



Short communication

Effect of bunch-trimming on yield and quality in banana

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ABSTRACT

The experiment consisted of different intensities of hand removal viz. 1, 2 and 3 hands (H_1 , H_2 and H_3 respectively) and time of hand removal i.e., immediately after opening of last hand (T_1), one week after opening of last hand (T_2), and two weeks after opening of last hand (T_3). Results were statistically analysed using augmented 2 factor factorial CRD. The time of hand removal did not show any significant difference on yield while hand weight, finger weight, finger length, finger diameter and volume of finger increased with the increase in number of hands removed. It is suggested that removal of three hands between one and two weeks after opening of last hand is beneficial for improving yield and finger quality of banana cv. Martaman (*Musa AAB*).

Key words: Banana (*Musa AAB*), bunch trimming, production, quality

INTRODUCTION

Basal hands of a banana bunch are often larger in size than the terminal hands. These are usually discarded or sold as third quality fruits in the market. Thus, at least two or three hands in a bunch fail to reach the finger quality standards required for the specialized markets thereby reducing income to the producers. Dehanding consists of removing two or three terminal hands of each bunch and is a routine practice in banana production system for export. By removing the terminal hands, it may be expected that dry matter would be redistributed among the remaining hands of the bunch thus helping to increase the size of the remaining hands (Rodriguez *et al*, 1988). Keeping the above aspects in view the present investigation was carried out.

MATERIAL AND METHODS

The experiment was conducted in the Research Station of All India Coordinated Research Project on Tropical Fruits at Mondouri of Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal on the dessert cultivar, Martaman (*Musa AAB*). One hundred and twenty four (124) plants of cv. Martaman spaced at 1.8 m \times 1.8 m were selected for bunch trimming with three replications laid out in augmented 2 factor factorial CRD. The experiment consisted of different intensities of hand removal viz. 1, 2, or 3 hands (H_1 , H_2 and H_3 respectively) and time of hand removal viz. immediately after opening of hand, one week after opening of last hand, two weeks after opening of last hand (T_1 , T_2 , T_3 respectively) along

with control. Allocation of bunch trimming treatments were done on the bunches which had opened on the same day with uniform length, finger size and having nine hands. The floral remnants and male buds were removed. Observations on yield, hand weight, finger weight, finger volume, finger density, pulp weight, peel weight, pulp/peel ratio, pulp thickness, peel thickness, TSS, sugar and acidity were recorded. For statistical analysis, Principal Component Analysis was followed, based on correlation matrix.

RESULTS AND DISCUSSION

It was evident that hand removal had significant effect on bunch weight, yield, hand weight, finger weight, finger length, diameter, pulp weight, peel weight, pulp thickness, peel thickness, total sugar, reducing and non-reducing sugar, acidity and TSS/acid ratio. The highest bunch weight of 14.95 kg was recorded with removal of one hand (H_1). Time of hand removal and interaction effect of number of hands removed and time of hand removal ($H \times T$) significantly affected bunch weight. Bunch weight of 15.14 kg was recorded with removal of one hand after one week of opening of last hand (H_1T_2) followed by removal of one hand after two weeks of opening of last hand (H_1T_3) and immediately after opening of last hand ($H1T1$).

However, the untrimmed plants yielded a maximum bunch yield of 15.20 kg as compared to trimmed bunches. Among the various intensities of hand removal, one hand removal (H_1) showed yield of 46.14 t/ha. The time of hand removal did not show any significant difference on yield

Table 1. Effect of intensity and time of hand removal on bunch characters

Treatment	Weight of bunch (kg)	Yield (t/ha)	Weight of hand (kg)	Weight of finger (g)		
Number of hand removal (H)						
H ₁	14.95	46.14	1.821	141.99		
H ₂	13.17	40.63	1.833	145.33		
H ₃	12.75	39.36	2.002	153.27		
S.Em (±)	0.168	0.518	0.004	0.592		
CD (<i>P</i> =0.05)	0.496	1.528	0.012	1.746		
Time of hand removal (T)						
T ₁	13.61	41.99	1.862	144.85		
T ₂	13.63	42.06	1.885	149.43		
T ₃	13.64	42.08	1.909	146.30		
S.Em (±)	0.168	0.518	0.004	0.592		
CD (<i>P</i> =0.05)	NS	NS	NS	1.746		
Treatment	Length of finger (cm)	Diameter of finger (cm)	Volume of finger (cc)	Density of finger (g/cc)		
Number of hand removal (H)						
H ₁	11.74	4.02	146.6	0.969		
H ₂	11.89	4.11	150.60	0.965		
H ₃	12.20	4.25	158.17	0.968		
S.Em (±)	0.038	0.034	0.559	0.001		
CD (<i>P</i> =0.05)	0.112	0.100	1.649	0.003		
Time of hand removal (T)						
T ₁	11.86	4.09	150.02	0.965		
T ₂	11.96	4.18	154.23	0.969		
T ₃	12.00	4.11	151.13	0.967		
S.Em (±)	0.038	0.034	0.559	0.001		
CD (<i>P</i> =0.05)	0.112	NS	1.649	0.003		
Treatment	Total soluble solids (°Brix)	Total sugar (%)	Reducing sugar (%)	Non-reducing sugar (%)	Acidity (%)	TSS: Acidity ratio
Number of hand removal (H)						
H ₁	18.35	16.29	8.25	7.63	0.482	38.24
H ₂	18.36	16.44	8.62	7.43	0.494	37.15
H ₃	18.33	16.78	8.83	7.55	0.527	34.75
S.Em (±)	0.041	0.009	0.007	0.01	0.003	0.183
CD (<i>P</i> =0.05)	NS	0.027	0.021	0.029	0.009	0.540
Time of hand removal (T)						
T ₁	18.35	16.38	8.49	7.49	0.486	37.93
T ₂	18.34	16.46	8.55	7.51	0.504	36.41
T ₃	18.34	16.67	8.66	7.61	0.513	35.80
S.Em (±)	0.041	0.009	0.007	0.010	0.003	0.183
CD (<i>P</i> =0.05)						
Control vs Rest						
S.Em (±)	0.137	0.031	0.025	0.036	0.010	0.645
CD (<i>P</i> =0.05)	0.286	0.065	0.052	0.075	0.021	1.345

Note: H₁ = Removal of one hand, H₂ = Removal of two hands and H₃ = Removal of three hands; T₁ = Removal of hand (s) immediately after opening of last hand, T₂ = Removal of hand (s) one week after opening of last hand, and T₃ = Removal of hand (s) two weeks after opening of last hand

although hand weight, finger weight, finger length, finger diameter and volume of finger increased with the increase in number of hands removed. Increase in fruit weight due to dehanding might be due to higher rate of fruit filling because of reduction in sink size (Jullien *et al*, 2001). Removal of one hand showed highest finger density of 0.969 g/cc. On the contrary, pulp weight, peel weight, pulp thickness, total sugar and reducing sugar improved significantly with the increasing intensity of hand removal. But in case of acidity content and TSS/acid ratio, the data showed a reverse pattern

i.e., removal of one hand (H₁) produced fruits having lowest acidity (0.482%) and higher TSS/acid ratio (38.24) compared to two hands (H₂) and three hands (H₃) removal.

Hand removal after two weeks of opening of last hand produced maximum hand weight (1.909 kg), finger weight (149.43 g), finger length (12.0 cm), pulp: peel ratio (3.06) and also the sugar content of fruit. Finger diameter (4.18 cm), finger volume (154.23 cc), density of finger (0.969 g/cc), pulp weight (112.169), peel weight (37.27 g) and pulp thickness (3.91 cm) were higher in T₂

Table 2. Effect of intensity and time of hand removal and their interaction on finger parameters

Treatment	Weight of pulp (g)	Weight of peel (g)	Pulp : Peel ratio	Pulp thickness (cm)	Peel thickness (cm)
Number of hand removal (H)					
H ₁	105.88	36.11	2.94	3.73	0.271
H ₂	109.05	36.28	3.01	3.83	0.273
H ₃	115.87	37.15	3.12	3.98	0.269
S.Em (±)	0.410	0.709	0.066	0.034	0.004
CD (P=0.05)	1.209	NS	NS	0.100	NS
Time of hand removal (T)					
T ₁	108.59	36.26	3.00	3.81	0.275
T ₂	112.16	37.27	3.01	3.91	0.270
T ₃	110.05	36.00	3.06	3.82	0.269
S.Em (±)	0.410	0.709	0.066	0.034	0.004
CD (P=0.05)	1.209	NS	NS	NS	NS
Control vs Rest					
S.Em (±)	1.427	2.393	0.222	0.120	0.014
CD (P=0.05)	2.977	4.992	NS	0.250	0.029

Note: H₁ = Removal of one hand, H₂ = Removal of two hands and H₃ = Removal of three hands; T₁ = Removal of hand (s) immediately after opening of last hand, T₂ = Removal of hand (s) one week after opening of last hand, and T₃ = Removal of hand (s) two weeks after opening of last hand

treatment. Time of hand removal did not show any significant variation in TSS content.

Interaction effect of number of hand removal and time of hand removal significantly affected bunch weight, hand weight, finger weight, finger length, finger diameter, finger volume, density of finger, pulp weight, peel weight, pulp: peel ratio, pulp thickness, TSS, total sugar, reducing sugar and TSS/acid ratio. In respect of bunch weight and yield the untrimmed bunches yielded maximum. This result is supported by the findings of Irizarry *et al* (1992) who reported that three hands removal reduced total yield. Mandal and Sharma (2000) also reported that removal of 1, 2 and 3 lower hands reduced yield by 9, 12.7 and 17.4%, respectively in cultivar Alpan. Removal of three hands after two weeks of opening of last hand (H₃T₃) produced fruits with maximum hand weight (2.020 kg) followed by H₃T₁. Removal of the hands after one week of opening of last hand (H₃T₂) recorded maximum finger weight (156.33) followed by H₃T₃ and H₃T₁ treatments. Control plants yielded the lowest finger weight (119.09 gm) as compared to treatment of hand removal irrespective of its time of removal. H₃T₃ also produced fruits with maximum length (12.33 cm), finger diameter (4.28 cm), pulp: peel ratio (3.15), and pulp thickness (4.01 cm). Arcila *et al* (2002) found that longer size fruit was attained with hand tear off at 20 days after flowering and leaving 4-6 hands per bunch in banana hybrid FHIA-21. Removal of three hands after one week of opening of last hand (H₃T₂) produced fruits with maximum volume (160.93 cc) closely followed by H₃T₃. The same interaction (H₃T₂) proved beneficial in

respect of density of finger and also pulp weight. Total sugar content was highest (16.85) in H₃T₂ interaction. In respect of TSS : acid ratio, H₁T₁ i.e., removal of one hand immediately after opening of last hand proved to be the best. Loss of biomass was partially compensated by increasing fruit weight, length and circumference. Treatments of hand removal at different time increased fruit weight, length and diameter through redistribution of dry matter content by reducing competition for photosynthate among the different hands.

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(MS Received 16 July 2007, Revised 1 October 2007)