Madras Agric. J. 89 (7-9) : 434-437 July-September 2002
https://doi.org/10.29321/MAJ.10.A00242

Studies on the effect of pre-harvest treatments on maturity, yield and quality of red banana

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Abstract : Field experiment conducted during 1998-2000 in red banana revealed significant variations in maturity, yield and quality attributes due to pre-harvest sprays of GA_3, $MnSO_4$ and K_2SO_4, soil mulch by coir waste and covering the bunches with 0.5% and 1.0% ventilated 100 gauge blue polythene sleeves. Among the treatments, covering the bunches with 1% ventilated 100 gauge blue polythene sleeves after opening of the last hand significantly reduced the time taken for maturity from 138.5 days in control to 110 days. The bunch yield was found to be significantly higher in this treatment (13.5 kg) than in control (11.6). Quality attributes *viz.* TSS, sugars and peel colour of the fruit were also enhanced due to covering bunches with 1% ventilated blue polythene sleeves.

Key words: Red banana, Blue colour polythene sleeves, Fruit maturity and Fruit quality.

Introduction

Banana is the cheapest fruit and rich source of energy in the form of sugars and starch. In India, it is grown from coastal deltaic plains to inland and the uplands of altitude of upto 1800 m in both irrigated and rainfed conditions. Among the different bananas, red banana, known for its good flavour and taste, is grown both in plains and hilly area. The colour development and quality in plains are poor. Red banana with purplish red peel colour attracts the consumer and fetches higher price in the market. Hence, a study was conducted in red banana to find out the effect of pre-harvest sprays of chemicals, growth regulators and also covering the bunches with blue polythene sleeves on fruit growth, maturity and colour development.

Materials and Methods

A field experiment in red banana (local type) was conducted during 1998-2000 at Horticultural College and Research Institute, Periyakulam. The crop was raised in sandy loam soil during 1998 with recommended package of practices. The experiment was laid out in Randomized block design with 7 treatments and 4 replications. The treatments were imposed during flowering phase. The treatment details are as follows:

1. Soil mulching of agricultural waste - coir waste for 20 cm depth
2. Spraying 0.5% $MnSO_4$ at 30, 60 and 90 days after the opening of last hand
3. Spraying 1.0% K_2SO_4 at 30, 60 and 90 days after the opening of last hand
4. Covering the bunches with 100 gauge blue polythene sleeves with 0.5% ventilation after the opening of last hand
5. Covering the bunches with blue polythene sleeves of 100 gauge with 1% ventilation after the opening of last hand
6. Spraying 100 ppm GA_3 at 30, 60 and 90 days after the opening of last hand
7. Control (untreated)

The blue polythene sleeves of 1. 5 m length x 0. 6 m breadth were used for the study. The bunches were covered when the last hand was completely open. After inserting the bunches into sleeves, the upper end of the sleeves was tightly tied to the stalk with a rubber string and allowed the lower end free. The plants were tagged during flowering and the days to maturity was assessed. Apart from yield and yield components, the fruits were subjected to natural ripening and physiological loss in weight (PLW), pulp, peel, TSS, acidity and ascorbic acid contents were also estimated (Ranganna, 1979).

Results and Discussion

Pre-harvest treatments significantly influenced the maturity, yield and yield components of red banana (Table 1). Among the treatments, covering the bunches with 100 gauge blue colour polythene sleeves with 1% ventilation recorded the highest yield (13.5 kg $bunch^{-1}$) followed by spraying of 100 ppm GA_3 at 30, 60 and 90 days after opening of the last hand (13.0 kg ha^{-1}) and covering the bunches with 0.5% ventilated

Table 1. Effect of pre-harvest treatments on yield and yield components of red banana

Treatments		Days to maturity (days)	Bunch weight (kg per bunch)	No.of hands per bunch	No. of fingers per hand	No.of fingers per bunch	Fruit length (cm)	Fruit circum-ference (cm)	Fruit weight (g/fruit)	Fruit weight at ripening (g/fruit)	PLW (%)
T_1	Control	138.5	11.6	5.7	12.0	69	13,0	13.5	140.5	135.0	3.91
T_2	Soil mulching by coir waste	135.2	12.3	5.8	11.9	69	15.5	14.8	150.5	144.2	3.86
T_3	Spraying 0.5% $MnSO_4$ on bunches	129.4	11.8	5.2	12.8	66	14.0	13.5	145.1	139.5	3.85
T_4	Spraying 1.0% K_2SO_4 on bunches	130.3	12.5	5.6	12.5	70	13.8	14.9	152.6	142.7	3.53
T_5	Covering bunches by 100 gauge blue Polythene sleeve of 0.5% ventilation	114.0	12.9	5.9	12.2	72	14.5	15.1	154.8	149.0	3.74
T_6	Covering bunches by 100 gauge blue Polythene sleeve of 1.0% ventilation	110.0	13.5	5.5	12.6	7.1	15.0	16.5	162.6	157.5	3.13
T_7	Spraying 100 ppm of GA_3	118.1	13.0	5.9	12.2	70	16.0	15.3	155.3	149.5	4.04
	SEd	2.565	0.584	0.146	0.160	0.787	0.383	0.301	1.412	1.618	0.039
	CD (P=0.05)	5.590	1.272	0.318	0.349	1.714	0.834	0.665	3.076	3.526	0.085

Table 2. Effect of pre-harvest treatments on quality attributes of red banana

	Treatments	Pulp weight (g per fruit)	Peel weight (g per fruit)	Pulp/ Peel ratio	TSS (°Brix)	Acidity (%)	Ascorbic acid (mg/100g)	Total Sugar (%)	Reducing sugar (%)	Non-reducing sugar (%)	Peel colour
T_1	Control	95.2	39.8	2.39	16.5	0.384	4.31	14.53	12.47	2.06	Pale red
T_2	Soil mulching by coir waste	105.6	38.6	2.73	16.9	0.316	4.40	14.80	13.05	1.75	Light red
T_3	Spraying 0.5% $MnSO_4$ on bunches	95.8	43.7	2.19	17.3	0.346	4.17	15.51	12.54	2.97	Red
T_4	Spraying 1.0% K_2SO_4 on bunches	97.1	45.6	2.13	18.3	0.294	4.07	16.43	14.08	2.35	Red
T_5	Covering bunches by 100 gauge blue Polythene sleeve of 0. 5% ventilation	101.1	47.9	2.11	18.0	0.284	4.25	16.02	13.94	2.08	Red
T_6	Covering bunches by 100 gauge blue Polythene sleeve of 1.0% ventilation	106.9	50.6	2.11	18.8	0.247	4.49	16.98	15.27	1.71	Dark red
T_7	Spraying 100 ppm of GA_3	103.6	45.9	2.25	16.9	0.305	4.29	15.65	13.16	2.49	Red
	SEd	2.825	1.818	0.064	0.808	0.004	0.081	0.059	0.053	0.034	
	CD (P=0.05)	6.156	3.962	0.138	1.759	0.009	0.177	0.128	0.116	0.074	

polythene sleeves (12.9 kg bunch^{-1}). The untreated control recorded significantly lower yield (11.6 kg bunch^{-1}) than the other treatments. The highest fruit yield achieved in blue colour polythene sleeves might be due to more supply of photosynthates to the developing fruits, faster conversion of carbohydrates and better assimilation of metabolites which were accelerated by the warmer temperature created inside the bunch cover (Ganry, 1975). Individual fruit weight and fruit circumferences were also found to be higher in fruits covered with 1% ventilated sleeves than the other treatments. The number of fingers / bunch was found to be higher in 0.5% ventilated sleeves, but it was found to be on par with 1.0% ventilated sleeves. Thus, the individual fruit weight along with moderate number of hands per bunch could have contributed to higher yield in 1.0% ventilated polythene sleeves.

Covering the bunches with 100 gauge blue polythene sleeves with 1% ventilation significantly reduced the time for maturity from 138.5 days in control to 110. 0 days. This was in close conformity with the findings of Reddy (1989) who has also reported that bunch covers increased the growth and development of finger and thus, shortened the days taken for maturity. The low PLW (3.13%) recorded in fruits harvested from 1.0% ventilated sleeves may be attributed to the slow ripening processes and also due to higher fruit weight which was achieved because of better filling of individual fingers due to polythene sleeves (Daniells *et al.* 1992).

The higher pulp content (106.9 g), TSS (18.80), total sugars (16.98%), reducing (15.27%) and non-reducing sugars (1.71%) with low acidity (0.24%) were recorded in fruits covered with 1% ventilation blue polythene sleeves than the other treatments. The higher filling of fingers with starch achieved in this treatment might be responsible for higher TSS and sugar content. This was in agreement with the findings of Choudhury *et al.* (1997) who had also reported similar increase in qualities of banana fruit due to bunch cover. Peel colour, one of the quality attributes of red banana, was markedly influenced by the treatments. Here again, covering the bunches with 1% ventilated blue sleeves increased the colour to dark red as against pale red in control. This may be attributed to the fact that the fruit growth in the present study coincided with hot sunlight period (May - August) and the use of blue colour sleeves with 1% ventilation (leaving the sleeves open at the cover end) might have reduced the exposure of fruit from the direct irradiance and thus, increased the pigmentation of the fruits.

Hence, it was revealed from the present investigation that covering the bunches with 100 gauge blue colour polythene sleeves at 1.0% ventilation after opening of the last hand significantly increased the fruit yield, quality attributes and decreased the period of maturity.

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(Received: April 2001 ; Revised: June 2002)