase in crops. Beneficial effect of biofertilizers, chemical fertilizers and vermicompost in crop productivity has already been reported by many researchers (Jat *et al.,* 2006 in Gram; Dubey *et al.,* 2012 in Fenugreek). Among various production factors bio-fertilizer and nitrogen application are important to attain uniform plant stand and better growth which ultimately affect the yield of crop. Biofertilizers offer an economically attractive and ecologically sound means for reducing the requirement of chemical fertilizers. They do not require non-renewable source of energy during their production and increase the sustainability of soil with respect to physical-chemical and biological properties. Bio-fertilizers are helpful as bio-control agents as they prevent many plant pathogens. An adequate supply of nitrogen is associated with vigorous growth and use of available inputs finally leading to higher productivity. In India, because of existing intensive farming system, organic manures, which requires in bulk quantities, increased the transportation and labour charges and hence increased the cost of production. So, there is a need to find out alternative to bulky organic matter. Thus biofertilizer can serve as an alternative of bulky organic matter and NPK fertilizer upto certain extent. Applying of biofertilizers such as nitrogen fixing bacteria has led to a decrease in the use of chemical fertilizers and has provided high quality products free of harmful agrochemicals for human safety (Salem and Awad, 2005; Mahfouz and Sharaf Eldin, 2007). Free-living nitrogen fixing bacteria such as; *Azotobacter chroococcum* and *Azospirillum lipoferum*, were found to have not only the ability to fix nitrogen but also the ability to release phytohormones similar to gibberellic acid and indole acetic acid, which could stimulate plant growth, absorption of nutrients, and photosynthesis . By using correct nutritional sources through biofertilizers, growth and yield of medicinal plants can be maximized. Also, proper agronomic management include suitable plant density has a huge influence on growth and yield of medicinal plants.

Kalmegh (*Andrographis paniculata*) is an important medicinal plant of family Acanthaceae being used in Indian system of medicines since time immemorial. The plant is also known as rice bitters in West Indies and king of bitters or chiretta in England. *A.paniculata*, known on the Indian subcontinent as Chirayetah and Kalmegh in Urdu and Hindi languages, respectively, is an annual plant, 1-3 ft high, that is one of the most commonly used plants in the traditional systems of Unani and Ayurvedic medicines. It is called Creat in English and is known as the “king of bitters”. *A. paniculata* has been reported as having antibacterial, antifungal, antiviral, choleretic, hypoglycemic, hypocholesterolemic, and adaptogenic effects.

In the Unani system of medicine, it is considered aperient, anti-inflammatory, emollient, astringent, diuretic, emmenagogue, gastric and liver tonic, carminative, antihelmintic, and antipyretic. Due to its "blood purifying" activity it is recommended for use in cases of leprosy, gonorrhea, scabies, boils, skin eruptions, and chronic and seasonal fevers (Shahid Akbar, 2011).

MATERIALS AND METHODS

Normal soil(unsterilized) collected from local area from Thanjavur and the physiochemical parameters of the soil were analyzed in soil testing laboratory, Trichy the nutritional load and microbial population (Waksman,1922).

Table.1: Physicochemical properties of soil samples.

S.No	Name of the parameter	Sample
1.	pH	7.6
2.	Electrical conductivity (dsm^{-1})	0.48
3.	Organic carbon (%)	0.12
4.	Organic Matter (%)	0.24
5.	Available Nitrogen (Kg/ac)	112.2
6.	Available Phosphorus (Kg/ac)	3.75
7.	Available Potassium(Kg/ac)	118
8.	Available Zinc (ppm)	0.89
9.	Available Copper (ppm)	0.48
10.	Available Iron (ppm)	4.89
11.	Available Manganese (ppm)	2.16
12.	Cat ion Exchange Capacity (C. Mole $Proton^{+}$/kg)	23.6
Ex changeable Bases (C. Mole $Proton^{+}$/kg)		
13.	Calcium	10.6
14.	Magnesium	6.8
15.	Sodium	1.26
16.	Potassium	0.24

Table. 2: Microbial population of soil samples.

S. No	Name of the microbes	Microbial load (CFU/g)
1	Bacteria	98×10^{-5}
2	Fungi	25×10^{-3}
3	Actinomycetes	10×10^{-4}

The seeds of *Andrographis paniculata* were bought from Anandha exports, Chennai and the biofertilizer (*Azotobacter* and *Phosphobacteria*) from Tamil nadu Agricultural University (TNAU), Coimbatore, the chemical fertilizer (NPK) from local market and the vermicompost were bought from Periyar maniyammai university, Thanjavur The species of biofertilizer

were identified by using the biochemical tests such as Indole, methyl red voges proskauer, citrate utilization, catalase and carbohydrate fermentation test to confirm the strains (Bergy's manual of determinative bacteriology, 12th edition).

Green pouch experiments:

The experiment were conducted in earthen pots measuring 15x15 cm in diameter, unsterilized soil were filled in each pots (Kuntal *et al*, 2007), and then following treatments were provided for each plants and the treatments were

T_1- Control

T_2- *Azotobacter chroococcum* (3g/Kg)

T_3- *Phosphobacteria(Pseudomonas sp)* (3g/ Kg)

T_4- Vermicompost (3g/ Kg)

T_5`- Chemical fertilizer (NPK) (50:25:25)

Each treatment were replicated three times and all together thirty pots were maintained and was sprayed regularly. The morphometric analysis was taken once in 15 days from the experiments.

Table. 3: Morphometric analysis of *Andrographis paniculata*.

S.NO	Growth parameters	30 Days					45 Days				
		C	AC	PS	NPK	VC	C	AC	PS	NPK	VC
1	Shoot length (cm)	4.7	5.2	6.9	5.0	7.2	6.5	6.5	7.1	5.3	8.2
2	Root length (cm)	4.4	4.5	6.4	4.9	6.5	5.1	6.8	6.6	5.1	10.0
3	Plant height (cm)	9.1	9.7	11.3	9.4	13.7	11.6	13.3	13.1	9.9	18.2
4	Leaf length (cm)	3.5	4.0	3.9	3.9	4.8	4.5	4.8	4.4	3.9	5.3
5	Leaf width (cm)	1.1	1.4	1.0	0.9	1.5	1.7	1.9	1.4	0.9	2.0
6	Leaf area (cm^2)	1.9	2.7	2.2	1.7	3.6	3.8	4.6	2.7	1.8	5.3
7	No of leaves	6	10	8	8	10	9	11	12	10	14
8	No of hairy roots	14	20	22	17	30	37	38	27	33	40
9	Shoot grith (cm)	0.1	0.3	0.2	0.2	0.3	0.4	0.4	0.2	0.2	0.4
10	No. of branches	-	-	-	-	-	-	-	-	-	-

C- Control, AC- *Azotobacter chroococcum*, PS- *Pseudomonas* sp, NPK- Chemical fertilizers, VC- Vermicompost

RESULT AND DISCUSSION

In the present research, it was found that the maximum yield in growth parameters such as in shoot length, root length, plant height, leaf length, leaf width, leaf area, number of leaves, number of hairy roots, shoot grith and number of branches were obtained in biofertilizer applied pot than the untreated pots (VC>PS >AC> CF>control) as shown in table. The same

results have been reported by Pal., (2002) in Brahmi; Chand *et al*., (2011) in Geranium; Gupta *et al*., (2011) in black Henbane; Abbey and Kanton., (2004) in onion; Shashidhar *et al*., (2009) in Mulberry; Prabhu *et al*., (2006) in Cucumber. Rajasekaran et al (2015) has been reported the germination and growth of paddy (*Oryza sativa*. L) using biofertilizers and the effect of phosphate biofertilizer on the growth of Marigold by Fatemeh Zaradost, (2014). Like that the same results were observed by Nimisha patel (2014) on *Cuminium cyminum* and Krishnamoorthy (2012) in *Aloe barbadensis* using Cyanospray fertilizer.Thus good soil fertility management ensures adequate nutrient availability of the plant and improve their growth. Only inorganic fertilizers can't sustain plant growth under modern farming. Likewise, nutrient supply through organic manures or biofertilizers can hardly fulfil the need of a plant. From the above results it may be stated that the use of bio-fertilizers, chemical fertilizers along with vermicompost in integrated manner is beneficial in improving the growth of *Andrographis paniculata.*

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