EFFECT OF DIFFERENT LEVELS OF YEAST ON PHYSICO-CHEMICAL AND SENSORY PROPERTIES OF GUAVA (*Psidium guajava* L.) Cv Allahabad Safeda CIDER DURING STORAGE

ABSTRACT

An experiment was carried out at the Post Harvest Technology, Department of Horticulture, SHUATS, Prayagraj (Uttar Pradesh) during the year 2021 - 2022. The experiment consisted of 6 different treatments and control comprising the T_0 Guava juice (1L) + yeast (0), T_1 Guava juice (1L) +yeast (0.5gm), T_2 Guava juice (1L) +yeast (1gm), T_3 Guava juice (1L) + yeast (2gm), T_4 Guava juice (1L) + yeast (3gm), T_5 Guava juice (1L) + yeast (4gm), T_6 Guava juice (1L) + yeast (5gm). Guava juice was fermented using *Saccharomyces cerevisiae.* This investigation was laid out in a completely randomized design with three replications. The cider was tested for the physico-chemical changes after preparation, and sensory evaluation was done based on the 9-point hedonic scale tested on a panel of 5 experts. This cider was stored for about 120 days at ambient temperature. From storage studies, it was revealed that T_1 Guava juice (1L) +yeast (0.5gm) is most suitable in terms of their physicochemical properties and organoleptic test of cider. The effect of storage on physico-chemical and organoleptic characteristics was also observed.

Keywords: - Cider, Fermentation, Guava, *Saccharomyces cerevisiae*, Storage, Yeast

INTRODUCTION

Guava (*Psidium guajava L.*) is one of the most important commercial fruit crops of India **(Tandon *et al.*, 1983)**. Guava belongs to the family Myrtaceae and it is native to tropical America (Neotropics), it is cultivated in all tropical and subtropical countries and thus one of the important fruit crops of India **(Chopda *et al.*, 2001; Ghosh *et al.*, 2013**).

Guava is a fair source of minerals and vitamins like vitamin A (250 IU per 100g of pulp), Ascorbic acid (75-265 mg per 100g of pulp), thiamine, riboflavin and niacin, and phosphorus (17.8–30 mg per 100g of pulp) **(Ghosh *et al.*, 1996 and Das *et al.*, 1995).**

Fermented guava beverage is the product of anaerobic fermentation by yeast in which the sugars are converted into alcohol and carbon dioxide. Fermented guava beverage production from guava pulp or juice is reported by **(Gurvinder *et al.*, 2011**).

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Cider is considered to be a pleasant, refreshing, thirst-quenching, and hygienic beverage. It is also highly nutritive and health-giving among all the fermented drinks. Besides, it is said to possess remarkable therapeutic properties like the prevention of stone formation in the bladder on account of its diuretic properties **(Chaudhary, 1969)**. Cider is produced all over the world and consumed throughout the European countries **(Alberti *et al*., 2011)**.

Cider making process includes various steps such as harvesting fruit, sweating, washing, grinding, pressing, blending, testing, fermentation, racking off, filtering or fining, bottling, and storage.

MATERIAL AND METHODS

The study was conducted in Completely Randomized Design (CRD) with 6 treatments and control (T_0) replicated thrice. The treatments were T_0 Guava juice (1L) + yeast (0), T_1 Guava juice (1L) +yeast (0.5gm), T_2 Guava juice (1L) +yeast (1gm), T_3 Guava juice (1L) + yeast (2gm), T_4 Guava juice (1L) + yeast (3gm), T_5 Guava juice (1L) + yeast (4gm), T_6 Guava juice (1L) + yeast (5gm).

Raw material and extraction of juice

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Healthy uniform size guava (*Psidium guajava* L.) Cv. Allahabad Safeda free from diseases, pests, and bruises was randomly selected and brought from a local market. After washing, the fruits were cut into small pieces and crushed and the must be obtained was filtered through muslin cloth which was stored in glass bottles after inoculating.

Yeast and inoculum preparation

Saccharomyces cerevisiae was obtained from the market. The inoculum was prepared by inoculating 0.5g,1g,2g,3g,4g, and 5g brewer's yeast was added to 10ml of lukewarm water in separate beakers according to treatments and stirred gently. The activated wine yeast was added to the pulp according to the treatments respectively.

Preparation of Cider

Cider was prepared with different concentrations of yeast. Steps of preparation are given below.

Chart 1: Preparation of Cider

Selection of Fruit

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Washing

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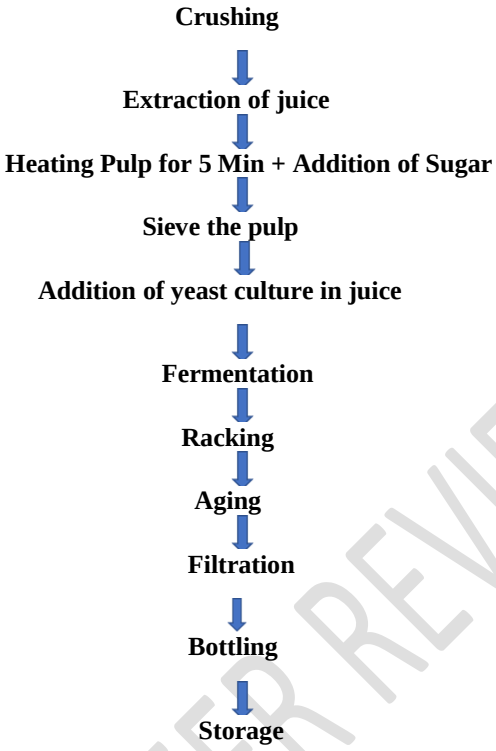

Physico-chemical and organoleptic quality of cider

The cider was tested for the physico-chemical changes after preparation and during storage at ambient conditions. pH of the product was determined using a digital pH meter, TSS using a hand refractometer, titrable acidity using the titrimetric method, alcohol content and specific gravity by hydrometer, whereas ascorbic acid was determined by titrating the product against 2, 6-dichlorophenol indophenol indicator (A.O.A.C, 1990). Sugars were estimated by Lane and Enyo's method (1923) in terms of sugar. The product was evaluated for colour, flavour, aroma and overall acceptability.

RESULTS AND DISCUSSION

pH

The pH dropped gradually as the fermentation time increases. The variation observed was due to the effect of different concentrations of yeast and the fermentation period. Studies have shown that during the fermentation of fruits, low pH is inhibitory to the growth of spoilage organisms but creates a conducive environment for the growth of desirable organisms. Also, low pH and high acidity are known to give fermentation yeast a comparative advantage in the natural environment **Medina *et al.* (2006).** It can be observed

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from the table that in terms of pH, the lowest score of pH was observed in treatment T_6 (Guava juice+ 5gm yeast) ranging from 4.58 to 3.18 followed by treatment T_5 (Guava juice+ 4gm yeast) with 4.71 to 3.41, whereas the maximum score was observed in treatment T_0 (Guava juice+0 gm) with 5.40 to 4.13 during I initial days,30,60,90 and 120 days of storage.

TSS (^{0} Brix)

The rate of utilization of sugar depended upon the amount of yeast added it increased the rate of fermentation. The decrease in the TSS content of wine indicates the utilization of the sugar present in the must during fermentation. The above results are similar to the findings of **Shankar *et al.* (2006)**. The decrease in TSS was also governed by the level of the inoculum rate (0.5 and 5 gm). In terms of Total Soluble Solids, the lowest score of TSS ranging 17.87 to 4.20 $^\circ$Brix in T_6 (Guava juice + 5gm yeast), followed by treatment T_5 ranging from 18.27 to 4.73^0 Brix, whereas the maximum score was observed in treatment T_0 (Guava+0gm yeast) with 19.93 to 13.77 $^\circ$ Brix during Initial day,30,60,90,120 days storage.

Acidity (%)

During storage yeast produced certain organic acid, was might be the reason for the increasing acidity in guava cider. A similar finding was registered by **Beera *et al.* (2013).** In terms of Acidity, the lowest score of titratable acidity ranging from 0.34 to 0.67 after storage was observed in treatment T_0 (Guava juice), followed by treatment T_1 (Guava juice + 0.5gm) ranging from 0.35 to 0.69, whereas the maximum score was observed in treatment T_6 (Guava+5gm yeast) ranging 0.42 to 0.91 during the initial day,30,60,90,120 days storage.

Alcohol content (%)

There was a slight increase in alcohol level during storage however the difference was not significant statistically **Kumar (2006)**. There was a statistically significant decrease in ethanol production beyond the inoculum level of 9 % (v/v) as more sugar was consumed by the biomass production at higher inoculum levels. **Kaur *et al.* (2009). Srivastava *et al.* (1997)** reported that 10% inoculum size added for guava pulp led to the production of 5.8 % (w/v) ethanol by *S. cerevisiae*.

In terms of Alcohol content (%) The highest score of Alcohol content ranging from 8.57 to 9.10 was observed in treatment T_6 (Guava juice + 5gm) followed by treatment T_5 (Guava

juice + 4gm) 7.70 to 8.4, whereas the minimum score was observed in treatment T_0 (Guava juice+ 0gm) ranging 3.5 to 4.83 during initial days,30,60,90,120 days storage.

Ascorbic Acid (mg/100g)

The decrease was significantly higher in all the treatments during storage. Heat destruction and oxidation was might be the reason for ascorbic acid reduction during the storage period. **Yadav *et al.* (2012)** observed that the ascorbic acid content was decreased from 1.26 mg/100g to 1.19 mg/100g in mahua vermouth during one year of maturation. Loss of ascorbic acid during storage of fruit wines was reported by **Patras *et al.* (2009)**. In terms of Ascorbic Acid (%) The highest score of ascorbic acid ranging from 166.5 to 91.90 was observed in treatment T_1 (Guava juice + 0 gm) followed by treatment T_2 (Guava juice + 1 gm) ranging from 150.78 to 87.60, whereas the minimum score was observed in treatment T_6 (Guava juice+5gm) with 57.5 to 40.4 during initial,30,60,90,120 days storage.

Specific gravity

The specific reduces as the fermentation days of cider increase. The decrease in specific gravity with different yeast levels is due to different concentrations of sugar availability. *Saccharomyces cerevisiae* has been reported to reduce the specific quality of fruit wines during fermentation. The above results are similar to the findings of **Amerine *et al.* (2005).** The specific gravity of the cider was recorded, the highest was found in T_0 (1.075) followed by T_1, T_2, T_3, T_4, and T_5 Whereas the lowest score was observed in treatment T_6 (1.035) during storage.

Organoleptic evaluation

In the organoleptic evaluation such as color and appearance, taste, aroma, and overall acceptability. Sensory scores for treatment (T_1 Guava juice (1L) + yeast (0.5gm)) were found to be highest in all parameters of organoleptic attributes. The highest overall acceptability score (8.2) indicated that it was well-received by the judges.

Table 1: Effect of yeast at different concentrations on pH and TSS during storage period.

Treatments	pH					TSS				
	Storage period (days)					Storage period (days)				
	0	30	60	90	120	0	30	60	90	120
T_0	5.40	5.24	4.94	4.81	4.13	19.93	16.97	15.1	14.83	13.77

T_1	5.20	4.73	3.79	3.71	3.68	19.73	12.63	9.3	8.47	8.37
T_2	4.64	4.59	3.74	3.71	3.62	19.53	9.57	8.57	7.57	7.67
T_3	4.94	4.55	3.71	3.62	3.55	18.73	8.77	8.13	7.20	6.27
T_4	4.80	4.47	3.62	3.60	3.46	18.43	8.37	7.93	6.87	5.73
T_5	4.71	4.34	3.61	3.51	3.41	18.27	8.17	7.63	6.37	4.73
T_6	4.58	4.18	3.53	3.50	3.18	17.87	7.77	7.37	6.13	4.20
F-test	S	S	S	S	S	S	S	S	S	S
S.Ed(±)	0.182	0.056	0.017	0.007	0.042	0.300	0.806	0.415	0.413	0.303
CD @ 5%	0.394	0.122	0.036	0.015	0.091	0.091	0.084	0.076	0.090	0.657

Table 2: Effect of yeast at different concentrations on acidity and alcohol during storage

Treatments	**Acidity**					**Alcohol Content**				
	Storage period (days)					**Storage period (days)**				
	0	**30**	**60**	**90**	**120**	**0**	**30**	**60**	**90**	**120**
T_0	0.34	0.41	0.59	0.62	0.67	0.03	3.50	4.73	4.83	4.83
T_1	0.35	0.42	0.61	0.66	0.69	0.06	5.70	5.90	6.10	6.07
T_2	0.36	0.43	0.63	0.67	0.71	0.06	6.30	6.37	6.27	6.27
T_3	0.38	0.45	0.64	0.71	0.75	0.20	6.60	6.70	6.73	6.73
T_4	0.38	0.48	0.67	0.75	0.77	0.26	6.17	6.80	6.87	6.90
T_5	0.40	0.52	0.71	0.79	0.85	0.33	7.70	8.43	8.43	8.43
T_6	0.42	0.57	0.74	0.81	0.91	0.43	8.57	9.07	9.13	9.10
F-test	S	S	S	S	S	S	S	S	S	S
S.Ed(±)	0.008	0.009	0.010	0.009	2.93	0.06	0.33	0.09	0.12	0.11
CD @ 5%	0.01	0.02	0.02	0.02	6.43	0.13	0.72	0.20	0.25	0.23

period.

Table 3: Effect of yeast at different concentratio on ascorbic acid and overall acceptability during storage period.

Treatments	**Ascorbic Acid**					**Overall Acceptability**		
	Storage period (days)					**Storage period (days)**		
	0	**30**	**60**	**90**	**120**	**60**	**90**	**120**

T_0	117.9	103.1	80.5	72.3	82.2	7.3	7.4	7.5
T_1	166.5	137.1	111.4	100.1	91.9	7.7	8.0	8.2
T_2	150.7	110.7	100.6	97.2	87.6	6.5	7.5	7.5
T_3	72.8	69.4	70.3	66.1	65.6	6.1	6.2	6.9
T_4	59.8	56.2	54.5	54.1	54.2	6.0	5.8	6.3
T_5	67.2	62.9	61.4	50.0	58.1	5.2	5.7	5.7
T_6	57.5	48.6	40.6	43.8	40.4	4.9	4.9	5.3
F-test	S	S	S	S	S	S	S	S
S.Ed(±)	7.35	5.26	5.39	3.55	2.96	0.47	0.35	0.51
CD @ 5%	15.92	11.39	11.68	7.69	6.43	1.03	0.76	1.11

CONCLUSION

In this investigation, the treatment of T_1 Guava juice (1L) +yeast (0.5gm) was found most suitable treatment in terms of physico-chemical properties i.e., pH (3.68), total soluble solids (8.37), titrable acidity (0.69), alcohol content (6.07) and ascorbic acid (87.60) and organoleptic test overall acceptability (8.2).

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Comment [ni5]: bibliography references need to be added the last 5 years

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