



# Impact of Plant Growth Regulators on Growth, Yield and Fruit Quality of Strawberry (*Fragaria × ananassa Duch.*) Cultivar Winter Dawn under Polyhouse (Natural Ventilated Polyhouse)

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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

The present experiment was laid out in randomized block design, and the study consists of ten treatments with three replications including control. From the present investigation, it was concluded that the treatment T10 (NAA-125ppm) was found to be best in the term of vegetative

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parameter, flowering, fruiting, yield and quality of strawberry. The present experiment concluded that, for better vegetative growth, yield and quality of strawberry fruits. It is concluded that the treatment T10 (NAA-125ppm) was found best in terms of vegetative growth and yield characters of strawberry. The economics of the treatment T10 was found best in terms of B:C ratio 3.25 of strawberry.

**Keywords:** Strawberry; NAA; growth; yield and quality.

## 1. INTRODUCTION

The modern cultivation strawberry (*Fragaria x ananassa Duch*) is a hybrid between two largely dioecious octaploid species, *Fragaria chiloensis* and *Fragaria virginiana*. *Fragaria* species belongs to the family Rosaceae, with basic chromosome number of  $x=7$ . 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.

It is grown all over the world. Area is 21 hectare and production 200-ton/season average weights 20-30 g/fruit. Following the runaway successes of experiment plantation strawberry have today become a popular and lucrative source of income for Meghalaya farmers [1-3].

Strawberry is a slow growing herbaceous plant with a short perennial branch, crown and runners are produced in the axils of the leaves, which are normally trifoliate [1,2]. Strawberry fruits are richest source of vitamin (both fat soluble A, D, E and K), protein, minerals like calcium, iron, and phosphorus [4]. Nutritionally strawberry is a low-calorie carbohydrate fruit but a rich source of Vitamin A (60 IU/100g of edible portion), Vitamin C (30-120mg/100g of edible portion) and fiber. Water is a major constituent (90%) of strawberry fruit [5-7].

The total world area and production of strawberry was 2.6 lakh and 3.61 MT respectively. Strawberries are grown throughout most of the parts of United state, Canada, European countries including France, Italy, United Kingdom, Bulgaria, Poland. In India, strawberry is cultivated in J & K, hills of Himachal Pradesh, Nainital, Dehradun, Mahabaleshwar, but Kashmir occupies a leading place for its successful and profitable cultivation increased due to introduction [8,9].

In India the total area of strawberry is 1000ha with production of 5000 MT. (Brahamchari et al

2017). In India, Maharashtra is the leading state in. The nutrition status of strawberry plant plays a vital role in determining the yield and yield attributing parameters since, it is a very sensitive plant to nutritional balance.

## 2. MATERIALS AND METHODS

### 2.1 Geographical Location of the Experimental Site

Present experiment was carried out in naturally ventilated polyhouse to study the growth and yield parameters of strawberry under Prayagraj condition. The experimental site is located in the sub-tropical region which is located at 25.271N latitude, 81.0561E longitude and 98m above the mean sea level.

Area of Prayagraj district comes under subtropical belt in the south east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46 °C – 48°C and seldom falls as low as 4°C – 5°C. The relative humidity ranges between 20 to 94 percent. The average rainfall in this area around 1013.4mm annually.

### 2.2 Experimental Details

#### 2.2.1 Treatment combinations

T0 Control, T1 Cycocel (500ppm), T2 Cycocel (750ppm), T3 Cycocel (1000ppm), T4 Cycocel (1250ppm), T5 Cycocel (1500ppm), T6 NAA (25ppm), T7 NAA (50ppm), T8 NAA (75ppm), T9 NAA (100ppm), T10 NAA (125ppm).

## 3. RESULTS AND DISCUSSION

### 3.1 Effect of Plant Growth Regulators on Growth, Yield and Fruit Quality of Strawberry (*Fragaria x ananassa Duch*) Cultivar Winter Dawn under Polyhouse (Natural Ventilated Polyhouse) Plant Height (cm)

At harvest, the superiority of treatment T10 (NAA, 125ppm), registered maximum plant

height (41.75 cm), which was found at par with T7 (NAA, 50ppm) having the plant height of 40.67 cm. However the minimum plant height (19.21 cm) was recorded under the treatment Control (T0).

At harvest, the superiority of treatment T10 (NAA, 125ppm), registered maximum number of leaves per plant (59.35), which was found at par with T7 (NAA, 50ppm) having the number of leaves per plant of 57.25. However the minimum number of leaves per plant (40.59) was recorded under the treatment Control (T0).

The leaf area at harvest, the superiority of treatment T10 (NAA, 125ppm), registered maximum leaf area (95.90 cm<sup>2</sup>), which was found at par with T8 (NAA, 75ppm) having the leaf area of 96.72 cm<sup>2</sup>. However the minimum leaf area (89.32 cm<sup>2</sup>) was recorded under the treatment Control (T0).

The plant spread from E-W, the maximum plant spread (55.49 cm) was recorded under the treatment T10 (NAA, 125ppm) which was found at par with T<sub>4</sub> (Cycocel, 1250ppm) having the plant spread 54.22 cm. However, the lowest plant spread (30.60 cm) was confirmed under the treatment T0.

Maximum number of runners was recorded with T10 (NAA, 125ppm) T9 and T5 (4.67). Closely followed by T8 (4.33). Minimum numbers of runners was recorded in T0 (2.67). Maximum number of days to taken first harvest was recorded with T0 (control) 62.33. Closely followed by T1 (Cycocel, 500ppm)(61.25). Minimum number of days to taken first harvest was recorded in T10 (NAA, 125ppm)(53.38).

Maximum number of days to taken final harvest was recorded with T<sub>10</sub> (NAA, 125ppm) 96.12. Closely followed by T9 (NAA, 100ppm) (93.01). Minimum number of days to taken final harvest was recorded in T0control (85.95).

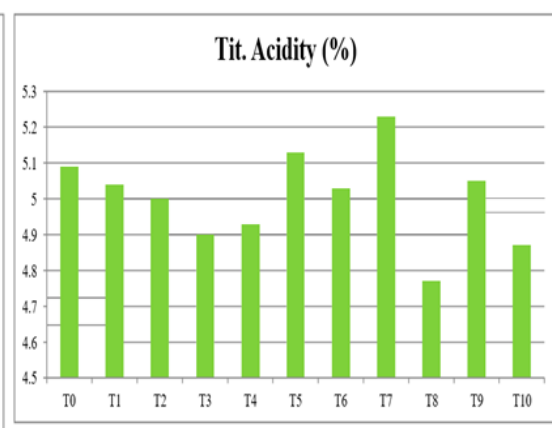
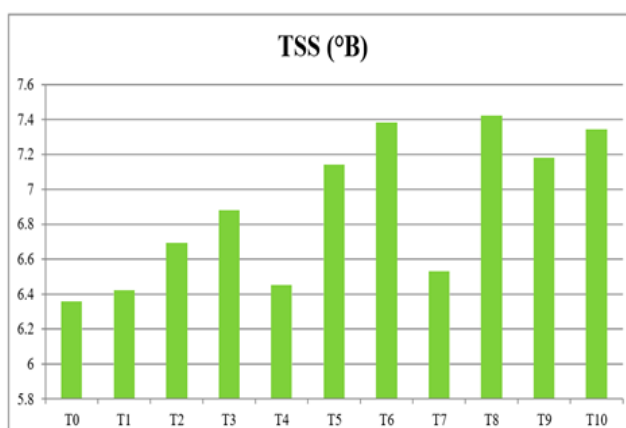
Maximum number of flowers per plant was recorded with T10 (NAA, 125ppm) 58.77. Closely followed by T9 (NAA, 100ppm)(54.56). Minimum number of flowers per plant was recorded in T0control (35.89).

Maximum number of fruits per plant and was recorded with T10 (NAA, 125ppm) with 30.25. Closely followed by T7 (NAA, 125ppm) (29.50). Minimum number of fruits per plant was recorded in T0 control (17.44).

Maximum fruit length of fruit was recorded with T10 (NAA, 125ppm) 4.95 mm closely followed by T6 (NAA, 25ppm) (4.72 cm). Minimum fruit length was recorded in T0control(2.92 cm).

Maximum fruit weight (g) was recorded with T10 (NAA, 125ppm) 26.17 g closely followed by T9 (26.05 g). Minimum fruit weight (g) was recorded in T0 control (22.29 g).

The data presented in the revealed the fruit yield per plant (kg) was significantly influenced by different treatments. Maximum fruit yield per plant (kg) was recorded with T<sub>10</sub> (NAA, 125ppm), 0.79 kg closely followed by T7 (0.72 kg). Minimum fruit yield per plant (kg) was recorded in T0control (0.39kg) treatments. Maximum fruit yield (q per ha) was recorded with T10 (NAA, 125ppm) 39.58 q/ha closely followed by T7 (36.05 q/ha). Minimum fruit yield (q per ha) was recorded in T0control (19.44 q/ha).



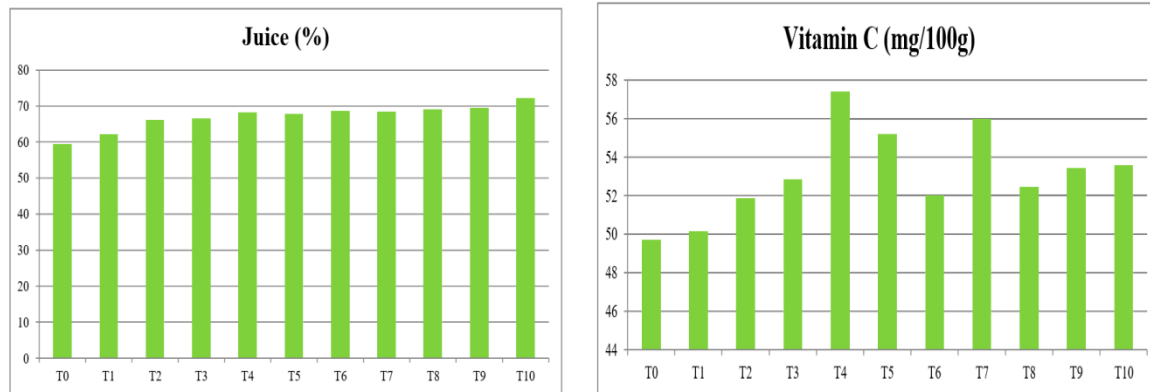


Fig. 1. Bar graph showing treatment variation for different parameters

Table 1. Variation in fruit parameters with different treatment efficacy

Treatment	Plant height	No. of leaves /plant	Leaf area	No. of runners	Days taken to first harvest	Days taken to final harvest	No of flowers /plant	No of fruits /plant
T0	19.21	40.59	89.32	2.67	62.33	85.95	35.89	17.44
T1	22.21	42.65	91.81	3.67	61.25	91.12	39.72	19.74
T2	23.64	43.63	92.61	3.67	59.49	91.49	41.72	20.41
T3	23.91	46.21	93.1	4.33	60.57	91.56	45.82	22
T4	24.78	44.42	91.83	4.33	59.38	92.33	48.93	24.73
T5	28.76	45.2	92.93	4.67	59.9	89.26	47.8	26.37
T6	30.33	51.88	93.67	3.44	58.39	89.6	50.46	27.82
T7	40.67	57.26	94.56	3.66	57.39	91.01	51.66	29.5
T8	29.68	48.25	96.72	4.33	55.17	89.79	52.96	22.02
T9	31.24	53.8	95.67	4.67	54.74	93.01	54.56	25.89
T10	41.75	59.35	95.9	4.67	53.38	96.12	58.77	30.25
F test	S	S	S	S	S	S	S	S
CDat 5%	1.84	1.61	0.63	0.19	0.75	0.6	1.84	1.17
SEm±	1.01	0.89	0.35	0.11	0.41	0.33	1.01	0.64
CV	22.81	11.03	2.25	15.79	4.15	2.2	13.51	12.86

Treatment	Fruit length	Fruit diameter	Fruit weight (g)	Fruit yield plant(kg)	Fruit yield(q/hac)
T0	2.92	2.69	22.29	0.39	19.44
T1	3.35	2.71	24.55	0.48	24.23
T2	3.58	2.96	24.46	0.5	24.96
T3	3.67	3.36	23.87	0.53	26.26
T4	3.74	3.01	23.51	0.58	29.07
T5	4.24	3.22	25.64	0.68	33.81
T6	4.72	3.57	24.57	0.68	34.18
T7	3.84	3.79	24.44	0.72	36.05
T8	4.17	3.56	24.24	0.53	26.69
T9	4.54	3.6	26.05	0.7	34.89
T10	4.94	3.82	26.17	0.79	39.58
F test	S	S	S	S	S
CDat 5%	0.17	0.12	0.37	0.34	1.67
SEm±	0.09	0.06	0.2	0.39	2.89
CV	14.61	11.84	2.64	1.88	8.43

Maximum acidity percentage of fruit was recorded with T10 (NAA, 50ppm) 5.23 closely followed by T5 (5.13). Minimum acidity percentage of fruit was recorded in T10 (NAA, 125ppm)(4.87). Maximum TSS of fruit was recorded with T9 (NAA, 100ppm) 7.42 closely followed by T6 (7.38). Minimum TSS of fruit was recorded in T0control (6.36). Maximum ascorbic

acid of fruit was recorded with T4 (Cycocel, 1250 ppm), 57.40 closely followed by T7 (55.99). Minimum ascorbic acid of fruit was recorded in T0control (49.70) [10].

#### 4. CONCLUSION

The application of PGRs on fruit Strawberry cv. Winter dawn, it also helps in maintaining the soil

growth of the fruits at a desired level. It can be concluded that, for better vegetative growth, yield and quality of strawberry fruits. It is concluded that the treatment T10 (NAA125ppm) was found best in terms of vegetative growth and yield characters of strawberry. The economics of the treatment T10 was found best in terms of B:C ratio 3.25 of strawberry. So application of this PGRs can be recommended to growers after few more conjunctive trials.

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### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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