

Original Research Article

Effect of plant growth regulators on vegetative growth and fruiting in strawberry c.v. Winter Down

ABSTRACT

A field trial has been conducted during 2021 and 2022, to study about the effect of growth regulators on vegetative growth and fruiting in strawberry c.v. Winter Down. The experiment was laid out in Randomized Block Design (RBD) with 13 treatments viz. GA₃ 50, 75 and 100 ppm, promalin at 4, 6 and 8 ppm, GA₄₊₇ at 10, 15 and 20 ppm, NAA at 15, 20, 25 ppm and control (water spray) and each treatment was replicated thrice. The results showed the plants sprayed with 20 ppm GA₄₊₇ two weeks before flowering significantly reported highest plant height (33.15 cm), leaf area (238.59 cm²), number of flowers (30.76), fruit set (86.46%), number of fruit per plant (29.46) and yield (539.03 g) per plant as compared to control. Plant sprayed with 8 ppm promalin also showed significant results in vegetative growth and fruiting traits as compared with water spray. Therefore, it is concluded that foliar spray of 20 ppm GA₄₊₇ applied two weeks before flowering is beneficial in vegetative growth and fruiting of strawberry plants.

Key Word: Strawberry, GA₃, Promalin, GA₄₊₇, NAA and growth

INTRODUCTION

Strawberry (*Fragaria x ananassa* Duch.) is a member of family Rosaceae. It is an herbaceous and perennial fruit crop which can be successfully cultivated in wide range of agro-climatic conditions from subtropics to temperate climate (Singh *et.al.*, 2006). It gives highest return in shortest possible time. The fruits are very nutritious and attractive with distinct pleasant aroma and flavour. In addition to fresh consumption, fruits have a special demand by the fruit processing units for preparing the jam, ice-cream, syrup and for quick freezing and canning. In India it is commonly grown as an open field condition as well as under protected conditions. Growth regulators have been reported to play an important role in sustainable quality fruit production in fruit crops (Kumar *et. al.*, 2013). Besides cultural practices, plant growth regulators should be effectively used for the improvement of vegetative growth and reproductive growth of strawberry. On the basis of these views and facts, the experiment was conducted to assess the efficacy of plant growth regulators on growth and fruiting traits of strawberry c.v Winter Down under open field condition.

MATERIALS AND METHODS

An experiment was conducted in the farmer's field, Deoria, U.P. during 2020-21 and 2021-22 under open conditions. At the time of bed preparation, the land was thoroughly prepared by repeated ploughing with the help of power tiller and well rotten FYM@ 60 kg per m² area was incorporated in the soil. The raised beds 1.5x1.5 m size were prepared and twenty six healthy runners of strawberry cultivar Winter Down were

planted in these beds at a spacing of 50 cmx25 cm during the first week of October 2021 and again in the first week of October,2021 for second year experiment as the crop was grown as annual crop. The cultural practices such as weeding, hoeing, irrigation and mulching were done at regular intervals to all the plants. The growth regulators consisting of GA3 at 50, 75 and 100 ppm, Promalin at 4, 6 and 8 ppm, GA4+7 at 10, 15 and 20 ppm, NAA at 15, 20 and 25 ppm and control (water spray) were sprayed two weeks before flowering. In all there were thirteen treatments and each treatment were replicated thrice in a Randomized Block Design (RBD).

The observations on different vegetative growth, fruiting and yield parameters were measured. The height of plants was measured with a measuring scale from the crown level to the apex of primary leaves and results were expressed as average height in centimeters (cm).The leaf area was measured with the help of LICOR3100 leaf area meter and average leaf area was expressed in cm².The vegetative characteristics viz. plant height and leaf area was recorded at the end of fruiting, when plant attain, when plant attain full growth. The floral characteristics were recorded during the flowering season. The percentage of fruit set per plant was calculated by using formula given by Westwood (1993).The number of fruits per plant was counted at the time of fruit maturity. The weight of entire fruits harvested per plant was recorded for each treatment and accordingly, yield per plant was work out. The level of significance for different variables was tested at 5% value of significance.

RESULT AND DISCUSSION

The pooled data presented in Table-1 showed that plant growth regulators exerted significant effect on plant growth of strawberry. The maximum plant height (33.15 cm) and leaf area (238.59 cm²) was recorded in plant sprayed with 20 ppm GA₄₊₇, whereas, the minimum plant height and leaf area was observed in control, recording 23.19 cm and 183.87 cm², respectively. The higher plant height and leaf area with the spray of GA₄₊₇ in the present study may be due to increased cell division and elongation as gibberellic acid is known to stimulated the growth of plants by cell elongation (Turner, 1963).GA also reported to increase photosynthetic activity.

Salisbury and Ross (1986) which may account for higher leaf area. These results are in conformity with those of Saima *et al.* (2014) who also recorded significant increase in height and leaf area of strawberry.

Similarly, in the present study application of promalin also significantly increased the plant height and leaf area in comparison to control. The plants are treated with 8 ppm promalin concentration that showed 32.85 cm plant height and 228.64 cm² leaf area.GA₄₊₇ and BA are the major constituent of promalin, BA and GA₄₊₇ plays role in cell division, differentiation and elongation (whiting and Roll, 2015), hence, the increased plant height and leaf area in present study may be due to cumulative effect of BA and gibberellic acid in cell division and cell elongation. Similar increase in plant height and leaf area with the application of promalin has also been reported by Radivojevic *et al.* (2015) in apple. The maximum number of flower (30.76) was obtained with the spray of 20 ppm GA₄₊₇ and minimum number of flower (16.84) was recorded in control. The increase in number of flowers with the spray of GA₄₊₇ may be due to more growth of inflorescence which might have resulted in production of more flowers.

Similarly, the maximum fruit set (86.46%) was recorded in plants sprayed with 20 ppm GA₄₊₇ and minimum fruit set (64.28%) was obtained in control. These results are in accordance with the findings of Saima et al. (2014). Similarly, increased flower number and fruit set of 27.46 and 85.14% ,respectively was also obtained with the application of 8 ppm promalin in present study. Mc Arteny et al. (2014) also recorded increase in flower number and fruit set with foliar spray of promalin in apple. As well as Thakur et.al. (2017) also reported that an increase the flower number and fruit set with the application of GA₄₊₇ in strawberry.

The data presented in Table-1, showed that the highest number of fruits (29.46) and yield (539.03) per plant was reported in plant sprayed with 20 ppm GA₄₊₇. However, the minimum number of fruits (14.02) and yield (181.25 g) per plant was reported in plant sprayed was obtained in control. The present findings are in conformity with those of Roussos et al., (2009) and Saina et al. (2014), who recorded significant increase in number of fruits and yield of strawberry with the application of gibberellic acid. Thakur et.al. (2017) also recorded that an increase the number of fruits per plant and yield per plant with the application of GA₄₊₇. Similarly, in number of fruits and yield per plant higher than control when the plants are treated with 8 ppm promalin concentration in the present study. The present finding on increased fruit number and yield was in accordance with the results obtained by those of Zurawicz et al.

(2004) and Quintero et al. (2013) in strawberry who also obtained improvement in fruit number and yield with the application of promalin.

CONCLUSION

On the basis of results obtained in present investigation, it is inferred that the foliar spray of 20 ppm GA₄₊₇ applied two weeks before flowering increase the plant height, leaf area, number of flowers, fruit set %, number of fruits per plant and yield per plant by 33.15 cm, 238.59 cm², 30.76, 86.46 %, 29.46 and 539.03 over control. The next best treatment was found 8 ppm promalin that showed positive effect on vegetative growth and fruiting traits over control. Hence, application of 20 ppm GA₄₊₇ two weeks before flowering is beneficial for improving growth, flowering, fruiting and yield of strawberry plants under field condition.

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Table-1: Effect of plant growth regulators on vegetative growth and fruiting in strawberry c.v. Winter Down (Pooled Data)

Treatments	Plant Height(cm)	Leaf Area(cm ²)	Number of flowers	Fruitset (%)	Number of fruitset per plant	Yield per plant(g)
T ₁ (GA ₃ 50 ppm)	28.94	210.95	24.74	83.75 (66.15)	19.35	320.95
T ₂ (GA ₃ 75 ppm)	29.85	214.35	25.25	84.11 (67.03)	19.78	331.35
T ₃ (GA ₃ 100 ppm)	30.12	220.15	26.75	85.12 (67.18)	20.48	339.45
T ₄ (Promalin 4 ppm)	29.25	225.46	26.26	84.05 (66.23)	22.50	392.18
T ₅ (Promalin 6 ppm)	31.19	233.35	29.25	84.30 (66.42)	25.32	432.12
T ₆ (Promalin 8 ppm)	32.85	228.64	27.46	85.14 (67.12)	24.02	471.08
T ₇ (GA ₄₊₇ 10 ppm)	33.33	236.38	26.48	84.11 (66.85)	23.54	447.02
T ₈ (GA ₄₊₇ 15ppm)	30.68	237.11	27.54	84.98 (67.48)	24.28	463.01
T ₉ (GA ₄₊₇ 20 ppm)	33.15	238.59	30.76	86.46 (68.23)	29.46	539.03
T ₁₀ (NAA 15 ppm)	26.49	199.98	22.85	77.35 (61.29)	19.34	260.26
T ₁₁ (NAA20 ppm)	27.26	206.02	23.36	79.56 (62.76)	20.37	299.76
T ₁₂ (NAA25 ppm)	29.02	207.76	23.98	81.56 (64.28)	21.01	308.64
T ₁₃ (Control)	23.19	183.87	16.84	74.72 (59.46)	14.02	181.25
CD (0.05)	0.94	1.12	0.74	0.45	0.53	5.75