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Response of yield and quality of winter guava to severity of summer pruning

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ABSTRACT

An experiment was undertaken to improve the fruit yield and quality of monsoon flushed guava crop by regulating flowering of spring-flushed crop using varying shoot pruning intensities (25 to 75%) under subtropical condition of Western Uttar Pradesh. Summer pruning of spring flushed bearing shoot of current season was found significantly effective in increasing the production of superior quality fruits in winter guava. With the increase in summer pruning severity, yield and quality of winter guava was improved significantly up to 33% pruning intensity. On the other hand, rainy season crop showed almost a reverse trend and fruit yield was inversely related to severity of pruning. The maximum yield in rainy season was recorded with unpruned shoot trees, while fruit yield was significantly reduced in trees receiving severe pruning. However, the fruit quality of rainy season guava was improved maximum with moderate pruning (33%). Among all the shoot pruning treatments, the maximum total cumulative yield (57.30 kg/tree) and better quality fruits of both the seasons were obtained with moderately pruned trees. Hence, moderate pruning of bearing shoot of current season's growth just before bud opening in summer was significantly most effective in improving the production of monsoon flushed crop and fruit quality of spring and monsoon flushed crops in guava.

Key words: Fruit quality, guava, summer pruning, yield.

INTRODUCTION

Guava (*Psidium guajava* L.) is the fourth largest fruit crop grown in India and Uttar Pardesh is by far the most important guava producing state in the country. Owing to its hardiness, adaptability, productivity and nutritive value, it surpasses most other fruits and gives handsome returns involving very little input (Singh *et al*., 10). In the Indo-Gangetic plain of Uttar Pradesh, which has the reputation of growing superior quality guava fruits on commercial scale, it normally bears two crops in a year: the first bearing in rainy season from spring flush (*Ambe bahar*) and the second in winter from monsoon flush (*Mrig bahar*). The crop of spring flush gives maximum production, however the fruits are of poor quality and severely infected by fruit fly. On the other hand, fruits produced from monsoon flush is more nutritious and superior in quality but the yield is low (Singh, 12). The chemical method for regulating flowering sometimes causes harmful effect on production, if the chemical is not sprayed at appropriate stage and recommended concentration (Dubey *et al*., 3). Secondly, flowering in guava is not uniform and bearing shoots are flowered continuously as blooming period varies from 25-45 days (Pandey and Mishra, 7). Thereby, growers failed to identify full bloom stage for foliar spray. Due to lack of location specific research on crop regulation, an experiment was designed to improve the fruit yield and quality of winter guava by regulating summer flowering through pruning of bearing shoots of spring flushed, which is critical in guava in regulating production.

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MATERIALS AND METHODS

The investigation was carried out at the Horticultural Research Centre of S.V.B.P. University of Agriculture & Technology, Meerut. Eight-year-old trees of guava cv. Sardar having uniform growth and vigour were selected for the study. Four levels of pruning treatments to bearing shoot of current season's growth of spring flush were applied to selected trees (except unpruned control trees) with the help of secateur in April just before bud opening stage comprised of treatments, *viz*. (a) removal of 25% of current season's shoot growth, (b) removal of 33% of current season's shoot growth, (c) removal of 50% of current season's shoot growth, and (d) removal of 75% of current season's shoot growth.

There were four replications with single tree as a treatment unit. The treatments were applied randomly in a randomized block design. The observations on fruit yield and quality attributes were recorded during both the fruiting seasons, *i.e.* spring and monsoon flushed crops. The fruit quality parameters in-terms

of total soluble solids (TSS) and vitamin C contents were determined with the Bausch and Lomb hand refractometer and by the methods of AOAC (1), respectively. The data were analyzed by analysis of variance as advocated by Gomez and Gomez (4) for interpretation of results and drawing of valid conclusion.

RESULTS AND DISCUSSION

The result indicated that pruning of spring flushed bearing shoot of current season's growth is found effective in regulating production of monsoon-flushed crop (Table 1). All the treatments of pruning applied to spring flushed shoot in April significantly improved the yield of winter guava and reduced the fruiting of rainy season's crop. The maximum yield (35.27 kg/tree) in rainy season from spring flushed crop was however recorded with unpruned trees, while fruit yield of spring flushed crop was significantly reduced in trees receiving severe pruning, *i.e.* removal of 75% of current season's growth (-81.96% reduction in yield over control). The fruit production of spring-flushed crop was inversely related to severity of shoot pruning. With the increase in the pruning intensity, the fruit yield of spring-flushed crop decreased significantly. On the other hand, winter season crop showed almost a reverse trend and fruit production of monsoon flushed crop was increased significantly with the increase in the levels of shoot pruning up to 33% (+99.79% increase in yield over control). Thereafter, it decreased insignificantly up to 50% intensity (-6.94% reduction in yield over 33% pruning intensity) and significantly up to 75% intensity (-15.48% reduction in yield over 50% pruning intensity). Among shoot pruning treatments, the maximum fruiting in winter from monsoon-flushed crop was recorded with moderately (33%) pruned trees and lowest with unpruned control trees followed by light pruned trees. When the effect of pruning treatments was compared on the per cent increase in winter yield over rainy season, the data indicate that the moderate (33%) pruning resulted in maximum yield of winter crop over rainy season's yield, whereas fruiting in winter from monsoon flushed crop in unpruned trees declined by 32.40% over rainy season. The study further showed that severe pruning proved to be the most effective among all the treatments in reducing the size of rainy season crop by 81.96% and on the other hand, moderate pruning was found to be the best in increasing the winter crop by 99.79% over control. When compared the cumulative yield of both rainy and winter seasons under different treatments. The trees which received 33% pruning intensity produced the maximum total cumulative yield (57.30 kg/tree) followed by the trees received 50% pruning intensity (53.89 kg/tree).

Data on fruit quality revealed that pruning of spring-flushed shoot in summer significantly affected the physical and chemical composition of rainy and winter guava fruits when compared with fruits of un-pruned trees (Table 2). The fruits of spring-flushed crop harvested from moderately pruned trees had maximum weight (104.83 g) and size in respect of length (66 mm) and breadth (66.20 mm) and also contained highest level of total soluble solids (11.57°Brix) and vitamin C (187.73 mg/100 g pulp). However, the unpruned control trees bore fruits of smallest size and of minimum weight with lowest TSS and ascorbic acid content. The fruit quality of monsoon flushed crop also showed the similar trend as observed in spring-flushed crop. For instance, the moderately pruned trees in winter season produced fruits of largest size and of maximum weight and such fruits had highest TSS and ascorbic acid content as well, whereas smallest size and minimum weight with lowest TSS and ascorbic acid content was recorded in fruits harvested from unpruned control trees. In both spring and monsoon flushed crop, moderate (33%) pruning was found to be significantly most effective among all the shoot pruning treatments in producing fruits of largest size and of maximum weight with higher content of soluble solids and ascorbic acid. However, when the quality of rainy and winter guava fruits compared, the maximum fruit weight and size with highest content of soluble solids and vitamin C was recorded in winter season from monsoon flushed crop with moderately pruned trees. The total soluble solids and ascorbic acid content in rainy and winter guava fruits showed wide variations. The minimum TSS was recorded in rainy season fruits harvested from light and unpruned trees, while the maximum TSS was observed during winter in moderately pruned trees. Similarly, rainy season guava fruits of unpruned trees had the lowest content of ascorbic acid, whereas winter guava fruits harvested from moderately pruned trees contained highest level of ascorbic acid (Table 2).

In the present study, moderate pruning of bearing shoot of current season's growth proved to be most effective in improving the winter crop and fruit quality of spring and monsoon flushed crop. These results confirm the findings of Mishra and Pathak (6), and Dubey *et al.* (3), where the former researchers observed highest yield of quality fruit during winter season with trees shoot pruned moderately in May, while later recorded lowest fruit yield in rainy season and highest yield in winter season with severely pruned trees in summer, which caused increased accumulation of metabolites and rendered better fruit quality of winter crop due to diversion of synthesized food materials of spring flushed crop to monsoon flushed crop (Chandra and Govind, 2). Furthermore,

Table 1. Rainy and winter season's fruit yield of 'Sardar' guava as influenced by shoot pruning severity.

Treatment	Fruiting season					
	Rainy			Winter		
	Fruit yield		Per cent increase (+)/ decrease (-) in fruit yield over control	Fruit yield		Per cent increase (+) in fruit yield over control
	(kg tree^{-1})	(q ha^{-1})		kg tree^{-1}	q ha^{-1}	
Control (unpruned trees)	35.27	120.26	-	23.84	68.05	-
Removal of 25% of current season's shoot growth	10.71	29.78	(-) 69.63	40.13	111.58	(+) 68.33
Removal of 33% of current season's shoot growth	09.67	26.89	(-) 72.58	47.63	132.42	(+) 99.79
Removal of 50% of current season's shoot growth	07.91	21.99	(-) 77.57	45.98	133.38	(+) 92.86
Removal of 75% of current season's shoot growth	06.36	17.70	(-) 81.96	42.55	118.30	(+) 78.48
LSD (P = 0.05)	0.85	02.36	-	01.82	05.07	-

Table 2. Effect of shoot pruning intensity on physical and chemical attributes of 'Sardar guava' during rainy and winter season.

Treatment	Fruiting season									
	Rainy					Winter				
	Fruit size		Fruit weight (g)	TSS (°Brix)	Vitamin C (mg 100 g^{-1} pulp)	Fruit size		Fruit wt. (g)	TSS (°Brix)	Vitamin C (mg 100 g^{-1} pulp)
	Length (mm)	Breadth (mm)				Length (mm)	Breadth (mm)			
Control (unpruned trees)	62.70	55.70	90.22	10.29	150.28	61.50	56.40	102.25	11.26	283.75
Removal of 25% of current season's shoot growth	64.40	59.70	92.57	10.65	176.09	63.60	65.40	101.81	13.27	302.50
Removal of 33% of current season's shoot growth	66.00	66.20	104.83	11.57	187.73	72.40	72.40	116.24	13.37	314.25
Removal of 50% of current season's shoot growth	64.30	63.80	100.43	10.98	162.58	71.00	71.00	111.00	12.63	314.00
Removal of 75% of current season's shoot growth	65.00	57.10	95.77	10.86	165.78	65.20	64.20	110.75	12.93	300.25
LSD (P = 0.05)	0.31	0.31	3.09	0.39	4.98	0.35	0.35	4.28	0.38	3.41

fruit size has direct correlation with number of fruits bore on the trees. Owing to high leaf to fruit ratio and availability of more photosynthates due to removal of current season's growth, the fruits gained larger size and weight compared to those from unpruned trees (Dubey *et al.*, 3). The improved fruit size and weight during rainy and winter season without reduction in fruit yield of winter crop as a result of shoot pruning has also been reported by Dubey *et al.* (3), and Lal *et al.* (5). The chemical composition of fruit in respect of soluble solids and ascorbic acid in the present study showed an increasing trend with increase in shoot pruning intensity up to 33% in both seasons which is in accordance with the findings of Sahay and Kumar (8), Tiwari *et al.* (13), and Sheikh and Hulmani (9). The improvement in chemical composition of fruits obtained from pruned trees might be due to abundant availability of photosynthates for lesser number of fruits (Dubey *et al.*, 3). In the present study, irrespective of pruning intensity, significantly higher vitamin C was observed in winter season fruits than in those harvested from spring flushed crop which may be ascribed to the effect of low temperature as also been observed by Singh and Dhaliwal (10) who stated that low temperature governs the enzymatic system involved in biogenesis and catabolism of ascorbic acid. It was found that fruits harvested during winter season yielded significantly higher soluble solids than rainy season crop which may be attributed to low moisture content and more compact cells in winter season fruit as earlier reported by Singh and Dhaliwal (10).

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