Organic Manures and Industrial by-Products Influence the Yield Attributes and Yield of Sugarcane

D. Venkatakrishnan, S. Manimaran

ABSTRACT
A field experiment was conducted to evaluate the effect of organic manures and industrial by-products on cane productivity. The soil type of experimental site was sandy loam. The treatments consisted of T₁ – Seasoned pressmud @ 25 t ha⁻¹, T₂ – T₁ + Lignite flyash @ 25 t ha⁻¹, T₃ – Vermicompost @ 5 t ha⁻¹, T₄ – Vermicompost @ 5 t ha⁻¹ + Lignite flyash @ 25 t ha⁻¹, T₅ – Biocompost @ 5 t ha⁻¹, T₆ – T₅ + Lignite flyash @ 25 t ha⁻¹, T₇ – FYM @ 10 t ha⁻¹, T₈ – NPK alone (RDF). The results revealed that yield attributes and cane yield improved in addition of organic manures and industrial by-products. The addition of integrating Vermicompost @ 5 t ha⁻¹ + Seasoned Pressmud @ 25 t ha⁻¹ along with RDF (T₄) significantly recorded yield attributes of (125.83 × 1000) of millable cane ha⁻¹, 2.57 cm of cane girth, 27.82 internodes cane⁻¹, 1.37 kg of individual cane weight and cane yield of 165.18 t ha⁻¹. It was observed that vermicompost, seasoned pressmud and chemical fertilizers enhanced yield attributes and yield of sugarcane.

Key words: Lignite flyash, Seasoned pressmud, Sugarcane, Vermicompost, Yield attributes.

INTRODUCTION
Sugarcane is an important commercial crop in India and plays pivotal role in agricultural and industrial economy of the country. Sugarcane occupies an area of 47.74 lakh hectares, production of 3550.90 lakh tones and cane productivity of 74.4 t ha⁻¹ (Statistics, 2018). The spectacular increased production would not have been possible without manifolds in use of fertilizers. The nutrient need of sugarcane crop and soil should be met with organic manures and industrial by-products. Then only we can utilize the full potential of high yielding varieties with respect to yield. Farmers generally apply inorganic fertilizers due to their easy availability and scarcity of organic manures.

The physical, chemical and biological properties of soil get adversely affected due to continuous use of chemical fertilizers resulting in low yield of sugarcane. Further, there are signs of yield stagnation in fertilizer consumption and low responses of fertilizers and other inputs because of imbalanced fertilizer use and determination in soil health. Besides primary nutrients (NPK), deficiencies of secondary and micronutrients are coming up rapidly in Indian soils. Under such deficiency, farmers are not getting much response even to the applied NPK. Another matter of concern is the inadequate use of organic manures and integrated nutrient management (INM). This leads to decline in organic matter in soils, decline in soil health, sustainability and productivity. With this view the present investigation has been formulated for increased cane productivity with the objective for identifying suitable organic manures for yield and yield attributes of sugarcane.

MATERIALS AND METHODS
Field experiment of sugarcane in light textured soil belonging to Alfisol to study the influence of organic manures and industrial by-products. The treatments consisted of T₁ – Seasoned pressmud @ 25 t ha⁻¹, T₂ – Seasoned pressmud @ 25 t ha⁻¹ + Lignite flyash @ 25 t ha⁻¹, T₃ – Seasoned pressmud @ 25 t ha⁻¹ + Vermicompost @ 5 t ha⁻¹, T₄ – Vermicompost @ 5 t ha⁻¹ + Lignite flyash @ 25 t ha⁻¹, T₅ – Biocompost @ 5 t ha⁻¹, T₆ – Biocompost @ 5 t ha⁻¹ + Lignite flyash @ 25 t ha⁻¹, T₇ – FYM @ 10 t ha⁻¹, T₈ – NPK alone (RDF). All the plots received uniform dose of 275, 62.5, and 112 kg ha⁻¹ of N, P₂O₅ and K₂O through urea, DAP and Muriate of potash, respectively. The treatments were replicated thrice and design followed was randomized block design. At the time of harvest, yield attributes and cane yield were recorded.

The materials used for experiment are mentioned in Table 1. FYM is decomposed mixture of dung and urine of farm animals along with litter and left over material from roughages fed to the cattle. FYM is collected from trench. Decomposed FYM was applied in the experiment before planting as per treatment. The manure became ready for use of FYM in about 4 months period after plastering. It is

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Table 1: Organic carbon and NPK content of organic manures and industrial by-products

| Manures / Industrial by-product | Organic carbon (g kg⁻¹) | Total N (%) | Total P (%) | Total K (%) |
|--------------------------------|-------------------------|-------------|-------------|-------------|
| FYM                            | 1.83                    | 0.79        | 0.92        | 0.8         |
| Seasoned pressmud              | 2.1                     | 1.26        | 3.83        | 1.46        |
| Biocompost                     | 3.1                     | 2.0         | 2.0         | 3.0         |
| Lignite flyash                 | 0.025                   | 0.56        | –           | 1.67        |

Table 2: Physico-chemical properties of experimental soil.

| Soil properties                  | Values |
|----------------------------------|--------|
| Sand (%)                         | 69     |
| Texture                          | 16     |
| Clay (%)                         | 14     |
| Taxonomical classification       |        |
| Ultic haplustalf                 |        |
| pH                               | 7.1    |
| EC (dS m⁻¹)                      | 0.24   |
| Organic carbon (g kg⁻¹)          | 5.45   |
| K Mn O₄-N (kg ha⁻¹)              | 243    |
| Olsen-P (kg ha⁻¹)                | 22.5   |
| NH₄OAC extractable (kg ha⁻¹)     | 320    |

Table 3: Yields and attributes.

Yield attributes (Table 3)

The treatment T₃ which received vermicompost @ 5 t ha⁻¹ + Seasoned pressmud @ 25 t ha⁻¹ (T₄) resulted in no. of millable cane (125.83 × 1000 ha⁻¹) individual cane weight (1.37 kg). This was comparable with the treatment T₃ (Seasoned pressmud @ 25 t ha⁻¹ + Lignite flyash @ 25 t ha⁻¹) registered no. of millable cane (122.68 × 1000 ha⁻¹), individual cane weight (1.33 kg). The lowest no. of millable...
The results revealed that the treatments significantly increased the cane yield of sugarcane. The cane yield varied from 120.53 to 165.16 t ha\(^{-1}\). The highest cane yield was obtained in T\(_3\) (165.18 t ha\(^{-1}\)) received vermicompost @ 5 t ha\(^{-1}\) + seasoned pressmud @ 25 t ha\(^{-1}\) and was comparable with the yield of T\(_6\) (158.43 t ha\(^{-1}\)). The treatment T\(_3\) which received 100 per cent NPK alone recorded the lowest cane yield (120.53 t ha\(^{-1}\)). The rapid mineralization of organic manures viz, seasoned pressmud and vermicompost may have optimized nutrient availability to the plants, thereby stimulating growth and development (Rambuatsaiha et al., 2017). With the increment is supply of essential nutrients to the plant, their availability, acquisition mobilization and influx into the plant tissues increased and thus, improved yield components and finally the yield (Amithkumar Kashyap et al., 2017). Regarding industrial by-products Lignite flyash might have served a good amendment and source of nutrients for the plant crop (Muni et al., 2016). In sugarcane cultivation, the cane yield is the ultimate product that decides the benefit accrued out of it. The organic manure treatments significantly influenced the cane yield. The higher response of sugarcane due to application of organic manures may be attributed to the availability of plant nutrients in manifolds by the solubilizing effect of the decomposing manures with steady release of plant nutrients over longer periods. These findings are in accordance with the findings of Korai et al. (2014) and Mabry Mc Crary et al. (2015).

### Table 3: Influence of composites and industrial by-products on yield attributes and cane yield.

| Treatments | NMC (X1000 ha\(^{-1}\)) | Cane girth (cm) | No. of internodes | Individual cane weight (kg) | cane yield (t ha\(^{-1}\)) |
|------------|--------------------------|----------------|------------------|-----------------------------|--------------------------|
| T\(_1\) – Seasoned pressmud @ 25 t ha\(^{-1}\) | 119.92 | 2.48 | 23.86 | 1.29 | 152.71 |
| T\(_2\) – Seasoned pressmud @ 25 t ha\(^{-1}\) + Lignite Flyash @ 25 t ha\(^{-1}\) | 122.68 | 2.52 | 24.95 | 1.33 | 158.43 |
| T\(_3\) – Seasoned pressmud @ 25 t ha\(^{-1}\) + Vermicompost @ 5 t ha\(^{-1}\) | 125.83 | 2.57 | 27.82 | 1.37 | 165.18 |
| T\(_4\) – Vermicompost @ 5 t ha\(^{-1}\) + Lignite Flyash @ 25 t ha\(^{-1}\) | 107.64 | 1.95 | 20.00 | 1.23 | 131.77 |
| T\(_5\) – Biocompost @ 1 t ha\(^{-1}\) | 104.68 | 1.92 | 19.60 | 1.21 | 129.39 |
| T\(_6\) – Biocompost @ 5 t ha\(^{-1}\) + Lignite Flyash @ 25 t ha\(^{-1}\) | 109.37 | 2.08 | 20.69 | 1.26 | 134.06 |
| T\(_7\) – FYM @ 10 t ha\(^{-1}\) | 110.73 | 1.91 | 19.40 | 1.19 | 125.09 |
| T\(_8\) – NPK alone (RDF) | 100.77 | 1.87 | 18.91 | 1.17 | 120.53 |
| S.Em ± | 2.55 | 0.05 | 0.50 | 0.02 | 3.2 |
| C.D. (P≤0.05) | 5.48 | 0.10 | 1.08 | 0.05 | 6.88 |

CONCLUSION

The demand of sugar has enhanced with the explosion of Indian population. Experimental results revealed that sugarcane responds to seasoned pressmud, vermicompost in light textured soils for sugarcane production. Application of seasoned pressmud, vermicompost with chemical fertilizers in sugarcane production, improved yield attributes of cane. Therefore, seasoned pressmud @ 25 t ha\(^{-1}\) + Vermicompost @ 5 t ha\(^{-1}\) + RDF (T3) increased the cane yield of 165.18 t ha\(^{-1}\).

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