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GROWTH AND YIELD OF FINGER MILLET (*Eleucine coracana* L.) AS INFLUENCED BY LIQUID ORGANIC MANURES

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ABSTRACT
A field study was conducted to study the effect of liquid organic manures- jeevamrutha and panchagavya on growth and yield of finger millet at Research Institute on Organic Farming (RIOF), University of Agricultural Sciences, Karnataka, India during *kharif* 2016. The study was carried out in factorial RCBD with Jeevamrutha as factor A and Panchagavya as factor B and was replicated thrice with 12 treatment combinations. The growth and yield levels were greatly influenced by different levels of jeevamrutha and panchagavya in finger millet. Jeevamrutha at 1000 l ha^{-1} recorded 19.14 per cent higher grain yield over without jeevamrutha application. Panchagavya @7.5% accounted for 8.85% higher grain yield over without panchagavya application. Straw yield of finger millet also followed the same trend. The results of the field study indicated the beneficial role of jeevamrutha and panchagavya in increasing the grain yield of finger millet.

KEY WORDS: Jeevamrutha, panchagavya, liquid organic manure, finger millet.

INTRODUCTION

Finger millet (*Eleusine coracana* L. Gaertn) is one of the important rainfed crop and is widely cultivated in dry tracts of red soil in Southern Karnataka under constrained resources. It is one of the important millet crops grown for grain and fodder purpose under varied agro-climatic conditions. More importantly, its greater plasticity and adaptability to different ecological condition, feasibility for transplanting, better suitability to different cropping systems and its suitability for mid-season correction during vagaries of monsoon in the contingent plans made it so popular crop (Krishne Gowda, 2004). In the wake of green revolution and subsequently our agriculture is heavily dependent on fertilizers and chemicals. Through their imbalanced and indiscriminate use, increased pollution of soil, water and environment and in turn it has resulted in health hazards. The use of fertilizers and chemicals are banned under organic system of cultivation. In this context, the nutrient needs of the crop have to be met only through organics and biological activities. Organic farming gives major emphasis on recovery and maintenance of soil fertility and sustainable yield on long term basis. Organic farming helps to improve the physical, chemical and biological properties of soil and maintains the ecological balance as well as productivity of life supporting systems for the future generations. Organic liquid formulations like jeevamrutha and panchagavya helps for quick buildup of soil fertility through enhanced activity of soil microflora and fauna (Devakumar *et al.*, 2008). These have the properties of both fertilizer and biopesticide and play a key role in promoting growth and immunity to the plant system. Jeevamrutha serves as a source of beneficial microorganisms (Devakumar *et al.*, 2014). It is an important organic liquid formulation which provides a congenial environment to microorganisms upon its application to soil which helps in making essential nutrients available for plant growth *viz.*, nitrogen, phosphorus and potassium to the plants and providing congenial environment to beneficial microbes (Palekar, 2006). Panchagavya is an organic formulation with blend of five products obtained from cow *i.e.* milk, ghee, curd, dung and urine is a mixed culture of naturally occurring beneficial microbes which promotes the growth and improved yield in different crops (Shailaja *et al.*, 2014).

MATERIALS AND METHODS

A field study was conducted to study the effect of jeevamrutha and panchagavya on growth and yield of finger millet at Research Institute on Organic Farming (RIOF), University of Agricultural Sciences, Karnataka, India during *kharif* 2016. The variety used was PR 202 with spacing of 30 x15cm. The experiment was laid out in factorial complete block design with factor 'A' as Jeevamrutha at three levels (control, 500 l ha^{-1} and 1000 l ha^{-1}) and factor 'B' as panchagavya at four levels (0, 2.5%, 5% and 7.5%) with three replications. There were totally twelve treatment combinaytions. The recommended farmyard manure at 10 t ha^{-1} plus 100 kg N equivalent was applied to all plots three weeks before transplanting and incorporated into the soil. Jeevamrutha as soil application and panchagavya as foliar spray were applied at 20, 40 and 60 days after transplanting. The treatments comprising of different combinations of Jeevamrutha and Panchagavya are as follows:

T_1- Jeevamrutha 0 litre/ ha + Panchagavya 0 %
T_2- Jeevamrutha 0 litre/ ha + Panchagavya 2.5 %
T_3- Jeevamrutha 0 litre/ ha + Panchagavya 5%
T_4- Jeevamrutha 0 litre/ ha + Panchagavya 7.5%
T_5- Jeevamrutha 500 litre/ha + Panchagavya 0 %

T_6- Jeevamrutha 500 litre/ha + Panchagavya 2.5%
T_7- Jeevamrutha 500 litre/ha + Panchagavya 5%
T_8- Jeevamrutha 500 litre/ha + Panchagavya 7.5%
T_9- Jeevamrutha 1000 litre/ha + Panchagavya 0 %
T_{10}-Jeevamrutha 1000 litre/ha + Panchagavya 2.5 %
T_{11}- Jeevamrutha 1000 litre/ha + Panchagavya 5%
T_{12}- Jeevamrutha 1000 litre/ha + Panchagavya 7.5%

The growth and yield parameters were recorded at 30, 45, 60, 75 days after transplanting and at harvest and data was subjected statistical analysis and interpreted.

RESULTS AND DISCUSSION

The growth and yield levels were greatly influenced by different levels of jeevamrutha and panchagavya in finger millet. Jeevamrutha at 1000 l ha^{-1} recorded significantly higher grain yield (4367 kg ha^{-1}), an increase of 19.14 per cent over without jeevamrutha application (3519 kg ha^{-1}). Similarly significantly higher straw yield was also recorded with jeevamrutha at 1000 l ha^{-1} (9071 kg ha^{-1}) which is 22.65% superior over control (7016 kg ha^{-1}) (Table 2). The increase in grain and straw yield of finger millet in jeevamrutha at 1000 l ha^{-1} could be due to better availability of nutrients throughout the crop growth. These findings are in accordance with Kasbe *et al*., (2009) and they reported that higher nutrient status of jeevamrutha formulation (2500 l ha^{-1}) resulted in profused growth which was reflected in higher dry matter accumulation and yield parameters in rice. Significantly higher grain and straw yield was recorded with application of jeevamrutha at 1000 l ha^{-1} which was reflected by yield attributing characters like grain weight per plant (48.38 g), number of productive tillers per hill (12.42) (Table 1). The increased yield attributes might be due to the beneficial effect of jeevamrutha. In the present study all the yield attributing parameters were significantly higher in jeevamrutha at 1000 l ha^{-1} which might be due to the favourable effects of IAA, GA_3, macro and micro nutrients and also beneficial micro organisms present in the liquid organic manures (Somasundaram, 2003). When these liquid manures applied two times, they act as a stimulus in the plant system and in turn increased the production of growth regulators in the cell system. Palekar (2006); Vasantkumar (2006) and Devakumar *et al.* (2008) reported the beneficial effects of jeevamrutha attributed to incremental yield, microbial load and growth hormones which might have enhanced the soil biomass, thereby sustaining the availability and uptake of applied nutrients as well as native soil nutrients which ultimately resulted in growth and yield of crops. These findings are in conformity with the findings of Sharma and Thomas (2010).

Similarly panchagavya @7.5% given at 20,40 and 60 days after transplanting accounted for higher grain yield (4075 kg ha^{-1}) with an increase of 8.85% over without panchagavya application (3716 kg ha^{-1}). Similarly, significantly higher straw yield was also recorded with panchagavya @7.5% (8664 kg ha^{-1}) with an increase of 10.69 % over without panchagavya application (7738 kg ha^{-1}) (Table 2). The quantities of IAA and GA present in panchagavya when applied as foliar spray could have created stimuli in the plant system and turn increased the production of growth regulator in cell system and the action of growth regulators in plant system stimulated the necessary growth and development which resulted in increased yields (Sanjutha *et al*., 2008; Kondapa *et al*., 2009; Kumar *et al*., 2011). Panchagavya contains Effective Micro Organisms (EMO) which were mixed culture of naturally occurring beneficial microbes mostly lactic acidbacteria (Lactobacillus), yeast (Saccharomyces), actinomycetes (Streptomyces), photosynthetic bacteria (Rhodopsuedomonas) and certain fungi (Aspergillus) and that improved the soil quality, growth and yield in sweet corn as reported by Somasundharam *et al.* (2007).

Crop yield is the complex function of physiological processes and biochemical activities, which modify plant anatomy and morphology of the growing plants. Increase in plant height and other growth and yield parameters were mainly due to the growth hormones present in panchagavya which enhance the cell division and elongation. The significant improvement in the accumulation of dry matter in plant and its distribution in different plant parts was attributed to increased supply of plant nutrients, specific weight of leaf chlorophyll synthesis, nitrogen metabolism and phytohormones with the application of panchagavya.(Sanjutha *et al*., 2008; Kondapa *et al*., 2009; Venkataramana *et al*., 2009; Yadav and Lourdraj, 2006). Growth and yield parameters varied significantly with varied levels of jeevamrutha and panchagavya application. This study revealed that application of jeevamrutha and panchagavya have significant impact in increasing the growth and yield parameters of finger millet and also helps in sustainable crop production.

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TABLE 1: Growth and yield attributes of fingermillet as influenced by different levels of jeevamrutha and panchagavya

Jeevamrutha Levels (litres ha^{-1})	Panchagavya levels (per cent)																			
	Plant height(cm)					Leaf area (cm^2 plant^{-1})					No. of productive tillers hill^{-1}					Grain weight plant^{-1}				
	0	2.5	5	7.5	Mean	0	2.5	5	7.5	Mean	0	2.5	5	7.5	Mean	0	2.5	5	7.5	Mean
0	76.6	79.8	82.3	84.1	80.7	377.7	407.9	413.4	414.4	403.3	4.73	5.50	5.60	7.13	5.74	24.46	26.35	28.43	30.61	27.46
500	84.7	87.2	89.1	89.3	87.6	537.1	599.4	634.1	719.0	622.4	9.56	10.80	11.83	11.90	11.02	38.01	39.63	40.60	41.88	40.03
1000	92.9	93.3	95.9	96.9	94.7	834.5	872.9	880.6	906.6	873.7	11.96	12.20	12.73	12.80	12.42	43.71	47.78	48.63	53.40	48.38
Mean	84.7	86.7	89.1	90.1		583.1	626.7	642.7	680.0		8.75	9.50	10.05	10.61		35.40	37.92	39.22	41.96	
	S.Em ±		CD at 5%			S.Em ±		CD at 5%			S.Em ±		CD at 5%			S.Em ±		CD at 5%		
Jeevamrutha	0.47		1.38			17.91		52.53			0.30		0.69			1.35		3.97		
Panchagavya	0.54		1.60			20.68		60.66			0.34		1.01			1.56		4.58		
JXP	0.94		NS			35.82		NS			0.47		NS			2.70		NS		

TABLE 2: Grain yield (kg ha^{-1}) and straw yield (kg ha^{-1}) of finger millet as influenced by different levels of jeevamrutha and panchagavya

Jeevamrutha levels (litres ha^{-1})	Panchagavya levels (per cent)									
	Grain yield (kg ha^{-1})					Straw yield (kg ha^{-1})				
	0	2.5	5	7.5	Mean	0	2.5	5	7.5	Mean
0	3256	3568	3603	3649	3519	6515	6842	6950	7756	7016
500	3791	3890	3930	3999	3902	7843	8831	8852	8876	8600
1000	4101	4237	4557	4574	4367	8857	8926	9141	9359	9071
Mean	3716	3898	4030	4075		7738	8200	8314	8664	
	S.Em ±		CD at 5%			S.Em ±		CD at 5%		
Jeevamrutha	78		230			93		273		
Panchagavya	91		266			108		316		
J X P	157		NS			186		NS		