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Effect of PGR and Micronutrients on Growth, Yield and Quality of Strawberry (*Fragaria × ananassa*) cv. Winter Dawn

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Authors' contributions

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

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ABSTRACT

The experiment was laid out in Randomized Block Design which had 8+1(control) Treatments replicated thrice. The vegetative growth and fruit yield is concerned, application of different treatment of Plant Growth Regulator and Micronutrient significantly enhanced the Plant Height(cm), Number of leaves per plant, Plant Spread(cm) and Yield. Maximum (Plant Height(19.00cm), No. of

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leaves (20.67), leaf area (130.33 cm2), Plant spread (25.50 cm), (No. of fruit per plant (20.44), No. of flower per plant (32.00), fruit yield (9.21q/ha) were recorded best in treatment T2 (75 ppm Gibberellic acid) in terms of Vegatative Parameter.

Keywords: Micronutrients; fruit growth; fruit plant growth regulator; organic manures fruit; nutrient management; bioregulators.

1. INTRODUCTION

The modern cultivation of strawberry (Fragaria x ananassa Duch) is a hybrid between two largely dioecious octaploid species, Fragaria chiloensis and Fragaria verginiana. Fragaria species belongs to the family Rosaceae, with basic chromosome number x=7. However the cultivated strawberry, (Fragaria x ananassa), is an octaploid having chromosome number of 2n=56. In addition to Fragaria x ananassa the genus fragaria includes atleast 17 other species including diploids, tetraploids, octaploids and a hexaploids. Initially strawberry was growing in temperate zone of the country. However, it can also be cultivated under subtropical climate, even at higher altitudes of tropical climate and it is propagated through one year old runners.

Nutritionally strawberry is a low calorie carbohydrate fruit but a rich source of vitamin A (60IU/100g of edible portion), vitamin C (30-120mg/100g of edible portion) and fiber and also has high pectin (0.55%), available in the form of calcium pectate. Water is a major constituent (90%) of strawberry fruit. The strawberry fruit contains 5 percent of total sugar and 0.90 to 1.85% acids the prominent being malic acid, citric acid and succinic acid, with traces of quinic, glyceric, glycolic and oxalo acetic acid. Ripe strawberries attain attractive red colour on sudden rise in temperature after commencement of Fruiting in February. The fruits are delicious and attractive , having pleasant aroma and a delicate flavour.

In strawberry Ellagic acid is a naturally occurring plant phenol , it has been found to inhibit the cancer disease**.** It also controls asthma by the regular consumption of his fruits.

The quality and yield of fruit depends on different attributes which are closely associated with nutrient uptake by the plant. The supply of nutrients to the plants should be balanced, ensuring not to over or underfertilize. In addition to NPK, micronutrients have a great bearing in influencing the yield attributes and fruit production. Micronutrients are essentially as important as macronutrients to have better growth, yield and quality in plants. In the past, there was no need of micronutrients because these trace elements were naturally supplied by the soil.

The plant growth regulators are being successfully employed for improving germination, rooting, flowering, seed setting, tuberization, fruit setting, inducing parthenocarpy, fruit thinning and various plant growth hormones have been reported to improve fruit quality and of various horticultural and agricultural crops such as Ethrel, cycocel, and NAA, etc. the ripe fruit is ovate in shape and aggregrate of achenes or one seeded fruits.

Thus, this study was undertaken to evaluate the effect of PGR and Micronutrients on Growth, yield and Quality of strawberry.

2. MATERIALS AND METHODS

2.1 Geographical Location of the Experimental Site

The experimental site is located at a latitude of 25.41º North and longitude of 81.84 ºEast, with an altitude of 98 meters above the mean sea level(MSL).

2.2 Experimental Details

2.2.1 Treatment combinations

T_0 : Control, T_1 : 50 ppm Gibberellic acid, T_2 : 75 ppm Gibberellic acid, T_3 : 0.4% Zn, T_4 :0.6% Zn, T_5 : 50 ppm Gibberellic acid+ 0.4% Zn, T_6 :75 ppm Gibberellic acid + 0.4% Zn, T_7 : 50 ppm Gibberellic acid + 0.6% Zn, T_8 :75 ppm Gibberellic acid + 0.6% Zn

3. RESULTS AND DISCUSSION

3.1 Effect of PGR and Micronutrient on Plant Height (cm), Number of Leaves Per Plant, Leaf Area (cm^2), Plant Spread of Strawberry cv. Winter Dawn

3.1.1 Plant height (cm)

At 120 DAP, The maximum plant height (19.00 cm) was observed with treatment T_2 (75 ppm Gibberellic acid) followed by T_8(75 ppm

Gibberellic acid + 0.6% Zn) with (15.89cm). Minimum plant height of (10.00 cm) was observed T_0 (control).

Among the different treatments of application of plant growth regulators and micronutrients the maximum plant height was observed under T2 (75 ppm Gibberellic acid), while the minimum plant height was recorded under the treatment RDF + Control (T0).

The increased plant height of strawberry may be due to the increased nitrogen fixation, organic nitrogen utilization, development of root system (Beer et al*.,* 2017). Similar results were also reported by Tripathi et al*.* [1] in strawberry.

3.1.2 Number of leaves per plant

At 120 DAP, The maximum number of leaves per plant (20.67) was observed with treatment T_2 (75 ppm Gibberellic acid), followed by T_8 (75 ppm Gibberellic acid + 0.6% Zn) with (19.22). Minimum number of leaves per plant (12.56) was observed T_0 (control).

Among the different treatments of soil application of plant growth regulators and micronutrients the maximum number of leaves per plant was observed under T2 (75 ppm Gibberellic acid), while the minimum number of leaves per plant was observed under the treatment Control (T0).

Higher number of leaves & leaf area might be due to higher cell division caused by cytokinins& also due to higher supply of assimilate mediated by biofertilizers application. Increased number of leaves might have increased the photosynthetic activity resulting in higher accumulation of carbohydrates. Relatively higher amount of carbohydrate could have promoted the growth rate & in turn increased the berry weight. The findings are in close agreement with the findings of Dwivedi et al*.* [2] in strawberry.

3.1.3 Leaf area (cm^2)

At 120 DAP, the superiority of treatment T2 (75 ppm Gibberellic acid), registered maximum leaf area (130.33 cm^2), which was found at par with T8 having the leaf area of 128.89 cm^2. However the minimum leaf area (115.78 cm^2) was recorded under the treatment Control (T_0).

Among the different treatments of application of plant growth regulators and micronutrients the maximum leaf area was observed under T2 (75 ppm Gibberellic acid), while the minimum leaf area was recorded under the treatment Control (T0).

The increase in leaf area due to application of plant growth regulators and micro nutrients has also been reported by Jain et al*.* (2016). Applications in strawberries can increase beneficial microbial populations, which enhance production of plant growth hormones (auxin, gibberellins and cytokinins) and humic acids. Several experiments in strawberry have indicated that these hormones and acids may improve plant growth (leaf area, shoot biomass, number of flowers and runners.

3.1.4 Plant spread

At 120 DAP, the superiority of treatment T2 (75 ppm Gibberellic acid), registered maximum plant spread (25.50 cm), which was found at par with T8 having the plant spread of24.56 cm. However the minimum plant spread (18.22 cm) was recorded under the treatment Control (T_0).

Among the different treatments of application of plant growth regulators and micronutrients the maximum leaf area was observed under T2 (75 ppm Gibberellic acid), while the minimum leaf area was recorded under the treatment Control (T0).

Beer et al., 2017, reported increase in plant spread might be due to increased growth of plant in the form of height, which accumulated more photosynthesis & thereby increases leaf area per plant. These findings are corroborates with the finding of Umar et al. (2009).

3.2 Effect of PGR and Micronutrient on First Flower Initiation (days), Number of Flowers Per Plant, Number of Fruit Per Plant, Polar Diameter, Radial Diameter (mm), Fruit Yield (q per ha) of *Strawberry cv*. Winter Dawn

3.2.1 First flower Initiation (days)

Minimum days taken first flowering and fruiting was recorded with T2 (75 ppm Gibberellic acid), (59.17). Closely followed by T8 (60.44). Maximum days taken for first flowering and fruiting was recorded in T6 (65.44).

These outcomes have got the support of the findings of Kumar et al., (2015) who also recorded earliest flowering and fruiting with the application of cent per cent PGR and organic fertilizers, Shukla et al., [3], Kazemi et al. [4], who recorded earliest flowering. Tripathi et al. (2015) also recorded advancement in flowering. Number of days required minimum to produce first flower might be due to balanced supply of vermi-compost & bio-fertilizers, which provides all the necessary elements to plant to become early flowering and fruiting.

3.2.2 Number of flowers per plant

The Maximum number of flowers per plant was recorded with T_2 (75 ppm Gibberellic acid) 32.00. Closely followed by T_8 (25.67). Minimum number of flowers per plant was recorded in T_0 control (17.11).

The effect of plant growth regulators and micronutrients obtained from PGR the cell elongation and division. Soluble PGR increases photosynthetic activities of leaves, which leading to development of primary flowers, production of viable flowers. Similar results were also obtained by Tripathi et al. [5] and Singh et al [6] in strawberry.

Table 1. Effect of PGR and micronutrient on plant height (cm), number of leaves per plant, Leaf area (cm^2) , Plant Spread of *Strawberry cv*. winter dawn

Treatment	Plant height (cm)	Number of leaves per plant	Leaf area (cm^2)	Plant Spread (cm)
	120 DAP	120DAP	120 DAP	120 DAP
T_0	10.00	12.56	115.78	18.22
T_1	14.44	14.11	128.00	19.00
T_2	19.00	20.67	130.33	25.50
T_3	15.78	18.11	123.44	19.00
T_4	13.00	19.00	119.56	18.78
T_5	14.00	18.11	128.33	21.44
T_6	13.56	15.78	122.67	19.22
T_7	13.44	15.78	124.22	23.89
T_8	15.89	19.22	128.89	24.56
F test	S	S	S	S
SEd±	0.82	0.88	1.6	0.95
CD at 5%	0.37	0.40	0.72	0.43
CV	7.14	5.51	3.86	4.56

Table 2. Effect of PGR and micronutrient on first flower Initiation (days), number of flowers per plant, Number of fruit per plant, polar diameter, radial diameter (mm), fruit yield (q per ha) of *Strawberry cv*. winter dawn

Treatment	first flower Initiation (days)	Number of flowers per plant	Number of fruit per plant	Polar diameter	Radial diameter (mm)	Fruit yield (q per ha)
T_0	64.55	17.11	15.00	29.44	7.44	6.1
T_1	63.44	22.44	18.44	43.33	15.33	7.21
T_2	59.17	32	20.44	48.33	29.83	9.21
T_3	61.33	21.78	14.11	35.00	15.56	6.66
T_4	62.55	22.11	17.56	43.33	17.00	7.32
T_5	60.66	23.11	16.56	48.33	27.78	8.62
T_6	65.44	19.78	16.78	32.78	16.67	7.91
T_7	62.33	17.33	17.11	31.67	17.00	8.22
T_8	60.44	25.67	18.67	47.22	28.33	9.1
F test	S	S	S	S	S	S
SEd±	0.68	1.51	0.64	2.56	2.51	0.36
CD at 5%	0.31	0.68	0.29	1.15	1.13	0.16
CV	3.26	5.64	6.14	19.66	8.67	3.80

3.2.3 Number of fruit per plant

The Maximum number of fruits per plant and was recorded with T2 (75 ppm Gibberellic acid) with 20.44. Closely followed by T8 (18.67). Minimum number of fruits per plant was recorded in T3 control (14.11).

The results are consistent with those of Singh et al. [7] in strawberry, and they are similar to those of Al-Madhagiet al. (2012). Nor et al. (2014) and Yadav et al. [8] also reported increased fruit volume with the application of PGR and micronutrients in strawberry.

3.2.4 Polar diameter

The Maximum polar diameter of fruit was recorded with T2(75 ppm Gibberellic acid) 48.33 mm closely followed by T5 (48.33 mm). Minimum polar diameter of fruit was recorded in T0 control (29.44 mm).

3.2.5 Radial diameter (mm)

The Maximum radial diameter of fruit was recorded with T2 (75 ppm Gibberellic acid) 29.83 mm closely followed by T8 (28.33 mm).Minimum polar diameter of fruit was recorded in T0 control (7.44 mm).

3.2.6 Fruit yield (q per ha)

The Maximum fruit yield (q per ha) was recorded with T2 (75 ppm Gibberellic acid) 9.21 closely followed by T8 (9.1). Minimum fruit yield (q per h a) was recorded in T0 control (6.10).

The results are in line with Nowsheenet al., 2006, Umar et al., 2009 and Beer et al., [9] in the strawberry who described maximum yield in the strawberry. Increment in the number of runners per plant may be because of enhanced growth of vegetative and leaves number that gathered more photo- synthates and hence increased runners and the leaf area per plant. PGR and micronutrients might have an effect on runner production because of its ability to increase the nutrient availability in the soil as well as provide better environment for better and healthy root development.

4. CONCLUSION

On the basis of our experiment findings it is concluded that the treatment T2(Gibberellic acid -75ppm) was found to be best in the term of vegatative parameter, flowering, fruiting, yield and quality of strawberry.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Singh VK, Tripathi VK. Efficacy of GA3, boric acid and zinc sulphate on growth, flowering, yield and quality of *Strawberry cv.* Chandler. Progressive Agriculture. 2010;10(2):345-348.
2. Dwivedi MP, Negi KS, Jindal KK, Rana H S. Effect of bioregulators on vegetative growth of strawberry. Scientific Horticulture. 1999;6:79-84.
3. Shukla AK, Dwivedi BS, Singh VK, Gill M.S. Role of Macro and Micronutrients. Indian J. Fert. 2009;5(5):11-12, 15-18, 21-24 & 27-30.
4. Kazemi M. Influence of foliar application of iron, calcium and zinc sulphate on vegetative growth and reproductive characteristics of strawberry cv. Pajaro. Trakia Journal of Sciences. 2014;12(1): 21-26.
5. Tripathi VK, Kumar S, Gupta AK. Influence of Azotobacter and vermicompost on growth, yield and quality of *strawberry cv.* Chandler. Indian Journal of Horticulture; 2015.
6. Kumar N, Singh HK, Mishra PK. Impact of organic manures and biofertilizers on growth and quality parameters of Strawberry cv. Chandler. Indian Journal of Science and Technology. 2015;8(15): 1-6.
7. Nowsheen N, Singh SR, Aroosa K, Masarat J, Shabeena M.. Yield and growth of strawberry cv. sengasengana as influenced by integrated organic nutrient management system. Environment and Ecology. 2006; 24S(3):651-654.
8. Yadav A, Pratap B, Shivam AK, Patro A. Assess the effect of micronutrients and plant growth regulators on quality parameters of *strawberry cv*. Chandler. The Pharma Innovation J. 2018;7(1): 303-305.
9. Beer, Karma &Syamal, Alok. Effect of organic, inorganic and bio-fertilizer on

growth, flowering, yield and quality of strawberry (*Fragaria* × *Ananassa* Duch.) cv. Chandler. International Journal of Current Microbiology and Applied Sciences. 2016; 6:2932-2939. DOI: 10.20546/ijcmas.2017.605.332

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