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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ABSTRACT-

The present experiment was laid out in randomized blockdesign, and the study consists of ten treatments with three replications including control. Fromthe present investigation, it was concluded that the treatment T10 (NAA-125 ppm) wasfound to be best in the term of vegetative parameter, flowering, fruiting, yield and quality ofstrawberry. 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 etc

INTRODUCTION-

The modern cultivation 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 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 hactare and production 200-tan/season average weights 20-30 g/fruit. Fallowing the runaway successes of experiment plantation strawberry have today become a popular and lucrative source of income for meghalaya farmers.

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 . Strawberry fruits are richest source of vitamin (both fat soluble A, D, E and K), protein, minerals likes calcium, iron, and phosphorus. (Ahire, 2017) 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..

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.

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 250. 271 N latitude,810.561Elongitudeand98mabovethemeansealevel.

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 locationreaches up to 46 ºC – 48 ºC and seldom falls as low as 4ºC – 5ºC. The relative humidity ranges be-tween20to94percent.Theaveragerainfallsinthisareaarearound1013.4mmannually.

2.2 Experimental Details

2.2.1 Treatment combinations

T0 Control ,T1Cycocel (500 ppm), T2 Cycocel (750 ppm), T3 Cycocel (1000 ppm), T4Cycocel (1250 ppm), T5 Cycocel (1500 ppm) ,T6 NAA (25 ppm), T7 NAA (50 ppm),T8 7NAA (75 ppm) ,T9 NAA (100 ppm) ,T10 NAA (125 ppm)

3.RESULT AND DISCUSSION-

3.1 Effect of plant growth regulators on growth, yield and fruit quality of strawberry (Fragaria × ananassa Duch.) Cultivar Winter Dawn under polyhouse (Natural Ventilated Polyhouse

Plant height (cm)

At harvest, the superiority of treatment T10 (NAA, 125 ppm), registered maximum plant height (41.75 cm), which was found at par with T7 (NAA, 50 ppm) 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, 125 ppm), registered maximum number ofleavesperplant(59.35),whichwasfounda tparwithT7(NAA,50ppm)havingthenumb erof leaves per plant of 57.25. However the minimum number of leaves per plant (40.59) wasrecordedunder thetreatment Control(T0).

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

The plant spread from E-W, the maximum plant spread (55.49 cm)was recorded under thetreatment T10 (NAA, 125 ppm)which was found at par withT_4 (Cycocel, 1250 ppm) havingthe plant spread 54.22 cm. However, the lowest plant spread (30.60 cm) was confirmed underthetreatment T0.

Maximum number of runners was recorded withT10(NAA, 125 ppm) 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 totaken first harvest was recorded with T0 (control)62.33. Closely followed by T1 (Cycocel,500 ppm)(61.25). Minimum number of days to taken first harvestwas recorded in T10 (NAA,125 ppm)(53.38).

Maximum number of days totaken final harvest was recorded with T_{10} (NAA, 125 ppm) 96.12. Closely followed by T9(NAA, 100 ppm) (93.01).Minimum number of days to taken final harvest was recorded in T0control(85.95).

Maximum number of flowers per plantwas recorded with T10 (NAA, 125 ppm)58.77. Closely followed by T9 (NAA, 100 ppm)(54.56).Minimum number of flowersperplant wasrecorded inT0control (35.89).

Maximum number of fruits per plant and was recorded with T10 (NAA, 125 ppm) with 30.25. Closely followed by T7 (NAA, 125 ppm) (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,125 ppm) 4.95 mm closely followed by T6(NAA, 25 ppm) (4.72 cm).Minimum fruit length wasrecordedinT0control(2.92 cm).

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

recorded inT0control(22.29 g).

The data presented in the revealed the fruit yield per plant (kg)wassignificantly influenced by different treatments. Maximum fruit yield per plant (kg) was recordedwith T_{10}(NAA, 125 ppm), 0.79 kg closely followed by T7 (0.72 kg). Minimum fruit yield perplant(kg)wasrecorded inT0control (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 fruity I e l d(qperha)wasrecorded in T0control(19.44 q/ha).

Maximum acidity percentage of fruitwas recorded with T10(NAA, 50 ppm) 5.23 closely followed by T5(5.13). Minimum acidity percentageoffruitwasrecorded in T10(NAA, 125 ppm)(4.87). Maximum TSS of fruitwas recorded with T9(NAA, 100ppm)7.42 closely followed by T6(7.38).Minimum TSS of fruitwas recorded in T0control(6.36). Maximum ascorbic acid of fruit was recorded withT4(Cycocel, 1250 ppm), 57.40 closely followed by T7 (55.99).Minimum ascorbic acid of fruitwasrecorded inT0control (49.70). (Deka et al 1996)

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

treatment	Fruit length	Fruit diameter	Fruit weight (g)	Fruit yield plant(kg)	Fruit yield(q/hac)
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

Table 1 : Variation in fruit parameters with different treatment efficacy

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

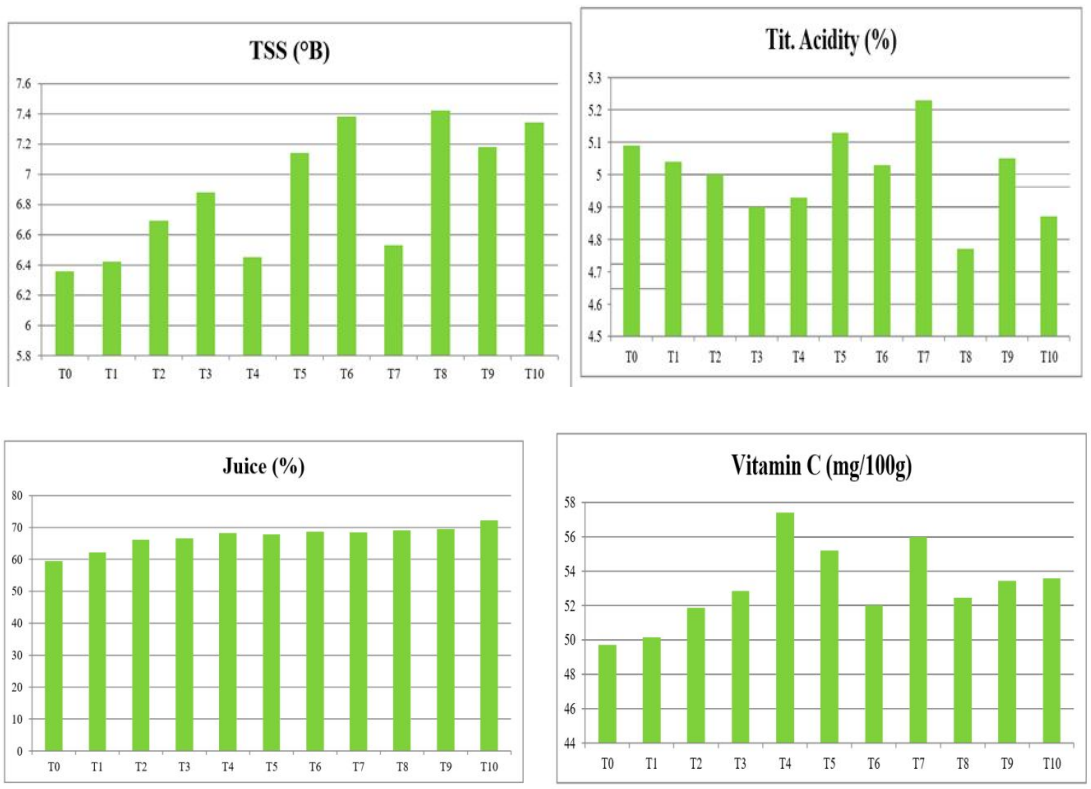

Fig .1 Bar graph showing treatment variation for different parameters

CONCLUSION

The application of PGRs on fruit Strawberry cv. Winter dawn, it also helps in maintaining thesoil growth of the fruits at a desired level. It can be concluded that, for better vegetative growth,yield and quality ofstrawberry fruits. It is concluded that the treatment T10 (NAA125 ppm) wasfound best in terms of vegetativegrowth and yield characters of strawberry. The economics ofthe treatment T10 was found best in terms of B:C ratio 3.25 of strawberry. So application of thisPGRscan berecommendedto growersafter fewmoreconjunctivetrials.

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REFERENCES-

Aakharova , O.M. (1981), Application of growth regulators in strawberry propagation.

Doklady MOSK-S-Kh-Ak. Ad.I.M.K.A. Timiyazeva (Russia). 256:33–37.

Abdullah, Shakir & Wani, Ab Waheed & Sharma, Ankur & Singh, Gurpreet & Za-rina,. (2023). Improving Production and Quality of Strawberry (Fragaria × ananassa Duch.) Cv. Chandler with Plant Growth Regulators: A Study in Northern Punjab. International Journal of Plant & Soil Science. 35. 170-176. 10.9734/ijpss/2023/v35i213959.

Agafonov, N.V., Blinovski, I.K. and Solovei, E.P.(1978). The preparation jury as strawberry. Sodovodstovo (Russion). No. 6: 29-30

Ahire, D.k(2017). Effect of PGR on growth, yield and quality of strawberry (*Fragaria x ananassa Duch*) cv. Sweet

Charlie. 10. 8817-8819.

Asrey, R.,Jain, O.K. and Singh, R.(2000-01).Effect of plant growth regulators ongrowth and survival of strawberry runners under semi arid region of Punjab. Indian J. Plant Physiology, 8(2): 196-198.

Beer, Karma &Syamal, Alok. (2017). Effect of Organic, Inorganic and Bio-Fertilizer on Growth, Flowering, Yield and Quality of Strawberry (Fragaria × Ananassa Duch.) cv. Chan- dler. International Journal of Current microbiologyand Applied Sciences.6.2932-2939. 10.20546/ijcmas.2017.605.332.

Brahamachari, V.S. and Rani, R.(2001) Effect of growth substances on productivity , cracking, repining and quality of fruits in litchi. Orissa-j. Hort. 299 (1): 41-45.

Brahamachari, V.S., Mandal, A.K., Kumar, R. and Rani, R.(1995). Effect of growth substances of fruit set and physic-chemical characteristics of sardar guava. Recant Horti. 2 (1): 127-131.

Deka, P.C. and Shadeque, A.C. (1996). Effect of foliar spray of cycocel on fruit characters and Ascorbic acid content of sweet pepper (Capsicum annum var. grossum L. Send t). New Agriculturist. 7(1): 7-10.

Dwivedi, M.P.(1987). Effect of photoperiod and growth regulators on vegetative growth, flowering and yield of strawberry. Ph.D. thesis, Dr. Y.S Parmar University of Horticulture and forestry, Solan , India