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CHARACTERISTICS OF MANGO FRUIT LEATHER (*MANGIFERA INDICA*) WITH THE ADDITION OF LIME (*CITRUS AURANTIIFOLIA*) IN VARIATION OF DRYING TEMPERATURE

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ABSTRACT

Mango is a fruit favorite of tropical people and oranges Lime is rich in vitamin C as well abundant available moment season harvest. As an easy commodity broken, needed innovation to get consumed moment no season harvest. Innovation possible processing one of them did fruit leather. Influence variation temperature drying (50 °C; 60 °C; 70 °C; and 80 °C) to characteristics physical that is color and texture as well as Vitamin C levels of fruit leather were observed using Complete Random Design (RAL) Non-Factorial. Therefore, a sensory test was carried out on the resulting product on 25 panelists no trained. From the results research fruit leather mango with a temperature of 60 ^{o}C is sufficiently preferred with a content of vitamin C 1of 5.74 (mg/100 g) and water content of 11.59 (% db) and texture 4365.58 g and color L = 53.81, a= 21.29, b = 48.58).

Keywords: Drying, *Fruit leather*, Lime, Mango, Sensory analysis

INTRODUCTION

Fruits are a source of vitamins needed by humans in small doses (Panigoro *et al.,* 2021). Vitamin C acts as an antioxidant needed by the body. Vitamin C plays a role in increasing endurance by supporting various cellular functions in the immune system. Vitamin C cannot be synthesized in the human body, so vitamin C is needed from outside the body (Hasanah, 2018) through the consumption of fruits and vegetables. The consumption pattern of fresh fruit is lacking along with the rise of practical lifestyles.

Mango is a member of the kingdom Plantae, Division Tracheophyta, class Magnoliopsida, order Sapindales, and family Anacardiaceae (Luqyana and Husni, 2019). Besides being sweet and refreshing, mango gedong gincu contains 80% water and 15-20% sugar as well as vitamins A, B1, B2, and C (Sibuea *et al.,* 2016). The raw material in making fruit leather should have a high fiber content and a distinctive aroma. The thickness of fruit leather is 2-3 mm with a moisture content of 10-20 % with the criteria of attractive color and clay texture (Astuti *et al.,* 2015). In addition to mango, lime juice is also added to the fruit leather as a source of vitamin C. Lime fruit (*Citrus aurantifolia*) contains bioflavonoids, pectin, enzymes, proteins, fats, and pigments (Prastiwi and Ferdiansyah, 2013). Lime contains 27 mg/100 gr of vitamin C, 40 mg/100 g of Ca, and 22 mg/100 g of P (Lestari *et al.,* 2018). Fruit is a perishable agricultural product, so innovation is needed to extend its shelf life.

One of the fruit processing techniques is fruit leather (Astuti *et al.,* 2015). Fruit leather is made from one or a mixture of fruits that are dried into a flat layer (Herlina *et al.,* 2020). One of the fruits that can be utilized is mango. The purpose of this study was to determine the effect of drying temperature variations (50 °C; 60 °C; 70 °C; and 80 °C) on physical characteristics, namely color and texture as well as vitamin C content of mango fruit leather (*Mangifera indica*) with the addition of lime extract (*Citrus aurantiifolia*) and to determine panelist acceptance of the resulting product.

MATERIALS AND METHODS

Experiments were conducted from June to August 2022 at the Laboratory of Agricultural Product Technology, FIH - UNU Yogyakarta.

Materials

The basic ingredients for making mango fruit leather are gedong gincu mangoes and fresh limes purchased from the Istana Buah shop. Other ingredients are water, gum arabic, white crystal sugar (gulaku), and CMC. Analytical materials include 5 ml of 0.1 N iodine solution, and distilled water obtained from CV Chemix Pratama.

Tools

Tools used that is cutter , pan aluminum 32 x 25 x 2 cm, nutribullet *blender*, *mixing bowls* , strainer spatula Plastic and *Oven* (Memmert UN110). Tools used for testing physical that is *Texture Analyzer* (Brookfield CT-3) for the texture test and *Chromameter* (Minolta CR-400) for the color test (L, a, b). Analysis chemical use balance sheet analytics, flask measure, erlenmeyer, burette, stative, beaker, dropper pipette volume pipette, *vortex* (thThermocientific), tube reaction, glass measure, and *shaker water bath* (Memmert WNB 7-45).

Research Design

Fruit leather rated in a manner sensory to 25 panelists no range trained age 20 to 45 years. Testing sensory done is a preference test , ie favorite on taste, aroma, color, texture and overall with a scale of 0 to 5. Score 1 to very no preferred, score 2 for not preferred, 3 points for enough preferred, 4 points for liked and 5 points for very preferred. Fruit leather mango anayzed in manner chemistry, overs analysis water content with thermogravimetry and vitamin C with titration iodometry. Besides that also done analysis of sical fruit leather mango including texture test and color tetests color data showed with L notation, reddish with notation a, as well yellowish with notation b. A positive value symbolizes color tore red, otherwise negative symbolize. Positive b value symbolizes the yellow, otherwise negative b value symbolizes the color bluer.

Research Stages

Flow chart study presented in Figure 1.

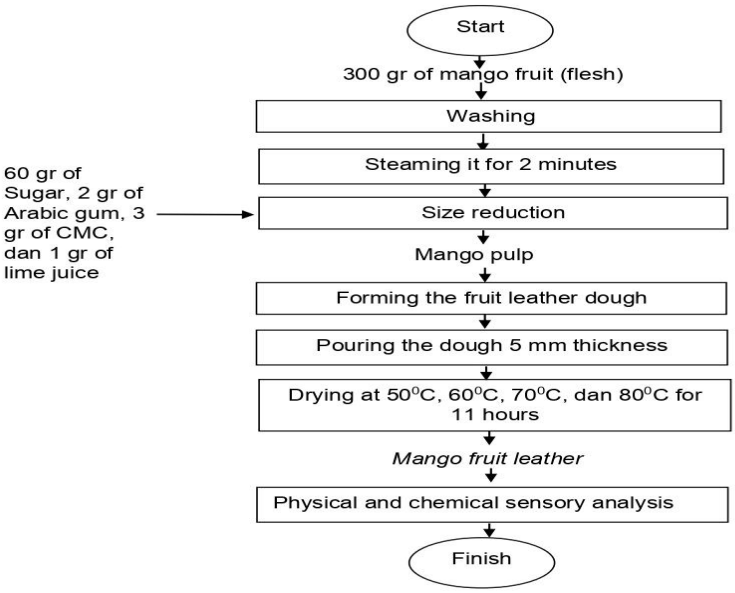

Figure 1. Diagram of Making *Fruit Leather* Mango

Methods

Method experiments carried out is Draft Random Complete (RAL) Non-Factorial with two-time test treatment and twice test analysis (Duplo Variable free in study this is variation temperature Variable bound in the study this is characteristics physical (color and texture) and rate vitamin C. Mango *fruit leather* made with variation temperature drying (50 °C; 60 °C; 70 °C; and 80 °C). From whole sample tested characteristics physical (color and texture) and chemical (level of l vitamin C and water content).

Analysis Procedure

Processing results in data characteristics physical and chemical use software SPSS IBM 25 *one-way anova.* the difference real (significant) the DMRT test was carried out at a test level of 5 %.

RESULTS AND DISCUSSION

1. Analysis of Sensory

Attribute sensory describes characteristics sensory from something product food,. According to natures sensory could be measured using the g five senses of humans. As one of the quality parameters, the sensory test could be conducted for determining reception products by consumers Color is one of the product parameters for food as characteristic ccharacteristic and attribute of es quality (Onainor, 2019) Based on Figure 2, treatment temperature drying 50 °C, 60 °C, 70 °C, and 80º C is enough preferred color by the panelists and not different significant. Color fruit leather which is yellow reddish. According to Kusbandari and Susanti (2017), color yellow and reddish generated from the beta carotene pigment contained in mangoes build gincu already ripe.

Aroma is the smell of product food. Compound volatility can enter through behind the throat at the moment eating (Tarwendah, 2017) . Fruit *leather* scent mango with additional orange lime dried at 50 °C, 60 °C, and 70 °C is sufficient for preferred panelists, whereas at 80 °C it was not preferred panelists. *Fruit leather* that is dried at 50 °C, 60 °C, and 70 °C maybe produce volatile compounds that give a *lemony* (fruity) aroma, *caramel* (caramel aroma), *cooked* (fruity aroma) ripe), *green (* fruit aroma raw), *fermented (* fermented aroma), *floral* (flower scent), and *sweet*. *Fruit leather* that is dried at 80 °C is not preferred because of the distinctive aroma contained in mangoes build gincu the already many experiences evaporation during drying. According to Utami *et al* (2020) that profile sensory fruit mango build gincu namely *lemony* aroma (fruity aroma), *caramel* (caramel aroma), *cooked* (fruity aroma)ripe), *green (*fruit aroma raw), *fermented (*fermented aroma), *floral* (flower aroma), *sweet* (sweet aroma) , and sour aroma . A sour smell also comes from orange thin (Ni'mah *et al.,* 2018) .

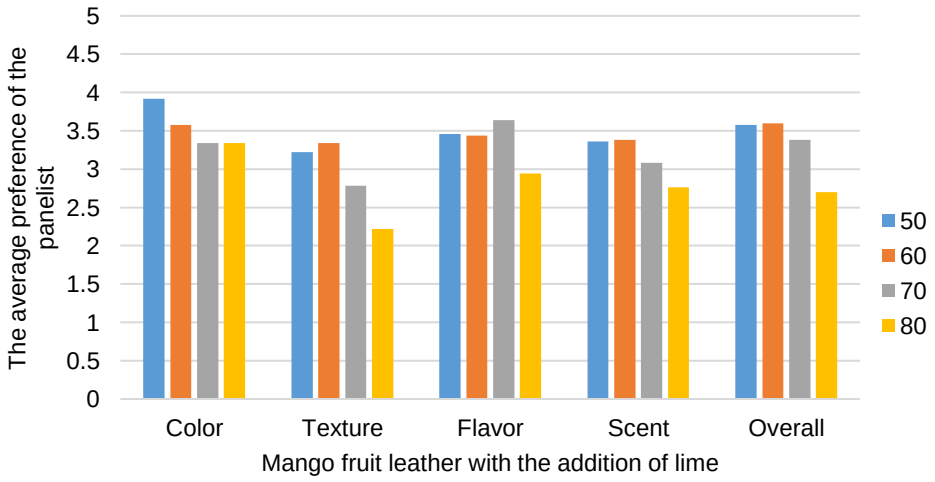

Figure 2. Sensory Test Results *Fruit Leather* Mango With Addition Orange Thin

Taste is perception biological properties that arise from the product incoming food to mouth (Midayanto and Yuwono, 2014). Based on Figure 2, the taste of *fruit leather* mango with addition extract orange thin on treatment temperature drying 50 °C, 60 °C, and 70 °C is sufficient favored by the panelists, whereas at 80 °C it was not preferred panelist. This is supported by the panelist's assessment of the panelist's aroma parameters which are also sufficient, such as mango fruit leather with the addition of lime extract at several drying temperatures in this study.The resulting flavors from *fruit leather* mango with addition extract orange thin i.e. sweet and little taste sour. Mango gedong gincu already ripe contain solids dissolved that is high in sucrose, fructose, and glucose. Mango starch build gincu hydrolyzed Becomes sugar simple. The total amount of solids dissolved also affects profile sweet taste sensory in *fruit leather*. On research this, mango brix rate build used gincu as ingredients raw by 15.05 %. Ratio sugar-sour from fruit mango build gincu (0.79) (Utami *et al.,* 2020). Besides In addition, a sour taste is also produced from orange thin (Ni'mah *et al.,* 2018) .

Texture is characteristic product nature generated food physical such as, size, shape, number, and elements shaper material that can felt by the senses taste and touch man (Tarwendah, 2017). Refer to Figure 2, texture *fruit leather* mango with addition extract orange lime dried at 50 °C and 60 °C is sufficient preferred panelists whereas *fruit leather* which is dried at 70 °C, and not at 80 °C preferred consumer. The higher temperature drying causing more texture hard and dry from *fruit leather*. According to Rahmanto *et al* (2014) The *fruit leather* criteria is color interesting, textured clay as well as easy rolled. Enhancement temperature drying could lower level plasticity *fruit leather* (Riadyani, 2018) .

Evaluation whole is evaluation by panelists to all attribute quality fruit leather *(Zhaki et al.,* 2018). Overall, the treatment at several drying temperatures in this study was quite favorable , while at 80 °C the panelists did not like it. analysis results sensory addition orange thin on *fruit leather* mango enough preferred until temperature drying 70 °C.

2. Physical Analysis

2.1.Texture

Analysis physical covers analysis texture and analysis color. Trait test physical texture use *Texture Analyzer* on a 4/1000 cylinder probe(38.1 mm , 35 mm L).

Table 1. Texture Test Results (N) of Mango *Fruit Leather on* Various Treatment

Temperature Drying (°C)	Texture Test Results (N)
50	2918.58 ± 703.31 [a]
60	4365.58 ± 745.60 [a]
70	5147.33 ± 439.75 [a]
80	4694.50 ± 271.73 [a]

Significant differences ($p<0.05$) are shown with different letters

Based on Table 1, fruit leather mango with addition extract orange thin on treatment temperature drying 50 °C, 60 °C, 70 °C and 80 °C no different significant between treatment. The resulting texture tough and compact. Texture clay because hydrocolloid such as gum arabic and CMC. Arabic gum added influence level strong pull. Texture plastic on *fruit leather* mango with addition extract orange thin formed by the gel formation process. Gel formation by gum arabic is also caused by heat (Glicksman, 1969).

3. Color

One factor main in determination quality or level reception product food is color. This caused because the most prominent color visually (Wahyuni et al., 2018) .

Based on Table 2, temperature drying 50 °C, 60 °C, 70 °C and 80 °C no influential real to attribute colors L, a, and b. The average value of L (brightness) on *fruit leather* around 52.65 %. The average value of a (red) on *fruit leather* around 22.34 % and average the value of b (yellow) is around 47.55 %.

Table 2. Color Test Results Mango *Fruit Leather On* Various Treatment

Temperature Drying (°C)	L Color Test Results	Color Test Results a	Color Test Results b
50	53.66 ± 0.39 [a]	23.33 ± 0.32 [a]	54.63 ± 0.63 [a]
60	53.81 ± 1.03 [a.]	21.29 ± 0.09 [a.]	48,58 ± 5.79 [a.]
70	52.15 ± 0.51 [a]	22.17 ± 0.76 [a.]	44,20 ± 0.98 [a.]
80	51.01 ± 0.60 [a.]	22.58 ± 0.79 [a.]	42,79 ± 0.80 [a.]

Significant differences (p<0.05) are shown with different letters

4. Chemical Analysis

4.1. Water content (%)

Table 3. Moisture Content Test Results (%) Mango *Fruit Leather on* Various Treatment

Drying Temperature (°C)	Water content (%)
50°C	29.40 ± 10.74 [a.]
60°C	11.59 ± 16.82 [b]
70°C	13.45 ± 19.80 [c]
80°C	16.88 ± 25.75 [c]

Significant differences (p<0.05) are shown with different letters

Based on Table 3 that temperature drying influential significant to water content of mango fruit leather with addition thin orange extract. Mango fruit leather temperature of e 50 °C has different water level significantly with fruit leather dried at 60 °C; 70 °C; and 80 °C. Fruit leather mango which is dried at 50 °C has the highest water content. Mango fruit leather dried at 70 °C has no water content different significantly from the fruit leather dried at 80 °C. .

4.2. Vitamin C

Table 4. Test Results for Vitamin C Levels (Mg/100 Gr) *Fruit Leather* Mango on Various Treatment

Temperature Drying (°C)	Test Results for Vitamin C Levels (mg/100 gr)
50	12.56 ± 0.37 [a]
60	15.74 ± 0.09 [b]
70	11.83 ± 1.22a [c]
80	10.70 ± 0.05[c]

Significant differences (p<0.05) are shown with different letters

Based on Table 4, temperature drying influential significantly on the content of vitamin C *fruit leather*. The decrease in vitamin C in *fruit leather* is caused by high heat at the time drying. Vitamin C has characteristic easy oxidized by heat, temperature high, and enzymes oxidase (Puspitasari *et al.,* 2019).

Rich commodity fruit tropical Study related technology fruit need improved, fine manipulation processing nor innovation product. Product *fruit leather* own potential prospects as one alternative processed fruit practical and nutritious.

CONCLUSION

Fruit leather mango with a temperature of 60 °C drying is sufficiently preferred with a content of vitamin C 15.74 (mg/100 gr) and water content of 11.59 (% d) and texture 4365.58 g and color L = 53.81, a= 21.29, b = 48.58). Variation temperature drying (50 °C; 60 °C; 70 °C; and 80 °C) no influent significant to color (L,a,b) and texture e *fruit leather, please*. Temporary water and vitamin V levels C effect significant at various variation temperature drying.

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