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Short Communication

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Fruit characters and yield of strawberry (*Fragaria x ananassa* Duch.) as influenced by different concentrations of gibberellic acid

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ABSTRACT
The effect of gibberellic acid concentrations on fruit characters and yield of strawberry was studied on two varieties, namely 'Sweet Charlie' and 'Winter Dawn' during November, 2018 to March, 2019. Foliar application of three different concentration of GA_3 viz. 50 ppm, 75 ppm and 100 ppm were done at 40 days and 60 days after planting. Experimental results showed that GA_3 @ 75 ppm had the best effect to increase yield components and yield of both the varieties. Under GA_3 @ 75 ppm, Winter Dawn exhibited higher fruit diameter (3.38cm) and fruit length (4.74cm) as compared to Sweet Charlie (3.28cm fruit diameter and 4.60cm fruit length). Though the fruit weight was slightly higher in Sweet Charlie (18.36g) as against Winter Dawn (17.90g) under the best treatment i.e. 75 ppm GA_3 the yield recorded was higher in Winter Dawn (573.62g/plant and 24.04t/ha) as against Sweet Charlie (445.43g/plant and18.73t/ ha) due to higher number of fruits (32.44/plant) produced by Winter Dawn as compared to Sweet Charlie (24.94/plant). So, Winter Dawn variety produced 28.35% higher yield as compared to Sweet Charlie under GA_3 @ 75 ppm treatment.
Keywords: Strawberry, Gibberellic acid, Foliar application, Fruit character, Yield

INTRODUCTION

Strawberry (*Fragaria X ananassa* Duch.) is a popular fruit which is best known for its flavour, taste, fresh use and processing purposes. Fruits of strawberry are most attractive, delicious and refreshing having rich source of antioxidant, vitamin C and phenolic compounds. Fruits are also rich source of minerals and nutrients and having anti cancerous property. In West Bengal its commercial cultivation is mainly concentrated in some pockets of North Bengal. Recently the interest in strawberry production is increasing rapidly due to its high price value and more demand. There is good scope for its cultivation in different parts of West Bengal having congenial climate if right varieties are selected. But farmers are facing many problems for its successful cultivation mainly due to poor growth and low fruiting. Due to lack of standardized production technology and proper technical knowhow, farmers are facing some sorts of problem in commercial production of strawberry. Lack of application of proper nutrients and particularly growth promoting substances is the major cause of poor growth and fruiting in strawberry especially when temperature starts rising. Different reports showed that hormones regulate the plant growth and increase the yield of strawberry (Kumar et al., 2012; Khunte et al., 2014). Foliar application of GA_3 has been successfully proved to have increased the yield and quality of different horticultural crops (Sharma and Singh, 2009). Gibberellins promote cell division and elongation (Anonym, 2017). Growth regulating chemicals are becoming important in strawberry for the modification of their vegetative growth, flowering and fruiting affecting total yield and also quality (Vishal et al., 2016; Palei et al., 2016). Therefore, growth regulators at optimum doses and proper growth stages are very essential for increasing growth and production in strawberry. Considering the above views this study was conducted with three different concentration of gibberellic acid (GA_3) to find out the optimum concentration of gibberellic acid for the improvement of fruit size and yield of strawberry.

MATERIALS AND METHODS

The experiment was carried out at Instructional Farm of Hooghly Krishi Vigyan Kendra, Chinsurah, Hooghly district of West Bengal during November, 2018 to March, 2019. The experimental site comes under subtropical humid region. The average temperature ranges from 15-20°C during December-January and 25-30°C during March-April. The soil of the experimental field was clay loam having high water holding capacity with pH around 6.6. Two varieties of strawberry

namely 'Sweet Charlie' and 'Winter Dawn' were taken for the study. Three different treatment concentration of gibberellic acid (GA_3) was taken along with control. The treatments were T-1: Foliar application of GA_3 @ 50 ppm twice at 40 DAP and 60 DAP, T-2: Foliar application of GA_3 @ 75 ppm twice at 40 DAP and 60 DAP, T-3: Foliar application of GA_3 @ 100 ppm twice at 40 DAP and 60 DAP and T-4: Control (No use of GA_3), *(*DAP= Days After Planting).*

The experiment was laid out in a Randomized Block Design with five replications. Along with organic manure (Vermicompost @ 3.0 t/ha) a dose of NPK @ 50:80:80 kg/ha was applied as basal to all plots. Foliar spray of top-dressing fertilizer i.e., NPK (19:19:19) @ 5g/L was given at 20 DAP, 35 DAP, 50 DAP and 70 DAP to all plots. Micronutrient mixture (Zn, B, Mo, Cu) @ 2.0 g/L was applied to all plots during flowering. All plots were covered with black/silver plastic mulch. GA_3 was applied as per treatment schedule. The planting was done during 1st week of November, 2018 in open field and harvesting was started during 1st week of January, 2019 and continued till last week of March, 2019. The observations recorded were i) Number of fruits per plant ii) Diameter of fruits iii) Length of fruits iv) Average fruit weight and v) Yield. The recorded data were statistically analyzed.

RESULTS AND DISCUSSION

Fruit characters

Fruit characters like fruit diameter and fruit length were significantly varied by different concentrations of gibberellic acid for both the varieties (Fig.1 & 2). Application of GA_3 increased the diameter and length of fruits over control and dose of 75 ppm GA_3 resulted highest fruit size followed by 100 ppm GA_3. Highest fruit diameter (3.28cm and 3.38cm) and fruit length (4.60cm and 4.74cm) were recorded under 75 ppm GA_3 treatment (T-2) in both Sweet charlie and Winter Dawn varieties respectively, whereas without application of growth regulator resulted smaller fruits. Application of GA_3 might increase carbohydrate level and dry matter content due to higher photosynthesis rate and increase cell division and elongation which leads to larger fruits. Again 75 ppm GA_3 accelerated higher fruit growth and development as compared to 50 ppm and 100 ppm GA_3. Beyond 75 ppm concentration GA_3 might cause excessive elongation of fleshy receptacles which might reduce fruit size. According to Saima et al. (2014) fruit weight and volume of strawberry are increased by growth regulators. Jamal Uddin et al. (2012) and Kumar et al. (2014) also reported that there were increases in fruit sizes, weight, yield and water-soluble dry matter due to GA treatments. Sarita Paikra (2018) found that fruit length, fruit width, fruit weight, fruit volume, fruit diameter and yield per plant as well as yield were increased considerably in strawberry cv. Sabrina with application of RDF + Gibberellic acid 75 ppm (T3).

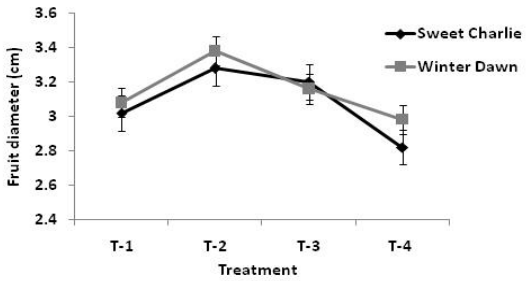

Fig. 1: Effect of gebberellic acid concentration on fruit diameter of strawberry

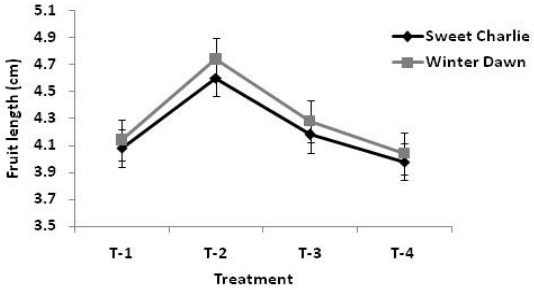

Fig. 2: Effect of gebberellic acid concentration on fruit length of strawberry

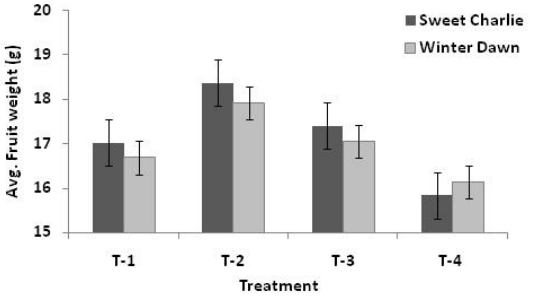

Fig. 3: Effect of gebberellic acid concentration on fruit wieght of strawberry

Yield component and Yield

The yield components and yield were significantly influenced by application of gibberellic acid and the results showed that all concentrations of GA_3 increased fruit weight, number of fruits and yield significantly over control in both the varieties of strawberry (Fig.3, 4, 5 & 6). Highest average fruit weight (18.36g and 17.90g) number of fruits per plant (24.94 and 32.44), yield per plant (445.43g and 573.62g) and yield per hectare (18.73t and 24.04t) was recorded under GA_3 75 ppm treatment (T-2) in both the varieties Sweet Charlie and Winter Dawn, respectively. The increase in number of fruits might be due to higher fruit set ability by GA_3 treatments and higher yield might be due to the increased fruit set per plant, fruit length and fruit diameter as well as fruit weight. Though the average fruit weight is somewhat more in Sweet Charlie, but due to production of higher number of fruits per plant Winter Dawn resulted higher yield as compared to Sweet Charlie. Again, reduction of fruit weight beyond 75 ppm concentration of GA_3 might be due to excessive elongation of fleshy receptacles in the fruits. Similar results were found by Thakur et al. (2015) that the GA_3

75 ppm gave best result in terms of plant growth, yield and fruit quality as compared to other treatments. Yadav et al. (2017) showed that foliar spray of GA_3 75 ppm after 45 days of transplanting was found superior over all other treatments with respect to various parameters to enhance strawberry yield. Whereas some Researchers found best effect on strawberry by application of GA_3 100 ppm (Tripathi and Shukla, 2010; Singh and Singh, 2009; Kumar and Tripathi, 2009).

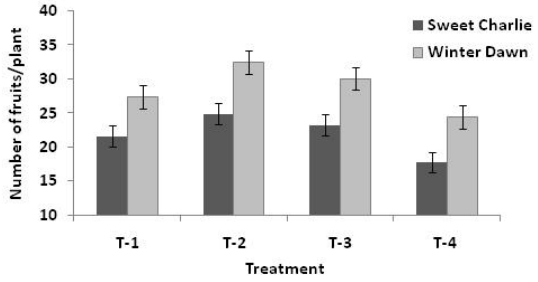

Fig. 4: Effect of gebberellic acid concentration on number of fruits/plant of strawberry

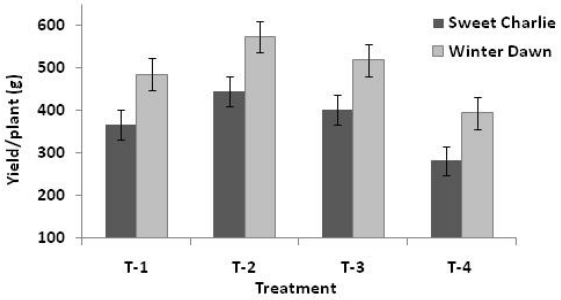

Fig. 5: Effect of gebberellic acid concentration on yield/plant of strawberry

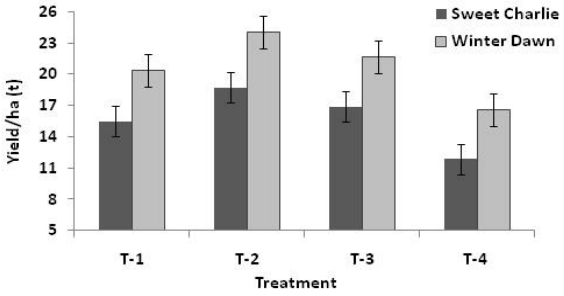

Fig. 6: Effect of gebberellic acid concentration on yield/ha of strawberry

CONCLUSION

Based on the experimental results, it can be concluded that application of gibberellic acid can increase bearing capacity, fruit size and yield in strawberry. Application of GA_3 @ 75 ppm twice at 40 DAP and 60 DAP had the best effect to increase fruit-set, number of fruits per plant, fruit size and yield. Again, Winter Dawn variety produced 28.35% higher yield as compared to Sweet Charlie under GA_3 @ 75 ppm treatment. Therefore, cultivation of strawberry with application of 75 ppm GA_3 can bring ample scope for increasing fruit size and yield in strawberry to fetch more profit for the farmers. Again, the variety Winter Dawn may be selected to achieve higher yield for getting better remuneration.

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