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Anjali Tripathi
Department of Horticulture, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana, India

SK Sehrawat
Department of Horticulture, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana, India

DS Dahiya
Department of Horticulture, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana, India

Corresponding Author:
Anjali Tripathi
Department of Horticulture, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana, India

Effect of spacing and pruning on chlorophyll and NPK contents of guava leaves cv. Hisar Safeda

Anjali Tripathi, SK Sehrawat and DS Dahiya

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Abstract
The present investigation was conducted in order to examine the effect of spacing and pruning on chlorophyll a' and 'b' content and NPK content of leaves of guava cv. Hisar Safeda. In this experiment two levels of pruning *viz* no pruning and 50% shoot pruning of last season growth were done in the month of April in guava trees spaced at nine different spacing viz. 6×2 m, 6×3 m, 6×4 m, 6×5 m, 5×2 m, 5×3m, 5×4 m, 5×5 m, 6×6 m. Observations revealed that leaves chlorophyll 'a' and 'b' content and NPK content were significantly increased with increasing the spacing and pruning levels. Highest chlorophyll content and leaf NPK content were registered in widest spacing at 6×6 m with pruned trees during both the seasons. Whereas lowest chlorophyll 'a' and 'b' content and leaf NPK content were found in closest spacing at 5×2 m with non-pruned trees.

Keywords: Spacing, pruning, chlorophyll content, leaf NPK, guava

Introduction
Guava (*Psidium guajava* L.) is undoubtedly the most important tropical and subtropical fruit crop of the world. It can be considered as the 'Apple of Tropics' for its high vitamin C and mineral content and also known as 'Poor Man's Fruit'. Guava fruits are used both for fresh consumption and processing. Guava bears on current season's growth and flowers appear in the axils of new leaves, therefore, it responds well to pruning. Pruning of guava is one of the most important practices that influence the vigour, productivity and quality of the fruits under high density planting. Hence, there is over riding need to improve the existing planting system and to manipulate tree growth using canopy management tree growth patterns, tree shape and maintaining high fruit production of desired size and quality. The pruning levels in guava under high density conditions have achieved a great importance. Pruning is usually practised in the summer (April–May) before flower initiation. Guava crop is highly suitable for high density planting because pruning gives positive response in guava as it bears on current season growth. Shoot pruning in high density orchards is prerequisite to maintain the desired canopy of this fast growing guava plant. The efficient training and pruning can maintain the proper canopy size of the guava tree, improve fruit quality and provide opportunity to increase the number of trees per unit area (Lal *et al*., 2000) [8]. Presently shoot pruning has emerged as eco-friendly alternative method for regulating the guava crop. It is free from all the demerits of existing methods.

The principle objective to underlying modern planting system is to promote the light distribution within tree canopy through optimized total light interception by reducing individual tree size and arrangement (Tustin *et al.*, 1989) [16]. Tree spacing is one of the prominent factors in cultivation of land for its efficient and profitable usage. Its basic function is to confine the exploitation zone of the plant with regard to optimal availability of light, water and nutrients to obtain the highest total yield potential from the smallest possible area (Singh, 2005) [13].

Materials and methods
The experiment was laid out in randomized block design (RBD) allocating two levels of pruning *viz*. 50% shoot pruning of last season growth and no pruning and nine different spacing with three replications, comprising 18 treatment combinations during the year 2016-2017. Trees for the study were uniformly grown seven year old, spaced at a distance of 6×2 m,

6×3 m, 6×4 m, 6×5 m, 5×2 m, 5× 3 m, 5× 4 m, 5× 5 m and 6×6 m. Pruning was done in the month of April. They were kept under uniform condition of orchard management and cultural practices during the study period. Chlorophyll 'a' and 'b' content of the leaves (mg/100g): Leaf discs (0.03 g) were washed, blotted dry and dipped in test tubes containing 3 ml of dimethyl sulfoxide (DMSO) for overnight as described by Sawhney and Singh, (2002) [12]. Estimation of leaf NPK: Total nitrogen was determined by micro-Kjeldahl method (AOAC, 1970) [1]. Phosphorus content of leaf samples was determined by "Vandomolybdophosphoric yellow colour method" as described by Jackson (1973) [5]. The results were expressed in per cent on dry weight basis. Total potassium content in the samples was determined with the help of flame photometer (Chapman and Pratt, 1961) [3]. The statistical method described by Panse and Sukatme (1967) [10] was followed for the analysis and interpretation of the experimental results. In order to evaluate comparative performance of the various treatments, the data were analyzed by the technique of analysis of variance described by Fisher (1958) [4].

Results and discussion

Chlorophyll 'a' and 'b' content of leaves

The data (Table 1) regarding the chlorophyll 'a' and 'b' content of leaves were found statistically significant among the spacings and pruning treatments during rainy and winter season. The plant with wider spacing recorded higher chlorophyll contents of leaves compared to closer spacing during both the seasons. The highest chlorophyll 'a'content (3.33 mg/g and 3.30 mg/g) was registered in widest (6×6 m) spacing and minimum (3.16 mg/g and 3.07 mg/g) in closest (5×2 m) spacing respectively. Maximum chlorophyll 'b' content (2.94 mg/g and 2.77 mg/g) was recorded in 6×6 m spacing and minimum (270 mg/g and 2.50 mg/g) in 5×2 m spacing during both the seasons. Chlorophyll 'a' and 'b' content of leaves was also significantly affected by pruning treatments. In pruned trees chlorophyll "a" and chlorophyll 'b' were found 3.28 mg/g and 2.92 mg/g, during rainy season and 3.22 mg/g and 2.73 mg/g during winter season whereas, in un-pruned trees chlorophyll 'a' and chlorophyll "b" content of leaves were observed 3.24 mg/g and 2.74 mg/g during rainy season and 3.16 mg/g and 2.54 mg/g during winter season respectively. Chlorophyll 'a' and 'b' content of leaves was found significantly higher in widest spacing (6×6 m) and pruned trees which might be due to more availability of light and nutrients by the plants and leaves that were found more greener in widest spacing plants. Similarly, Mirza *et al.* (2013) [9] reported that chlorophyll is an antioxidant compound which is present and stored in chloroplast of leaf plant especially present in the green area of leaves. More chlorophyll 'a' and 'b' content found in pruned trees might be due to chlorophyll content was more in young leaves than old leaves. Similarly Kamble *et al.* (2015) [6] observed in guava that chlorophyll a (chl.a) and chlorophyll b (chl. b) content was found higher in younger leaves than adult leaves.

Table 1: Effect of spacing and pruning on leaves chlorophyll 'a' and 'b' content (mg/g) of guava cv. Hisar safeda during the rainy and winter season

Spacing (m)	Rainy season						Winter season					
	Chlorophyll '(a)'			Chlorophyll '(b)'			Chlorophyll '(a)'			Chlorophyll '(b)'		
	Pruning			Pruning			Pruning			Pruning		
	Non pruned	Pruned	Mean	Non pruned	Pruned	Mean	Non pruned	Pruned	Mean	Non pruned	Pruned	Mean
6 x 2	3.17	3.23	3.20	2.60	2.95	2.78	3.06	3.14	3.10	2.47	2.70	2.58
6 x 3	3.22	3.27	3.25	2.88	2.87	2.87	3.13	3.21	3.17	2.47	2.81	2.64
6 x 4	3.26	3.31	3.29	2.82	2.97	2.89	3.20	3.27	3.23	2.67	2.85	2.76
6 x 5	3.30	3.33	3.31	2.80	3.00	2.90	3.26	3.30	3.28	2.57	2.81	2.69
5 x 2	3.14	3.19	3.16	2.56	2.84	2.70	3.02	3.11	3.07	2.23	2.77	2.50
5 x 3	3.20	3.26	3.23	2.72	2.89	2.80	3.11	3.17	3.14	2.63	2.59	2.61
5 x 4	3.25	3.29	3.27	2.78	2.85	2.82	3.17	3.23	3.20	2.67	2.60	2.63
5 x 5	3.28	3.32	3.30	2.70	2.81	2.76	3.23	3.27	3.25	2.52	2.61	2.56
6 x 6	3.31	3.34	3.33	2.80	3.07	2.94	3.28	3.31	3.30	2.67	2.87	2.77
Mean	3.24	3.28		2.74	2.92		3.16	3.22		2.54	2.73	
	CD (0.05)			CD (0.05)			CD (0.05)			CD (0.05)		
	Spacing		0.02	Spacing		0.14	Spacing		0.02	Spacing		0.14
	Pruning		0.01	Pruning		0.68	Pruning		0.01	Pruning		0.07
	Spacing x Pruning		NS	Spacing x Pruning		NS	Spacing x Pruning		NS	Spacing x Pruning		0.20

Richardson (2002) [11] revealed that the chlorophyll a and chlorophyll b are essential pigment of the photosystems. Chlorophyll a is the primary photosynthetic pigment in plants which helps to produce energy in plant (Srichaikul *et al.*, 2011) [15].

Leaf NPK

Leaf nitrogen, phosphorus and potassium content (Table 2) was significantly affected by plant spacing and pruning levels during the rainy and winter season. Maximum mean leaves nitrogen (1.68% and 1.56%) phosphorus (0.28% and 0.24%) and potassium (1.28% and 1.21%) contents were registered in trees spaced at 6×6 m which was significantly higher than all other spacing and minimum nitrogen (1.52% and 1.4%), phosphorus (0.18% and 0.13%) and potassium (1.18% and 1.09%) content of leaf were recorded in trees spaced at 5×2 m during both the seasons. The leaf nitrogen, phosphorous and potassium content was also significantly affected by the pruning levels during both the seasons rainy and winter. Leaves nitrogen content (1.64% and 1.52%) phosphorus content (0.27% and 0.20%) potassium (1.25% and 1.17%) content were recorded in pruned trees. In un-pruned trees leaf nitrogen (1.56% and 1.47%), phosphorus (0.19% and 0.16%) and potassium (1.20% and 1.12%) content were recorded during both the seasons rainy and winter respectively. Interaction between spacing and pruning of nitrogen, phosphorus and potassium of leaves was found non-significant during both the seasons. NPK content of leaf found less in closest spacing of plant might be due to more competition among the plants for nutrients and water leads less availability of nutrients to the plants, whereas more availability of nutrients to the plant in widest spacing. Pruning

effect was also found significant. Maximum leaf NPK was found in pruned trees and minimum in un-pruned trees. It might be due to pruning reduces the crop loads and plant part more exposed to sun light which provides more photosynthates and nutrients to the plants as compared to un-pruned trees. Similarly Adhikari (2009) [2] reported in guava that highest NPK content of leaves found with increasing pruning severity. Singh *et al*. (2017) [14] observed that in guava highest N, P and K content of leaves observed on the plants which was 60% shoot pruned. These results are in agreement with the findings of Lal *et al.* (2000) [8] and Kumar and Thakur (2012) [7] in guava.

Table 2: Effect of spacing and pruning on leaves npk content (%) of guava cv. Hisar safeda during the rainy and winter season

Spacing (m)	Leaf N (%)						Leaf P (%)						Leaf K (%)					
	Rainy season			Winter season			Rainy season			Winter season			Rainy season			Winter season		
	Pruning			Pruning			Pruning			Pruning			Pruning			Pruning		
	Non pruned	Pruned	Mean	Non pruned	Pruned	Mean	Non pruned	Pruned	Mean	Non pruned	Pruned	Mean	Non pruned	Pruned	Mean	Non pruned	Pruned	Mean
6 x 2	1.51	1.58	1.54	1.43	1.46	1.45	0.16	0.23	0.20	0.12	0.15	0.14	1.16	1.21	1.19	1.09	1.13	1.11
6 x 3	1.54	1.62	1.58	1.45	1.50	1.48	0.18	0.26	0.22	0.14	0.19	0.17	1.18	1.23	1.21	1.11	1.16	1.13
6 x 4	1.58	1.67	1.62	1.48	1.54	1.51	0.21	0.28	0.24	0.17	0.22	0.19	1.21	1.26	1.24	1.13	1.19	1.16
6 x 5	1.61	1.71	1.66	1.51	1.57	1.54	0.23	0.30	0.27	0.19	0.25	0.22	1.23	1.29	1.26	1.16	1.22	1.19
5 x 2	1.49	1.55	1.52	1.42	1.45	1.43	0.14	0.22	0.18	0.11	0.14	0.13	1.15	1.20	1.18	1.08	1.11	1.09
5 x 3	1.53	1.60	1.57	1.44	1.48	1.46	0.16	0.25	0.20	0.13	0.17	0.15	1.17	1.22	1.20	1.10	1.14	1.12
5 x 4	1.56	1.64	1.60	1.47	1.52	1.49	0.19	0.25	0.22	0.15	0.20	0.18	1.20	1.25	1.22	1.12	1.17	1.15
5 x 5	1.59	1.69	1.64	1.49	1.55	1.52	0.22	0.29	0.26	0.18	0.23	0.20	1.22	1.27	1.25	1.15	1.20	1.18
6 x 6	1.63	1.73	1.68	1.53	1.58	1.56	0.24	0.32	0.28	0.21	0.26	0.24	1.25	1.32	1.28	1.18	1.23	1.21
Mean	1.56	1.64		1.47	1.52		0.19	0.27		0.16	0.20		1.20	1.25		1.12	1.17	
	CD (0.05)			CD (0.05)			CD (0.05)			CD (0.05)			CD (0.05)			CD (0.05)		
	Spacing Pruning Spacing x Pruning		0.02 0.01 NS	Spacing Pruning Spacing x Pruning		0.01 0.00 0.01	Spacing Pruning Spacing x Pruning		0.01 0.01 NS	Spacing Pruning Spacing x Pruning		0.01 0.01 NS	Spacing Pruning Spacing x Pruning		0.01 0.01 NS	Spacing Pruning Spacing x Pruning		0.01 0.00 NS

References

1. AOAC. Official methods of analysis. Association of Agricultural Chemists. 11th Ed. Washington, D.C., U.S.A, 1970.
2. Adhikari S. Studies on the effect of time and level of pruning on growth, flowering and yield of guava (*Psidium guajava* L.) M.Sc. Thesis C.C.S.H.A.U., Hisar, Haryana, India, 2009.
3. Chapman HD, Pratt PF. Methods of analysis for soils, plant and water. University of California, Los Angeles, 1961; 60-61, 150-179.
4. Fisher RA. Statistical Methods for Research Workers, Edn. 10th. Oliver and Boyd. Edernburgh and London, 1958.
5. Jackson ML. Soil chemical analysis. Asia Publishing House, New Delhi, 1973.
6. Kamble NP, Giri SP, Mane RS, Tiwana A. Estimation of chlorophyll content in young and adult leaves of some selected plants. Universal Journal of Environmental Research and Technology. 2015; 5(6):306-310.
7. Kumar J, Thakur D. Effect of different pruning intensities on growth, yield, fruit quality and leaf macronutrient content of plum cv. Santa Rosa. The Asian Journal of Horticulture. 2012; 7(2):484-487.
8. Lal S, Tiwari JP, Mishra KK. Effect of plant spacing and pruning intensity on fruit yield and quality of guava. Progressive Horticultre. 2000; 32(1):20-25.
9. Mirza H, Kamrun N, Mahabub MA, Roychowdhury R, Fujita M. Physiological, biochemical, and molecular mechanisms of heat stress tolerance in plants. International Journal of Molecular Sciences. 2013; 14:9643-9684.
10. Panse VG, Sukhatme PV. Statistical Method for Agricultural Workers, ICAR, New Delhi, 1967.
11. Richardson AD, Duigan SP, Berlyn GP. An evaluation of noninvasive methods to estimate foliar chlorophyll content. New Phytologist. 2002; 153:185-194.
12. Sawhney V, Singh DP. Effect of chemical desiccation at the post-anthesis stage on some physiological and biochemical changes in the flag leaf of contrasting wheat genotypes. Field Crops Research. 2002; 77:1-6.
13. Singh G. Meadow-orchard system in guava production. Indian Horticulture Journal. 2005; 50(1):17-18.
14. Singh S, Singh D, Sharma JR, Rana MK, Sharma N, Vijaya, HM. Studies on canopy management practices on npk status of leaves in high density planting of guava (*Psidium guajava* L.) Cv. Hisar Safeda. International Journal of Current Microbiology and Applied Science. 2017; 6 (7):2782-2788.
15. Srichaikul B, Bunsang R, Samappito S, Butkhup S, Bakker G. Comparative study of chlorophyll content in leaves of thai *Morus alba* Linn. Species. Plant Science and Research. 2011; 3:17-20.
16. Tustin S, Hurst P, Warrington I, Stanley J. Light distribution and fruit qualityhrough multi-layered trellis apple canopies. Acta Horticulture. 1989; 243:209- 212.