



# An Efficacy of Plant Growth Substances on Vegetative Growth Traits and Fruiting Behaviour in Strawberry c.v. Winter Down under Open Condition

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## Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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## ABSTRACT

An experiment has been undertaken in the year of 2021 and 2022, to investigate about an efficacy of plant growth substances on vegetative growth traits and fruiting behaviour in strawberry c.v. Winter Down under open condition. This research work has been done under Randomized Block Design (RBD) having thirteen treatments viz. GA<sub>3</sub> 50, 75 and 100 ppm, promalin concentration such as 4, 6 and 8 ppm, GA<sub>4+7</sub> with 10, 15 and 20 ppm, NAA at 15, 20, 25 ppm and control (water spray) and every treatment was replicated three times. Result showed the strawberry plants treated by 20 ppm GA<sub>4+7</sub> fourteen days before blooming positively find out the highest plant height (33.33 cm), leaf area (238.59 cm<sup>2</sup>), number of flower plant<sup>-1</sup>(30.76) as compared to control. Plant treated

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by 8 ppm promalin has also revealed positive results as compared with water spray. Therefore, this has been concluded that the application of 20 ppm GA<sub>4+7</sub> applied fourteen days before blooming is significant for vegetative growth traits and fruiting of Winter Down cultivar of strawberry.

**Keywords:** Strawberry; gibberellic acid; promalin; GA 4+7; NAA and growth.

## 1. INTRODUCTION

The strawberry is a man-made fruit which born by single flower, then finally into aggregate fruit and their edible portion is succulent thalamus. Botanical name of strawberry is *Fragaria x ananasa* Dutch. and belong to Rosaceae family. It is a herbaceous and perennial fruit crop that can be successfully cultivated in wide range of agro-climatic conditions from subtropics to temperate climate [1]. This fruit crop is commercially propagated by runner. 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, so many commercial processed products should be prepared by strawberry such as Jam, Syrup, Ice-cream, Chocolate, Toffee etc. An anthocyanin is responsible for fruit colour. Now at present time it's occupied more area of land due to releasing of few low chilling required cultivars. The fruit has good amount of vitamin C. In India it is commonly grown as an open field condition as well as under protected structure. Plant growth substances have been reported to play an important role in sustainable quality fruit production in fruit crops [2]. Besides, cultural operations, plant growth substances should be positively correlated with somatic cell growth and reproductive growth of strawberry plant. On the basis of these views and statements, this research work was started to assessment an efficacy of plant growth substances on vegetative growth traits and fruiting behaviour of strawberry c.v Winter Down under open field condition.

## 2. MATERIALS AND METHODS

The investigation entitled "An efficacy of plant growth substances on vegetative growth traits and fruiting behaviour in strawberry c.v. Winter Down under open condition" was undertaken during 2021 and 2022 at farmer's field, Deoria, U.P. Deoria is situated in semi-tarai region with annual rainfall being 2045 mm and the potential evaporation of about 1.85 mm per day. Research area is situated in tarai region of northern India. Sandy loam soil is found in experimental field. The pH of soil is 7.1., medium organic carbon (0.53%), phosphorous-16 kg per ha, potassium-

164 kg per ha and available nitrogen-215 kg per ha. During experimentation, strawberry cultivar i.e. Winter Down was selected. This cultivar was taken from Solan, Himachal Pradesh. Weeding was done by manually as well as mechanical. Raised beds (35 cm height) were ready for transplanting of strawberry plant at row to row 30 cm and plant to plant 20 cm.

The research plot was well prepared (Three times ploughing i.e. one time heavy and two time light) then planking to get a good texture. FYM@ 60 kg per m<sup>2</sup> area was incorporated in the soil. The research work was laid out in Randomized Block Design (RBD) with 13 treatment combination viz. T<sub>1</sub>(GA<sub>3</sub>-50 ppm),T<sub>2</sub> (GA<sub>3</sub>-75 ppm),T<sub>3</sub> (GA<sub>3</sub>-100ppm),T<sub>4</sub> (Promalin-4 ppm),T<sub>5</sub> (Promalin-6 ppm),T<sub>6</sub> (Promalin-8 ppm),T<sub>7</sub> (GA<sub>4+7</sub>-10 ppm),T<sub>8</sub> (GA<sub>4+7</sub>-15 ppm),T<sub>9</sub> (GA<sub>4+7</sub>-20 ppm), T<sub>10</sub> (NAA-15 ppm),T<sub>11</sub> (NAA-20 ppm),T<sub>12</sub> (NAA-25ppm),T<sub>13</sub> (Control). Different plant growth substances consisting of GA<sub>3</sub> @ 50, 75,100 ppm, Promalin @4, 5, 6 ppm, GA<sub>4+7</sub> @10, 15, 20 ppm, NAA @ 15, 20, 25 ppm and T<sub>13</sub> (Control) were treated fourteen days before blooming. The treatments were replicated thrice. The data on vegetative growth traits and fruiting behaviour were recorded. Measuring scale was used for measuring plant height in cm. LICOR3100 leaf area meter was used for measuring area of leaf (cm<sup>2</sup>).Plant height and leaf area was counted at the end of harvesting. The floral traits were observed during the blooming season. Westwood (1993) was proposed a formula for calculating fruit set. This formula was used during research. Number of fruits plant<sup>-1</sup> were determined at the time of harvesting. The weight of fruit and yield plant<sup>-1</sup> was calculated for each treatment. The data on different parameters were analysed using analysis of variance (ANOVA).Valid conclusions were drawn only on significance differences between the treatments mean at 0.05 % level of probability.

## 3. RESULTS AND DISCUSSION

The table containing pooled data that showed plant growth substances induce positive role on the strawberry plant growth. The highest plant

height i.e. 33.33 cm and leaf area i.e. 238.59 cm<sup>2</sup> was noticed in plant treated by 20 ppm GA<sub>4+7</sub> followed by plant treated by 10 ppm GA<sub>4+7</sub> was recorded the plant height (33.15 cm), area of leaf (237.11 cm<sup>2</sup>) under sprayed with GA<sub>4+7</sub> 15 ppm dose, so, the lowest value of height of plant and area of leaf was recorded under control (T<sub>1</sub>) revealing 23.19 cm and 183.87 cm<sup>2</sup>, respectively. The maximum height of plant and area of leaf may be due to increased cell division and elongation. GA<sub>3</sub> is very popular plant growth substances. Gibberellic Acid is known to stimulate the growth of plant by cell elongation [3]. GA also noticed to increase photosynthetic activity.

Salisbury and Ross [4] was reported on higher leaf area. These findings are supported by Saima et al. (significantly increase in height and leaf area of strawberry) [5].

Similarly, in the current investigation spraying of promalin also positive response the plant height and area of leaf in respect to control. The plants are treated with 8 ppm promalin concentration that showed 32.85 cm plant height and 228.64 cm<sup>2</sup> area of leaf. BA and GA<sub>4+7</sub> are the main component of promalin. GA<sub>4+7</sub> and BA plays an

important role in cell division, differentiation and elongation [6] 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. Radivojevic et al [7]. Noticed that the application of promalin effect on plant height and leaf area in apple. The highest no. of flower (30.76) was recorded with the application of 20 ppm GA<sub>4+7</sub> and lowest no. of flower (16.84) was noticed under control. The increase in no. of flower with the application of GA<sub>4+7</sub> may be due to more growth of inflorescence which might have resulted in production of more flowers. Likewise, the highest fruit set (86.46%) was noticed in plant treated with 20 ppm GA<sub>4+7</sub> and lowest fruit set (64.28%) was noticed under control. Saina et al. [5] noticed similar findings of above said. Similarly, spraying of promalin @8 ppm was positive respond on no. of flower and fruit set revealing 27.46 and 85.14%, respectively. Mc Arteny et al. [8] also reported positive response in flower number and fruit set with application of promalin in apple. As well as Thakur et al. [9] also reported that an increase the flower number and fruit set with the application of GA<sub>4+7</sub> in strawberry.

**Table 1. An efficacy of plant growth substances on vegetative growth traits and fruiting behaviour in strawberry under open condition c.v. Winter Down (Pooled Data)**

Treatments	Height of plant (cm)	Area of leaf(cm <sup>2</sup> )	Number of flower	Fruit set (%)	Number of fruit plant <sup>-1</sup>	Yield plant <sup>-1</sup> (g)
T <sub>1</sub> (GA <sub>3</sub> 50 ppm)	28.94	210.95	24.74	83.75(66.15)	19.35	320.95
T <sub>2</sub> (GA <sub>3</sub> 75 ppm)	29.85	214.35	25.25	84.11(67.03)	19.78	331.35
T <sub>3</sub> (GA <sub>3</sub> 100 ppm)	30.12	220.15	26.75	85.12(67.18)	20.48	339.45
T <sub>4</sub> (Promalin 4 ppm)	29.25	225.46	26.26	84.05(66.23)	22.50	392.18
T <sub>5</sub> (Promalin 6 ppm)	31.19	233.35	29.25	84.30(66.42)	25.32	432.12
T <sub>6</sub> (Promalin 8 ppm)	32.85	228.64	27.46	85.14(67.12)	24.02	471.08
T <sub>7</sub> (GA <sub>4+7</sub> 10 ppm)	33.15	236.38	26.48	84.11(66.85)	23.54	447.02
T <sub>8</sub> (GA <sub>4+7</sub> 15ppm)	30.68	237.11	27.54	84.98(67.48)	24.28	463.01
T <sub>9</sub> (GA <sub>4+7</sub> 20 ppm)	33.33	238.59	30.76	86.46(68.23)	29.46	539.03
T <sub>10</sub> (NAA 15 ppm)	26.49	199.98	22.85	77.35(61.29)	19.34	260.26
T <sub>11</sub> (NAA20 ppm)	27.26	206.02	23.36	79.56(62.76)	20.37	299.76
T <sub>12</sub> (NAA25 ppm)	29.02	207.76	23.98	81.56(64.28)	21.01	308.64
T <sub>13</sub> (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

The data presented in the table noticed that the maximum number of fruits (29.46) and yield (539.03) plant<sup>-1</sup> was reported in plant treated @ 20 ppm GA<sub>4+7</sub>. So, the lowest no. of fruits (14.02) and yield (181.25 g) plant<sup>-1</sup> was reported in plant sprayed was obtained under control. Similar results were obtained by Roussos et.al [10] and Saima et al. [5] who noticed significantly increase in no. of fruits and yield of strawberry with the application of gibberellic acid. Thakur et al. [9] also recorded that an increase the number of fruits per plant and yield per plant with the application of GA<sub>4+7</sub>. Similarly, in number of fruits and yield plant<sup>-1</sup> higher than control when the plants are treated with 8 ppm promalin concentration in the investigation. Zurawicz et al. [11] and Quintero et al. [12] in strawberry had found the similar result.

#### 4. CONCLUSION

On the basis of above observation it may be inferred that the application (spraying) of 20 ppm GA<sub>4+7</sub> applied fourteen days before flowering increase the height of plant, area of leaf, no. of flower, fruit set %, no. of fruit and yield plant<sup>-1</sup> revealing 33.15 cm, 238.59 cm<sup>2</sup>, 30.76, 86.46 %, 29.46 and 539.03 over control. Hence, application of 20 ppm GA<sub>4+7</sub> is beneficial for vegetative growth traits and fruiting behaviour under open condition.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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