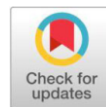


Research Article

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Response of pre-harvest plant bio-regulator applications over the bunch characters and yield traits in banana cv. Poovan under the Cauvery delta



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ABSTRACT

Bananas are one of the most important fruit crops which are the major economic source for several fruit growers. Lack of knowledge over the pre-harvest practices and insufficient post-harvest spray could be the contributing factors towards lower productivity in banana. Meanwhile, the inevitable use of plant bio-regulators has become a crucial component of the current cropping system with a view to improving the production of high-quality fruit. Hence, an investigation entitled 'Effect of pre-harvest sprays with plant bio-regulator on bunch character and yield of banana cv. Poovan' was taken up to assess the impact of certain plant bio-regulators sprays over the bunch development and yield-related traits in banana cv. Poovan. The experiment was laid out in Randomized Block Design (RBD) with six treatments (T1 - GA3 50ppm, T2 - CPPU 2ppm, T3 - 2,4-D 25 ppm, T4 - Brassinosteroid 1 ppm, T5 - Sea weed extract 0.1% and T6 - control) and four replications. Two Bunch sprays of treatments were given at the time of opening of last hand and at 20 days later the first spray. The results revealed that the bunch treatment with GA3 at 50 ppm recorded highest yield and found effectiveness over the bunch characters and yield of banana.

Keywords: 2,4-D, gibberellin, Plant bio regulators, Poovan, Pre-harvest spray, bunch character, banana yield.

I. INTRODUCTION

Bananas are considered to be one of the economical fruit crops notified often as 'Kalpatharu, Apple of Paradise, Adams fig. It evolved basically from South-East Asian humid tropical regions and facilitates year-round fruit production. Musa sp. has its commercial production with 120 countries around the world which facilitates better the remunerative price and income sources of several growers of developing countries (FAO, 2017). Poovan (AAB), a triploid banana cultivar belonging to the Mysore subgroup is one of the most common commercial cultivars of Tamil Nadu produced by many small-scale farmers for domestic use exclusively on desert purposes. Moreover, the fruit crop cultivation is limited with the coastal track of Karaikal region and the banana cultivation taken up with few commercial varieties of Poovan, Monthan, Karpooravalli and peyan in small scale farming. In that line, the production of poor-quality fruits often experienced in the region even though rendered with balanced nutrition in recent years. Enrichment of plant nutrients at shooting and fruit development stage is crucial with productivity enhancement in banana. Inadequacy of post-harvest spray as the pre-harvest practices be another possible factor over the low productivity. On the other hand, the

inevitable use of plant bio-regulators become an integral part of the modern cropping system on enhancing the quality fruit production. Research outcomes from several fruit crops evidenced the significant impact of bio-regulators towards the enhancement of flowering, fruit size directly by stimulating cell division and alter the flowering time even with adverse climatic conditions. In banana, bunch application of CPPU (2 ppm) enhanced fruit quality and shelf life of banana [16]. Biwas and Lemtur (2014) observed that bunch sprays with GA3 (50 ppm) + Brassinolide 1 ppm over recently emerged bunches improved both the bunch and hand weight including finger size. Bunch spray with 2,4-D (30 ppm) increased the nutritive value in harvested fruits of banana [18]. On other hand, seaweed bio-formulations (1 ppm) recorded positiveness over yield and quality traits of banana cv. Grand Naine [17]. Hence with this background, the current field study was carried out to assess the pre-harvest spray effect of plant bio regulators on bunch character and yield of banana cv. 'Poovan' in the track of Karaikal region under Cauvery delta of Tamil Nadu.

II. MATERIALS AND METHOD

A field study was performed at the banana cropped area at Varichikudy, Karaikal (Puducherry) during 2020-2021. The experimentation was laid out with six treatments (T1 - GA3 50ppm, T2 - CPPU 2ppm, T3 - 2,4-D 25 ppm, T4 - Brassinosteroid 1 ppm, T5 - Sea weed extract 0.1% and T6 - control) under RBD and replicated four times. For each treatment, the optimum concentrations were prepared as per standard norms and bunch sprays were given twice using hand operated pressure

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sprayer after mixing with a wetting agent viz., one at the time of last hand opening and another at 20 days later the first spray. Parameter of bunch characters such as bunch length, bunch circumference, bunch weight, number of hands per bunch, number of fingers per bunch, internodal length among first and second hand, second and third hand and distance between first and last hand, hand weight and yield related traits were measured and statistically analyzed as per the standard procedures of Panse and Sukhatme (1984).

III. RESULTS AND DISCUSSION

The results revealed that those bunch sprays of banana cultivar Poovan treated with of GA3 (50ppm) registered positiveness over the increment of traits such as bunch length, bunch circumference, bunch weight, Number of hands per bunch, Number of fingers per bunch and yield per hectare (Table.1). GA3 are well known to play a vital role in stimulating the fruit size through the process of cell enlargement by producing enzymes which debilitate the cell wall for favoring the cell elongation [20]. For other characters, 'T3' of 2,4-D (25ppm) expressed positiveness with inter nodal length as compared with all other treatments including untreated control. Even though the positive results from the application of 2,4-D to the banana cv. Poovan is well-known fact, GA3 treatment remain superior over other treatments. This might be due to the phenomenon that GA3 aided in the enhancement of the auxin levels that made the availability to the compound towards the action site in crop. Hence, this resulted in better performance of GA3 as compared with other auxin-sourced treatments. Studies from several researches are also evident that the impact of bunch sprays with gibberellic acid in banana after inflorescence emergence promoted profitable bunch-related characters specifically the bunch weight [4].

The highest bunch length (65.33 cm), bunch circumference (81.90 cm), number of hands per bunch (8.70), number of fingers per bunch (127.50) and maximum bunch weight (12.84 Kg) was recorded in the GA3 at 50ppm treated bunches whereas lower the bunch length (54.67 cm), bunch circumference (66.10 cm), number of hands per bunch (8.00) and lesser bunch weight (9.80 Kg) were recorded in control. Similar results were obtained by Kumar, et.al., (2011), where the highest bunch weight (6.37 kg) registered as pre-harvest spray of GA at 200 ppm treatment rendered to banana cv. Nanjangudu Rasabale [10]. Furthermore, GA3 responds certain functionality changes over their metabolic activity in fruits through the accumulation of food assimilates and thus increased the bunch weight in cv. Ney Poovan [9] and Robusta [2] [19]. Moreover, the

improvement with bunch character might be due to the increased accumulation of carbohydrates with the sink during the bunch development stage.

The greater internodal length among the first and second hand (11.00 cm) observed 2,4-D 25 ppm treated bunches. A similar case of increased internodal length was observed in banana cv. Rajapuri [6] when bunches fed with 15 mg of 2,4-D and 500 ml cowdung slurry. On the other hand, positiveness is observed with the number of fingers in bunches of banana cv. Grand Naine (AAA) [15]. The longest distance between the first scar and last hand (41.00 cm) obtained in the treatment with GA3 50 ppm whereas the least was found in control (29.60 cm). This might be due to the impact of GA3 which regulated the process of stem elongation with profuse mechanisms of cell division and elongation [12]. The maximum hand weight recorded in GA3 and seaweed extract treated banana bunches (1.13 Kg and 1.10 Kg respectively) and lesser noticed in control (0.77 Kg). The increased hand weight might be due to higher the accumulation of carbohydrates in sink at the reproductive phase of the crop [3]. Auxin and gibberellins were well known for their performance with cell division and cell elongation phenomenon that resulted in enhanced size with fruits. In addition, GA3 also tend to retain protein synthesis in active state for a longer period and thereby grants continuous fruit growth [13].

The highest Yield per hectare (32.10 t/ha) was recorded in GA3 (50ppm) treatment which was on par with seaweed extract (31.03 t/ha) and lesser in control (24.50 t/ha). Banana hands during the mobilization process undergo enhancement with size and hence they were in requisition of relatively larger amounts of gibberellic acid that hampers greater the yield including the quality with fruits. The development of banana at numerous developmental stages remain complex and regulated accordingly. The statement agrees with the scientific reports of other researchers [7] [4] and [21]. The foliar application of GA3 might have triggered cell division and cell elongation that leads to an increment in fruit growth rate, fruit development and increased yield. Apart, the positive increment on yield attributed parameters with pre-harvest foliar application of GA3 might be due to several functionalities in rapid division and elongation of cells in fruits due to the enlargement of vacuoles and cell wall loosening mechanism. Later it tends to enhance the plasticity in cell wall, sugar translocation is directly or indirectly reflected with the overall production and yield in banana [14]. The results were in confirmation with the findings of Agrawal and Dikshit (2008) [1]. Similarly, the seaweed extract was also proved to be an efficient bio regulator to improve the yield of banana in several cultivars [17] [8] [5].

IV. TABLES AND FIGURES

Table 1: effect of preharvest spray of different plant bioregulator on banana cv. Poovan

Treatment	Bunch length (cm)	Bunch circumference (cm)	Bunch weight (Kg)	No. of hands per bunch	No. of fingers per bunch	Internodal length among first and second hand (cm)	Internodal length among second and third hand (cm)	Distance between first scar and last hand (cm)	Hand weight (g)	Yield per hectare (t/ha)
T1	65.33	81.90	12.84	8.70	127.50	9.80	5.00	41.00	1.13	32.10
T2	60.53	69.45	11.52	8.00	106.00	9.60	4.20	33.00	1.04	28.80
T3	60.33	75.85	11.36	8.20	116.00	11.00	5.10	35.20	1.00	28.40
T4	56.63	77.30	12.00	8.10	99.00	9.60	8.50	34.00	1.09	30.00

T5	57.43	74.25	12.41	8.40	99.00	9.00	7.00	32.00	1.10	31.03
T6	54.67	66.10	9.80	8.00	99.50	7.50	3.60	29.60	0.77	24.50
MEAN	59.15	74.14	11.66	8.23	107.83	9.42	5.57	34.13	1.02	29.14
Sed	1.13**	1.42**	0.22**	0.16**	2.07**	0.18**	0.11**	0.65**	0.02**	0.55**
CD (0.05%)	2.42	3.03	0.47	0.34	4.41	0.38	0.23	1.39	0.04	1.18

Fig.1. View of fruit hands under different treatment in banana cv. Poovan



Fig.2. View of harvested bunches under different treatment in banana cv. Poovan



V. CONCLUSION

Application of plant bioregulators at the right concentration at the right stage of crop development are one of the physiological maneuvering tactics to improve the yield of various crops. From the present investigation, it was clear that the exogenous application of GA3 at 50 ppm concentration during the post-shooting stage as pre-harvest practices enhanced the productivity of banana cv. Poovan.

VI. CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

VII. ACKNOWLEDGEMENT

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