"Effect of different levels of cider, Baker yeast and Hamei on pineapple cider"

ABSTRACT

Cider is an alcoholic beverage that is produced when fruit juices are fermented; it is made using the same techniques as wine. Cider occupies a special place among its more well-known alcoholic siblings since it is brewed like wine but mostly served as beer. Eight treatments were reproduced three times in the CRD (Complete Randomized Design) format of the experiment. The pineapples were fermented by using two different kinds of yeast, baker yeast (*Saccharomyces cerevisiae*) and Hamei (Bacteria (*Bacillus sp*.), fungi (*Aspergillus niger van Tiegh*.) and the yeast (*Saccharomyces cerevisiae*) for 30 days. Longer fermentation times resulted in higher levels of alcohol, acidity, and sensory characteristics, but lower levels of total soluble solids, pH, and specific gravity were observed. Cider is a fermented product, produced from fruit juices, which increases juice's shelf life. In this experiment, Hamei and baker yeast were used to make pineapple cider. Treatment T_5 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1L) produced the best cider among all the treatments in terms of alcohol content (7.00), pH (3.90) and total soluble solids (4.90 Brix).

KEYWORDS: Cider, Pineapple, Fermentation, *Saccharomyces cerevisiae*, Hamei, Alcohol Content.

INTRODUCTION

The pineapple, scientifically known as Ananas Comosus and belonging to the Bromeliaceae family, encompasses approximately 2,000 species, many of which are visually stunning and predominantly epiphytic. These species exhibit a wide range of colours, varying from nearly white to yellow (Morton, 1987). Pineapples possess a favourable sugar content, making them suitable for the production of wine (Adaikan and Ganesan, 2004). In terms of its physical characteristics of Queen variety, the pineapple fruit is a vibrant yellow colour and typically weighs between 0.9 and 1.3 kilogrammes. The flesh has a deep golden yellow hue, is less juicy compared to the Kew variety, and has a crisp texture that is accompanied by a pleasant aroma and flavour. The fruit's small and deep-set eyes necessitate a thicker cut when removing the skin. Additionally, the leaves of the pineapple are brownish-red, shorter in length, and adorned with numerous spines. Traditionally, cider was exclusively prepared by fermenting apple juice. However, nowadays, it can be crafted using various fruits such as pineapple, grapes, plums, olives, and numerous others. Cider can be categorised into two main types: sparkling and natural, depending on the inclusion of sugars and CO2 (Picinelli et al., 2000). As a versatile and refreshing beverage, cider has gained popularity among consumers seeking alternatives to conventional alcoholic drinks. The global cider industry has experienced significant growth and diversification in recent years, both in terms of production volume and market demand. This surge in popularity has sparked increased interest in understanding the intricacies of cider production, its cultural significance, and the factors driving consumer consumption patterns. Fermentation serves as a viable technique for developing new products with modified physiochemical and sensory qualities, particularly in terms of flavour and nutritional components. Quality production relies on important fermentations such as alcoholic, acetic, and lactic acid fermentations. Among these, alcoholic fermentation is widely employed for producing beverages where alcohol constitutes a major component. The consumption of fermented beverages has been prevalent throughout human history. An alcoholic beverage is defined as a drink that contains ethanol. Fruit wines and ciders, typically made from apples, grapes, or other fruits such as pears, pineapples, and bael, are non-distilled alcoholic beverages that are both nutritious and mildly stimulating. These fruits undergo a fermentation and ageing process. Generally, their alcohol content ranges between 5 and 13 percent. Wines and ciders derived from fruits are often named after the specific fruits used. Throughout history, no other beverages, apart from water and milk, have gained such universal acceptance and esteem as wine and cider. Both wine and cider can be stored and transported under existing conditions while retaining a flavour reminiscent of fresh fruit. Being a fermented and non-distilled fruit-based product, wine retains most of the nutrients found in the original fruit juice. Cider's nutritive value is enhanced by the release of amino acids and other nutrients from yeast during fermentation. Cider typically contains 4 to 12 percent alcohol and 2 to 3 percent sugar, with an energy value of 208 kcal per 100 mL. The processes involved in wine and cider making can be broadly categorised into three stages: pre-fermentation, fermentation, and post-fermentation (Iland et al., 2000; Jackson, 2000; Ribéreau-Gayon et al., 2000). During pre-fermentation, the fruits are crushed to release the juice. Fermentation is the

phase where sugars present in the juice are converted into alcohol and carbon dioxide through a reaction facilitated by yeasts. Yeasts utilise the sugars as the fermentation progresses. A stuck fermentation occurs when yeasts fail to fully consume
the available sugar, resulting in a slowdown or cessation of the fermentation process. Clarification is achieved through techniques such as racking, filtration, and centrifugation. Post-fermentation practises are performed once the desired stage of fermentation is reached or when it is complete. At this stage, the wine is separated from the yeast lees, typically using stainless steel vessels or oak barrels. Throughout maturation, both wine and cider continue to undergo changes, and when they reach an appropriate stage, they are filtered and bottled (Swami et al., 2014). For the fermentation process, the commercial yeast Saccharomyces cerevisiae Instant Dry Yeast (Four Season) from Kothari Fermented and Biochem Ltd., New Delhi, and Hamei (consisting of bacteria, Bacillus sp., fungi, Aspergillus niger van Tiegh., and yeast, Saccharomyces cerevisiae) from Sekmai, Manipur, were utilised (Walker GM and Stewart GG, 2016; P K Singh and K I Singh, 2006).
The objective of this study was to investigate the impact of different levels of cider, baker yeast (Saccharomyces cerevisiae), Hamei bacteria (Bacillus sp.), fungi (Aspergillus niger van Tiegh.), and yeast (Saccharomyces cerevisiae) on pineapple cider. Additionally, the study aimed to assess the economic aspects of various treatments.

MATERIALS AND METHODS

The experiment, titled "Effect of different levels of cider, baker yeast, and Hamei on pineapple cider," was conducted in the Post-Harvest Laboratory, Department of Horticulture at Sam Higginbottom University of Agriculture, Technology, and Sciences in Prayagraj, Uttar Pradesh. The completely randomised block design (CRBD) by Panse and Sukhtme (1984) was statistically analysed using the analysis of variance (ANOVA) method. Using the critical difference (C. D. at 5%) threshold of significance, the overall significance of differences between the treatments was examined. A window-based computing tool called OPSTAT was used to statistically analyse the results (Sheoran, 2004).

Table 1: Treatment details.

SL.	TREATMENT SYMBOL	DETAILS OF TREATMENT COMBINATION
1.	T_1	Pineapple pieces (700g) + Sugar (300g) + Baker yeast (0.5g) + Water (1L)
2.	T_2	Pineapple pieces (700g) + Sugar (300g) + Baker yeast (1g) + Water (1L)
3.	T_3	Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (1.5g) + Water (1L)
4.	T_4	Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (2g) + Water (1L)
5.	T_5	Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1L)
6.	T_6	Pineapple pieces (700 g) + Sugar (300g) + Hamei (1g) + Water (1L)
7.	T_7	Pineapple pieces (700 g) + Sugar (300g) + Hamei (1.5g) + Water (1L)
8.	T_8	Pineapple pieces (700 g) + Sugar (300g) + Hamei (2g) + Water (1L)

***Water was sterilised before adding.**
****Baker yeast contains (*Saccharomyces cerevisiae*)**
*****Hamei contains Bacteria (*Bacillus sp.*), fungi (*Aspergillus niger van Tiegh.*) and the yeast (*Saccharomyces cerevisiae*).**

Raw material preparation:

Fruits were cleaned, cut, weighed, and processed as must when they were at their healthiest and best

stage for wine production. Commercial cider yeast Saccharomyces cerevisiae Instant Dry Yeast (Four Season) (from Kothari Fermented and Biochem Ltd., Community Centre Saket, New Delhi-110017) and Hamei (Bacteria (Bacillus sp.), fungi (Aspergillus niger van Tiegh.), and the yeast (Saccharomyces cerevisiae)) from Sekmai, Manipur) were used in fermentation.

Activation of yeast:

The baker yeast and local yeast were activated by putting yeast into Luke's warm water. After some minutes, it shows a bubble-like structure and makes a little sound, and that's the point where the yeast is ready to inoculate.

Fermentation:

With the addition of the starting culture, the main fermentation was started. Every day, following a one-day break, the must was stirred. A tube was introduced into a clean bottle containing clean water to perform the secondary fermentation in an airtight container. The most important thing was to keep an eye on the fermentation process. This was permitted until the fermentation process was complete, which was indicated by the absence of bubbles in the container, which often happened after weeks. The fermentation process lasted 30 days. When fermentation was complete, the cider was quickly racked off the lees to ensure minimal oxygen exposure. The upper liquid was then transferred to a different, clean container to filter out any contaminants. After the secondary fermentation, the cider's microbial analysis, alcohol, sugar content, specific gravity, titratable acidity, and pH were all measured.

Clarification of cider:

After fermentation was finished, the cider was extracted, filtered through a clean, sterile muslin cloth, Whatman No. 1 filter paper, sieve, and syphon tubes sterilised with 70% alcohol, and then stored in sterile glass jars. For three weeks, the cider was racked to clarify it. Before doing further chemical analysis, the residues were eliminated, and the filtrates were given time to develop. Due to the presence of sediments in fermented cider, clarification is a crucial step in the manufacture of cider.

Packaging and preservation:

For storage and marketing, mature cider should be packaged in hygienic containers. Glass bottles are excellent for packaging since they are simple to maintain. The bottles in which the cider will be preserved should be sterilised to reduce microbial infestation.

Determination of physiological and chemical parameters:

During the fermentation and storage processes, the pineapple cider was examined for the following qualities to evaluate whether the pineapple fruit is acceptable for use in the production of cider, its physiochemical makeup must be thoroughly investigated.

By decanting, the fermented samples were removed from the bottles and used for proximate analysis of the variables T.S.S. (Brix), Titratable acidity (%), pH, Specific gravity, and Alcohol content (%). Using a hand-held refractometer, the total soluble solids (TSS) in pineapple cider were calculated, and the findings were represented in degree brix (°B). With distilled water, the refractometer was checked for error, adjusted as necessary, and the TSS content noted (Ranganna, 1986).

By titrating an aliquot of the sample (10 ml) with 0.1 N NaOH while using phenolphthalein as an indicator, the acidity of the cider was determined.

The pH of the must was calculated using the AOAC (2004) method. The pH metre electrode was thoroughly cleansed with distilled water, and its measurement was adjusted to zero. The pH of each beaker holding 25 ml of the must was measured by dipping the pH electrode (probe) into the beaker. After each measurement, distilled water was used to clean the pH metre's electrode.

Specific gravity was determined from the sugar content. By using the formula,

Specific gravity = (Brix / (258.6)- ((Brix / 258.2) *227.1)) + 1

The alcohol percentage was calculated from the specific gravity with the formula,

Alcohol by volume = (Original Gravity minus Final Gravity) *131.25

And both specific gravity and alcohol percentage are cross-checked by calculating them using an instrument called a hydrometer. The alcohol content is given as a percentage. The instrument for determining specific gravity is made up of a tube-like form. A 250-mL measuring cylinder should hold 250 mL of cider. After placing the hydrometer into the cider that was already within the measuring cylinder, the readings were recorded. The readings are shown on the hydrometer, which floats on the cider.

RESULT AND DISCUSSION

Physio-chemical parameters result:

Table 2: Physio-chemical parameters of pineapple cider.

Treatment Symbol	Treatment details	Total Soluble Solids (· Brix)		Acidity (%)		pH		Specific Gravity		Alcohol Content
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
T_1	Pineapple pieces (700gm) + Sugar (300g) + Baker yeast (0.5g) + Water (1L)	19.30	5.03	0.41	0.61	4.79	3.61	1.07	1.03	5.25
T_2	Pineapple pieces (700gm) + Sugar (300g) + Baker yeast (1g) + Water (1L)	19.16	5.20	0.39	0.53	4.68	3.79	1.06	1.03	4.37
T_3	Pineapple pieces (700 gm) + Sugar (300g) + Baker yeast (1.5g) + Water (1L)	19.13	5.30	0.39	0.44	4.72	3.92	1.06	1.04	3.50
T_4	Pineapple pieces (700 gm) + Sugar (300g) + Baker yeast (2g) + Water (1L)	19.33	5.16	0.38	0.82	4.79	3.85	1.07	1.06	2.18
T_5	Pineapple pieces (700 gm) + Sugar (300g) + Hamei (0.5g) + Water (1L)	18.50	4.90	0.35	0.80	4.62	3.90	1.06	1.01	7.00
T_6	Pineapple pieces (700 gm) + Sugar (300g) + Hamei (1g) + Water (1L)	18.83	5.24	0.40	0.75	4.75	3.84	1.07	1.06	2.18
T_7	Pineapple pieces (700 gm) + Sugar (300g) + Hamei (1.5g) + Water (1L)	19.33	4.96	0.38	0.51	4.80	3.91	1.06	1.02	4.81
T_8	Pineapple pieces (700 gm) + Sugar (300g) + Hamei (2g) + Water (1L)	19.20	5.00	0.38	0.77	4.83	3.78	1.07	1.04	3.93
F-test		S	S	S	S	S	S	S	S	S
CD		0.274	0.151	0.020	0.059	0.066	0.09	0.011	0.024	2.921
SE.(d)		0.128	0.071	0.009	0.028	0.031	0.04	0.005	0.011	1.366
CV		0.821	1.699	2.892	5.154	0.791	1.38	0.573	1.302	40.25

Total Soluble Solid:

According to the TSS, all of the storage treatments differed significantly from one another. At various times, the TSS content decreased. The lowest score of TSS (18.50 and 4.90 oBrix) at Initial and 30 days after storage was observed in treatment T5 (Pineapple pieces (700 g) + Sugar (300g) + Hamei

(0.5g) + Water (1 L)), whereas the maximum score was observed in treatment T3 (Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (1.5g) + Water (1 L)) with 19.13 and 5.30 oBrix) at initial and 30 days after storage and given in table no. 2.

During storage, the total soluble solids concentration of pineapple cider decreased. With increasing cider levels, the total soluble solid content of pineapple cider decreases. The presence of yeast and sugar in storage may be due to the fermentation of sugars into alcohol by the activity of yeast. TSS decreased as time passed, which was clearly due to yeast fermentation of sugar. This is common fermentation behaviour in any alcoholic fermentation of fruit juice into cider. The higher alcohol production inhibits the activity of yeast in the medium, thus exerting an inhibitory effect on the fermentation ability (Nishino et al., 1985; Joshi et al.,1999). The TSS levels in cider are declining, which shows that the sugar used for fermentation was used.

Acidity:

Acidity is important in assessing cider quality since it aids in fermentation and improves the overall quality and balance of the cider. Due to its direct and indirect effects on cider quality, acidity is another essential factor (Clarke and Bakker, 2004). According to Berry (2000), a lack of acidity will result in poor fermentation. The Acidity (%) proved that there were substantial variations between all treatments during storage. Afterwards, the acidity increased throughout various storage times. The lowest score of Acidity (0.39 and 0.44) initially and 30 days after storage was observed in treatment T3 (Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (1.5g) + Water (1 L)), whereas the maximum score was observed in treatment T4 (Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (2g) + Water (1 L)) with (0.38 and 0.82) during initial and 30 days storage and given in table No. 2.

During storage, all pineapple ciders' acidity showed an increasing trend. A reduction in pH occurred along with a rise in titratable acidity. The rise in acidity of pineapple cider with varied amounts of cider yeast during storage might be due to the action of different yeast strains and fermentation periods. According to Attri (2009), the increase in alcohol production brought on by the high initial sugar content may be the cause of the rise in acidity. According to Samah et al. (1992), S. cerevisiae produced organic acids such as citric, malic, lactic, tartaric, oxalic, and succinic acids when fermenting cocoa beans. Because too much acidity can result in tartness and too little can result in stale and insipid cider, acid prevents the formation of spoilage bacteria and promotes the growth and activity of ciders. Contrary to what Pratima et al. (2006) observed, they found that the amount of inoculum had no impact on the TA of fermenting juice.

pH:

During storage, the pH revealed substantial changes across all treatments. At various storage times, the pH subsequently decreased. The lowest pH (4.79 and 3.61) initially and 30 days after storage was observed in treatment T1 (Pineapple pieces (700g) + Sugar (300g) + Baker yeast (0.5g) + Water (1 L)), whereas the maximum score was observed in treatment T3 (Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (1.5g) + Water (1 L)) with pH (4.72 and 3.92) during 30 days storage.

Table No. 2 displays the cider's pH measurement results. As the fermentation period increased, the pH steadily fell. The influence of the varied yeast strain and fermentation time served as the reason for the variation that was found. According to studies, low pH during fruit fermentation inhibits the development of microbes that cause spoilage while fostering the growth of beneficial organisms. In addition, it is known that fermentation yeast has a competitive advantage in natural conditions when the pH is low and the acidity is high (Macrae et al., 1993). The dissociation of parental acids and the production of hydrogen ions may be what causes a decrease in pH with the rise in the acidity of cider. The cider's pH is influenced by the must's composition, the number of organic acids and sugars contained in the cider, and other factors.

Specific Gravity:

The specific gravity revealed that during storage, all of the treatments differed significantly from one another. At various storage times, the specific gravity subsequently decreased. The lowest score of Specific gravity (1.06 and 1.010) initially and 30 days after storage was observed in treatment T5 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1 L)), whereas the maximum score was observed in treatment T6 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (1g) + Water (1 L)) with 1.07 and 1.062 at initial and 30 days after storage and given in table no. 2.

All pineapple ciders' specific gravities under storage exhibited a trend towards decline. Table No. 2 displays the outcomes of the fermentation process. As the cider's fermentation days increase, its specific gravity decreases in the study's pineapple cider. The type of yeast used to make the cider may be the cause of the drop in specific gravity of pineapple cider with various levels of cider yeast throughout storage. During the fermentation process, Saccharomyces cerevisiae has been observed to decrease the quality of certain fruit ciders. The findings of Amerin et al. (2005), Robinson (2006), Anon (2008), Okafor (2007), Idise and Ofiyai (2011), and Noah et al. (2013) are comparable.

Alcohol:

Fruit sugar level directly affects the amount of alcohol in fruit wine, and a must with too little sugar will produce cider with little alcohol. The primary alcoholic component of cider and an index of its quality is ethanol. Due to its preservation capabilities, capacity to dissolve volatile compounds, and influence on the growth of aromatic compounds, its concentration is essential to the stability, ageing, and sensory qualities of the cider. According to the alcohol concentration, all of the storage procedures differed significantly from one another. The data given in Table 2 reveal that as fermentation time rose, the concentration of alcohol increased. The highest score of Alcohol content (7.00) at 30 days after storage was observed in treatment T5 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1 L)), whereas the minimum score was observed in treatment T4 (Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (2g) + Water (1 L)) with a score of (2.18) during 30 days of storage. Throughout the storage period, the alcohol percentage of pineapple cider increased. According to Joshi and Sharma (1995), the fermentation behaviour of every fruit that made wine followed a similar trend of alcohol growth or TSS decline. The rise in alcohol content of pineapple wine with various levels of wine yeast and sugar throughout storage may perhaps be caused by the variability in the yeast's capacity to use the fermentable sugars, which affects the fermentability and results in the variable alcohol production (Amerine et al., 1980).

ORGANOLEPTIC SCORE:

Colour and Appearance:

The colour revealed that there were considerable changes between all of the treatments throughout storage. The colouring gradually improved with time. The maximum score of colours (7.94) at 30 days, respectively, was observed in treatment T_5 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1 L), whereas the minimum score was observed in treatment T_6 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (1g) + Water (1 L)) with a score of (4.93) during 30 days of storage. Given in table no. 3.

Taste:

The taste confirmed that every single treatment during storage differed significantly from one another. Taste subsequently improved during various storage times. The maximum score of Taste (8.35) at 30 days, respectively, was observed in treatment T_5 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1 L), whereas the minimum score was observed in treatment T_6 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (1g) + Water (1 L)) with a score of 4.24 during 30 days of storage. Given in table no. 3.

All pineapple wines throughout storage showed an increasing tendency towards sweetness. A smooth, mellow flavour and a clean aroma are developed when the wine matures properly, replacing the harsh taste and yeasty odour (Amerine *et al*., 1980).

Since pineapples contain significant amounts of citric acid, malic acid, and ascorbic acid, pineapple wine has a higher pH than grape wine. These acids make it less likely for wines to get contaminated, and they help improve wine's flavour. The high overall quality score seen in pineapple wine may be attributable to the juice's initial good sensory characteristics as well as the juice's appreciable fermentation by yeast, as shown by the high alcohol concentration. The wine underwent several changes throughout maturation, some of which were beneficial to its sensory properties. White wine's body and astringency decreased as phenolic components were reduced (Gallego *et al*., 2013). According to their kind and concentration, alcohol and esters, the main category of aroma compounds that account for more than 90% of the free volatiles, contribute significantly to the flavour of wine (Valero *et al*., 2002). Higher levels of ethyl alcohol, lower levels of acidity, and a smaller quantity of volatile acidity are desirable qualities from a quality standpoint, and researchers have already discovered these effects on grape fermentation (Amerine *et al*., 1980; Carroll, 1986).

Aroma:

The Aroma revealed that all of the treatments differed significantly during storage. At various storage times, there was a subsequent rise in Aroma. The maximum score of Aroma (8.76) at 30 days, respectively, was observed in treatment T_5 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1 L), whereas the minimum score was observed in treatment T_6 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (1g) + Water (1 L)) with a score of 5.57 during 30 days of storage. Given in table no. 3.

During storage, every pineapple cider had an increasing tendency to have an unpleasant aroma. According to reports, the kind and scent of the cider generated during the fermentation process depend on the yeast, the environment, and the physio-chemical properties of the "musts". The harsh and yeasty aroma of the wine fades as it matures correctly, replacing it with a smooth, mellow taste and a clean aroma (Amerine *et al*., 1980). The pineapple wine's high overall quality score might be attributed to the juice's initial good sensory qualities and the juice's notable yeast fermentation, which is indicated by the juice's high alcohol level. The wine underwent several changes throughout maturation, some of which were advantageous to its sensory properties. White wine's body and astringency decreased as a result of the reduction of phenolic components (Gallego *et al*., 2013). According to type and concentration, alcohol and esters—the main category of aroma compounds and

accounting for more than 90% of the free volatiles—play a major role in wine flavour (Valero *et al*., 2002). Higher levels of ethyl alcohol, lower levels of acidity, and a smaller quantity of volatile acidity are desirable qualities from a quality standpoint, and researchers have already discovered these effects on grape fermentation (Amerine *et al*., 1980; Carroll, 1986).

Overall Acceptability:

All of the treatments during storage had noticeable changes, according to the overall acceptance. At various storage times, there was a subsequent rise in overall approval. The maximum score of Overall acceptability (7.79) at 30 days, respectively, was observed in treatment T_5 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1 L) g), whereas the minimum score was observed in treatment T_6 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (1g) + Water (1 L)) with a score of (4.41) during 30 days of storage. Given in table no. 3.

Overall, the acceptability of pineapple cider increased with storage. The pineapple wine's high overall quality score might be attributed to the juice's initial good sensory qualities and the juice's notable yeast fermentation, which is indicated by the juice's high alcohol level. The wine underwent several changes throughout maturation, some of which were advantageous to its sensory properties. White wine's body and astringency decreased as a result of the reduction of phenolic components (Gallego *et al*., 2013). According to type and concentration, alcohol and esters—the main category of aroma compounds and accounting for more than 90% of the free volatiles—play a major role in wine flavour (Valero *et al*., 2002). Higher levels of ethyl alcohol, lower levels of acidity, and a smaller quantity of volatile acidity are desirable qualities from a quality standpoint, and researchers have already discovered these effects on grape fermentation (Amerine *et al*., 1980; Carroll, 1986).

Table No.3: Organoleptic score on effect of different levels of cider yeast.

Treatment	Treatments combination	Final Reading			
		COLOUR AND APPEARANCE	TASTE	AROMA	OVERALL ACCEPTABILTY
T_1	Pineapple pieces (700g) + Sugar (300g) + Baker yeast (0.5g) + Water (1L)	7.00	7.557	8.03	7.66
T_2	Pineapple pieces (700g) + Sugar (300g) + Baker yeast (1g) + Water (1L)	5.74	6.277	7.71	6.55
T_3	Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (1.5g) + Water (1L)	5.36	5.363	6.38	5.53
T_4	Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (2g) + Water (1L)	5.33	5.333	6.44	5.63
T_5	Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1L)	7.94	8.353	8.76	7.79
T_6	Pineapple pieces (700 g) + Sugar (300g) + Hamei (1g) + Water (1L)	4.39	4.240	5.57	4.41
T_7	Pineapple pieces (700 g) + Sugar (300g) + Hamei (1.5g) + Water (1L)	5.21	5.500	6.51	5.56
T_8	Pineapple pieces (700 g) + Sugar (300g) + Hamei (2g) + Water (1L)	4.72	5.173	5.92	6.28
F-Test		**S**	**S**	**S**	**S**
C.D.		0.426	0.307	0.415	0.332
SE(d)		0.199	0.143	0.194	0.155
C.V.		4.266	2.940	3.434	3.079

BENEFIT-COST RATIO:

The data on the effect of different levels of cider, baker's yeast, and Hamei on pineapple cider on the benefit-cost ratio are shown in Table 4. The cost-benefit ratio revealed that there were considerable

variations between all treatments in terms of net cost return, gross return, and cost-benefit ratio. The highest Gross return of Rs.2100 is recorded in T_5 and highest Net Return of Rs.1203.15 and Cost Benefit Ratio 2.34 was recorded in treatment T_5 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1L)), whereas lowest Gross Return Rs.960, Net Return Rs. 62.85 and Cost Benefit Ratio 1.07 was recorded in treatment T_6 (Pineapple pieces (700 g) + Sugar (300g) + Hamei (1g) + Water (1L)).

Table no. 4: Economics of different treatments and benefit cost ratio.

Treatments	Treatment details	Total cost (Rs)	Pineapple cider output (1ltr)	Selling rate (Rs) /1ltr bottle	Gross return (Rs)	Net return (Rs.)	B:C ratio
T_1	Pineapple pieces (700g) + Sugar (300g) + Baker yeast (0.5g) + Water (1L)	301.10	3	660	1980	1076.70	2.19
T_2	Pineapple pieces (700g) + Sugar (300g) + Baker yeast (1g) + Water (1L)	303.35	3	550	1650	739.95	1.81
T_3	Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (1.5g) + Water (1L)	305.60	3	440	1320	403.20	1.43
T_4	Pineapple pieces (700 g) + Sugar (300g) + Baker yeast (2g) + Water (1L)	307.85	3	440	1320	396.45	1.42
T_5	Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1L)	298.95	3	700	2100	1203.15	2.34
T_6	Pineapple pieces (700 g) + Sugar (300g) + Hamei (1g) + Water (1L)	299.05	3	320	960	62.85	1.07
T_7	Pineapple pieces (700 g) + Sugar (300g) + Hamei (1.5g) + Water (1L)	299.15	3	550	1650	752.55	1.83
T_8	Pineapple pieces (700 g) + Sugar (300g) + Hamei (2g) + Water (1L)	299.25	3	440	1320	422.25	1.47

CONCLUSION AND DISCUSSION:

From the present investigation, it is concluded that treatment (T_5) (Pineapple pieces (700 g) + Sugar (300g) + Hamei (0.5g) + Water (1 L)) was found superior in terms of total soluble solids (4.90 ^{o}Brix), pH (3.90), and alcohol content (7.00). The treatment with the highest organoleptic test score out of the eight treatments was treatment (T_5). The highest B:C ratio was found in the treatment (T_5) with 2.34. In conclusion, the comparative analysis between baker yeast and Hamei yeast in pineapple cider production reveals that Hamei yeast is superior in terms of alcohol content. This research aimed to explore different yeast strains' potential in enhancing alcoholic fermentation in pineapple cider production. By examining the fermentation characteristics and alcohol production of both yeast strains, valuable insights have been gained. The study demonstrates that Hamei yeast outperforms baker yeast in alcohol production, making it a promising alternative for improving pineapple cider quality and potency. This finding is crucial for the alcoholic beverage industry, providing a promising alternative for enhancing fermentation and improving pineapple cider quality.

Hamei yeast efficiently ferments sugars, exhibits robust kinetics with a shorter fermentation period, higher tolerance to acidic and nutrient-deficient environments and demonstrates excellent resilience against fermentation stressors. These advantages result in higher alcohol content, improved sensory

characteristics, shorter fermentation periods, increased productivity, and reduced risk of off-flavours and contamination. Its potential makes it an attractive choice for both small-scale and large-scale producers. Although Hamei yeast's advantages are clear, further research is needed to explore its full potential and underlying mechanisms. Investigating different fermentation conditions would provide a more comprehensive understanding of its capabilities in pineapple cider production, but Hamei yeast holds great promise for future applications in alcoholic beverage production.

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