

## Research Article

# Influence of Organic Manures on the Growth and Yield of Foxtail Millet [*Setaria Italica* (L.) Beauv]

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**Abstract**

The field experiment was conducted at eastern block farm of Tamil Nadu agricultural University, Coimbatore during *kharif* 2015 to study the influence of organic manures on the growth and yield of foxtail millet. The experiment was laid out in randomized block design and replicated thrice. The treatment comprised different organic sources *viz.*, farm yard manure, goat manure, vermicompost, biogas slurry were used alone and along with 3% panchagavya spray. In addition, absolute control (no application of manures and fertilizers) was considered as the benchmark for ascertaining the performance of other treatments. For T<sub>1</sub> to T<sub>8</sub> - N equivalent at 44 kg/ha (recommended dose of nitrogen). For T<sub>6</sub> to T<sub>8</sub> – in addition to organic manures 3% Panchagavya sprayed at 30, 45 and 60 DAS. Among the various treatments imposed, Biogas slurry + 3 % panchagavya spray @ 30, 45 and 60 DAS enhanced the plant height, leaf area index and dry matter production in foxtail millet. The lower plant growth parameters were registered in application of FYM alone. Yield parameters like number of productive tillers/m<sup>2</sup>, ear length and number of grains/ear was higher under Biogas slurry + 3% panchagavya spray @ 30, 45 and 60 DAS.

Among the various treatments imposed, efficiently increase the plant growth and yield parameters leads to higher yield in Biogas slurry + 3% panchagavya spray @ 30, 45 and 60 DAS. Application of FYM alone has resulted in lower yield parameters and yield.

**Keywords:** Organic foxtail millet, FYM, Goat Manure, Vermicompost, Biogas slurry, panchagavya

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**Introduction**

Foxtail millet [*Setaria italica* (L.) Beauv.] is one of the oldest cultivated millet crops which requires warm weather and minimal water for rapid maturation during the hot and dry months of the year and also suited to wide range of soil conditions. It comes second after pearl millet in the global millets production. It is nutritionally superior to conventional food grains in terms of higher protein, dietary fiber which play an important role in the energy requirement and nutrient intake of human and exhibits hypoglycemic effect due to presence of higher proportion of unavailable complex carbohydrate. Application of organic manure to the crops is being practiced for long period. Well decomposed organic manure in addition to supplying plant nutrients act as binding material and improves the soil physical properties of soil. Beneficial effect of panchagavya will act as support to increase the microbial populations. In recent years the potential of organic manure and panchagavya to supply nutrients and enhance beneficial microbes for faster decomposition is being recognized widely in field crops. Keeping this in view the prospects, of organic farming has gained popularity in recent years not only in India but also in Australia, Argentina, USA, UK, Germany, South Africa, China, Japan and other Asian countries like Srilanka and Pakistan etc. Globally, organic agriculture is practiced in over 24 million ha [1]. General acceptance of organic farming is not only due to greater demand for pollution free food but also due to natural advantage of organic farming in supporting the sustainability in agriculture. Now, the agricultural research is focused on evolving ecologically sound, biologically sustainable and socio-economically viable technologies. There is need for a fresh look to exploit the organic farming approaches using the local manorial and bio-pesticide sources for growing organic crops. Organic farming minimizes environmental pollution and maintains sustainability of soil by maintaining high soil organic matter.

**Materials and Methods**

A field experiment was conducted to study the influence of organic manures on the growth and yield of foxtail millet. The experiment was laid out in randomized block design during *kharif* 2015 under irrigated condition at Tamil Nadu Agricultural University, Coimbatore. The nine treatments consisted of

- T<sub>1</sub> - Farm Yard Manure (FYM)  
 T<sub>2</sub> - Goat manure  
 T<sub>3</sub> - Vermicompost  
 T<sub>4</sub> - Biogas slurry  
 T<sub>5</sub> - FYM + Panchagavya spray (3%)  
 T<sub>6</sub> - Goat Manure + Panchagavya spray (3%)  
 T<sub>7</sub> - Vermicompost + Panchagavya spray (3%)  
 T<sub>8</sub> - Biogas Slurry + Panchagavya spray (3%)  
 T<sub>9</sub> - Absolute control (No application of manures and fertilizers )

Recommended dose of Nitrogen for foxtail millet - 44kg/ha

Note: T<sub>1</sub> to T<sub>8</sub> - N equivalent at 44 kg/ha

For T<sub>6</sub> to T<sub>8</sub> - 3% Panchagavya spray @ 30, 45 and 60 DAS.

**Table 1** Nutrient content of the different organic manures and quantity used in the experiment

Organic sources	N content (%)	P content (%)	K content (%)	Quantity (t/ha)
FYM	0.50	0.15	0.50	8.80
Goat manure	1.41	0.73	0.98	3.14
Vermicompost	2.20	0.90	1.12	2.00
Biogas slurry	1.68	0.80	1.23	2.62

Well decomposed farm yard manure, goat manure, vermicompost and biogas slurry were procured from the Department of Farm Management, Tamil Nadu Agricultural University, Coimbatore were used in this study. The data on various parameters were collected and analyzed statistically with standard procedure for randomized block design.

## Result and Discussion

### *Effect of organic sources on growth parameters*

Plant height was distinctly higher (**Table 2**) in application of biogas slurry +3% panchagavya spray (T<sub>8</sub>) @ 30,45 and 60 DAS due to narrow C: N ratio and quick mineralization of biogas slurry might have facilitated formation of rich nutrient pool contributing to higher plant height. Present study corroborating the earlier reports of [2] who reported that Biogas slurry enhances the plant growth and yield. Biogas slurry enhanced the cell division and elongation in plants, thereby resulting in maximum plant height as reported by [3]. The panchagavya contains considerable amount of nitrogen which would have been utilized for the protein synthesis essential for the formation of protoplasm which leads to cell division and cell enlargement and inturn stimulated growth. Further, panchagavya contains growth promoting substances such as IAA, GA<sub>3</sub>, cytokinins which might have helped in better growth of plants [4].

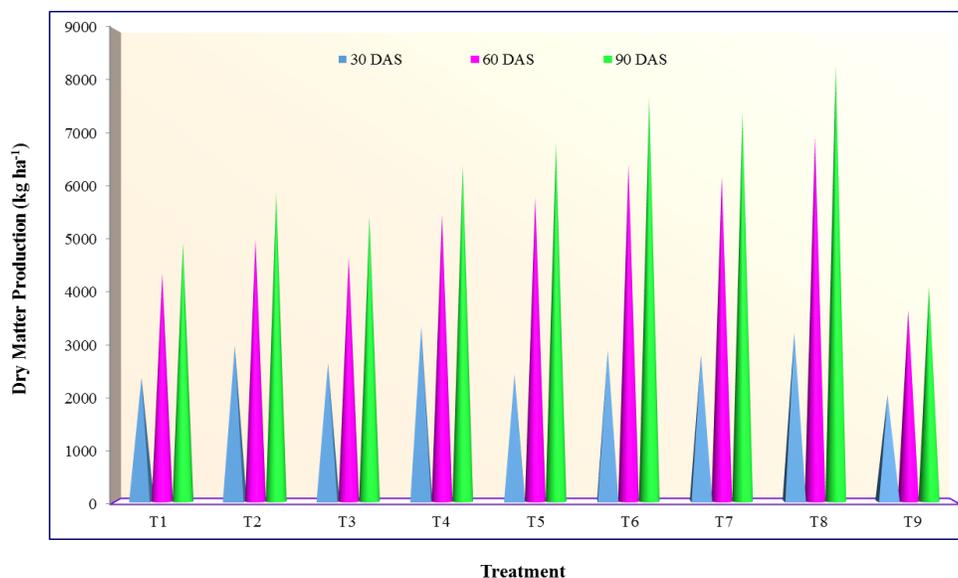
**Table 2** Plant height (cm) and leaf area index as influenced by various organic sources in foxtail millet at harvest

Treatments	Plant height	LAI
T1 FYM	80.9	2.62
T2 Goat Manure	90.3	3.02
T3 Vermicompost	86.6	2.84
T4 Biogas Slurry	96.3	3.24
T5 FYM + Panchagavya spray (3%)	101.1	3.57
T6 Goat Manure + Panchagavya spray(3%)	114.5	4.01
T7 Vermicompost + Panchagavya spray (3%)	108.6	3.87
T8 Biogas Slurry + Panchagavya spray(3%)	122.3	4.26
T9 Absolute control	67.5	2.19
SEd	5.8	0.21
CD(P=0.05)	12.3	0.43

Biogas slurry + 3% panchagavya spray @ 30,45 and 60 DAS(T<sub>8</sub>) increased the leaf area index (Table 2) which is essential for the total assimilating area available to the plant and quantum of source that would be available for translocation to the sink. With higher LAI plant would become photosynthetically more active. Biogas slurry +3% panchagavya spray might have been resulted due to quick N mineralization by microbes and also supply of nutrients

through panchagavya could have met the requirement of foxtail millet and hence appreciable dry matter production was also observed under biogas slurry + panchagavya. This results are in line with the findings of [5].

More plant dry matter production in Biogas slurry + 3% panchagavya spray@ 30,45 and 60 DAS(T<sub>8</sub>) at all the stages of observation (**Figure 1**) might be due to subsequent availability and better uptake of nutrients there by increased plant height, leaf area index as observed in this study, which could have utilized the photosynthesis process and increased dry matter production in foxtail millet. This finding corroborates with the findings [6-7].



**Figure 1** Dry matter production as influenced by various organic sources in foxtail millet at 30,60 and 90 DAS

### *Effect of organic sources on yield parameters*

All the yield attributes *viz.*, productive tillers, ear length, number of grains/ear and 1000 grain are positively influenced by 100 per cent N as biogas slurry + panchagavya spray. Increased productive tillers in biogas slurry + panchagavya spray may be due to increased availability of all macro and micronutrients under biogas coupled with nutrition through the spray of panchagavya and the better nutrient availability might have resulted in better tillering. This was supported by [8]. It might be due to better nutrient availability and uptake which resulted in increased ear length and number of grains/ear. [9] indicated that filling of grains with photosynthates likely to occur due to steady and continuous supply of N throughout the entire crop growth period due to gradual transformation and mineralization of organics, solubilization of water insoluble P compounds by organic acids released during decomposition of organics resulting in greater P availability to crop coupled with higher native K availability might have played a key role in ensuring superior yield attributes by organics. Improvement in yield attributes and yield of maize treated with biogas slurry was reported by [10] is concomitant to this finding.

**Table 3** Yield attributes and yield as influenced by various organic sources in foxtail millet

Treatments	Number of productive tillers/m <sup>2</sup>	Number of grains/ear	Ear length (cm)	Grain yield (kg/ha)
T1 FYM	179	811	11.8	2038
T2 Goat Manure	203	938	13.5	2354
T3 Vermicompost	194	863	12.5	2260
T4 Biogas Slurry	220	984	14.3	2536
T5 FYM + Panchagavya spray (3%)	233	1067	15.6	2756
T6 Goat Manure + Panchagavya spray(3%)	261	1198	16.8	3071
T7 Vermicompost + Panchagavyaspray(3%)	249	1134	16.3	2935
T8 Biogas Slurry + Panchagavyaspray(3%)	280	1268	17.7	3350
T9 Absolute control	149	690	9.8	1578
SEd	13	61	0.87	158
CD(P=0.05)	29	130	1.84	335

Higher yield recorded in this field experiment with application of biogas slurry +3% panchagavya spray @ 30,45 and 60 DAS (**Table 3**) might be due to higher leaf area increased the net photosynthesis and it facilitated higher soluble protein. Higher soluble protein content under biogas slurry + panchagavya might have increased the RUBP carboxylase activity in carbon cycle and thus more source to sink as evidenced through economic yield. The same has been attributed by [11].

## Conclusion

Among the various organic sources, biogas slurry + 3% panchagavya spray found to be the good source of nutrients for foxtail millet growth. Combined application of biogas slurry + 3% panchagavya spray recorded higher yield attributes and grain yield. Hence, it is concluded that application of biogas slurry + 3% panchagavya spray can be recommended as an effective organic source for foxtail millet production under irrigated condition.

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