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Short Communication

Effect of plant bio-regulators on growth, yield and quality of strawberry (*Fragaria x ananassa* Duch) cv. Sweet Charlie

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Abstract

The present study indicates that the growth, yield contributing characters and yield of strawberry cv. Sweet Charlie fruits were significantly influence by various bio-regulators. Among different bio-regulators GA_3 75 ppm recorded the significantly the highest yield 33.71 t ha^{-1}. However, the highest values with respect to different growth parameters, viz., Plant height (18.19 cm) was recorded with NAA 400 ppm, while the highest (26.72 cm) NS plant spread was recorded with application of GA_3 25 ppm. The maximum plant spread (EW) (27.20 cm) was recorded with GA_3 75 ppm. Among different yield contributing characters viz., berry weight (14.49 g), number of berries per plant (46.68) and yield per plant (674.33g), GA_3 75 ppm showed superiority than other plant bio-regulators. The maximum TSS (10.61^{0}Brix) was also recorded in GA_3 75 ppm.

Keywords: Strawberry, growth, yield, quality, bio-regulators.

Introduction

Strawberry (*Fragaria x ananassa* Duch) is one of the most delicious refreshing and nutritious among soft fruits of the world[1]. It is rich source of vitamin; minerals and antioxidant make strawberry highly delicious food in the diet of the millions of people around the world[2]. Plant bio-regulators are important aspect of crop production and regulation. Because of its diverse effect, it is possible to use certain growth regulating chemicals at particular stages of fruit growth and developments to have its maximum effect. Occasionally, they are needed to be supplemented exogenously for additional stimulus for strawberry which requires quick response for increased growth; fruit set and yield[3]. In India, Maharashtra is the leading state for the production of strawberry. However, the productivity of strawberry in this region is less as comparable to the western country due to its traditional systems of cultivation. The present investigation was conducted to find out the influence of plant bio-regulators on growth, yield and quality of strawberry cv. Sweet Charlie.

Materials and methods

The experiment was conducted at Regional Wheat Rust Research Station, Farm, Mahabaleshwar Dist. Satara, Maharashtra (India) during 2013-15. The experiment site was situated at elevation of 1350 m above msl and lies between17^{0}56'.6" N latitudes and 073^{0}40'27.9" E longitudes. The soil of the experiment plot was lateritic and acidic in reaction with soil pH 5.5. The experiment laid out in randomises block design with seven treatments and three replications. Recommended dose of FYM was applied before planting of strawberry runners in the respectively plot. Plant bio-regulators *viz.,* GA_3 and NAA were applied as foliar application at 30 days after planting. There were seven various treatments followed for the investigation i.e.: T_0 = Control (Water spray), T_1 = GA_3 25 ppm, T_2 = GA_3 50 ppm, T_3 = GA_3 75 ppm, T_4 = NAA 300 ppm, T_5 = NAA 400 ppm & T_6 = NAA 500 ppm.

Observations on growth and yield characters were recorded by using standard methods. Five plants from middle of each plot were selected randomly and tagged for observations of the plant growth characters. Twenty berries from each treatment were randomly selected to record the data on yield contributing characters. Fruit weight was taken using top pan digital balance. TSS was determined with hand refractometer (0- 32^0 Brix). Statistical analysis of the data was done by standards described by Panse and Sukhatme[4]. Pooled data were subjected to ANOVA[5]. Where appropriate means were separated with least significant differences analysis.

Results and discussion

The various bio-regulators showed significantly influence on growth and yield of strawberry plants (Table-1). The maximum growth in terms of plant height (18.19 cm) was observed with NAA 400 ppm. The maximum plant spread (EW) (27.20 cm) was recorded with $GA_3$75 ppm, while the highest (26.72 cm) NS plant spread was recorded with application of GA_3 25 ppm. The plant height and spread increased might due to more and fast cell division and cell elongation, therefore increased vegetative growth in strawberry by suppressing genetic dwarfism[3].

Table-1: Influence of plant bio-regulators on growth, yield and quality of strawberry cv. Sweet Charlie (Pooled 2013-15).

Treatments	Plant Height (cm)	Plant Spread (EW) (cm)	Plant Spread (NS) (cm)	Berry Weight (g)	Number of berries/plant	Yield/ plant (g)	Yield t/ha	TSS^0 Brix
T_0	13.67	20.98	21.71	11.11	32.00	356.66	17.83	10.51
T_1	16.59	26.03	26.72	11.46	45.97	497.17	24.85	10.46
T_2	15.45	24.29	24.97	13.48	44.86	602.09	30.10	10.38
T_3	17.91	27.20	25.32	14.49	46.68	674.33	33.71	10.61
T_4	16.94	23.37	24.06	13.19	41.57	536.82	26.84	10.47
T_5	18.19	24.27	25.83	13.29	34.11	444.34	22.21	9.62
T_6	16.26	24.12	24.66	12.92	37.17	472.13	23.60	10.33
SE+	0.60	0.73	1.36	0.42	2.15	26.60	1.33	0.27
CD@ 5%	1.89	2.28	NS	1.32	6.70	82.89	4.14	NS
CV.	6.39	5.21	9.55	5.73	9.23	9.00	9.00	4.65

The yield and yield contributing characters of strawberry was also significantly influence by different bio-regulators. It is observed from Table-1 that, the maximum number of berry was obtained in GA_3 75 ppm (46.68) and it was at par with the GA_3 25 ppm, GA_3 50 ppm and NAA 300 ppm, while minimum in control (32.00). The increased berry numbers in GA_3 treated plants might be due to the GA3 induced the production of enzymes which attributed to improved fruit set by playing a role in post fertilization period. In addition to this external application of GA_3 shifted the internal balance between promoters and inhibitors in favour of fruit forming metabolic process[6]. Berry weight (14.49 g) was also influence significantly by GA_3 75 ppm over other treatments. The increase in berry weight might be due to movement of metabolites within the plant and it is well known impact on developing fruit are extremely active metabolites sink which mobilize metabolites and their flow vegetative parts[7]. Sharma and Singh[8] reported higher fruit weight in strawberry by spraying GA_3. The variation in number of berries per plant was significant. The highest number of berries per plant was recorded in GA_3 75 ppm (46.68), while control recorded the lowest (32.00). The influence of GA_3 on number of berries may be attributed to its effect on better pollen tube germination and fruit set and development[8].

Among all bio-regulators GA_3 75 ppm recorded highest yield (33.71 t ha^{-1}). The lowest yield of (17.83 t ha^{-1}) was recorded in control. The increase in yield with GA_3 might be due to more flower numbers, better fruit set and maximum number of fruits with maximum weight over better vegetative growth. The development of strawberry fruit is dependent on the auxin produced by the developing achenes and if the flowers remain un-pollinated, the cells fail to elongate. GA_3 might have helpful in the cell division and elongation in the un-pollinated region of fruit, as well affected the auxin metabolism which might have indirectly helped in increased fruit size and also higher number of fruits which ultimately increase the yield[9]. Similar increase in strawberry yield following GA_3 application has also been reported by Paroussi *et. al*[10].

The different bio-regulators had non significant effect on TSS of the berries. However, the numerically maximum TSS (10.61^0 Brix) was recorded in GA_3 75 ppm. The maximum TSS with GA_3 treated plant can be attributed to that stress might be caused cell elongation[11].

Conclusion

It could be concluded that the GA_3 75 ppm (T_3) was effective plant bio-regulator for improving growth, yield and quality of strawberry cv. Sweet Charlie.

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