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Physicochemical and organoleptic characteristics of halal carica (*Carica pubescens*) jelly candy with the addition of carica seed juice

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ABSTRACT
Carica fruit is a fruit of the same genus as papaya, but has a chewier and more compact texture and a more fragrant aroma when compared to papaya. Carica can increase the body's immunity because the content of flavonoid compounds in carica is known to be higher than that of papaya. Carica seeds have antioxidant activity and have a high flavonoid content with a value of 55.6 mgQE/g, so they are beneficial for health. The addition of carica seed juice to carica jelly candy is expected to be able to add economic value and nutritional value to jelly candy. The purpose of this study is to determine the physicochemical and organoleptic properties of jelly candy. The method in the research was divided into three stages, namely making carica seed juice, making jelly candy formulations, and product analysis, including moisture content, ash content, pH, antioxidant, total flavonoids, texture, and organoleptic tests. This study used a Complete Random Design (CRD) with one factor of difference in the percentage of carica seed juice added in jelly candy, namely F0 (0% carica seed juice), F1 (32% carica seed juice), F2 (36% carica seed juice), and F3 (40% carica seed juice). Statistical analysis was carried out using one–way ANOVA followed by the Duncan Multiple Range Test (DMRT) at a confidence level og 95%. Jelly carica candy has moisture content value of 18.06% – 18.41%; ash content 1.35 – 1.85%; pH 4.6 – 5.3; antioxidant 928.69 – 1562.97 ppm; flavonoids 0.75 – 2.02 mgQE/g; hardness 61.01 – 141.70 N; cohesiveness 0.36 – 0.44; gumminess 28.37 – 62.45; springiness 0.76 – 0.83; chewiness 21.74 – 52.00; yellowish – orange color, distinctive carica flavor, chewy texture, non – sticky and has a sweet and sour taste. The addition of carica seed juice has a significant effect on the physicochemical and organoleptic properties of carica jelly candy.

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INTRODUCTION

Candy is a solid food product made from sugar or other sweeteners, with or without the addition of other usual food ingredients and food additives permitted for confectionery. Jellies are one of the many types of candy that are popular in the community. According to Smit & Bryant (1967), jelly is a combination of gelling agents, such as hydrocolloids, and fruit juices that give it a clear appearance and a specific texture and elasticity.

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Carica pubescens is one type of fruit that is often processed and consumed into wet sweets. This plant is widely found in the Dieng area, which has a tree shape similar to papaya fruit with a smaller size. Carica fruit is a fruit of the same genus as papaya, but has a chewier and more compact texture, and has a more fragrant aroma when compared to papaya. This fruit is rarely consumed directly, because it contains high papain enzymes with an average of 7.45g per fruit, which can irritate the throat and cause irritation to the stomach, so carica will be better if consumed after processing (Perwira et al., 2018).

Carica fruit has a pectin content of 12.07% and has sufficient acidity to form gel in jelly candy, making it suitable for making chewy and smooth jelly candy (Nurviani et al., 2014). In addition, the carica fruit contains many important nutrients, such as vitamin C, fiber, and antioxidants, which make processed products more valuable. Carica, as a raw material for jelly candy, can provide health benefits in addition to its unique flavor. In addition, the carica fruit is widely available in Wonsosbo, making it a cheap local raw material option (Maula et al., 2024). The flesh of the carica fruit has a cavity filled with seeds that are encased in white, clear, and juicy sarcotesta. Ripe carica seeds contain 0.18% fat, 1.06% protein, 3.93% carbohydrate, 0.50% mineral, and 69.30% vitamin C. Carica fruit seeds are waste from carica fruit processing that is still not widely utilized (Perwira et al., 2018). In addition, carica seeds contain a strong antioxidant value with an IC_{50} value of 21 ppm (Kurniawan et al., 2018). In this study, carica seeds added as juice to carica jelly candy are expected to increase the antioxidant value of jelly candy, so that the final product produced is jelly candy with high antioxidant content.

The aroma of *Carica pubescens* fruit is different fruit aroma compared to other types of fruit commonly used to make jelly candy. The strong aroma of carica pulp comes from volatile compounds, especially butylacetate, methyl, and ethyl butanoate, and various ester compounds (Idstein et al., 1985). The fresh, sweet, and slightly sour aroma of the carica fruit is caused by the volatile compounds contained in it. The aroma of carica gives a varied sensory impression (Raeatya & Rosida, 2024).

Carica is believed to provide benefits, namely, it can increase the body's immunity because the flavonoid compound content in carica is known to be higher than papaya, which is proportional to its antioxidant activity (Luhurningtyas et al., 2020). Papaya seeds contain two chemical compounds, namely polyphenol and phenol groups, that are beneficial for health. The polyphenol group contained in papaya seeds consists of saponin and tannin compounds, while the phenol group, contained in papaya seeds, consists of flavonoid compounds that cause papaya seeds to taste bitter and act as antioxidants. Papaya seeds are useful as antioxidants through the phytochemical substances they contain, which include flavonoids, saponins, and tannins (Najmudin et al., 2021).

Unlike papaya fruit, which has been widely studied for its chemical compounds, research on carica fruit is still limited. Therefore, a study was conducted to examine the effect of adding carica seed juice on the physicochemical and organoleptic properties of jelly candy. Making jelly candy with the addition of carica seeds aims to increase economic value, as well as increase the nutritional value contained in jelly candy.

RESEARCH METHOD

Materials

The tools used in this study are oven (Memmert), blender (Miyako), cabinet dryer (Omron DH48–S (H5CN)), 28 cm pot, ladle, measuring cup, gas stove (Rinnai), crucible, furnace (B–One), texture analyzer (TA–XT2i, UK), basin, baking sheet, knife, analytical balance, stainless sieve, digital scale (Vanstar), desiccator, mortar, pestle, erlenmeyer (Iwaki), porcelain cup, vortex, baking paper, pH meter (Ohaus), UV–Vis spectrophotometer (Mapada 6300), 10 ml volumetric flask (Iwaki), 50 ml volumetric flask (Iwaki), 100 ml volumetric flask (Iwaki), pro red pipette, pro green pipette, 1 ml measuring pipette, 10 ml measuring pipette, test tube (Iwaki), glass funnel, measuring cup, 100 ml beaker (Iwaki), filter paper, cuvette.

The materials used in this research are carica, carica seeds, sugar (Rose brand), agar (Swallow), jelly powder (Nutrijell), gelatin (Dupont), and water. Materials used for analysis are distilled water, DPPH, methanol pure/analytical, quercetin, 96% ethanol, 10% $AICI_3$, $NaNO_2$.

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Methods

Making carica seed juice according to Luhurningtyas et al. (2020), with slight modifications, begins with sorting the carica fruit, then the fruit skin is peeled and washed. Furthermore, the fruit and seeds of the carica are separated because the fruit will be used in the stage of making jelly candy. Furthermore, the seeds that have been separated are boiled with 300 ml of water for ± 10 minutes. The carica seed solution was allowed to stand for 1 hour and filtered to obtain carica seed juice.

Making carica jelly candy refers to research conducted by Adriana et al. (2020), with several modifications in its processing. The first step of the carica fruit that has been washed clean is then weighed at 750 g and cut into cubes to make it easier to pulverize using a blender. In the next stage, the carica that was ready to be mashed was added with additional ingredients, namely sugar 300 g, gelatin 30 g, agar powder 10 g, jelly powder 10 g, and carica seed juice (according to the formulation). Then the ingredients are mashed using a blender for ± 10 minutes until homogeneous. The mixture is then heated at a temperature to reach a boiling point of 100°C for ± 10 minutes until it gives off a fragrant aroma and changes color to orange. The purpose of heating is to thicken the jelly candy mixture. Next, the jelly mixture is poured into a baking sheet that has been coated with baking paper so that it is not sticky, and the mixture is allowed to stand at room temperature, ± 25°C for 2 hours. Next, the jelly candy is cut into a size of 2 x 2 cm, then the pieces of jelly candy are dried in a cabinet dryer at 60°C for a span of 24 hours to become a jelly candy product with the desired texture. The formulation used in making carica jelly candy is adapted from Adriana et al. (2020), with modifications that can be seen in Table 1.

Table 1. The formulation for making carica jelly candy.

Material	F0	F1	F2	F3
Carica (g)	750	750	750	750
Seeds juice (%)	0	32	36	40
Agar powder (g)	10	10	10	10
Jelly powder (g)	10	10	10	10
Sugar (g)	300	300	300	300

Data Analysis

The data obtained were then analyzed using one–way Analysis of Variance (ANOVA) to determine the significance of the average value of the existing data groups. If the treatment significantly affects the variable, proceed with the Duncan Multiple Range Test (DMRT) with a significant level of $\alpha = 0.05$ using SPSS 23 to determine which groups have significant differences. The DMRT test is used because it is more thorough and can be used on many treatments.

RESULT AND DISCUSSION

Chemical Properties

The results of chemical analysis in the form of water content analysis, ash content analysis, pH, antioxidant, and total flavonoid analysis of carica jelly candy with the addition of carica seed juice can be seen in Table 2.

Table 2. Results of the chemical properties of the carica jelly candy.

Sample	Chemical Properties				
	Water content (%)	Ash content (%)	pH	Antioxidant (ppm)	Total flavonoid (mgQE/g)
F0	18.063 ± 0.49^{a}	1.3533 ± 0.3^{a}	5.267 ± 0.6^{c}	1562.97 ± 299.23^{b}	0.75 ± 0.19^{a}
F1	18.077 ± 0.42^{a}	1.606 ± 0.25^{ab}	4.867 ± 0.6^{b}	1171.89 ± 110.30^{ab}	1.18 ± 0.11^{b}
F2	18.353 ± 1.08^{a}	1.8133 ± 0.29^{b}	4.833 ± 0.6^{b}	1303.62 ± 382.95^{ab}	1.86 ± 0.10^{b}
F3	18.41 ± 0.23^{a}	1.8500 ± 0.44^{b}	4.633 ± 0.6^{a}	928.69 ± 119.82^{a}	2.02 ± 0.10^{b}

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Water Content

According to research conducted by Perwira et al. (2018), the water content in food ingredients determines the freshness and durability of the food ingredients. Table 2 shows that the average water content of each sample treatment, F0 (0%), F1 (32%), F2 (36%), and F3 (40%), is 18.06%, 18.07%, 18.35%, and 18.41% respectively. So the average water content in carica jelly candy increases as the concentration of carica seed extract increases. According to Badan Standardisasi Nasional (2008), jelly candy has good quality if the water content contained therein is below 20%, so that carica jelly candy is in accordance with applicable quality standards.

The increase in water content is due to the carica seed extract containing pectin compounds. Research conducted by Minggi & Swasono (2018), stated that the higher the pectin content in jelly candy, the higher the water content of jelly candy. Papaya seeds contain 8.655% pectin compounds extracted using the hot water extraction method with optimum process conditions of pH 1.5, temperature 80°C, time 60 minutes, and liquid to solid ratio of 25 mL/g with ethanol precipitation. The methoxy content of the pectin was found to be 9.216%, which is a naturally low methoxy content. Low–methoxyl pectin has been used in the food industry to make low–sugar jams because it does not require high sugar levels to thicken (Madhuvanthi et al., 2022). According to Parnanto et al. (2016), the higher water content in jelly candy is because the substance in the material contains too much water or the soluble solids are too low. In addition, the factor that affects the moisture content in food products is the freshness of the food products. Product freshness in food is closely related to the water content in food, because water can affect the appearance, texture, and taste of the product. The water content in food also determines the acceptance, freshness, and durability of food (Simorangkir et al., 2017).

Ash Content

Ash is an organic residue that comes from burning materials that are organic in nature. Generally, these components are calcium, sodium, potassium, manganese, iron, and magnesium (Santoso & Mahardika, 2023). Table 2 shows that the average ash content of each treatment sample, F0 (0%), F1 (32%), F2 (36%), and F3 (40%), is 1.35%, 1.61%, 1.81%, and 1.85%, respectively. The average ash content of the carica jelly candy increased in each formulation. The average results show that carica jelly candy meets national quality standards. Based on Badan Standardisasi Nasional (2008), jelly candy has good quality if the ash content contained in it is below 3%, so carica jelly candy complies with applicable quality standards.

The ash content of a food ingredient shows the amount of minerals contained in the food ingredient. The increased ash content in each formulation is influenced by the mineral content. The higher the mineral content of the raw material, the higher the ash content of the jelly candy produced. The increase in ash content in carica jelly candy is thought to be due to the addition of carica seed juice, which contains several minerals, namely calcium and phosphorus (Kusnadi et al., 2016). This is reinforced by Rahayu & Pribadi (2012), which states that the minerals contained in 100 grams of carica are calcium (51 mg), phosphorus (33 mg), and iron (7.99 mg). Minerals that are not burned become volatile substances and are the residue left behind after a food sample is burned completely.

pH

pH measurement is carried out to determine the acidity value of a product. pH is the minus logarithm of the concentration of H^+ ions (Forsitawati et al., 2024). Table 2 shows that the average pH value of each treatment sample, F0 (0%), F1 (32%), F2 (36%), and F3 (40%), is 5.7, 4.87, 4.83, and 4.63. The average pH value of carica jelly candy decreased with the higher concentration of carica seed addition. This can occur because carica seeds are ingredients that have an acidic pH.

Based on the results of research Kurniawan et al. (2018), regarding the manufacture of carica seed gel, the results show that the pH value of carica seeds is 4.5, which indicates that carica seeds are acidic. Low pH value due to tannin content can increase the effectiveness of carica seed extract in jelly candy and provide health benefits through its antioxidant properties (Bestiar & Hanurawati, 2019). This is reinforced by Hidayat et al. (2024), which states that the carica fruit contains antioxidant compounds, flavonoids, polyphenols, tannins, and triterpenoids

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Antioxidant

Antioxidants are compounds that can capture free radicals. Free radicals are produced due to several factors, such as smoke, dust, pollution, and the habit of consuming fast food that is not balanced between carbohydrates, protein, and fat (Martemucci et al., 2022). The method commonly used to determine the antioxidant activity of plants is by using the DPPH free radical method. The purpose of this method is to parameterize the concentration equivalent to give 50% effect (IC_{50}) (Hani & Milanda, 2016).

Table 2 shows the results between the treatment samples F0 (0%), F1 (32%), F2 (36%), and F3 (40%) sequentially, which are 1562.97 ppm, 1171.89 ppm, 1303.62 ppm, and 928.69 ppm. The results of antioxidant activity testing with the IC50 method obtained the highest antioxidant value found in treatment F3, with an antioxidant value of 928.69 ppm, while the lowest was treatment F0 of 1562.97 ppm. According to Putri (2020), the IC_{50} value is a quantitative indicator to measure the ability of a substance to inhibit oxidation.

These results are lower when compared to research conducted by Kurniawan et al. (2018), on the potential of carica seed gel as an antioxidant, stating that the IC50 value of carica seed gel is 21 ppm, in other words, that carica gel is classified as having strong antioxidant activity. The weakening of antioxidant value in food products is caused by several factors, namely temperature and cooking time, and drying (Dewi et al., 2022).

Research by Miranti et al. (2017), on papaya juice jelly candy has decreased antioxidant activity due to heating during processing, which can cause degradation of vitamin C, so that it can accelerate the oxidation of vitamin C. In addition, vitamin C is easily oxidized, and the process is accelerated by heat, light, alkali, enzymes, oxidizers, and by copper and iron catalysts. In addition, vitamin C is easily oxidized, and the process is accelerated by heat, light, alkali, enzymes, oxidizers, and by copper and iron catalysts. In the processing process, vitamin C loss due to enzymatic reactions is very small, while non–enzymatic reactions are the main cause of vitamin C loss.

Total Flavonoid

According to Kurniawan et al. (2018), flavonoids are one of the antioxidant compounds that protect against oxidative agents and free radicals. Flavonoids are compounds consisting of 15 carbon atoms that are generally distributed in the plant world. Flavonoids are widespread in plants and have many functions.

Table 2 shows the results between treatments of samples F0 (0%), F1 (32%), F2 (36%), F3 (40%), which are 0.75 mgQE/g, 1.18 mgQE/g, 1.86 mgQE/g, and 2.02 mgQE/g, respectively. The results of the total test showed that the highest antioxidant value was found in treatment F3 with a value of 2.02 mgQE/g, while the lowest was treatment F0 at 0.75 mgQE/g. The results of this study indicate that the higher the concentration of carica seed juice, the greater the total flavonoid value in each carica jelly candy formulation. These results are lower when compared to research conducted by Luhurningtyas et al. (2024), on the determination of flavonoid levels and the effect of carica seed extract on the number of leukocytes in carrageenan–induced mice, stating that the flavonoid content in carica seed extract was 55.6 mgQE/g. Factors that affect the value of flavonoids are temperature and drying time of processed food products (Nisa et al., 2023).

Physical Properties

Analysis of physical properties of carica jelly candy, namely texture with test parameters including hardness, cohesiveness, gumminess, springiness, and chewiness, can be seen in Table 3.

Table 3. Physical properties of carica jelly candy**.**

Sample	Physical Properties				
	Hardness (N)	Cohesiveness	Gumminess (N)	Springiness	Chewiness (N)
FO	141,70 ± 17,66[c]	0,44 ± 0,36[ab]	62,45 ± 3,31[c]	0,83 ± 0,03[b]	52,00 ± 2,35[c]
F1	96,92 ± 3,45[b]	0,44 ± 0,03[ab]	43,13 ± 2,32[b]	0,79 ± 0,01[ab]	34,20 ± 2,11[b]
F2	118,76 ± 16,37[b]	0,36 ± 0,01[a]	47 ± 7,24[b]	0,78 ± 0,02[a]	36,75 ± 6,30[b]
F3	61,01 ± 6,61[a]	0,46 ± 0,03[b]	28,37 ± 4,24[a]	0,76 ± 0,02[a]	21,74 ± 3,69[a]

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Hardness

Hardeness is a food product that shows the level of resistance of the material to the maximum compressive force (Istinganah et al., 2017). The results of the one–way ANOVA test p-value < 0.05 that the sample treatment (F0, F1, F2, F3) is significantly different. To find out the differences between treatments continued with the Duncan test was used. Duncan's test results show that F0 is significantly different from F1, F2, and F3. Hardness value of F1 is significantly different from F1 and F3, but not significantly different from F2. The hardness value of F3 is significantly different from F0, F1, and F2. The range of values obtained in testing with the hardness parameter of carica jelly candy is 61.01 – 141.7 N. These results are higher when compared to the literature by Fadhilah & Syafutri (2021), kalamansi orange jelly candy with a range of values of 2.94 – 5.3 N. This is because the water content in an ingredient affects the texture of food products. The higher the value of water content in food, the lower the hardness value of the candy (Figiel & Tajner-Czopek, 2006).

Cohesiveness

Cohesiveness is an ability that describes how well a product can withstand mechanical deformation and remain intact after being pressurized. According to Indiarto et al. (2012), cohesiveness is also defined as the ratio of the pressure area during the second compression to the first compression and has no unit, but can be measured as the level of a material that is mechanically destroyed. The results of the one–way ANOVA test p-value < 0.05 that the sample treatment (F0, F1, F2, F3) is significantly different. To find out the differences between treatments continued with the Duncan test was used. Duncan's test results show that the cohesiveness values of FO and F1 are not significantly different from each other, but the cohesiveness values of F2 and F3 are significantly different. The range of values obtained in testing with the cohesiveness parameter of carica jelly candy is 0.36 – 0.46. These results are lower when compared to the literature by Mutlu et al. (2018), jelly candy with honey sweetener as a sugar substitute, with a value range of 0.54 – 0.82.

Gumminess

Gumminess is the energy required to break down semisolid food until it is ready to be swallowed (Patriani & Afgani, 2024). According to Putri et al. (2022), gumminess is a stickiness that is measured by calculating the hardness value with the cohesiveness value. The results of the one–way ANOVA test p-value < 0.05 that the sample treatment (F0, F1, F2, F3) is significantly different. To find out the differences between treatments continued with the Duncan test was used. Duncan's test results showed that F0 was significantly different from F1, F2, and F3. The gumminess values of F1 and F2 were not significantly different from each other, but F3 was significantly different from F0, F1, and F2. The range of values obtained in testing with the gumminess parameter of carica jelly candy is 28.37 – 62.45 N. These results are higher when compared to the literature by Patriani & Afgani (2024) of dragon fruit peel extract jelly candy with a range of values of 0.452 – 2.343 N.

Springiness

Springiness, as one of the textural attributes, is defined as the ability of a material to return to its original shape after the deformation force is removed. The measurement of springiness involves determining the recovery distance of the product after it has been subjected to compression or extension. This parameter is highly relevant in the evaluation of food product quality, especially concerning texture (Kusumaningrum et al., 2016). The results of the one–way ANOVA test p-value < 0.05 that the sample treatment (F0, F1, F2, F3) is significantly different. To find out the differences between treatments continued with the Duncan test was used. Duncan's test results showed that F0 was significantly different, while the value of springiness in F1, F2, and F3 was not significantly different. The range of values obtained in testing with the springiness parameter of carica jelly candy is 0.76 – 0.83. These results are lower when compared to the literature by Astuti et al. (2024) of pumpkin jelly candy with a comparison of gum arabic and carrageenan, which has a value range of 3.65 – 7.10.

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Chewiness

Chewiness in the sample is a multiplication of hardness, cohesiveness, and springiness, so that changes in chewiness values in the sample are strongly influenced by these parameters (Haliza et al., 2017). The results of the one–way ANOVA test p-value < 0.05 that the sample treatment (F0, F1, F2, F3) is significantly different. To find out the differences between treatments continued with Duncan's test was used. To find out the differences between treatments, Duncan's test was used. Duncan's test results showed that F0 was significantly different from F1, F2, and F3. The chewiness values of F1 and F2 were not significantly different from each other, but F3 was significantly different from F0, F1, and F2. The range of values obtained in testing with the chewiness parameter of carica jelly candy is 21.74 – 52.00. The test results show that the addition of carica seed juice to each carica jelly candy formulation reduces the chewiness value of the jelly candy. This is in accordance with the theory (Putri et al., 2022), which states that the chewiness value of a food ingredient is influenced by the water activity contained in the food ingredient; the higher the water content in the food ingredient, the lower the chewiness value of the material.

Organoleptic Acceptance Test

The results of the organoleptic analysis of carica jelly candy with the addition of carica seed juice can be seen in Table 4.

Table 4. Organoleptic result of the carica jelly candy.

Sample	Parameters				
	Color	Aroma	Springiness	Stickiness	Flavor
F0	3,03 ± 0,56[a]	2,8 ± 0,53[a]	2,6 ± 0,56[a]	2,63 ± 0,67[a]	2, 97 ± 0,4[a]
F1	3,00 ± 0,37[a]	2,87 ± 0,43[a]	2,8 ± 0,59[a]	2,83 ± 0,69[a]	3,03 ± 0,49[a]
F2	3,07 ± 0,45[a]	2,87 ± 0,43[a]	2,77 ± 0,57[a]	2,7 ± 0,65[a]	3,17 ± 0,53[a]
F3	3,10 ± 0,71[a]	2,87 ± 0,68[a]	3,43 ± 0,50[b]	3,00 ± 0,64[a]	3,07 ± 0,58[a]

Color

According to Perwira et al. (2018), as a dominant visual attribute, plays a crucial role in shaping consumers' perception of the quality and safety of a food product. Based on Table 4, which shows the results of color parameter organoleptic testing, the p-value > 0.05 indicates that the addition of carica seed juice does not significantly affect the level of color liking of carica jelly candy. All panelists liked the color of each formulation of carica jelly candy. The range of values obtained in organoleptic testing with the color parameter of carica jelly candy is 3.03 – 3.10, with F0 (0%) as the lowest value and F3 (40%) as the highest value.

The discoloration of carica jelly candy is caused by high-temperature heating during the process of making jelly candy, which can cause thermal degradation of natural pigments such as vitamin C and carotenoids and trigger Maillard reactions between sugars and amino acids. Pigment degradation can cause the original color of the product to be lost, while Maillard reactions produce brown–colored compounds that can cause browning. These two components significantly affect the color change in the final product, so the combination of the two is an important element in product quality control (Neswati, 2013).

Aroma

Aroma evaluation is a very important method in sensory analysis, as aroma is one of the most dominant sensory attributes in influencing consumer perception of food and beverage products (Nursan et al., 2023).

Based on Table 4, the results of organoleptic testing of aroma parameters showed that all panelists liked the aroma of each formulation of carica jelly candy. The range of values obtained in organoleptic testing with the aroma parameter of carica jelly candy is 2.8 – 2.87, with F0 (0%) as the lowest value and F3 (40%) as the highest value. The more the addition of carica seed juice increases the aroma of carica jelly candy. This is in line with research conducted by Mukminah et al. (2022), which states that

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carica has a distinctive aroma due to volatile compounds, namely aroma–forming ester compounds in volatile fruits. In addition, the addition of sugar in each formulation increases the aroma of the jelly candy produced because it can improve the aroma and taste effectively, with the ability to suppress sour, bitter, and salty sensations, thus creating a more harmonious taste profile. Optimal sugar concentration can increase the intensity of aroma volatiles and improve overall flavor perception (Minggi & Swasono, 2018).

Springiness

Springiness is a rheological property of plastic food products with respect to the resistance to breakage due to compressive forces that are deformable (Kusumaningrum et al., 2016). Based on Table 4, the test results show that all panelists liked the chewiness of each formulation of carica jelly candy. The range of values obtained in organoleptic testing with the springiness parameter of carica jelly candy is 2.60 – 3.43, with F0 (0%) as the lowest value and F3 (40%) as the highest value. This is reinforced by research conducted by Kusumaningrum et al. (2016), which states that Carica papaya has a gelling material content, namely pectin of 0.73 – 0.99%. Pectin is a gelling polysaccharide that plays a role in providing a gel structure and spring texture to jelly candy (Diana et al., 2023).

Stickiness

According to Setiaboma et al. (2021), stickiness is the energy required to crush semi–solid food until it is ready to swallow. Based on Table 4 shows the results of organoleptic testing of stickiness parameters. All panelists liked the color of each formulation of carica jelly candy. The range of values obtained in organoleptic testing with the stickiness parameter of carica jelly candy is 2.63 – 3.0, with F0 (0%) as the lowest value and F3 (40%) as the highest value. Panelists liked the texture of jelly candy with code F3 the most because it has a non–sticky texture when chewed. This can occur because the addition of seed juice affects the value of pectin in the jelly candy, which results in the texture of the candy becoming non–sticky.

Flavor

According to Haliza et al. (2017), taste can be detected by the sense of taste. For a compound to be recognized by its taste, the compound must be able to dissolve in saliva so that it can establish a microvillus connection, and the impulses formed are sent through the nerves to the nerve center. Based on Table 4, the results of organoleptic testing of aroma parameters showed that the value of $p > 0.05$ that the addition of carica seed juice did not significantly affect the level of liking for the taste of carica jelly candy. All panelists liked the taste of each formulation of carica jelly candy. The range of values obtained in organoleptic testing with the flavor parameter of carica jelly candy is 2.9 – 3.17, with F0 (0%) as the lowest value and F2 (40%) as the highest value. This is in accordance with research by Kurniawan et al. (2018), which states that the pH value of carica seeds is 4.5, which indicates that carica seeds are acidic. In addition, the addition of additional ingredients such as sugar in each carica jelly candy formulation gives a sweet taste to the carica jelly candy (Mukminah et al., 2022).

CONCLUSION

The results of the study of the chemical properties of jelly candy with the addition of carica seed juice had a significant effect on ash content, antioxidant pH, and flavonoids, but had no significant effect on water content. the results of the study of physical properties had a significant effect on the texture of jelly candy. The addition of carica seed juice to carica jelly candy has an influence on the organoleptic test parameters of color, taste, texture, and aroma. The most preferred treatment is F3.

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