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AGRONOMIC IMPACT OF VERMICOMPOST, FYM AND MIXED COMPOST ON GROWTH OF TWO MEDICINAL PLANTS - *BACOPA MONNIERI* L. AND *CENTELLA ASIATICA* L.

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Abstract

Bacopa monnieri L. and *Centella asiatica* L. are medicinal herbs ordinarily referred to as "Brahmi" after Brahma, the creator god as per Hindu mythology. *Bacopa monnieri* is often used to cure Alzheimer's disease, anxiety and Attention Deficit Highperactivity Disorder (ADHA) among several alternative uses as well as improving memory. *Centella asiatica* L. is additionally used to cure fatigue, anxiety, depression, medical specialty disorder, Alzheimer's disease and to enhance the memory power along with intelligence. Since previous few decades everywhere the globe, abundant stress is arranged on herbal treatment as a result of adverse effects of chemical based medication. Obviously, therefore the demand of these valuable plants is terribly high. Hence, giant scale cultivation of *Bacopa monieri* L. and *Centella asiatica* L. are vital. These plants are typically propagated through cuttings. The resource material was obtained from NBPGR, New Delhi, India. The cuttings were planted in several pots in botanical garden of V.B.U., Hazaribag and completely different treatments were given to search out optimum condition for higher growth. Some common biofertilizer like vermicompost, FYM and mixture of FYM & Vermicompost were given at different doses of 5%, 10% & 15%. A control set was also maintained, that was planted in traditional soil. The result indicates that just in case of *Bacopa monnieri*, vermin compost has been evidenced to be best additive, followed by FYM and mixed compost. And for *Centella asiatica* FYM were found to be best additive followed by vermincompost and mixed compost.
***Keywords*:** *Bacopa monnieri, Centella asiatica*, cultivation, FYM, mixed compost, vermicompost.

Introduction

Bacopa monnieri is a sprouting, creeping and succulent ayurvedic tropical herb of the family Plantaginaceae, found in fresh and barkish water, wet and boggy lands throughout India, Nepal, Sri Lanka, China, Taiwan and Vietnam (Anonymous 1998), and is additionally found in florida, Hawaii and other southern states of the USA. It grows eight to twelve inches tall and wide and need full sun to bloom profusely. Flowers and fruits seen in summer and also the entire plant is employed medicinally. *Bacopa* spreads by producing new plants on top of ground runners (Zimmerman, 1993). The new plants used to be separated from parent plant after they have taken root. In India, it is commonly referred to as "Brahmi". It's medicinally very important because it contains organic compound, alkaloids, saponins and alternative chemicals like stigmastano, b-sitosterol and stigmasterol (Bose and Bose, 1931). It is an ancient and renowned medicinal plant with legendary reputation as memory vitalizer (Anonymous, 1998). "Brahmi" is found to be effective just in case of anxiety and psychoneurosis. It possesses anti-inflammatory, analgesic and antipyretic activity (Vohra *et al*., 1997). It is conjointly used treat respiratory disorder, insanity, epilepsy, hoarseness, enlargement of spleen, snake bite, rheumatism, leprosy, skin disease and ring worm, it's conjointly used as a diuretic, appetitive and cardio tonic (Basu and Walia, 1994).

Centella asiatica L. belongs to the family Apiaceae, popularly named "Indian pennywort", is an aromatic creeping herb present in soil of agriculture field in southern India. *Centella asiatica* L. found throughout tropical and climatic zone region of India up to an altitude of 600m. The plant is autochthonic to south – East Asia, Sri Lanka, a part of china, the western sea island, Madagascar, African nation, south east USA, Mexico, Venezuela, Columbia and South America. The entire plant is used for hardening skin problem like eczemas (Sharma *et al*., 1999). Leprosy (Karting, 1988) and Psoriasis (Gupta *et al*., 1999). Leaf extract of *Centella asiatica* L. has also use to spread of medicinal perform like antineoplastic (Babu *et al*., 1995), memory enhancer (Gupta *et al*., 2003), immunomodulary (Punturee *et al*., 2005) elevation of inhibitor level (Shukla *et al*., 1999). The pharmacologic worth of this medicinal herb is especially because of the presence of major triterpenes, together referred to as Centelloside, that embody asiaticoside, madecassoside, Asiatic acid and madecassic acid.

The demands of these medicinal plants are rising rapidly in sight of popularity of *Bacopa* monnieri L. and *Centella asiatica* L. primarily based drug. The wild populations of these species are markedly depleted due to the act of harvesting on large scale, unrestricted exploitation, restricted cultivation, and meager tries at replacement. Thus, it is necessary to conserve these crops and meet the growing demand of material of medicinal plants.

In spite of accessibility of all the favorable environmental conditions and conjointly its usefulness, the business cultivation of these medicinal plants is restricted to only a few pockets of Hazaribag. That's also in a tiny scale and without following correct methodology of cultivation, that's mainly due to lack of site specific low value agro technology of the crop. Therefore, in order to develop an acclimatized and organic agro-technique, an endeavor was created to figure on the fertility management of the crop.

Material and Methods

An experiment was conducted during rainy season of 2017 & 2018. The cultivation was consisted of 10 treatment combinations.

Soil Preparation

Soil was taken from the Botanical garden of V.B.U, Hazaribag. The soil was sandy loam texture with Nitrogen (934.20 kg/ha), Potassium (378.65 kg/ha), Phosphorus (7.83 kg/ha), Organic carbon (0.28 g/kg), pH (5.97 mol/L), Electric

conductivity (0.09 µS/cm), Copper (74 kg/ha), Iron (15.28 kg/ha), Zinc (1.112 kg/ha) and Manganese (13.4 kg/ha).

Some common biofertilizers such as vermicompost, Farm Yard Manure and mixture of 50% vermincompost and 50% farm yard manure (mixed compost) were used at 3 different doses. 1 set was as control without any treatment.

Ratio of biofertilizers used in 10 treatment combinations are:

S. No.	Treatments	Quantity of soil	Quantity of Biofertilizers
1	Control	2kg	000gm
2	5% Vermicompost	1kg 900gm	100gm
3	5% FYM	1kg 900gm	100gm
4	5% Mixed compost	1kg 900gm	100gm
5	10% Vermicompost	1kg 800gm	200gm
6	10% FYM	1kg 800gm	200gm
7	10% Mixed compost	1kg 800gm	200gm
8	15% Vermicompost	1kg 700gm	300gm
9	15% FYM	1kg 700gm	300gm
10	15% Mixed compost	1kg 700gm	300gm

Propagation material:

Both the plants usually propagates through cuttings. The resource materials were obtained from NBPGR, New Delhi India. Shoot cuttings of 10 cm length with internodes and rootlets were used for the propagation.

Raising propagules:

The procured propagules (shoot cuttings) of 10cm bearing internodes & rootlets were manually embedded in the field of botanical garden of V.B.U Hazaribag at the distance of 5cm×10cm followed by light irrigation. The propagules developed root within a week of planting.

Planting of plantlets:

Then, after 10 days plantlets were transferred to the pots which having soil with different doses of biofertilizers.

Irrigation:

In case of *Bacopa monnieri* L. crop was preferably kept dipped into water at 4-5cm depth throughout growing period.

In the case of *Centella asiatica* L. irrigation was done at intervals, to maintain constant humidity.

Pest control:

No pest, insects or pathogens were reported to affect these crops seriously.

Crop maturity

The crop was matured after 90 days of planting.

At last, reading of the plant length, no. of nodes, distance between nodes, length and breadth of leaves, no. of leaves and no. of new branches were measured and recorded.

Result and Discussion

In this experiment the effect of vermicompost, FYM and mixed compost was studied on the growth of *Bacopa monnieri* L. and *Centella asiatica* L. and is discussed hereunder.

Generally application of the biofertilisers showed significant difference to no biofertilisers means control set. It is obvious from the result that vermicompost has been proved best additive for the better growth of *Bacopa monnieri* L. at its all ratio i.e. 5%, 10% & 15%. The result have shown that, with the increasing level of vermicompost there was increase in growth of plant in terms of plant length, length of leaves, breadth of leaves, no. of leaves and no. of branches (table 1), the overall plant growth was highest at 15% does of vermicompost. Vermicompost was reported to be useful in many medicinal aromatic plants (Anwar *et al*., 2005; Prabh *et al*., 2007). Impact of FYM on growth of crop was also good. At 5% dose, the growth of the crop was comparable to plant growth under the application of vermicompost in term of plant length no. of nodes, distance between nodes, breadth of leaves and no. of leaves were highest than vermicompost and mixed compost both. However, at 10% dose, plant length showed declination in plant growth. At 15% dose, FYM again performed better than mixed compost in overall growth of plant. The mixed compost also had good impact on the growth of *Bacopa monnieri* L., followed by FYM, at 5% dose mixed compost showed the lowest growth in the term of plant length, no. of leaves, distances between nodes. However, at 10% it showed good impact in comparision to FYM, growth was highest in the term of no. of nodes, distance between nodes, breadth of leaves, and in 2nd year cultivation no. of leaves were high. At 15% dose mixed compost did not show much significant impact.

Table 1 : Showing morphological variation of cultivated *Bacopa monnier* during 1st and 2nd years

Treatments	Plant Length (cm)		No. of Nodes		Distance Between Nodes (cm)		Length of Leaves (cm)		Breadth of Leaves (cm)		No. of Leaves		No. of Branch	
Year	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**
Control	14	24	9	11	1.62	2.63	1.36	1.68	0.39	0.48	46	140	2	3
5% VC	32.66	31.66	9	15	3.83	1.98	1.62	1.94	0.46	0.58	76	163	8	6
5%FYM	30	31	10	14	2.79	2.30	1.35	1.79	0.45	0.48	76	192	6	4
5%MIX	22	30.33	9	14	2.05	2.03	1.63	1.86	0.44	0.52	60	160	5	6
10%VC	42	39.33	12	17	3.52	2.12	1.99	2.18	0.53	0.56	120	163	11	7
10%FYM	22.66	35	9	16	2	2.06	1.62	1.95	0.49	0.58	81	197	5	7
10%MIX	35	39.33	14	18	3.88	2.3	1.85	1.94	0.71	0.56	100	228	10	6
15%VC	41.66	42.66	12	19	3.63	2.01	2.1	1.92	0.56	0.6	196	287	21	10
15%FYM	30.33	33	28	15	3.12	1.54	1.77	2.06	0.47	0.6	147	235	7	7
15%MIX	30	31.33	10	16	3.02	1.7	1.69	1.92	0.48	0.57	105	156	9	4

In the case of *Centella asiatica* L. the control set showed no significant differences in comparison to application of biofertilisers. In general, increasing level of FYM increased the growth parameters of *Centella asiatica* L. (table 2). At 5% dose FYM showed highest impact on the plant growth than vermicopost and mixed compost, in term of plant length, no. of nodes, distance between nodes, length of leaves, no. of leaves and no. of new branches. At 10% dose of FYM showed average plant growth. Application of 15% of FYM had significant influence on these attributes. The plant length increased significantly while no. of leaves, length of leaves, no. of new branches increased marginally with increase in FYM level and they were highest at the dose of 15%. The growth promoting effect of FYM as a source of plant nutrients and humus, which improves the soil physical condition by increasing its capacity to absorb and store water, enhancement of aeration and by favouring microbial activity is well established (BCD, 1999). vermicompst also had good impact on the growth of the crops. At 5% dose application of vermicompost did not showed the significant difference. However, at the dose of 10% plant growth was higher than FYM and mixed compost in term of plant length, distance between nodes, length of leaves, no. of leaves, no. of new branches(2nd year). At 15% dose FYM also had a good impact followed by mixed compost. At 5% dose mixed compost showed average performance. Plant length, no. of nodes, no. of leaves and no. of branches were low but distance between nodes length and breadths of leaves were high. At 10% impact of mixed compost was good on overall growth of the plant, and at 15% dose its performance was average.

Table 2 : Showing morphological variations of cultivated *Centella asiatic* during 1st and 2nd years.

Treatments	Plant Length (cm)		No. of Nodes		Distance Between Nodes (cm)		Length of Leaves (cm)		Breadth of Leaves (cm)		No. of Leaves		No. of Branch	
Year	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**
Control	20	16	4	3	4.63	5.30	1.69	1.60	1.97	1.96	21	18	2	2
5% VC	20	17	4	4	4.89	4.20	1.73	1.73	2.12	2.10	20	20	3	4
5%FYM	25	20	5	4	5.50	5	1.98	1.92	2.24	2.14	20	21	3	5
5%MIX	20.63	16	3	3	4.70	5.31	2.10	2.05	2.40	2.30	17	17	2	2
10%VC	30.43	28.20	3	4	6.01	7.42	2.05	1.90	2.34	2.30	21	21	2	5
10%FYM	21.66	30.16	4	5	4.93	5.4	1.95	2.0	5.85	5.78	9	25	4	4
10%MIX	28.46	27.31	5	6	5.54	6	1.85	1.78	2.25	2.35	24	20	3	4
15%VC	27.4	29	5	4	5.86	6.28	1.78	1.67	2.28	2.38	19	22	2	2
15%FYM	29.66	30.33	5	4	5.79	6.14	2.5	2.O	2.81	2.71	29	30	4	3
15%MIX	25.86	26.58	5	4	5.64	6	1.85	1.85	2.29	2.25	27	28	2	2

Conclusion

Looking towards the growing demand of Brahmi, the experiment conducted to develop a suitable cultivation method for the field of Hazaribag . Result indicates that for better growth of *Bacopa monnieri* L. supply of nutrient either through vermicompost is beneficial. Thus, in present experiment vermicompost has been proved as best additive for the better growth of *Bacopa monnieri* L. followed by and FYM mixed compost.

And in case of *Centella asiatica* L. the FYM showed the best response and faster growth has been found. It indicates that application of FYM helped *Centella asiatica* L. faster growth, which means better branching and faster elongation of prostrate branches. Vermicompost is also good for their growth followed by mixed compost.

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