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Enzyme and Yeast Added Fruit Juice Extraction and Clarification

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ABSTRACT

Presently, the most popular method for extracting juice is to use enzymes. Enzymes are an important part of neoteric fruit juice production and are ideal for streamlining procedures. The enzymes employed mostly in fruit juice industries are mostly pectinolytic enzymes mixed together. Their primary goals are to increase the yield of juice extraction from raw materials, improve processing competency (pressing, solid settling, or removal), minimise energy expenditures and waste, and produce visually appealing final goods of higher quality. Pre-treatment conditions for juice extraction optimised: steaming for 6 minutes at 121℃, pectinase enzyme treatment at 30 mg/100 g, incubation temperature 40°C, and incubation time 8 hours. The purpose of this article is to explore use of enzymes in the manufacturing of fruit juices, with an emphasis on juice recoveries, clarity, and the impact on the biochemical features of the juices. The application of pectinases enzymes results in a higher juice yield and better fruit juice quality. Research so that there is a significant effect of yeast treatment juice recovery. we found that highest juice recovery after 5-day incubation and juice is highly turbit and the highest TSS content.

Keywords: *wood apple, juice extraction, pectinase, juice yield, baker's yeast.*

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INTRODUCTION

The Rosaceae family includes the wood apple. Wood apple is native to India's and Sri Lanka's dry plains, where it is commonly cultivated. It's also found in a few spots in Malaya and southern Asia (1). The wood apple is primarily found in the Indian subcontinent's forests and dry plains. The plant's age ranges between from 13 to 7 years old, and the fruit yield potential of parent plant ranges from 650 to 1085 kilogrammes each plant. The fruit is generally spherical, measuring 7 to 9 cm in diameter and weighing around 180 g. on average (2). Wood apple fruits round or oval in shape, 2 to 5 inches (5 - 12.5 cm) in diameter, and have a thick, woody, greyish white, scurfy rind that is about 14 mm (6 mm) thick. Each fruit weighs between 150 and 500 gram.. The pulp accounts about 36% of the total fruit weight. Wood apples come in two sizes: larger ones with greater sweetness and smaller ones with less sweetness. The fruit pulp is brown, mealy, odours, resinous, astringent, acidic, or sweetish, and contains numerous little white seeds. The seeds are abundant in unsaturated fats and contain non-bitter oil (3)

Wood apple contains a wealth of non-toxic antioxidants and antibacterial agents (4). It has the potential to be a useful weapon in the fight against antimicrobial resistance in the food supply chain. which can cause cancer, liver appurtenance, and other health problems, may be prevented by using wood apple extracts in different forms (5). The many little hard seeds are nutritious and do not require spit or removal. As the wood apple ripens, the greenish white skin transforms into a strong, brown speckled wood skin that resembles tree bark in appearance and feel. Ripe apples have a sweet but musky scent. The pulp of an immature wood apple is a pale gold tint. Perfectly ripe wood apples range in colour from light brown and toffee brown. If kept refrigerated, wood apple pulp has a shelf life of 2 months.

The wood apple's nutritional and therapeutic profile is getting the attention of a food industry. The goal of this study is to determine and optimise the processing parameters for enzyme-assisted juice extraction from wood apples. Fruit pulp is treated with cold, heat, and enzymatic treatments to extract juice in today's world (6). Fungal enzyme in wood apple extraction of juice has been shown to considerably boost juice recovery when comparing to cold and hot extraction methods. Enzymes were used to hydrolyse the fruit cell wall, resulting in increased juice extraction, lowering sugar, soluble dry matter, and galacturonic acid concentration (7). The pulp that remains after the enzymatic hydrolysis has a very lower density, as does the pomace that comes with it (8). The goal of this research was to find the best enzymatic pre-treatment variables (incubation temperature, enzyme concentration, and incubation duration) for pre-treated (steamed) wood apple pulp in order to get the most juice recovery, total soluble solids, as well as juice purity.

Yeast extract has primarily been utilized in the culinary sector as a flavoring additive in soups, sauce, snack food, and canned food, including in pet feeds and cosmetic goods, as well as a plant nutrition. Vitamin and protein additions in natural food and as a nutrient source in microbiological media are two more applications. Autolysis and enzymatic processing were used to create yeast extract from commercially pressed baker's yeast cells. The goal was to design a procedure for producing high-protein yeast extracts by hydrolyzing both active and inhibited yeast cells utilizing varied doses of these enzymes and optimum incubation times.

MATERIAL AND METHODS

Sample preparation

A ripe wood apple with a firm shell, quite large and of distinctive shape was acquired in Vadodara, Gujarat, India's local market. In the month of Nov., 2021.for the study. After receiving wood apple behave analyse for Physico-Chemical analysis and we have selected ripe wood apple for the pulp extension. (9).

The wood apple's outer hard shell was shattered with a herd before the pulp was scraped out with a stainless-steel spoon. The juice was extracted from this fresh fruit pulp (9).

Juice Extraction:

The wood apple fruit has a sticky texture that makes extracting juice from the pulp challenging. And it having 1-2% of pectin. For easier juice extraction, water is frequently added to the pulp as a result, pulp is mixed 2.5 times with water for each experiment. Steam was used to treat this pulp (under pressure, 15 psi) at 121°Cfor 6min in an Autoclave (9). Next enzyme pre-treatment to the blanched/steamed pulp at pectinase enzyme concentration: 30 mg/ 100g and incubation in a laboratory scale incubator with fine temperature control incubation Temperature 40°C, Incubation time: 8,10,12 hours (Fig 1) At the end of each pre-treatment juice is extracted by using hand pressure juicer, filtered using muscling cloth, filtered juice heated in water for 90° C for 5 min to enzyme reduced (Fig 1). The resulting extract was referred to as clear juice.

Pulp	Water added pulp before pre treatment	Water added pulp after pre treatment	Refractometer
			

Figure 1: wood apple juice from wood apple pulp

Yeast Treatment:

Same way experiment is designed for juice extraction using Yeast. Therefore, for each experiment pulp is mixed with 2.5 times water. This pulp was subjected to steam (under pressure, 15 psi) at 121°Cfor 6min in a Autoclave. After reducing pulp temp to 37 °C, pulp is inoculated with yeast at concentration of 1gm / 100g. incubation in a laboratory scale incubator with fine temperature control incubation Temperature 37°C, for different time intervals (1, 2, 3, 4, 5 days) (Fig 1). At the end of each pre-treatment juice is

extracted by using hand pressure juicer, filtered using muscling cloth, filtered juice heated in water for 90° C for 5 min to inactivate yeast.

After each experiment juice were analysed for % juice recovery and TSS content (°Bx)

Juice Recovery:

The weight of juice received per unit of weight of fruit was used to compute the percentage juice recovery.

$$\text{Juice recovery (\%)} = \frac{\text{Weight of juice}}{\text{Weight of fruit}} \times 100$$

Total Soluble Solids (TSS):

Using a pocket refractometer (ERMA INC. Tokyo Japan), The content of total soluble solids (TSS) in wood apple juice was tested directly. With a Brix range of 0°-32° (Fig 1).

RESULTS AND DISCUSSION

The best juice recovery was achieved by steam blanching wood apple pulp for 6 minutes (9). Water added pulp is steamed for 6 min in autoclave to increase juice recovery as reported in earlier study. Enzymatic treatment found to increase juice recovery furthered as shown in table. Table 1 shows data of juice recovery and TSS from control sample (without enzyme treatment) and enzymatic treated pulp at 30mg/100 g concentration, 40°C incubation temperature and with variable incubation time (Table 1)

From table we can see that juice recovery is increasing by increasing incubation time up to 8 hr but with more 8hr incubation we found reversal trend that because of reduction in activity of enzyme as enzymes use to consume for a degradation of pulp. Pectin is degraded by enzyme treatment, resulting in a decrease in its water holding ability. As a result of the flow of free water into the system, the juice production rises (11). Same way increasing trend shown for TSS up to 8 hr of incubation. TSS rises as a result of increased tissue degradation caused by longer enzyme times, resulting in a more expansible discharge of sugar molecules, which adds to a higher amount of total soluble (10).

Pulp of wood apple having 74 % of carbohydrates so enzyme get enough substance to act on and resulted in increased juice recovery.

The pectinase enzyme produces a considerable disintegration of the pectin layer that binds the fruit's cell wall and central lamina, resulting in an increase in TSS. Pectinase also has various enzymatic activity, including pectinase, pectin methyl esterase, polygalacturonate, hemicellulose, and glycosidase, among others.

Optimized condition of pre-treatment for juice extraction: steaming for 6 min at 121 °C, pectinase enzyme treatment at concentration of 30 mg/100 g, incubation temperature 40 °C and incubation time 8 hr (Fig 2).

Yeast treatment:

Yeast found to increase juice recovery and TSS compare to control sample. Table 2 shows data of juice recovery and TSS from control sample (without yeast treatment) and yeast treated pulp at 1 mg/100 g concentration, 37 °C incubation temperature and with variable incubation time (Table 2) (Fig 3).

There is very less research available for yeast treatment in juice extraction. So, we have taken incubation time as a variable and conducted research by keeping yeast concentration 1 mg /100 g and incubation temp 37°C to have optimum result of yeast treatment. From table we can see the juice recovery is increasing with increasing in incubation time. We found maximum juice recovery after 5 days of incubation time also TSS is highest: and color is also brighter compared to control sample. However, juice recovery is higher with enzymatic treatment compare yeast treatment.

TABLE 1: Pre-treatment of wood apple pulp with steam

Incubation Time	Juice Recovery (%)	TSS (°Brix)
6 (optimized by ref.4)	84.3	4.8
8	86.1	5.1
10	84.2	5.0
12	83.8	4.9
Control) without Enzyme treatment	76.1	2.4

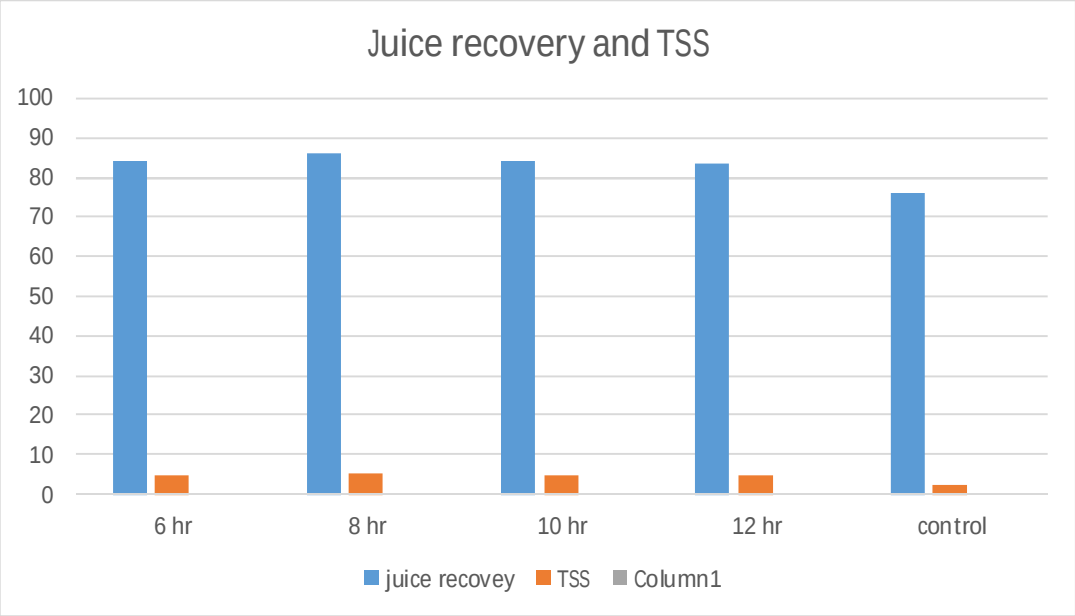

Figure 2: TSS (°Brix) evaluation of samples of enzyme treatment.

TABLE 2: Pre-treatment of wood apple pulp with steam

Incubation time (day)	Juice recovery (%)	TSS (°Brix)
1	63.2	4.3
2	70.1	4.6
3	68	4.3
4	65.2	4.2
5	76	5.3
Enzyme treatment optimized	86.1	5.1
Control) without Enzyme treatment	76.1	2.4

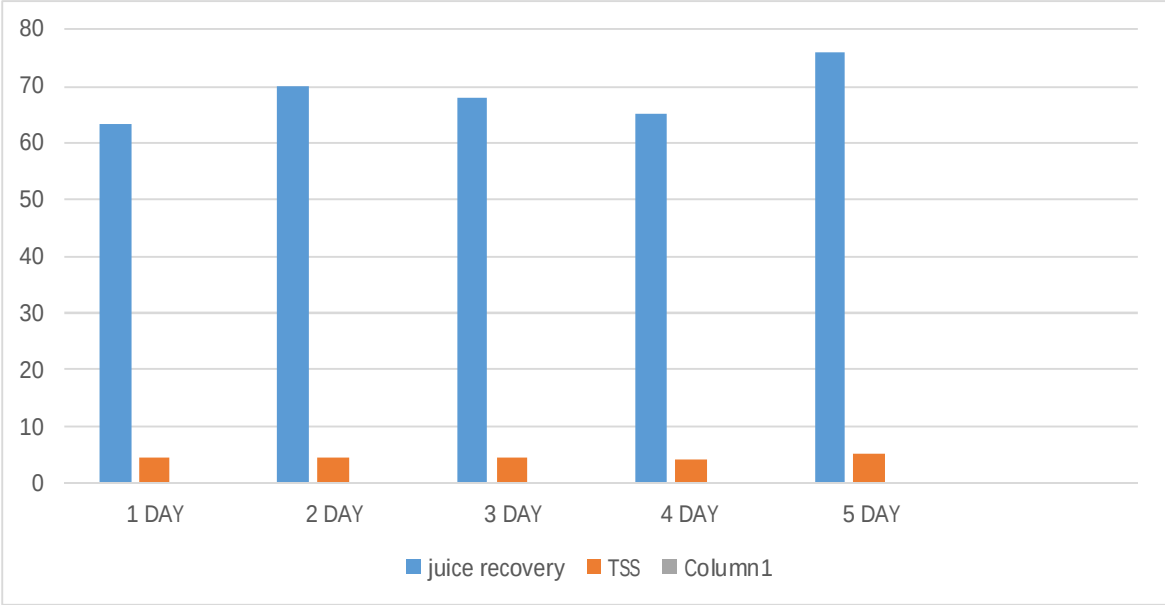

Figure 3: TSS (°Brix) evaluation of samples of yeast treatment

CONCLUSION

Enzymes are quickly becoming such a necessity with in beverage industry. pectinases have long been used in modern fruit processing techniques that involves the processing of fruit mass. Pectinase's

enzymes are said to improve juice recovery, TSS (Total Suspended Solids), as well as lowering viscosity as well as turbidity. The use of enzyme kinetics in the future time period has a lot of possibilities. And Research so that there is a significant effect of yeast treatment juice recovery. We found that highest juice recovery after 5-day incubation and juice is highly turbit and the highest TSS content. If I compared yeast treatment and enzymatic treatment, we found very good recovery with the enzyme compared the yeast.

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CONFLICT OF INTEREST
The authors declare that they have no conflict of interest.

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