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INFLUENCE OF DEHANDING AND EXOGENOUS APPLICATION OF GROWTH REGULATORS ON THE POST-HARVEST PHYSIOLOGICAL AND QUALITY PARAMETERS OF BANANA CULTIVAR GRAND NAINE

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ABSTRACT

An investigation was carried out to assess the impact of dehanding and bunch sprays of GA_3 and CPPU on the post-harvest characteristics of banana cv. Grand Naine at Dr. YSRHU-Banana Research Station, Pulivendula, A.P., India, during 2023-24. The experiment laid out in factorial randomised block design with de-handing and growth regulator sprays as factors and 12 different treatment combinations and replicated thrice. Retention of eight hands per bunch after dehanding showed minimum peel weight (28.28g) maximum pulp weight (119.87g) and Pulp: peel ratio (4.25). The highest pulp weight (116.40 g), pulp-to-peel ratio (3.91), shelf life (10.78), lowest peel weight (29.76 g) and physiological loss in weight (16.91%), were recorded in bunches sprayed with GA_3 100 ppm + CPPU 4 ppm. The combination of retention of 8 hands per bunch and bunch spray of GA_3 100 ppm + CPPU 4 ppm produced the highest Pulp weight (125.10 gm), Pulp: peel ratio (4.67) and lowest Peel weight (26.75 gm). The lowest percentage of Physiological loss in weight (16.41%) was recorded in the treatment combination of retention of nine hands per bunch after dehanding and bunch spray of GA_3 100 ppm + CPPU 4 ppm. The Shelf life (11.55 days) was highest in retention of ten hands per bunch and spraying with GA_3 100 ppm + CPPU 4 ppm.
Keywords: Grand Naine, Dehanding, CPPU, Shelf life, Physiological loss in weight.

Introduction

Bananas are the most widely cultivated fruit because they are affordable, nutritious and available year-round in India. Banana occupies 18% and 49% of global fruit production and one of the most significant tropical fruit crops. In 2020, global banana and plantain production reached 155.2 million tonnes, with bananas contributing 115.7 million tonnes (75%) and plantains 39.5 million tonnes (25%), which were grown across 8.72 million hectares (FAO, 2020). Banana exports are valued at approximately US$13.8 billion, with 20.07 million tonnes traded worldwide, and the Grand Naine variety alone represents over 90% of this global trade.

Bunch management is a common practice to enhance both yield and quality, enabling farmers to achieve higher market prices in banana farming. Finger size significantly varies within a banana bunch and

often the distal hands (near the bottom) are 30-40% smaller than the proximal hands at the top. These small hands don't meet market standards and are either removed or sold for low costs. Dehanding, is a common practice in export-oriented banana production, involves removing two or three terminal hands from each bunch.

Plant growth regulators in small quantities can accelerate, slow down, or alter various processes within plants. The use of these regulators has led to notable improvements in growth, production, and quality in many fruit crops. GA_3 and CPPU play key roles in enhancing fruit size and quality. GA_3 and CPPU promotes cell division and enlargement, that enhances protein production and stimulates development of new tissues, which results in larger fruits (Hassan and Behary, 2021).

Material and Methods

The present experiment was carried out at the YSRHU-Banana Research Station, Dr YSR Horticultural University, Pulivendula, Andhra Pradesh, India during 2023- 2024 (coordinates:14°27'57.7"N 78°12'54.8"E). The experiment was planted in factorial randomized block design with four de-handing levels (D_1- retention of 8 hands after dehanding, D_2- retention of 9 hands after de-handing, D_3- retention of 10 hands after dehanding, D_4- no dehanding), and three growth regulator treatments (T_1- GA_3 50 ppm + CPPU 4 ppm, T_2- GA_3 100 ppm + CPPU 4 ppm, T_3- Water spray). Observations on post-harvest parameters were recorded after the harvest. De-handing was done one week after the last hand opening, using a knife. Growth regulators GA_3 at concentrations of 50 ppm and 100 ppm, along with CPPU at 4 ppm, were used. Growth regulators were sprayed on banana bunches immediately after the opening of last hand and 15 days later (second application). Data were recorded on Pulp weight, Peel weight, Pulp: Peel ratio, Shelf life and Physiological loss in weight.

The data were analysed following the methods outlined by Panse and Sukhatme (1978) for a Factorial Randomized Block Design (FRBD). The analysis of variance was assessed using the F-test at a 5% significance level.

Results and Discussion

The results indicated that pulp weight, peel weight, and pulp-to-peel ratio were significantly affected by both dehanding and growth regulator sprays (Table 1). Significantly higher pulp weight (119.87 g) in fruits was recorded in bunches retained with 8 hands after dehanding. Spraying with GA_3 100 ppm + CPPU 4 ppm resulted in maximum pulp weight (116.40 g). with regard to interaction effects, the combination of retaining eight hands per bunch and spraying with GA_3 100 ppm + CPPU 4 ppm resulted in highest pulp weight of 125.10 g

The lowest peel weight (28.28 g) was recorded in bunches retained with eight hands retained after dehanding. Spraying of bunches with GA_3 100 ppm + CPPU 4 ppm recorded the lowest peel weight (29.46 g). The combination of retaining eight hands per bunch after dehanding and spraying with GA_3 100 ppm + CPPU 4 ppm resulted in lowest peel weight (26.75 g). These findings are in accordance with those of Wanichkul and Boonma (2009), Sarkar *et al.* (2015), and Deshmukh *et al.* (2023). Increase in soluble sugars in the pulp, which leads to osmotic movement of water from the peel to the pulp might be the reason for lower peel weight. These results are in tune with the findings of Tourky *et al.* (2014).

Highest pulp-to-peel ratio of 4.25 was recorded in bunches where eight hands were retained after dehanding. Application of GA_3 100 ppm + CPPU 4 ppm on bunches resulted in maximum pulp-to-peel ratio of 3.91. The combination of retaining eight hands per bunch and spraying with GA_3 100 ppm + CPPU 4 ppm recorded the highest pulp-to-peel ratio of 4.67. Similar results were reported by Sultana *et al*. (2012), Ghimire *et al.* (2021).

Removal of hands from bunch did not have any effect on shelf life, while significant differences in shelf life were observed due to growth regulator sprays and their interactions. Bunches sprayed with GA_3 100 ppm + CPPU 4 ppm showed the longest shelf life (10.94 days). The interaction between dehanding and growth regulator sprays was significant. Combination of retaining ten hands after dehanding and spraying with GA_3 100 ppm + CPPU 4 ppm extended the shelf life to 11.55 days compared to control (7.93). Gibberellic acid slows down the ripening process by controlling ethylene production, enzymatic activity and avoid transpirational losses (Sahithya *et al.*, 2015). These findings are in agreement with Shrestha (2010). Zomo *et al.* (2014).

Table 1: Effect of Dehanding and bunch spray of GA_3 and CPPU on post-harvest attributes of banana cv. Grand Naine

Treatments	Pulp weight (gm)	Peel weight (gm)	Pulp: peel ratio	Shelf life (days)	Physiological loss in weight (%)
Dehanding (D)					
D_1	119.87	28.28	4.25	9.80	17.76
D_2	115.70	29.78	3.89	9.72	17.79
D_3	111.27	31.43	3.56	9.76	17.73
D_4	101.47	34.02	3.00	9.71	17.81
SE (m)	0.30	0.14	0.02	0.09	0.11
CD at 5%	0.91	0.40	0.05	NS	NS
Growth regulators (T)					
T_1	113.95	30.38	3.85	10.01	17.44
T_2	116.40	29.46	3.91	10.94	16.91
T_3	105.93	32.80	3.27	8.29	18.96
SE (m)	0.30	0.12	0.01	0.08	0.09
CD at 5%	0.92	0.35	0.04	0.22	0.27
Interaction D x T					
D_1T_1	119.30	28.40	4.20	10.78	16.78
D_1T_2	125.10	26.75	4.67	10.22	16.58
D_1T_3	115.20	29.70	3.88	8.39	19.91
D_2T_1	118.90	29.26	4.07	9.89	17.48
D_2T_2	116.80	28.99	4.03	11.32	16.41
D_2T_3	111.40	31.09	3.58	7.95	19.48
D_3T_1	115.00	30.36	3.79	8.82	17.94
D_3T_2	112.00	29.73	3.77	11.55	16.91
D_3T_3	106.80	34.19	3.12	8.89	18.33
D_4T_1	112.20	33.48	3.35	10.54	17.56
D_4T_2	101.90	32.37	3.15	10.67	17.75
D_4T_3	90.30	36.22	2.49	7.93	18.11
SE (m)	0.50	0.24	0.03	0.16	0.18
CD at 5%	1.85	0.82	0.09	0.52	0.63

D1- 8 hands after dehanding
D2- 9 hands after dehanding
D3- 10 hands after dehanding
D4- no dehanding

T1- GA_3 50 ppm + CPPU 4 ppm
T2- GA_3 100 ppm + CPPU 4 ppm
T3- Water spray

No significant change in physiological loss in weight was observed due to dehanding in the present investigation. Bunches sprayed with GA_3 100 ppm + CPPU 4 ppm showed the lowest physiological weight loss in weight (16.91%). Retaining nine hands per bunch after dehanding combined with spraying of GA_3 100 ppm + CPPU 4 ppm recorded minimum physiological loss in weight (16.41%) while retaining eight hands per bunch after dehanding combined with spraying of GA_3 100 ppm + CPPU 4 ppm was at par. Fruits like banana, mango are climacteric in nature and are highly perishable during storage, which followed by texture loss and colour loss due to many physiological, biotic and abiotic factors that may occur after harvest (Sivakumar *et al*., 2011). GA_3, markedly delayed the colour changes and extend the shelf life. Zoffolio *et al*. (2009) demonstrated that the preharvest application of CPPU and GA_3 together increased thickness of pedicel and cuticle content, therefore maintained fruit quality of grape. GA_3 increases polyamine levels and the activity of the enzymes that produce them. This helps delay aging in plants, supports important physiological processes, and reduces weight loss, as shown by Valero *et al.* (1998) and Ghimire *et al.* (2021).

Conclusion

Dehanding and application of GA_3 and CPPU significantly improved the post-harvest qualities in banana. Retaining eight hands after dehanding produced higher pulp weight in fruits. Bunches Sprayed with GA_3 100 ppm + CPPU 4 ppm significantly increased the pulp weight. The spraying of bunches with GA_3 at 100 ppm combined with CPPU at 4 ppm recorded highest pulp weight, pulp-to-peel ratio, shelf life and lowest peel weight and physiological loss in weight.

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