Process Standardization for Mango Leather

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ABSTRACT

The super fruit base leather was prepared from Mango (*Mangifera Indica L.*) which naturally represent elevated nutritional status. The mango leather was dehydrated at 40, 50, 60, 70º C drying air temperature in cabinet dryer. The drying rate curves showed that 60º C temperature was suitable for obtaining good quality leather with a moisture content of 19.13% for 7 hours of drying time Mango pulp was found to have a moisture content of 80.63%. The proximate composition of mango leather (Protein 15.89%, crude fat 1.56%, carbohydrates 58.26%, total dietary fiber 14.06%, ash 1.98%) recorded significant increase than fruit pulp (Protein 0.61%, crude fat 0.42%, carbohydrates 14.39%, total dietary fiber 0.79%, ash 0.52%). The mineral profiling of fruit leathers demonstrated similar increasing trend due to concentration of nutrients during pulp to leather processing.

Keywords

Mango, fruit leather, dehydration

1. INTRODUCTION

Fruit puree is dehydrated to prepare a product called fruit leather. Mango, apple, and other tropical fruits are just a few examples of the many fruits that may be used to create fruit leathers. However, the composition considerably relies on the type of fruit added to the puree combination due to changes in the quantities of pectin, sugar, and acid. The formulation might occasionally include different kinds of carbohydrates as well as additives like hydrocolloids and preservatives in order to enhance the rheological qualities or preserve the fruit's original color. These fruit treats were first created as a small-scale alternative preservation technique, but recently they have become more popular due to their nutritional benefits. The processed fruit products offer less calories than traditional snacks and are a rich source of fiber as well as micronutrients (Diamante *et al*., 2014; Ruiz, *et al.*, 2012; Vatthanakul *et al*., 2010).

Fruits are a valuable source of nutrients that are good for your health, including minerals, vitamins, antioxidants, and fiber. Fruits are a good source of energy, but the time it takes to make them and their high perishability are obstacles to increased fruit intake. Fruit eating every day helps to strengthen the immune system that keeps illnesses at bay. Among the other nations, India is the one that produces the most fruits and vegetables. Fruits are subsequently processed into various value-added products to prevent post-harvest losses (Anonymous, 2002).

The Anacardiaceae family plant, the mango (Mangifera indica L.), has a variety of beneficial compounds. Mangoferin, quercetin, catechins, anthocyanins, ellagic acid, kaempferol, methyl and propyl gallate, benzoic acid, gallic acid, and protocatechuic acid are the primary phytochemicals in mango fruit that have antioxidant effects. The primary antioxidant in mangoes, mangiferin, is well-known for its therapeutic and nutraceutical properties and is still gaining popularity, particularly for its ability to fend off degenerative diseases like cancer and heart disease. (Masibo and Qian, 2009). Similar to other polyphenolic compounds, mango polyphenols are primarily antioxidants, protecting human cells from oxidative stress, which can result in lipid peroxidation, DNA damage, and a number of degenerative diseases (Raab and Oehler, 1976).

Hidden hunger is more common among urban residents and is exacerbated by urbanization, dietary change, and sustainable food systems. Therefore, one strategy for addressing hidden hunger is diet diversity using super fruits. This study aimed to establish the nutritional significance of fruit leathers prepared from mango fruit and the comparative analysis (Pulp vs leather) to emphasize and rejuvenate the nutritional profile of fruit leathers.

2. MATERIAL AND METHOD

2.1 Materials

The good quality of mango fruit pulp, sugar, pectin was procured from local market of Pune. The Department of Food Process and Product Technology laboratory at MIT ADT University in Pune provided the processing and further working tools.

2.2 Methods

2.2.1 Preparation of fruit leathers

In mango leather, the fruit pulp was mixed with sugar and pectin. The mixture was mixed thoroughly and heated at 70ºC for 3min. Mix and heat mixture, pour into stainless steel tray, smeared with butter, and dry in cabinet dryer at 60ºC for 6 hours. The dried fortified mixed fruit leathers were prepared. The process was followed for fruit leather preparation with slight modification as reported by Vijayanand *et al.*, (2000) as well as the fruit leather was prepared as per the method described by Patil *et al.*, (2017) where the date and mango leather (60:40) dried in cabinet tray dryer at 65±5^{0}C for 12-14 hrs.

2.3 Chemical analysis

2.3.1 Determination of the proximate composition of the fruit pulp and leathers

The method of A.O.A.C. (2005) was adapted for determination of ash, crude protein and crude fiber. The moisture and crude fat were determined by methods described in Ranganna (1986), while carbohydrate was calculated by difference method.

2.4 Statistical analysis

Each experiment was run in triplicate. For each treatment, the mean and standard deviations of the data were calculated. The statistically significant changes ($p < 0.05$) were found using ANOVA. The Statistical Analysis System version 9.21 was utilized for the statistical computations, and Microsoft Office Excel was used to examine the sensory assessment data. To find any significant differences between the mean values, a one-way ANOVA was performed after the means and standard deviations were calculated.

3. RESULT AND DISCUSSION

3.1 Influence of temperature on drying rate

The mango fruit leather drying curves shown in fig. 1 revealed fluctuations in moisture content with regard to time (7 h) for drying at 40, 50, 60, and 70 ºC. In all temperatures, it was found that fruit leathers moisture content dropped dramatically as they dried. As the drying air temperature increased from 40-70ºC, the drying curves exhibited steep slope indicating that the rate of moisture loss increased with increased in drying air temperature in cabinet dryer. The similar trend of results was notated by (Asabe *et al.*, 2021). The moisture loss at 70ºC was observed to be faster compared to 40, 50, 60 ºC temperatures. However, this resulted in colour degradation of the leathers and gave chewy texture to the leathers. Hence, the experimental finding showed that 60ºC drying air temperature was suitable for obtaining good quality dried leather with a moisture content of 19.13 % and drying time of 7 hours. The drying temperature range of 50-60ºC for drying of fruit leather is supported by (Kaur and Godara 2022).

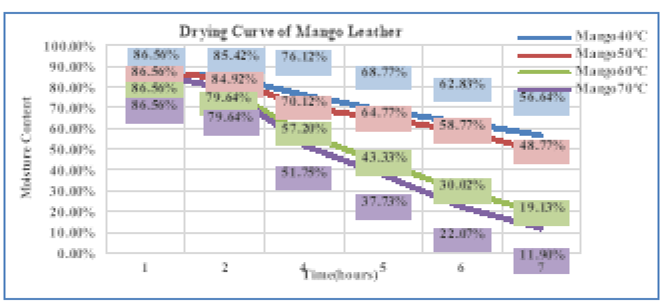

Figure. 1: Drying curve of mango leather

3.2 Comparative nutritional profiling of pulps and leathers

3.2.1 Proximate composition of raw materials

The moisture content of mango pulp was found to be 80.63%. On the other hand, mango pulp was high in carbohydrates (14.39%) and crude ash (0.52%), as depicted in table no. 1. The mango pulp contains 0.61% crude protein, 0.42% crude fat, 0.79% crude fiber. The mango pulp results are similar to those reported by Pawase *et al*., (2019) and Chakraborty *et al*., (2020) respectively. The protein-rich ingredient that is whey protein concentrate was specifically chosen to fortify mango fruit leather. According to Jangale and Ghanendra (2013), the substances mentioned above had an average protein level of 82.3%.

Table 1: Proximate composition of raw material and fortified leather

Raw materials	Moisture (%).	Carbohydrate (%)	Crude protein (%)	Crude fat (%)	Crude fiber (%)	Ash (%)
Mango pulp	80.63±0.045	14.39 ±0.86	0.61±0.040	0.42±0.021	0.79±0.020	0.52±0.04
Mango leather	19.13±0.02	58.26 ±0.015	15.89±0.40	1.56±0.015	14.06 ±0.015	1.98±0.01

(The values were mean ± standard deviation of three independent readings)

3.2.2 Proximate composition of leather

The proximate composition of mango leather revealed a significant increase in crude protein (15.89%), carbohydrate (58.26%), total fiber (14.06%) and crude fat (1.56%). The increase in crude protein, crude fat, carbohydrate and total fiber values is due to the addition of 12% whey protein concentrate to mango pulp. The findings are in agreement with Chauvan (2013) for mango leather that the nutritional goodness of the prepared product was improved by dehydration process which causes concentration of nutrients.

3.2.3 Comparative mineral profiling of fortified pulp and leathers

The processing of fruit pulp to leather resulted in concentration of minerals such as calcium, potassium, magnesium, iron. The calcium content in the leathers significantly increased from 30.62 to 141.01mg/100g, 176.37 to 662.12mg/100g, 20.14 to 54.16 mg/100g and 1.92 to 2.23 mg/100g in mango. This could be due to the dehydration process causing evaporation of moisture from the fruit pulp and concentration of dry matter in leathers. The trend of increase in the mineral content in fruit pulps to leather processing has been reported earlier by Karabacak *et al*., (2021) for pumpkin fruit leather.

Table 2: Comparative mineral profiling of pulp and leather

(The values were mean ± standard deviation of three independent readings)

4. CONCLUSION

In this study the super fruit-based fruit leathers were prepared to improve the nutritional potential of super fruit leathers in terms of the concentration of nutrients, phytochemicals and antioxidant activity. Fresh mango is a high source of macro and micronutrients such as vitamins, minerals, fibers, carbohydrates and other bioactive substances. Dehydrating fruits into leather reduces post-harvest losses due to their perishable nature and extends shelf life for seasonal fruits like mango. It can be concluded that Conversion of perishable fruits to fruit leathers preserves surplus harvest and minimizes postharvest losses globally. The drying process for preparation of leather was standardized at 40, 50, 60, 70ºC for 7 hours drying time in a cabinet dryer. Air drying temperature above 60ºC affected the color and texture of leathers. Hence, 60ºC for 7 h was found to be optimum temperature (Final moisture content 19.13%) in fortified fruit leather. The drying process increased the ash, carbohydrate, protein, ash, fibre, mineral total phenols, and carotenoids contents of the fruit leathers significantly when compared to their comparable fresh fruits. The present investigation thus rejuvenates the nutritionally superior status of fortified fruit leathers as a healthy snack.

5. REFERENCES

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Parameters	Calcium (mg/100g)	Potassium (mg/100g)	Magnesium (mg/100g)	Iron (mg/100g)
Mango pulp	30.62	176.37	20.14	1.92
Mango leather	141.01	662.12	54.16	2.23
SE±	0.024	0.5	0.03	0.009
CD @ 5%	0.094	0.19	0.11	0.035