

ANALYSIS OF CONSTRAINTS IN PRODUCTION AND MARKETING OF GUAVA VARIETIES IN DIFFERENT METHODS OF PLANTING USING KENDALL'S W STATISTIC

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ABSTRACT

The present study was conducted in Bengaluru (R) and Koppal districts of Karnataka which was selected purposively on basis of highest area of production under Guava cultivation. Multi-stage random sampling technique was adopted in designing sampling frame for the study. On the basis of the nature of the data, Kendall's W statistic technique was used for estimation of production and marketing constraints. Results revealed that Allahabad variety faced, frequent weed problem was the top most important constraint, followed by non-availability of labour and high labour charges. Whereas, in Taiwan pink damage due to pest and diseases was the foremost constraint faced by Taiwan pink growers. Under High density planting (HDP) method Taiwan pink faced a significant challenge with damage due to pest and diseases, followed by non-availability of processing units and frequent weed problems. In contrast, Lucknow 49 was notably affected by unfavourable weather conditions (1.11), non-availability of processing units (1.89), and lack of irrigation facilities (3.00) in production category. While in marketing category, the primary constraint for Allahabad safeda was lower prices, which was due to seasonal gluts, while in marketing of Taiwan pink guava the constraints faced by farmers were high marketing cost. In HDP method, the primary obstacles faced by Taiwan pink growers was lack of storage facilities (1.67). Conversely, Lucknow 49 was significantly hindered by lower prices due to seasonal gluts

(1.44). The study emphasized the need to develop the proper marketing, storage and processing facilities for large scale cultivation of guava in the state.

Keywords: Kendall's W statistic, Constraints, Taiwan pink, Allahabad safeda, Lucknow 49

Introduction

Horticulture is a branch of agriculture that deals with the cultivation of fruits, vegetables, flowers and herbs. Horticulture is primarily concerned with the growing and management of plants that are used as food sources as well as for medicinal and aesthetic purposes or it is the process of garden cultivation using scientific methods to generate fruits, vegetables and flowers in larger quantities and varieties. India has a diverse climate and soil, which supports a wide range of horticultural crops. Guava (*Psidium guajava* L) is regarded as the poor man's apple and is one of the major fruits of India. With a high nutritious content, guava ranks fourth in importance among Indian fruits after citrus, mango and banana. Guavas originated in a region that stretches from Mexico, Central America or northern South America across the Caribbean region. As early as 2500 BC, guava planting was recorded on Peruvian archaeological sites. It was introduced to India in the 17th century. Guava is an important fruit crop of the tropical and subtropical regions of the world. It is available throughout the year except during summer season. Guava is quite hardy and a highly remunerative crop which can be grown without much care and attention. Guava is also known as "Super Fruit" because it has high nutritive value with many health benefits. In Karnataka, area under guava is around 7.2 thousand hectares. The production of crop was 1.6 lakh MT while productivity was 20.99 MT/ha in the year 2020-21. The main guava growing districts in Karnataka are Bangalore (R), Bangalore (U), Koppal, Chikkaballapura and Kolar. In Bangalore (R) the area under guava is 925 hectares with the production of 18 thousand MT and productivity of 19.52 MT/ha. Apparently, Bangalore (U) has 868 hectares area under guava with the production of 21 thousand MT and productivity of 25.27 MT/ha and Koppal had 708 hectares area under guava cultivation with the production of 12 thousand MT and productivity of 18.08 MT/ha during the year 2020-21.

There are various constraints associated with Guava growers in India and solely in the Karnataka. There are many hurdles because some other fruit crops like Mango, Banana, Citrus, Papaya have been given more importance than Guava rather this fruit is rich in nutrient and vitamins. In ayurveda it is considered as tridoshanashaka and indicated in atyagni. Its leaves, bark, fruits and roots are used in treatment of cough, fever, diarrhoea, constipation, bad breath, gum problems and numerous other health problems (Kumari *et al.* 2013). Since guava is considered a poor man's apple and can easily be grown everywhere, it is crucial to examine the difficulties faced by guava growers in terms of production and marketing. Moreover, farmers considered these constraints as critical components in maximizing production and minimizing

expenses, thus it was necessary to make sure they were recognized, grouped, and assessed. Consequently, in order to gather farmers' perspectives, a survey was conducted, Kendall's W statistics was applied to document the constraints faced by farmers in production and marketing of guava.

Methodology

The present study was conducted in Bengaluru and Koppal districts of Karnataka. The main guava growing districts in Karnataka are Bangalore (R), Bangalore (U), Koppal, Chikkaballapura and Kolar. In Bengaluru (R) traditional method of planting was followed. While in Koppal district High Density Planting method was followed. Hence two districts were selected for this study due to their use of different planting methods. For each method, two varieties were chosen to compare the constraints in production and marketing of the varieties within each respective planting method. Multi-stage random sampling technique was adopted in designing sampling frame for the study. In the first stage, Bengaluru (R) and Koppal districts were selected based on the highest area under guava crop in South Karnataka and Kalyana Karnataka respectively. Similarly, in the second stage two taluks from each district were selected based on the highest area under guava crop. In the third stage, 15 farmers were selected from each taluk randomly in view of spread out of guava growers in different villages. Thus, total sample size of guava growers was 60 respondents constituting 30 sample respondents from each selected district were taken for studying constraints faced by farmers in production and marketing of guava.

Kendall's W statistics

Kendall's W statistic (sometimes called the Coefficient of Concordance) is a non-parametric statistic used to assess agreement between different rankers, and ranges from 0 to 1. Zero is no agreement at all between rankers, while 1 is perfect agreement. The statistic is calculated either on an interval scale or on an ordinal scale. If the W Statistic is 0, that means everyone ranked the list differently (or randomly). If the W Statistic is 1, then everyone ranked the list in exactly the same order.

$$W = \frac{12\{\Sigma K^2 - \Sigma K\}/m}{m\lambda^2(m^2 - 1)} \dots\dots\dots(1)$$

Where,

W= Coefficient of concordance

K= Sum of ranks for each constraint being ranked

λ = Number of constraints being ranked

m=Number of guava farmers

Results and discussion

Constraints in traditional method of planting

Table 1 shows the relative importance of the constraints faced by guava farmers in traditional planting method. From the results obtained, in Allahabad variety, frequent weed problem had a least mean score of 1.41, which indicated that frequent weed problem was the top most important constraint, followed by non-availability of labour and high labour charges (1.86), lack of irrigation facilities (2.90), damage due to pest and diseases (4.00), non-availability of processing units (5.00), damage due to unfavourable weather (6.10) and theft of guava fruits (6.90). Whereas, in Taiwan pink damage due to pest and diseases had a least mean rank of 1.38, which indicated that, it was the foremost constraint faced by Taiwan pink growers. While, non-availability of labour and high labour charges, lack of irrigation facilities, frequent weed problem, non-availability of processing units, damage due to unfavourable weather and theft of guava fruits were given mean score of 1.63, 3.00, 4.00, 5.00, 6.38 and 6.63 respectively by analysing the ordinal data collected from farmers using SPSS software. Table 3 revealed that Kendall's W^a for constraints in production of Allahabad safeda and Taiwan pink was 0.879 and 0.967 respectively and were significant at 1 per cent level. This underlined that there was a high degree of agreement among guava farmers in evaluating the constraints in production for both varieties and almost all the farmers evaluated the list in the same order.

Similarly, in the marketing category, the primary constraint for Allahabad safeda was lower prices, which was due to seasonal gluts, with a mean rank of 1.14. Non-availability of proper market for the produce and a lack of storage facilities had a mean rank of 2.59 and 3.09, respectively. The other constraints include, high cost of marketing (3.27), the perishable nature of the fruit (4.91), and lack of appropriate grading system (6.00). While in marketing of Taiwan pink guava the constraints faced by farmers were high marketing cost, lack of storage facility, lower price due to seasonal gluts, no proper grading system, perishability of fruit and non-availability of market with a mean score of 1.50, 1.75, 2.75, 4.00, 5.00 and 6.00 respectively. Table 3 revealed that Kendall's W^a for constraints in marketing of Allahabad safeda and Taiwan pink was 0.85 and 0.936 respectively and were significant at 1 per cent level. Hence, there was a high degree of agreement among guava farmers in ranking the constraints pertaining to marketing of both varieties, indicated that farmers ranked the list in almost similar the same order.

Table 1: Constraints in production and marketing of different varieties of guava in traditional method (n=30)

Sl. No.	Constraints	Allahabad safeda		Taiwan pink	
		Mean Score	Rank	Mean Score	Rank
I	Production				
1	Frequent weed infestation	1.41	I	4.00	1V
2	Non-availability of labour and high labour charges	2.27	II	1.63	II
3	Lack of irrigation facilities	2.36	III	3.00	III
4	Damage due to pest and diseases	3.95	IV	1.38	I
5	Non-availability of processing units in the region	5.45	V	5.00	V
6	Damage due to unpredictable weather conditions	5.55	VI	6.38	VI
7	Theft of guava fruits	6.52	VII	6.63	VII
II	Marketing				
1	Lower price due to seasonal gluts	1.14	I	2.75	III
2	Non-availability of market	2.59	II	6.00	VI
3	Lack of storage facility	3.09	III	1.75	II
4	High marketing cost	3.27	IV	1.50	I
5	Perishability of fruit	4.91	V	5.00	V
6	No proper grading system	6.00	VI	4.00	IV

On comparing the constraints in both the varieties, frequent weed was more prevalent in Allahabad variety. Whereas, in Taiwan pink variety, damage due to pest and disease was more prevalent which impacted on both productivity and fruit quality. In both the varieties non-availability of labour and high labour charges was the common and second most important production constraint. This was due to rural urban fringe which led to the changes in the occupation of people in this region as they moved to Bengaluru industrial region for employment. Whereas, in marketing category lower price due to seasonal gluts was found to be the major constraint in Allahabad sefeda variety due to too much variation in prices for this variety during harvest period. Similarly, in Taiwan pink variety high marketing cost was the most encountered issue because of high transportation cost.

Constraints in high density method of planting

Table 2 and Table 3 represents the comprehensive insights into the primary constraints encountered by Taiwan pink and Lucknow 49 growers in both production and marketing aspects. In production constraints, Taiwan pink faced a significant challenge with damage due to pest and diseases, which had a least mean score of 1.24, followed by non-availability of processing units (1.86) and frequent weed problems (2.90). In contrast, Lucknow 49 was notably affected by unfavourable weather conditions (1.11), non-availability of processing units (1.89), and lack of irrigation facilities (3.00). These scores highlighted the distinct vulnerabilities in each variety's production environment, Taiwan pink emphasized pest management and infrastructure limitations, while Lucknow 49 highlighted weather sensitivity and resource access issues.

Proceeding to marketing challenges, the primary obstacles faced by Taiwan pink growers was lack of storage facilities (1.67) and high marketing costs (1.71), followed by lower prices due to seasonal gluts (3.14) and absence of a proper grading system (3.48). Conversely, Lucknow 49 was significantly hindered by lower prices due to seasonal gluts (1.44) and non-availability of markets (1.56), with secondary issues revolving around storage facilities (3.67) and high marketing costs (3.33). These findings illustrated differing pressures in market dynamics for each variety, Taiwan pink with a focus on storage facilities and cost efficiencies, while Lucknow 49 tackled more prominently with market access and pricing volatility. The Kendall's W^a values for production were 0.975 and 0.993 for Taiwan pink and Lucknow 49 respectively, while Kendall's W^a values for marketing were 0.867 and 0.946 for Taiwan pink and Lucknow 49 respectively. Both varieties' Kendall's W^a were significant at one per cent level across both production and marketing categories, which indicated that there was a strong agreement among growers for ranking of these constraints, underscored the reliability and robustness of the findings across the surveyed population.

Table 2 Constraints in production and marketing of different varieties of guava in HDP method (n=30)

Sl. No.	Constraints	Taiwan pink		Lucknow 49	
		Mean score	Rank	Mean score	Rank
I	Production				
1	Damage due to pest and diseases	1.24	I	6.00	VI
2	Non-availability of processing units in the region	1.86	II	1.89	II
3	Frequent weed infestation	2.90	III	5.00	V
4	Non-availability of labour and high labour charges	4.00	IV	4.00	IV
5	Damage due to unpredictable weather conditions	5.00	V	1.11	I
6	Lack of irrigation facilities	6.10	VI	3.00	III
7	Theft of guava	6.90	VII	7.00	VII
II	Marketing				
1	Lack of storage facility	1.67	I	3.67	IV
2	High marketing cost	1.71	II	3.33	III
3	Lower price due to seasonal gluts	3.14	III	1.44	I
4	No proper grading system	3.48	IV	6.00	VI
5	Perishability of fruit	5.00	V	5.00	V
6	Non-availability of market	6.00	VI	1.56	II

When constraints faced by both varieties of guava were compared, it was evident that Taiwan pink guava was more vulnerable to pests and diseases such as guava wilt, guava fruit fly, powdery mildew, whiteflies, etc., which had a negative impact on the overall production, fruit quality, and plant health. Farmers who cultivated Lucknow 49 variety, however expressed

worries about harm brought by unfavourable weather, that impacted on flowering and fruit setting in Lucknow 49. On the other hand, the main obstacle in marketing of Taiwan pink was lack of storage facilities, which resulted in post-harvest losses, decreased fruit quality, and economic losses. This highlighted the significance of establishing processing plants and storage infrastructure in this area. Meanwhile, Lucknow 49 growers faced lower price due to seasonal gluts as their major marketing constraint which emphasized that there is need for several strategies to manage supply and stabilize prices.

Table 3 Test statistics for constraints in production and marketing of guava varieties in traditional and high-density planting method

Sl. No.	Test Statistics	Traditional method (n=30)		HDP (n=30)	
		Allahabad safeda	Taiwan pink	Taiwan pink	Lucknow 49
I	Production				
1	N	22	8	21	9
2	Kendall's W ^a	0.87	0.96	0.97	0.99
3	Chi-Square	96.67	46.39	122.82	53.61
4	df	6	6	6	6
5	Asymp. Sig.	P <0.01	P <0.01	P <0.01	P <0.01
II	Marketing				
1	N	22	8	21	9
2	Kendall's W ^a	0.85	0.94	0.87	0.95
3	Chi-Square	93.45	37.43	91.07	42.59
4	df	5	5	5	5
5	Asymp. Sig.	P <0.01	P <0.01	P <0.01	P <0.01

Note: a - Kendall's Coefficient of Concordance

Conclusion

Based on the findings of this study, it could be concluded that though guava production in the study area is profitable but there are many constraints like, under traditional method, in Allahabad variety, frequent weed problem had a least mean score of 1.41, which indicated that frequent

weed problem was the top most important constraint, followed by non-availability of labour and high labour charges. Whereas, in Taiwan pink damage due to pest and diseases had a least mean rank of 1.38, which indicated that, it was the foremost constraint faced by Taiwan pink growers. Under HDP method Taiwan pink faced a significant challenge with damage due to pest and diseases, which had a least mean score of 1.24, followed by non-availability of processing units (1.86) and frequent weed problems (2.90). In contrast, Lucknow 49 was notably affected by unfavourable weather conditions (1.11), non-availability of processing units (1.89), and lack of irrigation facilities (3.00) in production category. While in marketing category, the primary constraint for Allahabad safeda was lower prices, which was due to seasonal gluts, with a mean rank of 1.14. While in marketing of Taiwan pink guava the constraints faced by farmers were high marketing cost, lack of storage facility, lower price due to seasonal gluts, no proper grading system, perishability of fruit and non-availability of market under traditional method. In HDP method, the primary obstacles faced by Taiwan pink growers was lack of storage facilities (1.67) and high marketing costs (1.71), followed by lower prices due to seasonal gluts (3.14) and absence of a proper grading system (3.48). Conversely, Lucknow 49 was significantly hindered by lower prices due to seasonal gluts (1.44) and non-availability of markets (1.56).

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