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Effect of organic manure and panchagavya on the growth and yield of sweet corn (*Zea mays* L.)

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Abstract

A field experiment was conducted during *Rabi* 2023 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P) on the topic “Effect of Organic manures and Panchagavya on growth and yield of Sweet corn”, to study treatments consisting of two level of poultry manure (3.0, and 1.5 t/ha) and Farm yard manure (2.5 and 5.0 t/ha) with spary of panchagavya (3%, 5%, 7%). The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 8.0), low in organic carbon (0.62%), available N (225 kg/ha), available P (38.2 kg/ha) and available K (240.7 kg/ha). There were 9 treatments, each being replicated thrice and laid out in Randomized Block Design. The results revealed that significant and higher plant height (159.13 cm), higher plant dry weight (87.10 g), maximum number of cobs/plant (2.10), maximum number of row/cobs (12.48), maximum number of grain per row (29.36) seed index (21.19 g), seed yield (5.10 t/ha), stover yield (17.42 t/ha), gross returns (162340.00 INR/ha), Net returns (115740.00 INR/ha) and Benefit cost ratio (2.48) was recorded in treatment 9 - (Poultry manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 7%).

Keywords: Sweetcorn, panchagavya, poultry manure, yield, economics

Introduction

Globally, maize (*Zea mays* L.) is an important crop with the highest production potential among the cereal food crops. India produced 36.3 million tons of maize during 2019–2020 from 9.90 million ha with an average yield of 2.7 t/ha. The predominant maize growing states that contributes more than 80% of the total maize production are Andhra Pradesh (20.9%), Karnataka (16.5%), Rajasthan (9.9%), Maharashtra (9.1%), Bihar (8.9%), Uttar Pradesh (6.1%), Madhya Pradesh (5.7%), Himachal Pradesh (4.4%). Apart from these states’ maize is also grown in Jammu and Kashmir and North- Eastern states.

Intensive production systems have led to second generation problems such as deteriorating soil health, declining soil organic matter (SOM), increasing multiple deficiencies of N, P, K, S, Zn, Fe and Mn due to their over mining from soils and deterioration of groundwater quality and sodicity problems. In India, maize is traditionally grown in monsoon (*Rabi*) season, which is accompanied by high temperature (<35 °C) and rainfall. However, with the development of new cultivars and appropriate production technology, winter cultivation of maize has emerged as a viable alternative

Farm yard Manure (FYM) is prepared basically using cow dung, cow urine, waste straw and other dairy wastes. It is highly useful and some of its properties is rich in nutrients. A small portion of N is directly available to the plants while a larger portion is made available as and when the FYM decomposes. When cow dung and urine are mixed, a balanced nutrition is made available to the plants. Availability of Potassium and Phosphorus from FYM is like that from inorganic sources. Application of FYM improves soil fertility.

Poultry manure fertilizer contains all the essential nutrients required for crop production, and its value as an organic fertilizer and a source of plant nutrients has been recognized for centuries. Even with its beneficial effects on plant growth, however, manure constitutes only a small percentage of the nutrients applied to cropland when compared to commercial fertilizer. Panchagavya is a mixture used in traditional Hindu rituals that is prepared by mixing five

ingredients. The three direct constituents are cow dung, urine, and milk; the two derived products are curd and ghee. These are mixed in proper ratio and then allowed to ferment. The Sanskrit word Panchagavya means "five cow-derivatives". When used in Ayurvedic medicine, it is also called cowpathy.

Materials and Methods

Experimental sites and soil

The experiment was conducted during the *Rabi* season 2023, at the Crop Research Farm (CRF), Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (U.P.) which is located at 25°39' 42"N latitude, 81° 67' 56" E longitude, and 98 m altitude above the mean sea level (MSL). This area is situated on the right side of the river *Yamuna* by the side of Prayagraj Rewa Road about 5 km away from Prayagraj (U.P) city.

The soil been collected from the experimental sites was tasted in laboratory and the result are been observed.

| | |
|----------------|------------|
| Sand | 20.00% |
| Silt | 60.00% |
| Clay | 16.40% |
| Textural class | Sandy loam |

Organic Manure and Panchagavya on the growth and yield of Sweetcorn was carried out at Crop Research Farm Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences Prayagraj during 2023 *Rabi* Season.

Treatments used for the experiment

The level of Organic manure (FYM + Poultry manure) and Panchagavya is being used in the particular experiment *viz.* Farm yard manure (2.5, 5.0) t/ha and Poultry manure (1.5, 3.0) t/ha, and Panchagavya 3%, 5%, 7% was separately maintained. The experiment was laid out in Randomized block design in three replication. The Sweet corn were sown by maintaining 60 x 15 cm spacing in plot area 9 m². The seeds were treated with captan 4 g per kg seed and the dose of Organic manure and panchagavya was applied according to the treatment was laid in the treatments (T₁) Poultry Manure 3.0 t/ha + Panchagavya 3% , (T₂) Poultry Manure 3.0 t/ha + Panchagavya 5%, (T₃) Poultry Manure 3.0 t/ha + Panchagavya 7%, (T₄) Farm Yard Manure 5.0 t/ha + Panchagavya 3%, (T₅) Farm Yard Manure 5.0 t/ha + Panchagavya 5%, (T₆) Farm Yard Manure 5.0 t/ha + Panchagavya 7% (T₇) Poultry manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 3%, (T₈) Poultry manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 5% (T₉) Poultry manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 7%, each treatment carried out in three plot , total 27 plots.

The irrigation time, frequency and quantity were identical among treatment once after sowing and then every 20 days interval.

Analysis of yield attributes

In the study the yield per plot was measured by harvesting each plot pots of sweetcorn from each treatment, the sample were then air dried and weighted and each plot was a replication. Among them, five representative plants were selected from each treatment for testing, and each plant was a replication. The number of cobs per pod and number of row per cobs and seed index were determined.

Results and Discussion

Plant height

The application of poultry manure 3.0 t/ha with panchagavya 3% resulted significantly higher plant height (159.69 cm).

The significant and higher plant height was with application of Poultry manure (3.0 t/ha) might be due to involvement of Panchagavya 7% in stimulation of cell division, photosynthetic process as well as formation of chlorophyll. Further, the application of organic manure this might be due to enhances the differentiation of tissue cell division and nitrogen absorption from the soil. Similar result was found by Kumar *et al.* (2017) [8]

Cobs/plant

Significant improvement in number of cobs per plant (2.10), row per cob (12.48), observed Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 7% followed by application of Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 5%

The significant and higher number of cobs/plant was with the application of Poultry manure (1.5 t/ha) and FYM (2.5 t/ha) might be due to the tissue differentiation from somatic to reproductive meristematic activity and development of floral primordial might have increased with increasing in more flowers and cobs Further Significant and higher number of cobs/plants was with the application of might be because panchagavya is used more effectively, increasing yield qualities be the reason of moderate plant nutrients availability due to which the plant produces more cobs/plant as compare to other treatments. These results were similar with that of Ashok *et al.* (2021) [9].

Plant dry weight (gm)

Significant and maximum plant dry weight (87.10 g) was recorded in treatment 9 (Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 7%). However, the treatment 8 (Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 5% (83.27g), was statistically at par with treatment 9 (Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 7%.

Number of grains/rows

Significant improvement in number of grain/row (29.62) which was superior due to application of poultry manure (1.5 t/ha) and FYM (2.5 t/ha) with the spray of panchgavya 7%. Further Significant and higher number grain per row was with the application of might be because panchagavya is used more effectively, increasing yield qualities be the reason of moderate plant nutrients availability due to which the plant produces more grain/row as compare to other treatments. These results were similar with that of Kumar *et al.* (2021) [10].

Yield

The maximum green fodder yield (17.42 t/ha and seed yield 5.10 t/ha) achieved with application of Poultry manure 1.5 t/ha and farm yard manure

2.5 t/ha with spray of panchgavya 7% as compare to other treatments.

The significant and maximum green fodder yield was obtained with the application of Poultry manure (1.5 t/ha) with farm yard manure (2.5 t/ha) might be due to the part of amino acid, which helps in chlorophyll formation, photosynthetic process, activation of enzymes and leaf formation. Panchagavya application role decreases the pH of the soil and increasing root absorption of minerals and improving biosynthesis of plant growth regulator IAA, carbohydrate and N metabolism which leads of fodder yield. Similar results were reported by Pathak *et al.* (2021) [11].

Harvest Index

The higher Harvest index (34.29%) was recorded with application of poultry manure 1.5 t/ha and FYM 2.5 t/ha with the

spray of panchagavya 7%.

Significant increase in harvest index with inoculation of panchagavya may be increase due to the stimulatory effect in cell division, cell elongation and background of cell structure and also higher dose of poultry manure may be responsible for increased leaf area and chlorophyll content causing higher photosynthesis and assimilation, metabolic activities responsible for overall reproductive phase and ultimately increased the of harvest index. Similar findings were reported by Venkta *et al.* (2013) [12].

Economics

Cost of Production (INR/ha)

Cost of production (47600.00 INR/ha) was found to be highest in treatment 6 FYM 5.0 t/ha + Panchagavya 7% as compared to other treatment.

Gross return (INR/ha)

Gross return (162340.00 INR/ha) was found to be highest in

treatment 9 Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 7% as compared to other treatment.

Net return (INR/ha)

Net return (115740.00 INR/ha) was found to be highest in treatment 9 Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 7% as compared to other treatment.

B: C Ratio

Benefit Cost Ratio (2.48) was found to be highest in treatment 9 Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 7% and minimum Benefits cos ratio (1.67) found to be in control (Poultry manure 3 t/ha + Panchagavya 3%) as comapre to other treatment.

The maximum Net return (115740.00) and B:C ratio (2.48) achieved with application of poultry manure 1.5 t/ha and farm yard manure 2.5 t/ha with spray of pancahagavya 7% as compare to other treatment.

Table 1: Effect of Organic manures and Panchagavya on yield attributes and yield of Sweet corn.

| S. No. | Treatment combination | Number of cobs/plant | Number of rows/cobs | Test weight (g) | Green Seed Yield (t/ha) | Green fodder Yield (t/ha) | Harvest Index (%) |
|--------|---|----------------------|---------------------|-----------------|-------------------------|---------------------------|-------------------|
| 1. | Poultry manure 3 t/ha + Panchagavya 3% | 1.46 | 10.52 | 18.81 | 3.70 | 12.76 | 31.43 |
| 2. | Poultry manure 3 t/ha + Panchagavya 5% | 1.54 | 11.30 | 19.44 | 3.76 | 14.92 | 31.94 |
| 3. | Poultry manure 3 t/ha + Panchagavya 7% | 1.48 | 11.66 | 19.48 | 3.88 | 14.42 | 32.19 |
| 4. | Farm Yard Manure 5 t/ha + Panchagavya 3% | 1.40 | 11.69 | 19.76 | 4.07 | 15.26 | 32.18 |
| 5. | Farm Yard Manure 5 t/ha + Panchagavya 5% | 1.48 | 11.65 | 19.54 | 4.22 | 15.90 | 32.43 |
| 6. | Farm Yard Manure 5 t/ha + Panchagavya 7% | 1.52 | 12.37 | 20.18 | 4.34 | 16.06 | 32.65 |
| 7. | Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 3% | 1.58 | 12.37 | 20.83 | 4.50 | 15.39 | 33.12 |
| 8. | Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 5% | 1.94 | 12.48 | 20.98 | 4.81 | 16.88 | 33.78 |
| 9. | Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 7% | 2.10 | 12.71 | 21.19 | 5.10 | 17.42 | 34.29 |
| | F-test | NS | S | S | S | S | NS |
| | SEm (±) | 1.05 | 0.09 | 0.61 | 0.10 | 0.14 | 0.90 |
| | CD (p=0.05) | - | 0.28 | 1.83 | 0.31 | 0.43 | - |

Table 2: Effect of Organic manures and Panchagavya on Economics of Sweet corn.

| S. No. | Treatment combinations | Cost of cultivation (INR/ha) | Gross return (INR/ha) | Net return (INR/ha) | B:C |
|--------|---|------------------------------|-----------------------|---------------------|------|
| 1. | Poultry manure 3 t/ha + Panchagavya 3% | 43800 | 117040 | 73240 | 1.67 |
| 2. | Poultry manure 3 t/ha + Panchagavya 5% | 44200 | 123840 | 79640 | 1.80 |
| 3. | Poultry manure 3 t/ha + Panchagavya 7% | 44600 | 125840 | 81240 | 1.82 |
| 4. | Farm Yard Manure 5 t/ha + Panchagavya 3% | 46800 | 132270 | 85470 | 1.82 |
| 5. | Farm Yard Manure 5 t/ha + Panchagavya 5% | 47200 | 137300 | 90100 | 1.90 |
| 6. | Farm Yard Manure 5 t/ha + Panchagavya 7% ad | 47600 | 140620 | 93020 | 1.95 |
| 7. | Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + | 45800 | 143280 | 97480 | 2.12 |
| 8. | Panchagavya 3% Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + 5% | 46200 | 154010 | 107810 | 2.33 |
| 9. | Panchagavya Poultry Manure 1.5 t/ha + FYM 2.5 t/ha + Panchagavya 7% | 46600 | 162340 | 115740 | 2.48 |

Conclusion

It is concluded that application poultry manure 1.5 t/ha and Farm yard manure 2.5 t/ha with spray of panchagavya 7% recorded higher yield parameter and the higher benefit cost ratio in sweet corn among all treatment.

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