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EFFECT OF I.N.M. AND NATURAL BIO-STIMULANTS FOR IMPROVING THE GROWTH, YIELD AND BULB QUALITY OF ONION (*ALLIUM CEPA* L.)

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ABSTRACT

This work was carried out during the *rabi* season of 2022-2023 and 2023-2024 at Horticulture Research Center of SVPVA & T Modipuram Meerut U.P., Indiato investigate the effect of integrated nutrient management and natural Bio-stimulates *i.e.* Beejamrit and Jeevamrit for improving the growth, yield and bulb quality of onion. The experiment was laid out in a randomized block design with 3 replications. Results indicated that application of RDF 75% + Beejamrit 8% + Jeevamrit 8% had the highest effect on number of leaves per plant, height of the plant, leaf length and duration of crop, but 50% RDF with bio-stimulants Beejamrit 10% and Jeevamrit 10% give superior effect on bulb diameter, fresh bulb weight, dry bulb weight, yield per plot and bulb yield. The foliar application of different concentration of Beejamrit and Jeevamrit led to improve vegetative growth, yield and bulb quality of onion.

Key words: Beejamrit, bio-stimulants, Jeevamrit, onion and organic manures

Introduction

Onion (*Allium cepa* L.) is one of the most important commercial bulbous vegetable crops grown in India. Onion is ranked third in production and second in area among all vegetables. Among all the fruits and vegetables, onions are the most valuable crop in terms of foreign exchange earnings in addition to their importance for domestic consumption (Prajapati *et al.*, 2022). The total area under onion in India is about 1.91 million hectares with production of 31.27 million tonnes and yield 16339 kg/hectare in the year 2021-22. The states of Maharashtra, Madhya Pradesh, Karnataka, Gujarat, Rajasthan, Bihar, West Bengal, Andhra Pradesh, Tamil nadu, Haryana and Uttar Pradesh are the major producers of onions in the India (Anonymous, 2021-22). The mineral content of onion bulbs is high, including phosphorus, calcium, and vitamin C. Onions are pungent because of volatile oil (allyl-propyl disulphide) (Waniese *et al.*, 2023a). Since onions are surface feeders, they need a high level of nutrition. Finding

organic supplement sources is necessary to maintain soil fertility and achieve sustainable crop production, as the overuse of chemical fertilizers has depleted the soil environment and decreased the amount of organic matter in the soil as well as the yield and quality of crops (Waniese *et al.*, 2023b). K application is one of the most significant variables affecting onion development and production as it is crucial for sugar translocation (Awatef *et al.*, 2015). Organic farming system is not new in India, it has been done since ancient times. The main objective of organic farming is to cultivate the soil and grow crops using organic waste like crops, animals, farm waste and aquatic waste etc., so that the soil remains alive and healthy. Organic materials are used along with beneficial microbes to release nutrients to crops to increase sustainable production in an eco-friendly, pollution-free environment. Therefore, in this study, the effect of INM, Beejamrit and Jeevamrit has been tested in the onion crop based on organic farming.

Table 1: Effect of integrated nutrients managements & bio-stimulants on the yield & quality of onion (2022-23).

| Treatment | Number of Leaves /plants | | | Height of the Plant(cm) | | | Leaf Length (cm) | | | Duration of crop (days) | | | Shelf life in Normal room Condition (days) | | |
|--|--------------------------|-----------|------|-------------------------|-----------|-------|------------------|-----------|-------|-------------------------|-----------|--------|--|-----------|--------|
| | Rabi-2022 | Rabi-2023 | Avg | Rabi-2022 | Rabi-2023 | Avg | Rabi-2022 | Rabi-2023 | Avg | Rabi-2022 | Rabi-2023 | Avg | Rabi-2022 | Rabi-2023 | Avg |
| T1:RDF (100:50:50,NPK) | 433 | 433 | 433 | 24.57 | 24.27 | 24.42 | 23.34 | 23.67 | 23.51 | 146.67 | 146.00 | 146.33 | 70.00 | 68.00 | 69.00 |
| T2:RDF25% + Beejamrit 10% + Jeevamrit 10% TwoSpray | 300 | 313 | 307 | 23.03 | 22.33 | 22.68 | 22.00 | 22.00 | 22.00 | 141.00 | 141.67 | 141.33 | 98.33 | 96.00 | 97.17 |
| T3:RDF25% + Beejamrit 10% + Jeevamrit 12% TwoSpray | 333 | 347 | 340 | 23.48 | 22.98 | 23.23 | 22.45 | 22.71 | 22.58 | 143.00 | 143.33 | 143.17 | 116.00 | 115.00 | 115.50 |
| T4:RDF25% + Beejamrit 12% + Jeevamrit 12% TwoSpray | 3.67 | 3.73 | 3.70 | 23.84 | 23.41 | 23.62 | 22.77 | 22.84 | 22.81 | 143.67 | 144.00 | 143.83 | 110.00 | 107.67 | 108.83 |
| T5:RDF50% + Beejamrit 8% + Jeevamrit 8% TwoSpray | 433 | 420 | 427 | 24.22 | 23.75 | 23.99 | 23.12 | 23.22 | 23.17 | 145.00 | 145.33 | 145.17 | 141.67 | 151.00 | 146.33 |
| T6:RDF50% + Beejamrit 8% + Jeevamrit 10% TwoSpray | 500 | 480 | 490 | 24.96 | 24.66 | 24.81 | 23.66 | 24.03 | 23.85 | 147.33 | 148.67 | 148.00 | 134.33 | 138.33 | 136.33 |
| T7:RDF50% + Beejamrit 10% + Jeevamrit 10% TwoSpray | 600 | 580 | 590 | 25.59 | 25.42 | 25.51 | 24.26 | 24.52 | 24.39 | 151.00 | 150.33 | 150.67 | 137.67 | 145.67 | 141.67 |
| T8:RDF75% + Beejamrit 6% + Jeevamrit 6% TwoSpray | 533 | 520 | 527 | 25.21 | 25.04 | 25.13 | 23.91 | 24.21 | 24.06 | 148.67 | 148.67 | 148.67 | 126.00 | 127.33 | 126.67 |
| T9:RDF75% + Beejamrit 6% + Jeevamrit 8% TwoSpray | 633 | 607 | 620 | 26.11 | 25.88 | 25.99 | 24.44 | 24.78 | 24.61 | 153.33 | 152.67 | 153.00 | 129.67 | 133.33 | 131.50 |
| T10:RDF75% + Beejamrit 8% + Jeevamrit 8% TwoSpray | 6.67 | 6.33 | 6.50 | 26.81 | 26.41 | 26.61 | 24.91 | 25.41 | 25.16 | 157.00 | 155.33 | 156.17 | 122.00 | 120.33 | 121.17 |
| C.V. | 11.27 | 10.86 | | 0.53 | 0.57 | | 0.73 | 0.98 | | 0.69 | 0.72 | | 1.71 | 1.91 | |
| C.D. | 0.94 | 0.88 | | 0.23 | 0.24 | | 0.29 | 0.40 | | 1.77 | 1.85 | | 3.50 | 3.97 | |

Materials and Methods

This study was carried out at the Horticulture Research Center of SVPUA & T Modipuram Meerut U.P. during 2022-23 and 2023-24 to investigate the effect of integrated nutrient management and natural Bio-

stimulates i.e., Beejamrit and Beevamrit for improving the growth, yield and bulb quality of onion. The experimental trails were conducted in sandy soil using surface irrigation system through tube well. Onion seed were sowed on 9th and 10th of November for 2020-21

Table 2: Effect of integrated nutrients managements & bio-stimulants on the yield & quality of onion (2022-23).

| Treatment | Bulb Diameter (CM) | | | Fresh Bulb Weight (g) | | | Dry bulb Weight (g) | | | Yield per plot (kg) | | | Yield per hectare (qt) | | |
|--|--------------------|-----------|-----|-----------------------|-----------|-------|---------------------|-----------|-------|---------------------|-----------|--------|------------------------|-----------|--------|
| | Rabi-2022 | Rabi-2023 | Avg | Rabi-2022 | Rabi-2023 | Avg | Rabi-2022 | Rabi-2023 | Avg | Rabi-2022 | Rabi-2023 | Avg | Rabi-2022 | Rabi-2023 | Avg |
| T1:RDF (100:50:50,NPK) | 601 | 587 | 594 | 25.14 | 2497 | 2506 | 24.72 | 2445 | 2459 | 131.60 | 130.73 | 131.17 | 329.00 | 326.83 | 327.92 |
| T2:RDF25% + Beejamrit 10% + Jeevamrit 10% TwoSpray | 543 | 530 | 536 | 23.13 | 2226 | 2270 | 22.70 | 21.73 | 2222 | 118.93 | 121.53 | 120.23 | 297.33 | 303.83 | 300.58 |
| T3:RDF25% + Beejamrit 10% + Jeevamrit 12% TwoSpray | 595 | 575 | 585 | 24.48 | 2455 | 2451 | 24.06 | 24.01 | 24.04 | 128.33 | 128.33 | 128.33 | 320.83 | 320.83 | 320.83 |
| T4:RDF25% + Beejamrit 12% + Jeevamrit 12% TwoSpray | 574 | 551 | 562 | 24.01 | 2371 | 2386 | 23.57 | 23.20 | 23.39 | 125.67 | 126.30 | 125.98 | 314.17 | 315.75 | 314.96 |
| T5:RDF50% + Beejamrit 8% + Jeevamrit 8% TwoSpray | 622 | 602 | 612 | 25.75 | 2565 | 2570 | 25.34 | 25.11 | 25.22 | 134.30 | 135.00 | 134.65 | 335.75 | 337.50 | 336.63 |
| T6:RDF50% + Beejamrit 8% + Jeevamrit 10% TwoSpray | 680 | 673 | 676 | 27.20 | 2803 | 27.61 | 26.76 | 27.44 | 27.10 | 151.50 | 147.80 | 149.65 | 378.75 | 369.50 | 374.13 |
| T7:RDF50% + Beejamrit 10% + Jeevamrit 10% TwoSpray | 696 | 692 | 694 | 28.79 | 2919 | 2899 | 28.33 | 28.63 | 28.48 | 155.37 | 152.07 | 153.72 | 388.42 | 380.17 | 384.29 |
| T8:RDF75% + Beejamrit 6% + Jeevamrit 6% TwoSpray | 648 | 621 | 634 | 26.08 | 2628 | 26.18 | 25.59 | 25.73 | 25.66 | 138.73 | 138.27 | 138.50 | 346.83 | 345.67 | 346.25 |
| T9:RDF75% + Beejamrit 6% + Jeevamrit 8% TwoSpray | 658 | 644 | 651 | 26.64 | 2698 | 26.81 | 26.26 | 26.41 | 26.33 | 143.57 | 139.97 | 141.77 | 358.92 | 349.92 | 354.42 |
| T10:RDF75% + Beejamrit 8% + Jeevamrit 8% TwoSpray | 675 | 658 | 666 | 27.08 | 2731 | 2720 | 26.70 | 26.71 | 26.71 | 146.03 | 143.90 | 144.97 | 365.08 | 359.75 | 362.42 |
| C.V. | 1.71 | 1.32 | | 1.83 | 1.34 | | 1.90 | 1.36 | | 1.57 | 1.29 | | 1.57 | 1.29 | |
| C.D. | 0.19 | 0.14 | | 0.82 | 0.60 | | 0.83 | 0.60 | | 3.72 | 3.05 | | 9.29 | 7.63 | |

and 2021-22 seasons, respectively and transplanted 40 days after of seed sowing before transplanting seedling was treated with Beejamrit @ 6 & 8 percent solution as per treatments. The bio-stimulates Jeevamrit Solution @ 6 and 8 Percent were applied as foliar spray 35 and 45 days after Transplanting. The experimental design was a

randomized block design with 3 replications for each treatment. The plot area was 36.00 m². The experiment included the treatments as T1: RDF (100:50:50, NPK), T2: RDF 25% + Beejamrit 8% + Jeevamrit 8% Two Spray, T3: RDF 25% + Beejamrit 8% + Jeevamrit 10% Two Spray, T4: RDF 25% + Beejamrit 10% + Jeevamrit

10% Two Spray, T5: RDF 50% + Beejamrit 8% + Jeevamrit 8% Two Spray, T6: RDF 50% + Beejamrit 8% + Jeevamrit 10% Two Spray, T7: RDF 50% + Beejamrit 10% + Jeevamrit 10% Two Spray, T8: RDF 75% + Beejamrit 8% + Jeevamrit 8% Two Spray, T9: RDF 75% + Beejamrit 8% + Jeevamrit 10% Two Spray, T10: RDF 75% + Beejamrit 10% + Jeevamrit 10% Two Spray. The data recorded of 10 parameters as: number of leaves per plant, height of the plant (cm), leaf length (cm), duration of crop, shelf life of onion, bulb diameter (cm), fresh bulb weight (gm), dry bulb weight (gm), yield per plot (kg) and yield per hectare (qt). All obtained data were subjected to the statistical analysis and means were compared according to LSD at 5% level test described by Gomez and Gomez (1984).

Result and Discussion

Data presented in the Table 1 shows that, the effect of integrated nutrient management and bio-stimulants on growth- and growth-related characters of onion during 2022 and 2023. The growth and growth related characters recorded significantly higher number of leaves per plant (6.67 and 6.33), height of the plant (26.81 cm and 26.41 cm), leaf length (24.91 cm and 25.41 cm) and duration of crop (157.00 days and 155.33 days) under inorganic with bio-stimulants treatment RDF 75% + Beejamrit 8% + Jeevamrit 8% Two Spray (T₁₀), followed by RDF 75% + Beejamrit 6% + Jeevamrit 8% Two Spray (T₉), RDF 50% + Beejamrit 10% + Jeevamrit 10% Two Spray (T₇) and RDF 75% + Beejamrit 6% + Jeevamrit 6% Two Spray (T₈). While, the lowest value of growth characters were recorded in RDF 25% + Beejamrit 10% + Jeevamrit 10% Two Spray (T₂) in both season of 2022 and 2023. This might be due to the fact that application of integrated nutrient management with beejamrit and jeevamrit resulted in vigorous vegetative growth of the plant and imparted dark green colour to the foliage which favoured photosynthetic activity of the plant and greater synthesis of carbohydrate in the leaves leading to formation of alkaloids, amides, amino acids, nucleo-proteins and chlorophyll, etc. (Kaswan *et al.* 2017). This compound is very important for building of new tissue and several metabolic processes. These results agree with the findings of Bijjula and Somasundaram (2019), Praveenkumar *et al.* (2014), Sundharaiya *et al.* (2016) and Sundharaiya *et al.* (2017). The application RDF 50% + Beejamrit 8% + Jeevamrit 8% Two Spray (T₅) recorded highest shelf life of onion at normal room temperature followed by RDF 50% + Beejamrit 10% + Jeevamrit 10% Two Spray (T₇), RDF 50% + Beejamrit 8% + Jeevamrit 10% Two Spray (T₆) and RDF 75% + Beejamrit 6% + Jeevamrit 8% Two Spray (T₉) in both season of 2022 and 2023. The

shelf life is very important character for the quality of onion. The positive effect of foliar application of RDF 75% + Beejamrit 8% + Jeevamrit 8% Two Spray have been repeatedly reported on onion, for instance, it significantly increased vegetative growth parameters of potato (Gomaa *et al.*, 2005).

Data showing the effect of integrated nutrient management and bio-stimulants on yield and yield related characters of onion during 2022 and 2023 in presented in Table 2. The application RDF 50% + Beejamrit 10% + Jeevamrit 10% Two Spray (T₇) recorded highest bulb diameter (6.96 and 6.92 cm), fresh bulb weight (28.79 and 29.19 g), dry bulb weight (28.33 and 28.63 g), yield per plot (155.37 and 152.07 kg) and bulb yield (388.42 and 380.17 qha⁻¹), followed by RDF 50% + Beejamrit 8% + Jeevamrit 10% Two Spray (T₆), RDF 75% + Beejamrit 8% + Jeevamrit 8% Two Spray (T₁₀) and RDF 75% + Beejamrit 6% + Jeevamrit 8% Two Spray (T₉) and minimum value of yield characters were recorded in RDF 25% + Beejamrit 10% + Jeevamrit 10% Two Spray (T₂) in both season of 2022 and 2023. The superiority in bulb yield and quality of onion by foliar spray of Beejamrit and Jeevamrit increase bulb diameter, fresh and dry bulb weight and bulb yield per plot and per hectare. This might be due to the favorable effect of such treatment on yield which may increase the efficiency of photosynthetic capacity and this in turn resulted in best bulb yield and quality of onion. These results agree with the findings of Prajapati and Vekariya (2022), Mohamed *et al.*, (2020), Al-babilie and Rawaa (2018), Shafeek *et al.*, (2015) and Babilie *et al.*, (2020). The reason for increased bulb yield with the application of RDF could be attributed to solubilisation effect of nutrients by the addition of Beejamrit and Jeevamrit leading to increased uptake of nutrients especially NPK as reported by Raina and Jaggi, (2008).

Conclusion

This study demonstrated that the 75% RDF with bio-stimulants Beejamrit 8% and Jeevamrit 8% induced positive effects on growth and storability of onion, but 50% RDF with bio-stimulants Beejamrit 10% and Jeevamrit 10% give superior effect on bulb diameter, fresh bulb weight, dry bulb weight, yield per plot and bulb yield. The foliar application of different concentration of Beejamrit and Jeevamrit led to improve vegetative growth, yield and bulb quality of onion.

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