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Yield and Economics of Brahmi Crop under Natural Farming

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An experiment was carried out in Medicinal Plants Research and Development Centre (MRDC) of Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, District Udham Singh Nagar, India, during *Kharif* season to study the response of *Jeevamrit* on yield and economics of brahmi crop (*Bacopa monneri* L. var. CIM- Jagriti). The soil of experimental plot was sandy clay loam in texture, having pH 6.9, and medium in organic carbon (0.64%. The available nitrogen, phosphorus and potassium are 180.78 kg N/ha, 20.14 kg P_2O_5/ha, and 200.64 kg K_2O/ha,respectively. The experiment was laid out in randomized block design (RBD) having ten treatments with three replications. The treatments comprises with different rates of *Jeevamrit*, Farmyard manure (FYM) and vermicompost. Among all the treatments*, treatment comprises with Jeevamrit @* 5000 l/ha gave maximum return on investment as compared to other treatments.

Key Words: Brahmi, Economics, Farmyard manure, *Jeevamrit*, Vermicompost.

INTRODUCTION

Brahmi (Bacopa monnieri L.) which is also known as jalnimba or water hyssop belongs to family Scrophulariaceae. The genus has great diversity and found in warmer region of the world which includes more than 100 aquatic species. Brahmi *have great medicinal value and* used in various pharmacological/ Ayurvedic preparations for the treatment of bronchitis, diarrhea, joint pain relive and mostly as memory enhancer. The crop is used as raw in many herbal preparations, so the chemical residue free production of brahmi is very important for the health point of view. But the production under organic nutrient management is very costly, thus we need to develop low cost investment production under organic farming system. The agro chemicals used in modern agriculture like fertilizers, herbicides and pesticides are so expensive and cause ill effects on soil and human health. Presently, the sustainability of agriculture system is worldwide concern and there is a need to develop practices which are eco friendly, less expensive and easy to use. Under organic farming *Jeevamrit* is one of the emerging organic bio enhancer which is now a day's called natural farming component. *Jeevamrit* is the consortia of micro organism which multiply in soil and convert unavailable nutrients to available form. Large number of farmers doing farming using *Jeevamrit* as it is easy to prepare and use. According to Reddy (2008) *Jeevamrit* can be used as bio enhancer as it supplement the essential plant nutrients and maintain soil fertility in economically and eco-friendly manner. Therefore, keeping these facts in view, an experiment was conducted to study the effect of *jeevamit* on yield and economics of Brahmi crop under tarai region of Uttarakhand.

MATERIAL AND METHODS

The experiment was carried out in research centre of medicinal plant at G.B. Pant University of Agriculture and Technology, Pantnagar, U.S. Nagar, Uttarakhand, India. The experiment was consisting of 10 treatments replicated thrice in Randomized Block Design (RBD). Each plot of experiment was 4 m long and 3 m wide having 12 m^2 area. The buffer channel of 120 cm was kept after each replication which was also used as irrigation channel. For one hectare land 375 kg cuttings of brahmi variety CIM- Jagriti were used.

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Treatment	Detail of treatment
T_1	RDF (100:60:40) kg/ha
T_2	*Jeevamrit* 500 l/ha
T_3	*Jeevamrit* 1000 l/ha
T_4	*Jeevamrit* 2000 l/ha
T_5	*Jeevamrit* 3000 l/ha
T_6	*Jeevamrit* 4000 l/ha
T_7	*Jeevamrit* 5000 l/ha
T_8	Vermicompost (VC) 10 t/ha
T_9	Farmyard manure (FYM)20 t/ha
T_{10}	VC 5 t + FYM 10 t/ha

5 cm long cuttings having 2-3 nodes were planted at a spacing of 20 × 10 cm row to row and plant to plant respectively, at 5 cm depth. In morning hours' planting was done manually and after planting water was applied for proper establishment of crop.

In plots where FYM and vermicompost was treatments, FYM and Vermicompost was applied fifteen days before planting of cuttings and calculations of dose was based on recommended dose of fertilizers. The interpretation and calculations of data was done using standard procedures of statistics (Snedecor and Cochran, 1967). The details of treatments were as follow.

Prepration of *Jeevamrit* and its application

For the prepration of 200 l *Jeevamrit*, used 10 kg fresh desi cow dung, 5 l desi cow urine, 2 kg jiggery, 2 kg mxed dal flour and 200 g forest virgin soil where no chemical was applied before. All the ingredients were mixed in 200 l water and stir morning and evening hours with wooden stick in clockwise direction. After stir container was covered with gunny bag so that after fermentation, gasses may escape easily. As the fermentation proceeds, within 3-4 days pungent gasses formed in the container we filtered the *Jeevamrit* and sprayed on crop after irrigation at 30 days interval. First spray was applied third day after planting. Total four sprays were provided during the crop growth period up to harvest.

RESULTS AND DISCUSSION

Yield

The treatment T_7gave highest fresh biomass yield (216.69 q/ha) followed by treatment T_8 (207.84 q/ha). Significantly highest yield was observed in treatment T_7 over all the treatments T_6 and T_8, which was otherwise *on a par*. Treatment T_2 gave lowest fresh biomass yield. In case of dry biomass yield, similar trend was observed as of fresh biomass yield. Treatment T_7 had significantly highest dry biomass (43.89 q/ha) compared to all the treatments except treatment T_6, T_8 and T_{10} which was otherwise *on a par*. Treatment, T_8 and T_6 were equally effective and gave similar results, both the treatments were performed better over lower rates of *Jeevamrit* except RDF which were otherwise *on a par*. Combine application of vermicompost and FYM gave better results compared to RDF, FYM alone and lower rates of *Jeevamrit*.

Economics

The lowest cost of production was recorded in treatment T_2, followed by T_3 and T_4. While the highest cost of production was recorded with treatment T_8, where vermicompost was used followed by T_{10} and T_9, respectively. In general the gross return was higher in *Jeevamrit* treatments and maximum gross return was found in treatment T_7 (Rs. 94.39 lakh), followed by T_8 (Rs. 41.97 lakh). Treatment T_{10} also gave good gross return as compare to lower rates of *Jeevamrit*. In case of net return, treatment T_7 gave highest net return (Rs. 31.70 lakh), followed by T_6 (Fig.1). The lowest net return was received in minimum rate of *Jeevamrit* (T_2). The treatment consist of *Jeevamrit* 5000 l/ha gave highest benefit-cost ratio (2.60), followed by *Jeevamrit* 4000 l/ha (2.43) and RDF (2.20). Among organic treatments the treatment consist of VC 10 t/ha gave highest benefit cost ratio (1.61) followed by vermicompost 5 t/ha + FYM 10 t/ha

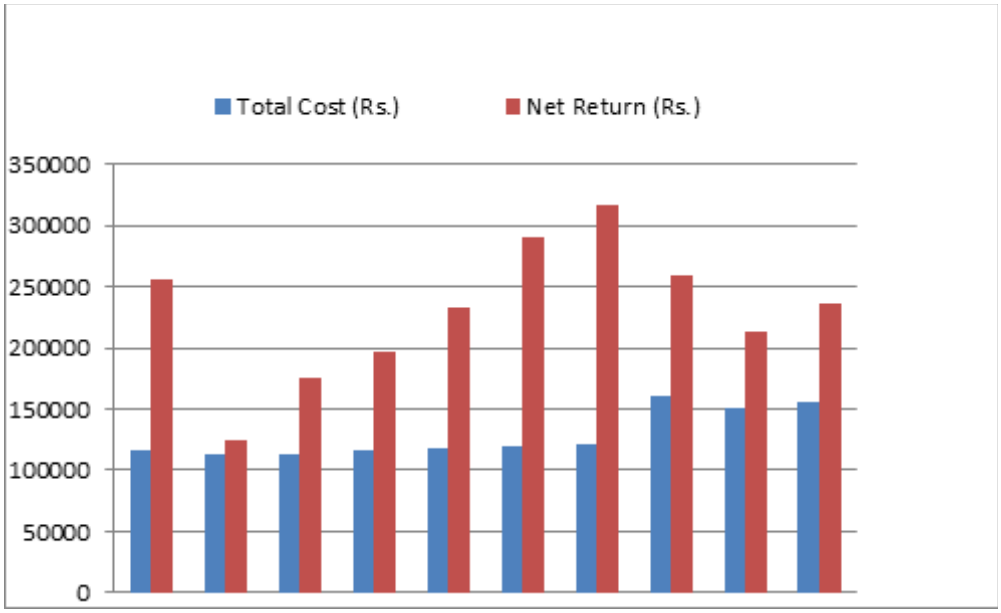

Fig. 1 Total cost and Net return as influenced by the different treatments

Table 1 Yield and economics of brahmi under natural farming

Treatment	Fresh biomass yield (q/ha)	Dry biomass yield (q/ha)	Total cost (Rs. in lakh)	Gross return (Rs. in lakh)	Net return (Rs. in lakh)	B-C Ratios
T_1: RDF (100:60:40) kg/ha	186.10	37.25	11.65	37.25	25.60	2.20
T_2: *Jeevamrit* 500 l/ha	126.68	23.80	11.30	23.79	12.50	1.11
T_3: *Jeevamrit* 1000 l/ha	148.93	28.94	11.39	28.94	17.55	1.54
T_4: *Jeevamrit* 2000 l/ha	157.00	31.31	11.59	31.31	19.72	1.70
T_5 : *Jeevamrit* 3000 l/ha	169.69	35.05	11.79	35.05	23.26	1.97
T_6 : *Jeevamrit* 4000 l/ha	205.31	41.07	11.99	41.06	29.08	2.43
T_7: *Jeevamrit* 5000 l/ha	216.69	43.89	12.18	43.88	31.70	2.60
T_8 : Vermicompost (VC)10 t/ha	207.84	41.98	16.06	41.97	25.91	1.61
T_9 : Farmyard manure (FYM)20 t/ha	185.25	36.44	15.06	36.44	21.38	1.42
T_{10} : VC 5 t/ha + FYM 10 t/ha	195.30	39.12	15.56	39.12	23.56	1.51
S.Em±	4.76	2.00	-	-	-	-
CD $_{(5\%)}$	14.16	5.95	-	-	-	-

(1.51) and FYM 20 t/ha (1.42). The lowest benefit-cost ratio was recorded with treatments consisting of lower rates of *Jeevamrit* application.

With the increase in *Jeevamrit* rate the fresh biomass yield of the crop was also increased. Similarly Vermicompost also perform better and produce equal harvest as higher rate of *Jeevamrit* application. According to Sundararaman *et al* (2001) cow products have capacity to revert the flow of cosmic energy into revitalize growth process. *Jeevamrit* has the capacity to increase the microbial population which converts the unavailable form of nutrients to available form which help in plant growth and development. *Jeevamrit* also contain many vitamins, essential amino acids, growth promoting factors like IAA, GA and beneficial microorganisms (Devakumar *et al*, 2008 and Tharmaraj *et al*, 2011) which ultimately promote plant growth. Better plant growth leads to more photosynthesis area and more photosynthesis leads to more dry matter accumulation which ultimately leads to more

biomass production. Similar findings were also reported by Kumawat *et al* (2010) and Sharma *et al* (2010).

The organic sources were more costly, consequently the net returns obtained from them were very less as compare to *Jeevamrit* and RDF. The preparation cost of *Jeevamrit* was negligible as a result, the total cost of the *Jeevamrit* treatments was much lower than the other treatments which lead to increase in net return and consequently benefits- cost ratio was increased. On the other hand, chemical fertilizers gave good amount of gross return which also gave higher benefits- cost ratio.

CONCLUSION

Organic sources are costly and bulky in nature whose availability is neither feasible nor possible. On the other hand bio-enhancer like *Jeevamrit* are prepared by using locally available resources which make them cost efficient, moreover *Jeevamrit* is eco-friendly and increase soil biodiversity by multiplying soil micro flora. *Jeevamrit* also gave good amount of return on as compare to fertilizer and organic manures. Thus by the use of *Jeevamrit* @ 4000 l/ha farmer can earn good amount of money.

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