**Original Research Article**

**Determining the effect of Panchgavya and Jeevamrutha on Growth and Yield Parameters of Chilli (*Capsicum annum* L.)**

**ABSTRACT**

The present investigation highlights the effect of Panchgavya and Jeevamrutha on the Growth and Yield Parameters of Chilli (*Capsicum annum* L.) during *Rabi* season 2022-23 at Research Field, Department of Horticulture, Udai Pratap Autonomous College Varanasi. The field trial was conducted in RBD with thrice replication and seven treatments including control. The data observation on growth and yield attributes on Chilli at 30, 60, and 90 days after transplanting. For the observation, five plants are randomly selected from each plot. The application of (T5) 75% RDF + 4% Panchgavya + 400 litre/ha Jeevamrutha was found most significant in growth and yield attributes of green Chilli including plant height, number of leaves per plant, number of branches per plant, and fruit length, girth and fruit yield per plant and fruit weight followed by all the other treatments. The application of a combination of RDF, Panchgavya, and Jeevamrutha showed better results on the growth and yield attributes of Chilli.

**Keywords:** *Capsicum annum,* inorganic fertilizers, crop productivity, micronutrients

**Introduction:**

Chilli (*Capsicum annum* L.) is one of the most important vegetable crops belonging to the Solanaceae family (Jadhav *et al*., 2014). It is a horticultural plant that is popular around the world, which are used for cooking spices, bottled sauces, and various types of sauces (Azizi, 2021). The Chilli originates from Peru and Mexico, the Chilli was brought to India by the Portuguese in the 15th century. In the 17th Century, its cultivation became popular (Naik, 2006). Chilli was growing in India in suitable conditions. The genus *Capsicum* includes five species which are *C. annum, C. frutescens, C. pubescens, C. baccatum,* and *C. chinensis* (Singh, 2024). The Chilli production in India is reported around 19.14 lakh tonnes with a 7.43 lakh hectare area and 14.92 thousand metric tons Chilli yield was gained from Uttar Pradesh state (Anonymous, 2023). After that, Chilli is the most demandable vegetable and spice crop for this crop productivity increases should use highly inorganic fertilizers. Inorganic fertilizers have a bad impact on the environment and human health (Korat et al., 2024). Organic farming based on cows has long been used for its dual benefits of increasing crop yield and improving soil fertility. For centuries, people have utilized well-known organic fertilizers made from cow dung and urine.
Panchgavya is a traditional organic product made from five different cow products: milk, ghee, curd, urine, and dung. It can improve plant development and immunity, giving them defense against pests and illnesses. Panchgavya has several mineral nutrients such as N, P, K, and some other micronutrients which are necessary for the growth and development of Chilli (Rakesh *et al*., 2017). Amino acids, vitamins, and plant growth regulators (PGRs) were also present in Panchgavya (Sreenivasa *et al*., 2010). It has several beneficial microorganisms such as *Pseudomonas, Azatobacter,* and phosphorus-solubilizing bacteria, etc (Singh *et al*., 2018). Jeevamrutha is a liquid-type manure that is prepared by using cow dung, cow urine, gram flour, jaggery, and soil (Kumar et al., 2022). The cow dung and cow urine have beneficiary properties that improve soil fertility. Jeevamrutha application is increasing the production of Chilli yield (Boraiah *et al*., 2017). It promotes the biological activity of soil and makes the availability of nutrients to crops.

**Materials and Methods**

The experiment was carried out at the Main Research Field, Department of Horticulture, Udai Pratap (Autonomous) College, Varanasi (U.P.) during the *Rabi* season 2022-23. The experimental sites come under Humid-Sub tropical climate which is located at above 128.94 MSL. The soil of the experimental site is Sandy loam and slightly alkaline with medium fertility. The trial was taken with Randomized Block Design (RBD) including three replications and seven treatments with untreated plots. The total area of the experimental field was 189 m2  with a 3m x 2.5 m plot size. The maintaining the spacing between plant and row was 60cm x 45cm.

**Table 1: Details of the treatments**

|  |  |
| --- | --- |
| **Treatments** | **Combination of Treatments** |
| **T0** | Control (100% RDF) |
| **T1** | 75% RDF + 4% Panchgavya |
| **T2** | 75% RDF + 400 litre/ha Jeevamrutha |
| **T3** | 50% RDF + 4% Panchgavya |
| **T4** | 50% RDF + 400 litre/ha Jeevamrutha |
| **T5** | 75% RDF + 4% Panchgavya + 400 litre/ha Jeevamrutha |
| **T6** | 50% RDF + 4% Panchgavya + 400 litre/ha Jeevamrutha |

**Method of Preparation of Panchgavya**

Panchgavya is a special formulation made from five by-products of cows along with certain other ingredients. The ingredients which are used for the preparation of Panchgavya *viz.,* Fresh Cow Dung, Cow urine, water, cow milk, cow curd, cow ghee, sugarcane juice, tender coconut juice, ripened banana, and yeast. Among all the ingredients mix together in a wide-mouthed mud pot/ concrete tank or plastic bucket. The content is to be stirred twice a day both morning and evening. The sugarcane juice and coconut water are used to accelerate fermentation. For increasing the fermentation rate mix the 100 g yeast powder (Natrajan, 2002).

Panchgavya has various types of nutrients in various quantities including pH (6.82), soluble salt (1.88dsm-1), Nitrogen (1000 ppm), Phosphorus (175.40 ppm), Potassium (194.10 ppm), Zinc (1.27 ppm), Copper (0.38 ppm), Iron (29.71 ppm) and Manganese (1.84 ppm) (Narendhiran, 2014).

**Application method of Panchgavya**

The application of Panchgavya @ of 2% (20 ml per litre) and 4% (40 ml per litre) at 30 days and 50 days after transplanting.

**Method of preparation of Jeevamrutha**

Jeevamrutha is prepared by mixing 10 kg of local cow dung with 10 litres of cow urine, adding 2 kg local jaggery, 2 kg local jaggery, 2 kg pulse flour, and a handful of garden soil, and the volume is made up to 200 litres. Keep the drum in shade covering it with a wet gunny bag stir the mixture clockwise thrice a day and incubate.Mix 10 kg of desi cow dung, 10 litre of desi cow urine, 2 kg of jaggery, 2 kg of pulse flour, and a hand full of soil in 200 litre of water and ferment it for 10 days. It can be applied to soil by diluting it with irrigation water @ 500 lit ha-1.The average nutrient content of *Jeevamrutha* is nitrogen 1.48%, phosphorus 0.28%, and potassium 0.32%.

**Application method of Jeevamrutha**

Add 100 ml of Jeevamrutha to 1 litre of water. Spray it to the base of the stem (where it meets soil) every 10-15 days (twice a month). Microorganism decay will begin 7 days after the fertilizer is applied to the soil. Don't water plants for 24 hours after spraying the fertilizer.

**Observations**

Growth parameters such as plant height, plant girth, and leaves per plant were recorded at 30, 60, and 90 days after transplanting. The days taken to 50% flowering were carried from transplanting to the initiation of flowering in 50% plants. The yield and yield attributes, including fruit length, number of fruits per plant, fruit diameter, and fruit yield (kg/plant), were recorded at harvest time.

**Result and Discussion**

The application of Panchgavya and Jeevamrutha as a foliar spray in combination with a recommended dose of fertilizers and solely spray. The application of these significantly increased the plant height, number of branches per plant, number of flowers per plant, number of leaves per plant, number of fruits per plant, chili fruit length and girth, weight, and yield per plant.

**Growth parameters**

Among all the treatment applications, the (T6) 75% RDF + 4% Panchgavya + 400 litre/ha Jeevamrutha was found to have significantly higher plant height (81.34 cm, 90.67 cm, and 119 cm) at 30, 60, and 90 days after transplanting, respectively. About all combinations of treatments, (T7) 50% RDF + 4% Panchgavya + 400 litre/ha Jeevamrutha was recorded plant height (79 cm, 90.40 cm, and 117 cm), at 30, 60, and 90 days after transplanting, respectively followed by (T3) 75% RDF + 400 litre/ha Jeevamrutha (77 cm, 89.10 cm, and 113 cm), (T2) 75% RDF + 4% Panchgavya (75 cm, 88.07 cm, and 113 cm), (T5) 50% RDF + 400 litre/ha Jeevamrutha (66.67 cm, 84.54 cm, and 103 cm) at 30, 60, and 90 days after transplanting, respectively. The lowest plant height (63 cm, 78.20 cm, and 101.34 cm) was recorded from (T4) 50% RDF + 4% Panchgavya. All treatments were found significant as compared to (T0) Control (100% RDF) (58.34 cm, 75.07 cm, and 97.67 cm) at 30, 60, and 90 days after transplanting, respectively (Table 2). A similar finding was reported by Sanjutha *et al.* (2008), Gore and Sreenivasa (2011), and Sreenivasa *et al*., (2010) in Chilli.

The maximum number of leaves per plant (36.20 cm, 55.75 cm, and 86.25 cm) were observed under the treatment T6 (75% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha) followed by 35.10, 54.20, and 85.80 were observed for T7 (50% RDF + 4% Panchgavya + 400 litre/ha Jeevamrutha) at 30, 60 and 90 DAT as compare to other treatments. However, it was lowest (27.80, 46.20, and 75.40) in treatment T1 (Control) at 30, 60, and 90 DAT, respectively. A similar finding was also reported by Mathews *et al*., (2017) and Maheshwari *et al*., (2017) that the treated plants with a combination of Panchgavya and Jeevamrutha have the highest number of leaves per plant. Treatment T6 (75% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha) was found significant maximum number of branches/plant (15.54) followed by (14.85) in treatment T7 (50% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha) as compare to other treatments. While the minimum number of branches/plants (8.50) was observed under the treatment T1 (Control). Ali *et al.*, (2011) also reported that the maximum number of branches per plant was noticed from Panchgavya and Jeevamrutha combination treated plants. The treatment T6 (75% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha) found a significant maximum number of flowers per plant (84.60) followed by (81.30) in treatment T7 (50% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha) as compare to other treatments. While the minimum number of flowers per plant (48.92) was observed under the treatment T1 (Control). These results are also similar to the findings of Patil *et al*., (2006) and Sanjutha *et al*., (2008) that the minimum number of flowers was recorded from the control plot whereas the maximum number of flowers was reported from the combination of Panchgavya and Jeevamrutha treated plot.

**Yield parameters**

From the data (Table 3) it was shown that the maximum number of fruits per plant (136.90) was shown by treatment T6 (75% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha) which was significantly higher followed by (133.86) in treatment T7 (50% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha) than other treatments. The minimum number of fruits (116.50) was observed under the treatment T1 (Control). The present findings were similar to the findings of Rukhsana *et al.*, (2018) that the maximum number of fruits was recorded from the combination of Panchgavya and Jeevamrutha plots. The significantly higher fruit length (11.97 cm) was noted in the case of T6 (75% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha) over all the remaining treatments. However, this was equally followed by (11.43 cm) in treatment T7 (50% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha). Whereas T1 (Control) recorded the lowest fruit length (8.23 cm). Umaira (2017) also reported that the present results were similar to them. Among the several treatment combinations, T6 (75% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha) recorded significantly higher (0.48 kg) fruit weight per plant followed by (0.47 kg) in treatment T7 (50% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha). While the treatment T1 (Control) had the minimum (0.41 kg) fruit weight per plant. Results obtained from the integration of Panchagavya and Jeevamrutha varied significantly for the fruit yield in q/ha. Among the treatments, T6 (75% RDF + 4% Panchagavya + 400 litre/ha Jeevamrutha) recorded significantly higher (243.33 q/ha) fruit followed by T7 (232.96 q/ha). While the treatment T1 (Control) had the minimum yield (176.66 q/ha) followed by T4 (185.55 q/ha). The present findings were similar to Kumar and Shashidhara (2006) and Reddy *et al*., (2017).

**Table 2: Effect of Panchgavya and Jeevamrutha on the growth attributes of Chilli**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatments | Plant Height(cm) | Number of leaves plant -1 | Number of branches plant-1 | Number of flowers plant-1 |
| **30 DAT** | **60 DAT** | **90 DAT** | **30 DAT** | **60 DAT** | **90 DAT** |
| T0: Control (100% RDF) | 58.34 | 75.07 | 97.67 | 27.81 | 46.20 | 75.40 | 8.50 | 48.92 |
| T1: 75% RDF + 4% Panchgavya | 75.00 | 88.07 | 113.00 | 32.90 | 52.10 | 82.27 | 13.70 | 78.90 |
| T2: 75% RDF + 400 litre/ha Jeevamrutha | 77.00 | 89.10 | 115.00 | 33.40 | 53.60 | 82.90 | 14.40 | 78.80 |
| T3: 50% RDF + 4% Panchgavya | 63.00 | 78.20 | 101.34 | 28.70 | 47.70 | 78.20 | 11.55 | 71.36 |
| T4: 50% RDF + 400 litre/ha Jeevamrutha | 66.67 | 84.54 | 103.00 | 29.30 | 48.12 | 79.30 | 13.70 | 72.20 |
| T5: 75% RDF + 4% Panchgavya + 400 litre/ha Jeevamrutha | 81.34 | 90.67 | 119.00 | 36.20 | 55.70 | 86.25 | 15.54 | 84.60 |
| T6: 50% RDF + 4% Panchgavya + 400 litre/ha Jeevamrutha | 79.00 | 90.40 | 117.00 | 35.10 | 54.20 | 85.80 | 14.85 | 81.30 |
| Sem(±) | **0.81** | **1.27** | **1.92** | **0.67** | **0.51** | **1.37** | **0.22** | **1.25** |
| CD (0.05%) | **2.51** | **3.91** | **5.92** | **2.04** | **1.55** | **4.22** | **0.67** | **3.86** |

**Table 3: Effect of Panchgavya and Jeevamrutha on the yield attributes of Chilli**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatments | Number of fruit plants -1 | Fruit length plants-1 | Fruit weight plants-1 | Fruit yield (q/ha) |
| T0: Control (100% RDF) | 116.50 | 8.23 | 0.41 | 176.66 |
| T1: 75% RDF + 4% Panchgavya | 131.20 | 10.90 | 0.45 | 218.51 |
| T2: 75% RDF + 400 litre/ha Jeevamrutha | 133.60 | 11.24 | 0.46 | 227.40 |
| T3: 50% RDF + 4% Panchgavya | 119.50 | 9.87 | 0.42 | 185.55 |
| T4: 50% RDF + 400 litre/ha Jeevamrutha | 126.70 | 10.28 | 0.43 | 201.48 |
| T5:75% RDF + 4% Panchgavya + 400 litre/ha Jeevamrutha | 136.90 | 11.97 | 0.48 | 243.33 |
| T6:50% RDF + 4% Panchgavya + 400 litre/ha Jeevamrutha | 133.86 | 11.43 | 0.47 | 232.96 |
| Sem(±) | **2.36** | **0.17** | **0.01** | **3.28** |
| CD (0.05%) | **7.26** | **0.53** | **0.02** | **10.11** |

**Conclusion**

The present findings were more satisfactory in treating the Chilli plant with the integration of Panchgavya and Jeevamrutha than solely. The combination of Panchgavya and Jeevamrutha found the most effective results as compared to spraying separately. Among all the treatments, the T6 (75% RDF + 4% *Panchagavya* + 400 litre/ha *Jeevamrutha*) was found as the best treatment combination. The application of a combination of RDF, Panchgavya, and Jeevamrutha showed better results on the growth and yield attributes of Chilli.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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