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RS Wankhade

Assistant Professor, Department of Agriculture Research Station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Achalpur, Amravati, Maharashtra, India

YD Charjan

Associate Professor, Department of Agriculture Research Station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Achalpur, Amravati, Maharashtra, India

VN Patil

SRA, Department of Fruit Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Achalpur, Amravati, Maharashtra, India

Sonali Wankhade

SRA, Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Achalpur, Amravati, Maharashtra, India

RK Patil

Associate Professor, Shri Shivaji Agriculture College, Amravati, Maharashtra, India

HH Dikey

Assistant Professor, Regional Research Centre, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Achalpur, Amravati, Maharashtra, India

Corresponding Author:

RS Wankhade

Assistant Professor, Department of Agriculture Research Station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Achalpur, Amravati, Maharashtra, India

Yield, quality and economics of banana influenced by bunch management

RS Wankhade, YD Charjan, VN Patil, Sonali Wankhade, RK Patil and HH Dikey

Abstract

The present investigation conducted during the year 2020-21 at Agriculture Research Station, Achalpur under Dr. Panjabrao Deshmukh Krishi Vidyapeeth, (M.S.), India to investigate the effect of bunch trimming on banana yield and quality. The experiment included five different retention of hands treatments was replicated four times in RBD viz. 6, 7, 8, 9 and 10 hands immediately after the last hand opened. Non-significant effect found in height of plant, girth of stem and total number of leaves in banana. Maximum length of fruit (20.25 cm), girth of fruit (13.95 cm), fruit weight (170.50 g) and pulp weight (115.00 g) recorded significantly in retention of 6 hands per bunch. Whereas, significantly the maximum number of fruits/bunch (152.00), bunch weight (23.83 kg) and yield (105.79 t/ha) was noticed in banana by retention of 10 hands per bunch. Maximum net return with excellent export quality standard and B:C ratio observed in retention of 9 hands per bunch.

Keywords: Bunch trimming, retention of hand, yield, bunch weight, banana

Introduction

Banana (*Musa* spp.) is an important commercial fruit crop in tropical and subtropical regions. It belongs to Musaceae family. The edible banana is derived from a natural hybrid between *Musa acuminata* and *Musa balbisiana* which are native to Malaysia and Burma respectively. The banana name derived from the word Arabic 'Banana', which means "Finger". It is also referred by other names like 'Adam's fig', 'Apple of Paradise', 'Tree of wisdom' and 'Kalpatharu' (Garasangi *et al.*, 2018) [6]. Banana known as "Kalpatharu" is because of its multipurpose uses from rhizomes to male flowers. It is one of the oldest fruits known to man. In terms of total gross production value, banana is considered the fourth food crop in the world after paddy, wheat and milk. (Adinarayana *et al.*, 2016) [1].

Andhra Pradesh, Gujarat, Maharashtra, Tamil Nadu and Karnataka are the leading banana producing states in India, Banana is cultivated over an estimated area of 0.88 million hectares with 30.80 million tonnes of production with productivity of 34.9 MT/ha in India. Overall export of banana is 101.31 thousand MT valued at Rs. 34877.39 lakh (Anonymous, 2018) [2]. Second leading producer of banana next to Andhra Pradesh in the country contributing 14.26 percent of total banana production is Maharashtra. In the country, Maharashtra state accounts for about 4628.04 thousand MT of the total production from an area of 69.54 thousand hectares with a productivity of 66.54 MT/ha (Anonymous, 2020) [3].

Nutrients play an important role in increasing fruit yield and quality. Banana absorbs major nutrients in larger quantities during peak growth phase and the rate of nutrient uptake slows down after shooting. Nutrients affect bunch size and quality of banana at the shooting stage. The terminal hands of banana bunch are often smaller in size than basal hands. These terminal hands are usually sold as third quality fruits in the market or discarded. Thus, at least two or three hands in a bunch fail to reach the finger required for the export quality standards markets thereby reducing income to the producers. Bunch trimming consists of removing two or three terminal hands of each bunch and is a routine practice in banana production system for export called dehanding. Rodriguez *et al.*, 1988 [11] reported that dry matter would be redistributed among the remaining hands of the bunch helping to increase the size of the remaining hands by removing the terminal hands. Bunch management directly influence yield and quality of banana.

Materials and Methods

The investigation was undertaken at agriculture research station at Achalpur of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra on the cultivar Grand naine during the year 2020-21. Three hundred and twenty (320) tissue culture plants of cv. Grand naine planted with spacing 1.5 m x 1.5 m were selected for bunch trimming. The experiment consisted of different intensities of hands retention viz. 6, 7, 8, 9 and 10 viz. T₁, T₂, T₃, T₄ and T₅ respectively with four replications in RBD. Bunch trimming treatments were done on the bunches immediately after opening of hand. The floral remnants and male buds were removed. Observations on height of plant, girth of stem, total number of leaves, no. of fruits/ bunch, fruit weight (g), length of fruit (cm), girth of fruit (cm), bunch weight (kg), fruit yield (t/ha), pulp weight, peel weight and pulp to peel ratio were recorded. For statistical analysis, RBD analysis was done as per the standard procedure given by Panse and Sukatme (1967)^[10].

Results and Discussion

Growth Parameters

The observation on height of plant, stem girth and total number of leaves were presented in Table 1 and found all non significant effect.

Yield Parameters and Yield

The observation on number of fruits per bunch, fruit weight, fruit length, fruit girth, bunch weight, fruit yield (t/ha), pulp weight, peel weight and pulp to peel ratio were recorded presented in Table 1. Different bunch trimming treatment

reported significant differences in respect of fruit length, fruit girth, number of fruits per bunch, fruit weight, bunch weight, yield/ ha and pulp weight.

Significantly maximum number of fruits per bunch (152.00), maximum bunch weight (23.83 kg) and yield (105.79 t/ha) were noticed in retention of 10 hands per bunch followed by retention of 9, 8, 7 and 6 hands. Similar results of three hands removal reduced total yield reported by Irizarry *et al* (1992)^[7]. Removal of 1, 2 and 3 lower hands reduced yield by 9, 12.7 and 17.4%, respectively in cultivar Alpan also reported by Mandal and Sharma (2000)^[9].

Significantly maximum fruit weight (170.50 g), fruit length (20.25 cm), fruit girth (13.95 cm) and pulp weight (115.00 g) were noticed in retention of 6 hands per bunch followed by retention of 7, 8, 9 and 10 hands. Increase in fruit weight because of reduction in sink size due to dehanding might be due to higher rate of fruit filling (Jullien *et al*, 2001)^[8]. 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 reported by Arcila *et al* (2002)^[4].

Economics of bunch trimming

Economics presented in Table 2 indicated that, retention of 9 hands per bunch recorded highest export quality yield 99.77 t/ha, net return of Rs 821446/- and B:C ratio 3.98 which was followed by retention 8 hands. Lowest yield, net return and B:C ratio (85.19 t/ha, Rs 661066 and 3.39) recorded in retention of 6 hands. Digal (2016)^[5] reported that maintaining of 9 hands per bunch found better for higher yields and net realization in grand Naine banana.

Table 1: Effect of bunch trimming on plant height, stem girth, number of leaves, no. of fruits/ bunch, fruit weight, length of fruit, girth of fruit, bunch weight, fruit yield, pulp weight, peel weight and pulp to peel ratio of banana

Sr. No.	Treatments	Height of plant (cm)	Girth of stem (cm)	Total number of leaves	No. of fruits/ bunch	Weight of fruit (g)	Fruit length (cm)	Fruit girth (cm)	Bunch weight (kg)	Fruit Yield t/ha	Pulp weight (g)	Peel weight (g)	Pulp to peel ratio
1	Retention of 6 Hands	185.88	57.50	23.75	112.50	170.50	20.25	13.95	19.19	85.19	115.00	40.50	2.87
2	Retention of 7 Hands	182.58	56.00	23.50	121.75	168.75	18.93	12.83	20.54	91.22	109.50	40.75	2.71
3	Retention of 8 Hands	182.25	55.50	24.00	133.50	163.75	18.50	12.50	21.86	97.06	106.25	40.50	2.67
4	Retention of 9 Hands	182.75	58.00	23.50	140.00	160.50	18.25	12.25	22.47	99.77	103.75	38.75	2.70
5	Retention of 10 Hands*	184.00	56.00	24.00	152.00	156.75	17.50	12.13	23.83	105.79	100.00	37.75	2.66
	SE m ±	1.04	0.83	0.48	1.57	1.12	0.43	0.37	0.33	1.46	2.05	2.10	0.18
	C.D. 5%	NS	NS	NS	4.84	3.44	1.32	1.14	1.01	4.50	6.32	NS	NS

Table 2: Economics of bunch trimming in banana for export purpose cv. grand naine

Sr. No.	Treatments	Yield (t/ha)	Gross Income (Rs/ha)	Cultivation Cost (Rs/ha)	Net return (Rs/ha)	B : C Ratio
1	Retention of 6 Hands	85.19	937090	276024	661066	3.39
2	Retention of 7 Hands	91.22	1003420	276024	727396	3.64
3	Retention of 8 Hands	97.06	1067660	276024	791636	3.87
4	Retention of 9 Hands	99.77	1097470	276024	821446	3.98
5	Retention of 10 Hands*	105.79	740530	276024	464506	2.68

*Banana fruit selling rate for export Rs 11000 per ton.

*Banana fruit selling rate for local market Rs 7000 per ton

* Retention of 10 hands is not eligible for export due to small length of fruit

Conclusion

Non-significant effect found in height of plant, girth of stem, total number of leaves, peel weight and pulp to peel ratio in banana. Whereas fruit length, fruit girth, number of fruits per bunch, weight of fruit, weight of bunch, yield/ ha and pulp weight had significant effect. Maximum fruit length, fruit girth, fruit weight and pulp weight recorded in retention of 6 hands per bunch whereas, significantly minimum fruit length,

fruit girth, fruit weight and pulp weight recorded in retention of 10 hands per bunch. Significantly the maximum number of fruits/bunch, bunch weight and yield t/ha was noticed in banana by retention of 10 hands per bunch. However, significantly minimum number of fruits/bunch, bunch weight and yield t/ha recorded with the retention of 6 hands /bunch. Maximum export quality net return and B:C ratio observed in retention of 9 hands per bunch followed by 8 and 7 hands per

bunch. Considering the yield, quality and economics of banana, retention of 9 hands per bunch is recommended for export purpose of banana.

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