



Effect of Panchagavya on Growth, Yield and Quality of Zucchini (*Cucurbita pepo*) under Protected Condition

Saurabh^{a++*}, Samir E.Topno^{a#}, Vijay Bahadur^{a†}, Anita Kerketta^{a#}, Rupesh kumar^{a++} and Abhishek kumar^{a++}

^a Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj-211007 (U.P.), India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

An experiment was conducted to study the effect of Panchagavya on Growth, Yield and Quality of Zucchini (*Cucurbita pepo*) in Protected Condition at Sam Higginbottom. University Of Agriculture Technology and Sciences, Prayagraj during summer 2023. The Treatment Performed best in terms of Plant Height (19.83 cm) and Number of node (12.00) after Foliar spray of Panchagavya (6%) at 30 DAS. Days to emergence of 1st male flower/ plant (28.87) after drenching of Panchagavya (9%) at 30 DAS. Days to emergence of 1st female flower/plant (34.03) after drenching of Panchagavya

⁺⁺ M.Sc. Scholar;

[#] Assistant Professor;

[†] Associate Professor;

*Corresponding author: E-mail: info.Saurabhitiwari@gmail.com;

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(9%) at 15 DAS. Days to 50% female flower/plant (34.67) Foliar spray of Panchagavya (6%) at 30 DAS. Days to 1st fruit setting/plant (43.00) after foliar spray of Panchagavya(9%) at 15 DAS. The Number of fruits/plant (4.67) after Foliar spray of Panchagavya (6%) at 15 DAS and the average weight of fruit (197.50g) after Foliar spray of Panchagavya (3%) at 15 DAS. Fruit length and Girth (25.00 Cm) and (16.00mm) after Drenching of Panchagavya (9%) at 30 DAS. Fruit Yield/plant (1.113 kg) after Foliar spray of Panchagavya (3%) at 15 DAS and Fruit yield per 250 m² was (3.71q). Fruit quality TSS°brix (3.22) after Foliar spray of Panchagavya (9%) at 30 DAS. The highest benefit cost ratio was found after Foliar spray of Panchagavya (3%) at 15 DAS (2.42). Result indicates that after Foliar spray of Panchagavya (3%) at 15 DAS were recommended for plant.

Keywords: Panchagavya; Zucchini; organic farming; protected condition.

1. INTRODUCTION

Zucchini (*Cucurbita pepo* L.) is a fruit belonging to the *Cucurbita* genus and the *Cucurbitaceae* family. This family is made up of 22 species; the 5 most cultivated being *C. maxima*, *C. moschata*, *C. pepo*, *C. ficifolia*, and *C. argyrosperma*. According to the Ministry of Agriculture, Fisheries, and Food, the production of zucchini in Spain is 591,341 tons (t) and a cultivation area of 11,037 hectares (ha). Zucchini is one of the lowest caloric content vegetables (14 kcal/100 g) and has the highest water content (96.5%). Its consumption covers the needs of vitamins and minerals, especially vitamin C and potassium, vitamin C being the most significant. The presence of mucilage gives it emollient properties on the digestive system and as an easy-to-digest food, it is suitable for those with digestive problems [1-3]. Heavy use of chemicals in agriculture has weakened the ecological base in addition to degradation of soil, water resources and quality of the food [4-6]. At this juncture, a keen awareness has sprung on the adoption of "organic farming" as a remedy to cure the ills of modern chemical agriculture [7] and Technology (2022).

Panchagavya is a term used in Ayurveda fermented product made from five ingredients obtained from cow, such as milk, urine, dung, curd and clarified butter [8]. Role of foliar applied panchagavya in production of many plantation crops has been well documented in India Kumar CS, Singh G et al. [9] and Chongre S et al. [10]. Panchagavya is a popular foliar nutrition prepared by organic growers of Tamil Nadu as an indigenous material and used widely for agricultural horticultural and crops [11,12-14,15-19] and Panchal P et al. [20]. The soil fertility is enhanced by an increase in organic substances and micro-nutrients, which are important for promoting the growth of crops and the

reproduction of microorganism that improve the texture of the soil Potkile SN et al. [21] and Ravishanker N [22]. Physico-chemical properties of Panchagavya revealed that they possess almost all the major nutrients, micro nutrients and growth hormones (IAA & GA) required for crop growth. Predominance of fermentative microorganisms like yeast and lactobacillus might be due to the combined effect of low pH, milk products and addition of jaggery/sugarcane juice as substrate for their Growth, It acts as an organic growth-promoter and immunity booster for plants, Yield enhancement by 18% and in few cases like Cucumber Boraiah B et al. [23] and Suchitra Rakesh et al. [24].

The present investigation was conducted to examine the effect of foliar and drenching application of panchagavya on different parameters, growth yield and quality of Zucchini.

2. MATERIALS AND METHODS

This experiment was carried out during in 2023 at Horticulture Research Farm, SHUATS, Prayagraj, Uttar Pradesh, India which is located at 25.28 °N latitude, 81.54 °E longitude and 98 m altitude above the mean sea level. 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, city. The experiment was done in the polyhouse. The highest O₂ and CO₂ concentration was 20.2% and 480 ppm respectively. In the polyhouse the maximum temperature was 34.7 °C. The maximum light intensity inside and outside the polyhouse was 63600 lux and 110600 lux.

The temperature reached up to 48°C in summer and in winter it goes down to as low as 2-3 °C. The experiment was laid out in a randomized block design with 12 treatments and three replications. The crop was grown in a naturally ventilated polyhouse.

The seeds of Zucchini (F1 Hybrid) were collected from Plantsman F1 hybrid variety Rajbaha road Patiala (Punjab) India. The sowing of seed performed on 1st May 2023 at 45 cm x 60 cm spacing on the raised bed. The plants were Grown over the Bed. The necessary recommended cultural practices like Panchagavya application, irrigation and weeding.

2.1 Statistical Analysis

The data recorded during the course of the investigation were subjected to statistical analysis as per the method of analysis of variance [1]. This investigation was done in the RBD statistical method. The significance and non-significance of the treatment effect were judged with the help of 'f' value (variance ratio) and compared with the table value at a 5% level of significance. If the calculated value exceeds then the value, the effect of considered to be significant. The significant difference between the means was tested against the critical difference at a 5% level of significance.

2.2 Treatments

The present investigation had following treatments T0-control, T1-Drenching of Panchagavya(3%) at 15 DAS, T2 - Drenching of Panchagavya(3%) at 30 DAS, T3 - Drenching of Panchagavya(6%) at 15 DAS, T4- Drenching of Panchagavya(6%) at 30 DAS, T5- Drenching of Panchagavya(9%) at 15 DAS, T6- Drenching of Panchagavya(9%) at 30 DAS, T7 - Foliar spray of Panchagavya (3%) at 15 DAS, T8 - Foliar spray of Panchagavya (3%) at 30 DAS, T9 - Foliar spray of Panchagavya (6%) at 15 DAS, T10 - Foliar spray of Panchagavya (6%) at 30 DAS, T11 - Foliar spray of Panchagavya (9%) at 15 DAS, T12 - Foliar spray of Panchagavya (9%) at 30 DAS.

3. RESULTS AND DISCUSSION

Observations were recorded for growth parameters which are Plant height (cm), Number of node, Number of male flower, Number of female flower, Flowering of 50% female flower, first fruit setting, Number of fruits/plant and the average weight of fruit (gm), Fruit length (cm) and Girth (mm), Fruit Yield (250sq.m). Fruit quality (TSS°brix). In economics parameters are cost of cultivation (Rs/250sq. m), Gross Return (Rs/250sq. m), Net Return (Rs/250sq. m) and Benefit Cost Ratio (Rs/250sq. m).

3.1 Growth Parameters

3.1.1 Plant height (cm)

The Maximum plant height at 30 DAS was recorded in the Treatment 10 (19.83 cm) given in (Table 1). This might be due to application of Panchagavya in different concentration and due to the favourable climatic conditions and sufficient accumulation of photosynthesis in the polyhouse condition

3.1.2 Number of nodes/plant

The Maximum number of node at 30 DAS was recorded in the Treatment 10 (12.00cm) given in (Table 1). This might be due to application of Panchagavya in different concentration. The temperature can be controlled and regulated under protected condition, therefore healthy and better growth of plants can be expected under protected condition.

3.2 Earliness Parameter

3.2.1 Days to emergence of 1st male flower/plant

The first male flower initiation were recorded in the Treatment 6 (28.87) given in (Table 2). This might be due to application of Panchagavya in different concentration and male flower come early reason high temperature, Better environmental conditions and available nutrients seems to have brought quick changes in plant growth and development.

3.2.2 Days to emergence of 1st female flower/plant

The first Female flower initiation were recorded in the Treatment 5 (34.03) given in (Table 2). This might be due to application of Panchagavya in different concentration, Better environmental conditions and available nutrients seems to have brought quick changes in plant growth and development.

3.2.3 Days to 50% flowering/plant

Days of 50% Flowering female flower initiation were recorded in the Treatment 10 (34.67) given in (Table 2). This might be due to application of Panchagavya in different concentration, Better environmental conditions and available nutrients seems to have brought quick changes in plant growth and development.

Table 1. Height of Plant (cm) and number of node/plant as affected by application of Panchagavya in different concentration in protected condition

| Symbol | Treatments | Plant height/plant (cm) 30 DAS | Node/plant 30 DAS |
|--------|--|-----------------------------------|----------------------|
| T0 | Control | 10.42 | 9.47 |
| T1 | Drenching of Panchagavya(3%)at15DAS | 13.17 | 10.67 |
| T2 | Drenching of panchagavya(3%)at30DAS | 12.67 | 9.83 |
| T3 | Drenching of Panchagavya(6%) at 15 DAS | 11.50 | 10.00 |
| T4 | Drenching of Panchagavya(6%)at 30 DAS | 14.00 | 9.30 |
| T5 | Drenching of Panchagavya(9%)at15DAS | 13.80 | 8.17 |
| T6 | Drenching of Panchagavya(9%)at30DAS | 12.17 | 10.00 |
| T7 | Foliar spray of Panchagavya (3%) at 15 DAS | 13.50 | 9.00 |
| T8 | Foliar spray of Panchagavya (3%) at 30 DAS | 11.67 | 9.50 |
| T9 | Foliar spray of Panchagavya (6%) at 15 DAS | 9.50 | 8.00 |
| T10 | Foliar spray of Panchagavya (6%) at 30 DAS | 19.83 | 12.00 |
| T11 | Foliar spray of Panchagavya (9%) at 15 DAS | 15.97 | 10.33 |
| T12 | Foliar spray of Panchagavya (9%) at 30 DAS | 14.17 | 10.00 |
| | F TEST | S | S |
| | SE(m) ± | 0.33 | 0.25 |
| | C.D. at 5% | 0.97 | 0.72 |
| | C.V. (%) | 4.11 | 4.36 |

Table 2. Days to emergence of 1st male flower/plant, Days to emergence of 1st female flower/plant, Days to 50% flowering/plant and Days to first fruit setting/plant as affected by application of Panchagavya in different concentration in protected condition

| Symbol | Treatments | Days to emergence of 1 st male flower /plant | Days to emergence of 1 st female flower/plant | Days to 50% female flower/plant | Days to 1 st fruit setting/per plant |
|--------|--|---|--|---------------------------------|---|
| T0 | Control | 33.67 | 35.83 | 34.67 | 42.50 |
| T1 | Drenching of Panchagavya (3%) at15DAS | 34.67 | 36.83 | 36.00 | 43.83 |
| T2 | Drenching of panchagavya (3%) at30DAS | 33.33 | 36.00 | 35.00 | 43.17 |
| T3 | Drenching of Panchagavya (6%) at 15 DAS | 31.17 | 38.50 | 37.67 | 45.17 |
| T4 | Drenching of Panchagavya (6%)at 30 DAS | 30.93 | 39.33 | 37.67 | 45.50 |
| T5 | Drenching of Panchagavya (9%) at15DAS | 31.17 | 34.03 | 37.67 | 45.17 |
| T6 | Drenching of Panchagavya (9%) at30DAS | 28.87 | 37.33 | 36.00 | 44.33 |
| T7 | Foliar spray of Panchagavya (3%) at 15 DAS | 33.83 | 37.50 | 37.00 | 44.67 |
| T8 | Foliar spray of Panchagavya (3%) at 30 DAS | 34.67 | 37.50 | 39.33 | 44.17 |
| T9 | Foliar spray of Panchagavya (6%) at 15 DAS | 34.33 | 37.00 | 35.67 | 43.33 |
| T10 | Foliar spray of Panchagavya (6%) at 30 DAS | 33.17 | 36.50 | 34.67 | 43.17 |
| T11 | Foliar spray of Panchagavya (9%) at 15 DAS | 33.67 | 36.83 | 36.33 | 43.00 |
| T12 | Foliar spray of Panchagavya (9%) at 30 DAS | 34.67 | 38.83 | 40.67 | 43.33 |
| | F TEST | S | S | S | S |
| | SE(m) ± | 0.78 | 0.91 | 0.88 | 0.51 |
| | C.D. at 5% | 2.30 | 2.68 | 2.57 | 1.51 |
| | C.V. (%) | 4.11 | 4.27 | 4.12 | 3.74 |

3.2.4 Days to 1st fruit setting/plant

Days to first fruit setting were recorded in the treatment 11 (43.00) given in (Table 2). This might be due to application of Panchgavya in different concentration. The temperature can be controlled and regulated under protected condition, therefore healthy and better growth of plants can be expected under protected condition.

3.3 Yield Parameter

3.3.1 No. of fruits per plant

The Maximum number of fruits per plant were recorded in the treatment 9 (4.67) given in (Table 3). This might be due to application of Panchagavya in different concentration. The temperature can be controlled and regulated

under protected condition, therefore healthy and better growth of plants can be expected under protected condition.

3.3.2 Avg. weight/Fruits(g)

The Maximum average weight of 1 fruit (g) were recorded in the treatment 7 (197.50 g) given in (Table 3). This might be due to application of Panchagavya in different concentration. The temperature can be controlled and regulated under protected condition, therefore healthy and better growth of plants can be expected under protected condition.

3.3.3 Fruit length (cm)

The Maximum Fruit diameter were recorded in the treatment 6 (25.00 cm) given in (Table 3). This might be due to application of Panchagavya

Table 3. Number of fruits per plant, Avg. weight/Fruits(g), Fruit length (cm), Fruit girth (mm), Fruit yield /plant (Kg) and Yield 250 m² (Quintal) as affected by application of Panchagavya in different concentration in protected condition

| Symbol | Treatments | Number of fruit/plant | Avg weight/Fruit(g) | Fruit length (cm) | Fruit girth (mm) | Fruit yield /plant (Kg) | Fruit yield per 250 m ² (q) |
|--------|--|-----------------------|---------------------|-------------------|------------------|-------------------------|--|
| T0 | Control | 3.50 | 138.00 | 20.00 | 12.00 | 0.687 | 2.32 |
| T1 | Drenching of Panchagavya(3%)at15DAS | 4.00 | 134.50 | 20.00 | 11.00 | 0.713 | 2.37 |
| T2 | Drenching of panchagavya (3%) at30DAS | 4.11 | 153.20 | 22.00 | 11.50 | 0.860 | 2.86 |
| T3 | Drenching of Panchagavya(6%) at 15 DAS | 4.00 | 163.00 | 21.00 | 14.00 | 0.920 | 2.38 |
| T4 | Drenching of Panchagavya(6%)at 30 DAS | 4.00 | 134.50 | 23.00 | 13.00 | 0.667 | 2.24 |
| T5 | Drenching of Panchagavya(9%)at15DAS | 3.33 | 133.50 | 20.00 | 15.00 | 0.617 | 2.25 |
| T6 | Drenching Panchagavya(9%)at30DAS | 3.83 | 140.50 | 25.00 | 16.00 | 0.747 | 2.48 |
| T7 | Foliar spray of Panchagavya (3%) at 15 DAS | 4.50 | 197.50 | 23.00 | 14.00 | 1.113 | 3.71 |
| T8 | Foliar spray of Panchagavya (3%) at 30 DAS | 4.17 | 174.50 | 21.00 | 10.00 | 1.043 | 3.27 |
| T9 | Foliar spray of Panchagavya (6%) at 15 DAS | 4.67 | 133.50 | 20.00 | 11.00 | 0.800 | 3.03 |
| T10 | Foliar spray of Panchagavya (6%) at 30 DAS | 3.67 | 147.50 | 21.00 | 11.00 | 0.703 | 2.45 |
| T11 | Foliar spray of Panchagavya (9%) at 15 DAS | 3.67 | 125.40 | 22.00 | 12.00 | 0.623 | 2.07 |
| T12 | Foliar spray of Panchagavya (9%) at 30 DAS | 3.33 | 160.50 | 21.00 | 11.00 | 0.753 | 2.48 |
| | F TEST | S | S | S | S | S | S |
| | SE(m) ± | 0.17 | 2.97 | 0.52 | 0.26 | 0.02 | 0.11 |
| | C.D. at 5% | 0.50 | 8.71 | 1.54 | 0.77 | 0.05 | 0.33 |
| | C.V. (%) | 7.62 | 3.45 | 4.22 | 3.67 | 3.45 | 7.50 |

Table 4. TSS (°Brix) as affected by application of Panchagavya in different concentration in protected condition

| Symbol | Treatments | Fruit quality TSS°brix |
|--------|--|------------------------|
| T0 | Control | 3.20 |
| T1 | Drenching of Panchagavya(3%)at15DAS | 3.20 |
| T2 | Drenching of panchagavya(3%)at30DAS | 3.12 |
| T3 | Drenching of Panchagavya(6%) at 15 DAS | 3.12 |
| T4 | Drenching of Panchagavya(6%)at 30 DAS | 3.12 |
| T5 | Drenching of Panchagavya(9%)at15DAS | 3.12 |
| T6 | Drenching of Panchagavya(9%)at30DAS | 3.20 |
| T7 | Foliar spray of Panchagavya (3%) at 15 DAS | 3.20 |
| T8 | Foliar spray of Panchagavya (3%) at 30 DAS | 3.20 |
| T9 | Foliar spray of Panchagavya (6%) at 15 DAS | 3.11 |
| T10 | Foliar spray of Panchagavya (6%) at 30 DAS | 3.11 |
| T11 | Foliar spray of Panchagavya (9%) at 15 DAS | 3.22 |
| T12 | Foliar spray of Panchagavya (9%) at 30 DAS | 3.22 |
| | F TEST | NS |
| | SE(m) ± | 0.07 |
| | C.D. at 5% | NS |
| | C.V. (%) | 4.06 |

in different concentration. The temperature can be controlled and regulated under protected condition, therefore healthy and better growth of plants can be expected under protected condition.

3.3.4 Fruit girth (mm)

The Maximum Fruit diameter were recorded in the treatment 6 (16.00 mm) given in (Table 3). This might be due to application of Panchagavya in different concentration. The temperature can be controlled and regulated under protected condition, therefore healthy and better growth of plants can be expected under protected condition.

3.3.5 Fruit yield/plant (kg)

The Maximum Fruit yield/plant were recorded in the treatment 7 (1.113 kg) given in (Table 3). This might be due to application of Panchagavya in different concentration. The temperature can be controlled and regulated under protected condition, therefore healthy and better growth of plants can be expected under protected condition.

3.3.6 Yield 250 sqm (Quintal)

The Maximum Fruit yield Yield 250 sqm (q) were recorded in the treatment 7 (3.71q) given in (Table 3). This might be due to application of Panchagavya in different concentration. The temperature can be controlled and regulated under protected condition, therefore healthy and

better growth of plants can be expected under protected condition.

3.4 Fruit Quality

3.4.1 TSS°Brix

The Maximum TSS (°Brix) were recorded in the treatment 11 and 12 (3.22°Brix) given in (Table 4). This might be due to application of Panchagavya in different concentration. The temperature can be controlled and regulated under protected condition, therefore healthy and better growth of plants can be expected under protected condition.

4. CONCLUSION

From the present investigation it is concluded that the T10 Performed best in terms of growth (Plant Height (19.83 cm) and Number of node/plant (12.00). The T6 is best performed in terms of days to emergence of 1st male flower/plant (28.87) and T5 is best performed in terms of days to emergence of 1st female flower/plant (34.03).The T10 is best performed in terms of Days to 50% female flower/plant (34.67), T11 performed best in term of days to 1st fruit setting/plant (43.00) and the T9 best performed in terms of Number of fruits/plant (4.67),the T7 Performed best in terms of average weight of fruit (197.50g). The T6 performed best in term of Fruit length and Girth (25.00 Cm) and (16.00mm). The T7 performed best in term of Fruit Yield/plant (1.113 kg) and Fruit yield per 250 m² (3.71q). The T11 and 12 performed best

in term of Fruit quality TSS°brix (3.22). whereas, the T7 reorded highest benefit cost ratio (2.42). Therefore it was recommended that, foliar spray of Panchagavya 3% at 15 DAS were best for Zucchini plant.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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