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BIOPESTICIDE IMPACT ON GROWTH OF ABELMASCHUS ESCULANTUS LINN. SEEDLINGS

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ABSTRACT

Modern intensive agriculture practices resulted in environmental pollution, degradation in soil health, agrochemical residues in soil and economic residues of the crop. This necessitated the need for an alternative production system which would be environmentally safe, ecologically sound and economically viable. Performance of biopesticide reduces the use of fertilizers, enhances better growth and creates a suitable environment for raising crops. As far as the growth of yield parameters were concerned, highest seedling growth was observed in panchakavya treated seedling of Bhendi. The number of flowers, number of fruits, fruit length and number of seeds were measured in the control and various organic manure treated plants at various stages of plant development. Soil nutrients of NPK level were rich in control than biopesticide treated soil samples. NPK level was found high when exposed to biopesticide in the following order panchakavya, *A. amara*, *Albiizzia amura*: pongamia treated soils respectively compared to control and other treatments. Thus the investigations suggest that the panchakavya has beneficial effect on growth, yield and nutrient content of Bhendi.

KEYWORDS

Biopesticide, *Abelmaschus esculantus*, organic farming, seedlings and biometry

INTRODUCTION

The world population is increasing by millions every year. It will be necessary to increase the supply of food and other agricultural products to meet their needs. At the moment many of these methods being used to increase production are damaging to natural resources and the environment and farmers are supposed to invest heavily into inputs to improve yields and productivity[1]. India loses about 30% of its crops due to pest and disease in each year. The damage due to these is estimated to be Rs. 60000 crores per annum. So the burgeoning population pressure has forced many countries to use chemicals and fertilizers to increase the farm productivity for meeting their food requirements[2].

The recent studies[3-4] reported the presence of pesticides in almost all types of food including human milk, blood, fat etc., other tissues resulting threat for human life. With *the* dramatic increase in the production of chemical pesticides and their reckless use, a chemical time-bomb is ticking away. Organic farming to be effectively replace by natural farming, brings ecological sustainability and agricultural development. Biodynamic farming could help to reverse the degenerative momentum of modern agriculture[5-6]. Now a day the cost of chemical fertilizers are going up very high. The farmers are getting used to organic manures to reduce the expenses towards fertilizers and to increase the yield of crops. Hence the present investigation has been undertaken to findout organic farming (biopesticide) impact on growth of *Abelmaschus esculantus* Linn.

MATERIALS AND METHODS

2.1 Collection of samples

2.1.1. Seed: A certified seed of *A. esculantus* was brought from the agricultural seed department at Tenkasi. A plot culture experiments with bhendi as the test crops to evaluate the biometric parameters obtained from the raised plants due to the application of bio pesticides.

2.1.2. *Biopesticide (Panchakavya):* Panchakavya prepared by Rajan[7] methods. Panchakavya an organic product has the potential to promote growth and provide immunity in plant system. It consists of five products from the cow dung, cow urine, milk, curd and ghee. It has a significant role in providing resistance to pests, diseases and increases the overall yield.

2.1.3. *Biopesticide (Pongamia):* Pongamia fresh leaves were collected in early morning. The leaves were dried in sunshade. Then powdered well and this was used as a pesticide while mixing with water.

2.1.4. *Biopesticide (Albiizzia amura):* *Albiizzia amura* powder was called as usili marathool. The healthy and leaves were collected and air dried under sunshade. Then the leaves were powdered well. They were mixed with water and filtered. This extract was used as a biopesticide.

2.2. Treatment

About 25 seeds of bhendi were sown in each plot, after germination and establishment, healthy plants were maintained. The seeds were selected in terms of uniform size and shape. The experimental plants (bhendi) were grown in the garden soil (Control), biopesticide are applied in different concentrations (Panchakavya (3ml/plant), pongamia (25ml/plant), *Albiizzia amura* (10ml/plant), Panchakavya: pongamia (1:1), Panchakavya

: *Albiizzia amura* (1:1) and *Albiizzia amura*: pongamia (1:1)).

2.3. Biometric observation:

Vegetative and reproductive parameters are analysed in the following techniques.

2.3.1. *Percentage of seed germination*: The percentage of seed germination was studied by keeping the seed samples in petridishes separately by adding soil and water. The experiments were performed in triplicate with each pertiplate containing 25 seeds and the experiments repeated thrice. Germination counts were done at the interval of 24 hrs for 5 days and all the counts were converted into percentage of seed germination. In the plot experiments bhendi seeds were sowed. Biopesticide application was done on 15th day onwards for further experiments.

2.3.1. Shoot length: **T**he emergence of seedlings, shoot and root length were measured. Shoot length was measured as the length of plant from the surface of the soil level to the tip of the plant was expressed in cm.

***2.3.3. Root length*:** Root length was measured as the length of surface of the soil level to the tip of the root was expressed in cm.

2.3. 4. Number of flowers: The number of flowers in the plants are counted and sowing was recorded.

2.3.5. Number of fruits: The number of fruits in the plants are observed in control and treated plants.

2.3.6. Number of seeds: The number of seeds in the plants are observed in control and treated plants.

3. RESULTS AND DISCUSSION

The garden soil was chosen for the growth of Bhendi seeds on different biopesticide treatment because soil is a living organism. The crop takes the nutrients from the soil and grows. What the crops take from the soil has to be recouped to the soil, to maintain its health. Also it shows the maximum percentage of germination and also length parameters.

The root, shoot and leaf length of bhendi on different biopesticide treatment were given in table 1. The panchakavya treated plant shoot length and root length have greater 'F' value than the calculated value. So they differed significantly on various treatments at P 1% and P 5% levels.

Anil Mahajan *et al.,*[3] stated that several research projects carried out in Germany and Sweden have shown that the use of biodynamic organic spray increased the yield of sugar beet by 8-14% stimulating the growth of leaves by 8-26%. The application of agnihotra ash and various organic manure increases the shoot and root length[6]. Sasireka *et al*.,[8] and Krishnakumar and Jawahar [9] who reported that combination of organic manure would have resulted in better growth accelerated meristemic activity. Somasundaram[10] mentioned that the 10% concentration of foliar spray of *A.amara* acts as a growth promoting substance.

According to Boomathi *et al*.,[11] panchakavya enhances the shelf life of vegetables, fruits and grains and improves the taste. They produce a bigger leaves and develop denser canopy. The photosynthetic system is activated for enhanced biological activity, enabling synthesis of maximum metabolites and photosynthesis[12].

In table 1 shows pongamia treated soil plants root length and leaf length have the lesser 'F' value than the calculated value. So they were insignificant to various treatments. The results presented in tables 2 and 3 reveals that reproductive yield parameters like number of flower per plant, number of seeds and mean length of fruit were

significantly influenced by different treatment conditions.

According to Boomathi *et al.,*[11] in field bean, panchakavya increases flowering and fruiting after a week and in Moringa it increases the number of flowering panicle per tree and number of flowers per panicle. John De Britto and Sorna Girrija[13] mentioned that panchakavya and biogas slurry not only increased the field but also controlled the number of pests.

In the present study increase in number of fruits and number of seed was observed in the treatment with panchakavya and also combination with pongamia + *A. amara.* Probably this combination would have provided better growth, which would have helped in synthesis of hormones like cytokines. Better accumulation of such hormones could have result more flowers, fruits, and seed set. The positive response could be attributed to the enhanced early vegetative growth.

Table 4 depicts the effect of biopesticide on mineral content of soil after harvest in bhendi. The application of organic manures either individually or in combination increased the amount of available NPK in the soil; probably more nitrogen and phosphorus were utilized by the plants for their metabolic activities under the influence of biopesticides.

Enhanced P availability (Table 4) is essential for seed formation. Increases in P uptake was attributed to release of fixed P to available form by phosphate enzymes, the activity of which was increased by the addition of panchakavya and other biodynamic cakes. Higher level of available P augmented the plant to produce more number of pods as a consequence of high sink availability from increased dry matter production, which led to better growth of the reproductive parts. Similar findings were already reported which form good support to the present work Chand and Tomar[14] and Ghash[15]. They reported that the application of organic manure increases the available nitrogen, phosphorus and potassium status in the soil.

Thus it can be concluded that the treatments such as panchakavya, *A. amara*, pongamia and combination of these biopesticides can be provided to *A. esculantus* L. for large scale multiplication and cultivation to increase growth parameters and biomass. Integrated soil fertility management using manures, fertilizers and biopesticides judiciously must be advocated and adopted, so that the green revolution that we have achieved can be sustained as a viable and profitable venture which would ensure the food security and the national security of our country.

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Table 1

Statistical analysis (ANOVA) for shoot, root and leaf length of Bhendi on different treatment.

Sample	Source	ANOVA				
		S.S	D.F	M.S	F ratio	F value
Shoot	Between days	94.6	2	47.3	29.5	3.88
	Between treatment	51.6	6	8.6	5.3	3
	Error	19.9	12	1.6	-	-
	Total	166.1	20	-	-	-
Root	Between days	71.0	1	7.1	50.7	5.99
	Between treatment	39.7	6	6.6	4.7	4.28
	Error	8.6	6	1.4	-	-
	Total	119.3	13	-	-	-
Leaf	Between days	23.28	2	11.64	46.56	3.88
	Between treatment	2.97	6	0.48	1.92	3
	Error	3.09	12	0.25	-	-
	Total	29.28	20	-	-	-

Table 2

Effect of biopesticide on reproductive parameters of bhendi.

S.No	Experimental set	No. of flower	No. of Fruit yield/ plant	No. of seeds	Higher % yield
1	Control	3	3	40	30
2	Panchakavya (3ml/plant)	9	9	72	90
3	pongamia (25ml/plant)	5	5	48	50
4	*Albiizzia amura* (10ml/plant)	8	8	67	80
5	*Albiizzia amura*: pongamia (1:1)	6	6	49	60
6	Panchakavya: pongamia (1:1)	3	3	36	30
7	Panchakavya : *Albiizzia amura* (1:1)	3	3	38	30

Table 3

Effect of biopesticide on fruit length of bhendi.

S.No	**Experimental set**	**Mean length of fruit (Cm)**	**% of variance**
1	Control	10.2	10.8
2	Panchakavya (3ml/plant)	12.9	40.2
3	Pongamia (25ml/plant)	11.0	19.5
4	*Albiizzia amura* (10ml/plant)	12.2	32.6
5	*Albiizzia amura*: pongamia (1:1)	07.2	21.7
6	Panchakavya: pongamia (1:1)	05.1	44.5
7	Panchakavya : *Albiizzia amura* (1:1)	04.9	46.7

Table 4
Effect of biopesticide on mineral content of soil after harvest in bhendi.

S.No	Experimental set	pH	EC	Soil nutrients Kg/acre		
				Nitrogen	Phosphorous	Potassium
1	Control	8.1	0.27	105	30	230
2	Panchakavya (3ml/plant)	8.49	0.47	120	50	440
3	pongamia (25ml/plant)	8.71	0.34	99	29	310
4	*Albiizzia amura* (10ml/plant)	8.54	0.42	105	39	430
5	*Albiizzia amura*: pongamia (1:1)	8.73	0.34	74	50	430
6	Panchakavya: pongamia (1:1)	8.83	0.29	70	47	296
7	Panchakavya : *Albiizzia amura* (1:1)	8.54	0.34	94	50	375

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