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Effect of different level of yeast on physico-chemical and sensory properties of Guava cider

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Abstract
A study titled "Effect of different levels of yeast on physico-chemical and sensory properties of guava cider" was carried out at the Research cum Instructional Farm of the College of Horticulture and Research Station, Saja, Bemetara (C.G.) during 2024–25. The experiment was arranged in a Completely Randomized Design with three replications. Ten treatments were tested, comprising varying combinations of guava juice (500 ml), sugar (100, 150 and 200 g) and yeast (1, 2 and 3 g), along with a control (T_0). Physico-chemical characteristics such as TSS, acidity, ascorbic acid, pH, reducing sugar and alcohol content, along with sensory attributes including colour, aroma, taste and overall acceptability, were assessed at 0, 15 and 30 days of storage. Guava fruits used in the study were well-suited for processing due to their high edible portion, low seed content and rich nutritional composition. Among the treatments, T_4 (150 g sugar + 1 g yeast), T_5 (150 g sugar + 2 g yeast) and T_6 (150 g sugar + 3 g yeast) performed best in terms of TSS, acidity, ascorbic acid, pH stability and reducing sugar. Treatments with 200 g sugar (T_7–T_9) showed moderate results, while the control consistently recorded the lowest nutritional quality. Sensory evaluation indicated that T_4, T_5 and T_6 received the highest preference, with T_4 and T_5 excelling in colour and taste stability and T_5 and T_6 performing best in aroma. Overall acceptability was highest for T_5, followed by T_4 and T_6, whereas higher sugar treatments and the control were less preferred due to off-flavours or lower quality. Based on both physico-chemical and sensory evaluations, T_5 (500 ml guava juice + 150 g sugar + 2 g yeast) emerged as the most suitable formulation, offering balanced fermentation and superior quality guava cider.

Keywords: Guava, yeast, ascorbic acid, reducing sugars, sensory and acidity

Introduction
Guava (*Psidium guajava* L.), a member of the Myrtaceae family, originated in Central America and southern Mexico (Minh *et al.*, 2019) [16]. Globally, it ranks fourth in fruit production after mango, banana and citrus, with India as the leading producer since the 17th century. In Chhattisgarh, guava production in 2023–24 was estimated at 197.022 thousand metric tonnes from 19.959 thousand hectares, with Bemetara contributing 15.991 thousand metric tonnes from 0.560 thousand hectares (Anonymous, 2023) [1, 2].
Wine, the oldest known fermented product, has long been valued for its dietary and therapeutic roles. Guava, regarded as a "superfruit," is rich in vitamins A and C, dietary fiber, essential minerals and omega fatty acids (Reddy & Reddy, 2011) [19]. Its antioxidant and nutritional properties contribute to reduced oxidative stress, improved cholesterol balance, digestive health, and immunity.
Due to its short shelf life, guava is processed into juice, pulp, jam, jelly, dehydrated products and fermented beverages (Tandon *et al.*, 1983) [23]. Fermentation of guava juice or pulp by *Saccharomyces cerevisiae* efficiently converts sugars into ethanol and CO_2, producing guava wine or cider (Bigelis *et al.*, 1983) [4]. Such products combine nutritional value with consumer demand for functional and therapeutic foods.

Materials and Methods
A field experiment entitled "Effect of different level of yeast on physico chemical and sensory properties of Guava cider." was conducted at College of Horticulture and Research

Station Saja, Bemetara (C.G.) during 2024-25. The location of the Bemetara district is latitude 22.09˚N and longitude 82.15˚E. This area is classified as India's Eastern Plateau and Hill Region (Agro-climatic zone VII). The state of Chhattisgarh is divided into three agro-climatic zones; Bemetara is located in the state's plains zone. The experiment was laid out in Completely Randomized Design with three replications. The treatments consisted of ten different yeast levels *viz.*, (T_0) Control, (T_1) Guava juice 500 ml + sugar 100 g + yeast 1 gm, (T_2) Guava juice 500 ml + sugar 100 g + yeast 2 gm, (T_3) Guava juice 500 ml + sugar 100 g + yeast 3 gm, (T_4) Guava juice 500 ml + sugar 150 g + yeast 1 gm, (T_5) Guava juice 500 ml + sugar 150 g + yeast 2 gm, (T_6) Guava juice 500 ml + sugar 150 g + yeast 3 gm, (T_7) Guava juice 500 ml + sugar 200 g + yeast 1 gm, (T_8) Guava juice 500 ml + sugar 200 g + yeast 2 gm and (T_9) Guava juice 500 ml + sugar 200 g + yeast 3 gm. Observations were recorded on physico-chemical parameters (TSS, acidity, ascorbic acid, pH, reducing sugar, alcohol content, etc.) and sensory parameters (colour, aroma, taste, and overall acceptability) at 0, 15, and 30 days of storage. The data were statistically analyzed to identify the most suitable treatment combination for high-quality guava cider.

Results and Discussion

Physico-chemical parameters

The guava fruits (*Psidium guajava* L.) used in the study had an average weight of 226.42 g, with 218.21 g peel, 8.21 g seed and 158.52 g edible portion. The moderate non-edible fraction (68.07 g) provided a high edible-to-non-edible ratio, making the fruits suitable for processing. Low seed content facilitated juice and pulp extraction, while the edible portion was rich in vitamin C, minerals, pectin and phenolic compounds, supporting health benefits. Overall, the fruits possessed favorable physical and nutritional characteristics, making them ideal for beverages, jams, jellies, and functional foods. Among the cider treatments, T_6 (500 ml guava juice + 150 g sugar + 3 g yeast) recorded the highest TSS, closely followed by T_5 (150 g sugar + 2 g yeast) and T_4 (150 g sugar + 1 g yeast) across all storage intervals (0, 15, 30 days). Moderate TSS was observed in T_1 and T_2 (100 g sugar + 1–2 g yeast), while T_7, T_8 and T_9 (200 g sugar) had comparatively lower values. The control (T_0) consistently recorded the lowest TSS. Maximum acidity was observed in T_6, statistically similar to T_5 and T_4, with moderate acidity in T_1–T_3 and lower acidity in T_7–T_9; the minimum was in T_0. Ascorbic acid content was highest in T_4, followed by T_5 and T_6, with T_7–T_9 showing moderate decline, and the lowest in T_0. pH stability was greatest in T_4 and T_5, closely followed by T_6, while T_7–T_9 recorded intermediate values; the lowest pH occurred in T_0, reflecting higher fermentation acidity. Reducing sugars were highest in T_4 and T_5, statistically similar, intermediate in T_6 and T_7, and lowest in T_0 due to absence of fermentation.

Sensory parameters

The most attractive colour was recorded in T_4 (500 ml guava juice + 150 g sugar + 1 g yeast) and T_5 (150 g sugar + 2 g yeast), which were statistically superior and maintained colour stability during storage. Moderate colour scores were noted in T_6 (150 g sugar + 3 g yeast), T_7 (200 g sugar + 1 g yeast) and T_8 (200 g sugar + 2 g yeast), whereas the control (T_0) received the lowest score. The most pronounced aroma was found in T_5 and T_6, followed by T_4, while higher sugar treatments (T_7–T_9) developed slight off-flavours over storage. The weakest aroma was consistently observed in the control. Regarding taste, T_4 and T_5 received the highest scores, closely followed by T_6, reflecting a well-balanced sweetness and fermentation. Moderate taste ratings were recorded for T_7 and T_8, whereas T_9 and the control were least preferred. Overall acceptability was highest in T_5, statistically comparable to T_4 and T_6. Treatments with 200 g sugar (T_7–T_9) achieved moderate consumer preference, while T_0 recorded the lowest overall acceptability.

Table 1: Physico-chemical parameters of guava fruits before processing.

S. No.	Parameters	Value in guava fruit
1	Fruit weight (g)	226.42 ± 23.28
2	Peel weight (g)	218.21 ± 21.32
3	Seed weight (g)	8.21 ± 2.13
4	Edible part weight (g)	158.52 ± 14.52
5	Non-edible part weight (g)	68.07 ± 7.35

Table 2: Effect of different level of yeast on TSS of Guava cider.

Treatment details	TSS (°Brix)		
	0 days (Initial)	15 days	30 days
T_0 - Control	19.79	17.91	14.07
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	19.35	17.29	13.59
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	19.29	17.21	13.52
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	19.23	17.12	13.45
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	18.72	16.41	12.89
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	18.64	16.30	12.80
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	18.58	16.21	12.74
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	18.15	15.61	12.27
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	18.03	15.44	12.13
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	17.94	15.32	12.03
S.Em (±)	0.13	0.19	0.15
CD (5%)	0.38	0.55	0.43
CV (5%)	4.19	4.96	4.95

Table 3: Effect of different level of yeast on Titratable acidity of Guava cider.

Treatment details	Titratable acidity (%)		
	0 days (Initial)	15 days	30 days
T_0 - Control	0.31	0.40	0.47
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	0.34	0.44	0.51
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	0.35	0.46	0.53
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	0.35	0.46	0.53
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	0.38	0.49	0.57
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	0.39	0.51	0.59
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	0.40	0.52	0.60
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	0.43	0.56	0.65
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	0.44	0.57	0.66
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	0.45	0.59	0.68
S.Em (±)	0.01	0.01	0.01
CD (5%)	0.02	0.03	0.04
CV (5%)	4.52	4.81	4.50

Table 4: Effect of different level of yeast on Ascorbic acid of Guava cider.

Treatment details	Ascorbic acid (mg/100 g)		
	0 days (Initial)	15 days	30 days
T_0 - Control	113.11	101.80	93.88
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	117.15	105.44	97.23
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	115.61	104.05	95.96
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	111.07	99.96	92.19
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	105.48	94.93	87.55
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	104.76	94.28	86.95
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	103.22	92.90	85.67
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	97.35	87.62	80.80
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	95.27	85.74	79.07
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	93.46	84.11	77.57
S.Em (±)	1.71	1.65	1.57
CD (5%)	5.03	4.87	4.62
CV (5%)	4.80	5.01	4.09

Table 5: Effect of different level of yeast on pH of Guava cider.

Treatment details	Ph		
	0 days (Initial)	15 days	30 days
T_0 - Control	5.48	5.21	4.93
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	5.29	5.03	4.76
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	5.23	4.97	4.71
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	5.18	4.92	4.66
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	5.02	4.77	4.52
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	4.95	4.70	4.46
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	4.88	4.64	4.39
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	4.71	4.47	4.24
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	4.64	4.41	4.18
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	4.57	4.34	4.11
S.Em (±)	0.04	0.05	0.04
CD (5%)	0.13	0.14	0.12
CV (5%)	4.53	4.73	4.57

Table 6: Effect of different level of yeast on reducing sugar of Guava cider.

Treatment details	Reducing sugar (%)		
	0 days (Initial)	15 days	30 days
T_0 - Control	2.19	2.12	2.06
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	2.45	2.38	2.30
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	2.50	2.43	2.35
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	2.56	2.48	2.40
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	2.74	2.66	2.58
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	2.80	2.71	2.63
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	2.86	2.77	2.69
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	3.04	2.95	2.86
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	3.10	3.01	2.92
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	3.19	3.09	3.00
S.Em (±)	0.05	0.05	0.04
CD (5%)	0.15	0.14	0.13
CV (5%)	4.21	4.09	4.05

Table 7: Effect of different level of yeast on non-reducing sugar of Guava cider.

Treatment details	Non-Reducing sugar (%)		
	0 days (Initial)	15 days	30 days
T_0 - Control	0.65	0.63	0.61
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	0.73	0.71	0.69
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	0.75	0.73	0.70
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	0.76	0.74	0.72
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	0.82	0.79	0.77
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	0.83	0.81	0.78
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	0.85	0.83	0.80
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	0.91	0.88	0.85
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	0.93	0.90	0.87
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	0.95	0.92	0.90
S.Em (±)	0.01	0.01	0.01
CD (5%)	0.04	0.04	0.03
CV (5%)	4.87	4.96	4.29

Table 8: Effect of different level of yeast on Total sugar of Guava cider.

Treatment details	Total sugar (%)		
	0 days (Initial)	15 days	30 days
T_0 - Control	2.84	2.75	2.67
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	3.18	3.08	2.99
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	3.25	3.15	3.06
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	3.32	3.22	3.12
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	3.56	3.45	3.35
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	3.63	3.52	3.41
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	3.71	3.60	3.49
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	3.95	3.83	3.71
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	4.03	3.91	3.79
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	4.14	4.02	3.89
S.Em (±)	0.05	0.06	0.05
CD (5%)	0.16	0.18	0.15
CV (5%)	4.64	5.06	4.63

Table 9: Effect of different level of yeast on Colour and Appearance of Guava cider.

Treatment details	Colour and Appearance (Score out of 9)		
	0 days (Initial)	15 days	30 days
T_0 - Control	5.28	5.54	5.62
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	5.91	6.20	6.30
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	6.05	6.34	6.44
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	6.18	6.47	6.57
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	6.62	6.94	7.05
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	6.75	7.08	7.19
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	6.90	7.23	7.35
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	7.35	7.70	7.82
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	7.50	7.86	7.98
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	7.70	8.07	8.20
S.Em (±)	0.13	0.14	0.15
CD (5%)	0.39	0.42	0.43
CV (5%)	4.46	4.55	4.58

Table 10: Effect of different level of yeast on Taste of Guava cider.

Treatment details	Taste (Score out of 9)		
	0 days (Initial)	15 days	30 days
T_0 - Control	5.12	5.37	5.45
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	5.74	6.01	6.11
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	5.86	6.15	6.24
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	5.99	6.28	6.38
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	6.42	6.73	6.84
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	6.55	6.87	6.97
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	6.69	7.02	7.13
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	7.13	7.47	7.59
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	7.27	7.62	7.74
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	7.47	7.83	7.95
S.Em (±)	0.12	0.13	0.14
CD (5%)	0.36	0.39	0.42
CV (5%)	4.29	4.40	4.61

Table 11: Effect of different level of yeast on Aroma of Guava cider.

Treatment details	Aroma (Score out of 9)		
	0 days (Initial)	15 days	30 days
T_0 - Control	5.02	5.26	5.35
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	5.62	5.89	5.99
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	5.75	6.02	6.12
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	5.87	6.15	6.25
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	6.29	6.60	6.70
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	6.42	6.73	6.83
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	6.56	6.88	6.98
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	6.98	7.32	7.43
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	7.13	7.47	7.59
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	7.32	7.67	7.79
S.Em (±)	0.12	0.13	0.14
CD (5%)	0.34	0.37	0.39
CV (5%)	4.17	4.29	4.42

Table 12: Effect of different level of yeast on Overall acceptability of Guava cider.

Treatment details	Overall acceptability (Score out of 9)		
	0 days (Initial)	15 days	30 days
T_0 - Control	5.14	5.39	5.47
T_1 - Guava juice 500 ml + sugar 100 g + yeast 1 gm	5.76	6.04	6.13
T_2 - Guava juice 500 ml + sugar 100 g + yeast 2 gm	5.89	6.17	6.26
T_3 - Guava juice 500 ml + sugar 100 g + yeast 3 gm	6.01	6.30	6.40
T_4 - Guava juice 500 ml + sugar 150 g + yeast 1 gm	6.45	6.76	6.86
T_5 - Guava juice 500 ml + sugar 150 g + yeast 2 gm	6.57	6.89	7.00
T_6 - Guava juice 500 ml + sugar 150 g + yeast 3 gm	6.72	7.04	7.15
T_7 - Guava juice 500 ml + sugar 200 g + yeast 1 gm	7.15	7.50	7.61
T_8 - Guava juice 500 ml + sugar 200 g + yeast 2 gm	7.30	7.65	7.77
T_9 - Guava juice 500 ml + sugar 200 g + yeast 3 gm	7.50	7.86	7.98
S.Em (±)	0.12	0.13	0.14
CD (5%)	0.34	0.37	0.41
CV (5%)	4.10	4.21	4.51

Conclusion

Guava fruits in the study demonstrated desirable processing qualities, including high edible portion, low seed content and rich nutrition. Treatments with 150 g sugar plus yeast (T_4, T_5, T_6) showed superior physicochemical attributes, with T_5 (500 ml guava juice + 150 g sugar + 2 g yeast) achieving the best balance of TSS, acidity, ascorbic acid, pH stability, reducing sugars and sensory preference. While treatments with 200 g sugar (T_7–T_9) showed moderate performance and slight off-flavours, the control (T_0) consistently ranked lowest. Overall, T_5 emerged as the most suitable formulation, combining optimal fermentation efficiency with high consumer acceptability.

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