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Characteristics of Jelly Candy Based on Bovine Split Hide Gelatin

Dwi Wulandari[1a], Sugiyanto[2], Armila Zahra Tawarniate[1]
[1]*Leather Processing Technology Study Program, ATK Polytechnic Yogyakarta, Indonesia*
[2]*Leather Product Processing Technology Study Program, ATK Polytechnic Yogyakarta, Indonesia*
[a]*email:* dwi.w80@yahoo.com

Abstract

This research aims to obtain a preferred jelly candy formula and characteristics from a bovine split hide gelatin combined with commercial gelatin. The materials used were bovine split hide gelatin, commercial gelatin, glucose, sucrose, citric acid, sodium benzoate, desiccant, and pineapple shield. Comparison of commercial gelatin and bovine split hide gelatin in the formula T1= 16:0%, T2= 12:4%, T3=8:8%, T4= 4:12% and T5= 0:16%, with the same percentage of other ingredients. The results were compared with commercial gelatin candy. Parameters observed included chemical tests of water content, pH, total sugar, physical tests (hardness, elasticity, and stickiness), and organoleptic tests (colour, aroma, taste, shape, texture, and overall). Data analysis used a completely randomized design with a unidirectional pattern. If any significant difference was found, Duncan's multiple region test was performed. The organoleptic test was analyzed by descriptive analysis. It was concluded that adding more commercial gelatin resulted in a harder jelly candy and gave different organoleptic test results. Panellists preferred jelly candies from 8% bovine split hide gelatin and 8% commercial gelatin. The organoleptic test results show the same assessment criteria as commercial jelly candy.
Keywords: gelatin, bovine split hide gelatin, jelly candy

Karakteristik Permen Jelly Berbahan Dasar Gelatin Kulit Sapi Split

Abstrak

Penelitian ini dilakukan untuk menemukan karakteristik dan formula permen jelly dari gelatin kulit sapi split yang dikombinasi dengan gelatin komersial terbaik. Penelitian menggunakan gelatin kulit sapi split, gelatin komersial, glukosa, sukrosa, asam sitrat, natrium benzoat, pengering dan perisa nanas. Perbandingan gelatin komersial dan gelatin kulit sapi split pada formula T1= 16:0%, T2= 12:4%, T3= 8:8%, T4= 4:12% dan T5= 0:16%, dengan persentase bahan yang lain sama, dan dibandingkan dengan permen gelatin komersial. Uji kimia yang diamati adalah kadar air, pH dan gula total, uji fisis (kekerasan, kekenyalan dan kelengketan) serta uji organoleptik (warna, aroma, rasa, bentuk, tekstur dan keseluruhan). Analisis data menggunakan Rancangan Acak Lengkap pola searah, kemudian dilanjutkan dengan uji wilayah ganda Duncan bila terdapat perbedaan. Uji organoleptik dianalisis dengan analisis diskriptif. Penambahan gelatin komersial yang semakin banyak menghasilkan permen jelly yang semakin keras dan memberikan hasil uji organoleptik yang berbeda. Panelis menyukai permen jelly yang dibuat dari kombinasi gelatin kulit sapi split 8% dan gelatin komersial 8%. Uji organoleptik menunjukkan kriteria penilaian yang sama dengan permen jelly komersial.
Kata kunci: gelatin, gelatin kulit sapi split, permen jelly

Introduction

Jelly candy is a type of confectionery with an attractive shape, chewy and soft texture, a sweet taste and available in various colours, so it is loved by people, from children to adults. Jelly candy is made from fruit juice and a thickening agent such as gelatin, resulting in a clear, transparent appearance and a chewy texture. Jelly candy is also semi-moist, which can easily be damaged if improperly wrapped.

Jelly gel formation is limited to a certain pH range. According to Rismandari *et al*. (2017), the growth of spoilage bacteria will be inhibited in acidic conditions. Therefore, storing jelly candy at a low pH will extend its shelf life. The presence of gelling agent is one aspect that determines the quality of jelly candy. Adding a substance containing a thickening agent can provide a firm gel and a flexible structure to jelly candy. The most common thickening agents added to obtain a porous structure are gelatin, carrageenan and agar-agar.

Gelatin is often used as a thickening agent because it has characteristics and utilities as a gum, emulsifier, thickener, clarifier, and water

binder (Mahardika *et al*., 2014). The gelatin type is determined based on gel strength and viscosity. The higher the viscosity value, the higher the gel strength in jelly candy (Cahyaningrum *et al.*, 2021). The property of being a gel-forming material is also possessed by one of the livestock products, namely bovine hide. According to Wulandari *et al.* (2016), gelatin can be made from split bovine hide (KSS), a by-product of the leather tanning industry in the form of cleavage of the flesh resulting from calcification. This split skin still contains collagen, which produces type A gelatin when hydrolyzed. It is made with acid in a shorter time than type B, has an *a*lpha helix structure, low gel strength and small molecular weight (Sanaei *et al* ., 2013).

Gelatin derived from split bovine hide has nearly identical properties to commercial gelatin, so split bovine hide gelatin can replace commercial gelatin or be used in various commercial applications. Alternative processing of split bovine hide into jelly candy is expected to increase the economic value of split bovine hide. It is hoped that the sweet and chewy taste of jelly candy can still be felt in jelly candy made from split bovine skin gelatin so that consumers will still like it and be safe for consumption. However, consumers' awareness of food quality has led to their demand for safe and healthy jelly candy products, so monitoring each stage of the process is necessary.

This research was conducted to make jelly candy with varying percentages of gelatin from split bovine hide and commercial gelatin to improve its texture, then compared to commercial product jelly candy. This research is expected to provide results for the formulation of jelly candy made from split bovine hide gelatin in accordance with the Indonesian National Standard (SNI).

Materials and Methods

Materials

This study used type A gelatin from split bovine skin, which the researcher produced, and halal commercial gelatin "Point" produced by PT. Pondasi Inti Sejahtera, Bantul, Yogyakarta.

Research Method

This study used a completely randomized design trial. The treatments in this study were some variations of gelatin candy formulas with three replications. The research treatments are shown in Table 1.

The Process of Making Split Bovine Hide Gelatin

This process began with soaking the split bovine hide for two days, deliming (removing lime), reducing the raw material to a size of 1-2 cm^2, weighing and then washing it with running water to a pH of 7.0. The skin was soaked within 24 hours in the 0.5 M acetic acid solution and then neutralized (pH 7.0) using water. Furthermore, the skin was extracted in stages from a temperature of 60, 70 and 80 °C for 5 hours. For each increase in temperature, the extracted skin was filtered using filter paper. The skin was concentrated by heating it at 60 °C within 5 hours, then poured into trays. The skin was dried in an oven at 50 °C until the skin extract formed sheets. The dried skin was ground.

The Process of Making Jelly Candy

Split bovine hide gelatin was dissolved in water at 60-70 ^oC, stirred until smooth, and added with sodium benzoate and jelly desiccant. Glucose, sugar and water were heated at a low temperature until it reached 110 ^oC in a separate pan. Citric acid was also added, stirring continuously until the temperature reached 120 °C. The stove was turned off, and then the gelatin mixture was added, stirred until smooth, added with the flavourings and continued with another stirring. The dough was then poured into moulds, left at room temperature for one day, then removed and sprinkled with caster sugar. The jelly candy formulations are shown in Table 1.

Testing Procedure

The jelly candied were chemically tested according to AOAC (1995). The jelly candy physical testing was carried out with a texture measuring tool, "TA-XT Plus Texture Analyzer" (Stable Micro Systems, America), which is a cylindrical probe with a diameter of 75 mm and a 30 kg load cell for measuring the texture of jelly candy (Widayati *et al.*, 2013). Organoleptic quality testing was carried out according to the methods used by Setyaningsih *et al.* (2010).

Table 1 . Formulation treatment of jelly candy made from split bovine hide

Material	T1 (% b/v)	T2 (% b/v)	T 3 (% b/v)	T 4 (% w/v)	T 5 (% w/v)
Commercial gelatin	16	12	8	4	0
KSS Gelatin	0	4	8	12	16
Sucrose	41	41	41	41	41
Glucose	12	12	12	12	12
Citric acid	0.5	0.5	0.5	0.5	0.5
Sodium benzoate	0.1	0.1	0.1	0.1	0.1
Jelly dryer	1	1	1	1	1
Hot water	16.2	16.2	16.2	16.2	16.2
Water	13.2	13.2	13.2	13.2	13.2
Flavor	Enough	Enough	Enough	Enough	Enough

Note: T1 = 16% commercial gelatin + 0% *split* bovine hide gelatin; T2 = 12% commercial gelatin + 4% split bovine hide gelatin; T3 = 8% commercial gelatin + 8% split bovine hide gelatin; T4 = 4% commercial gelatin + 12% split bovine hide gelatin; T5 = 0% commercial gelatin + 16% split bovine hide gelatin

Research Variables

The research variables assessed were the chemical, physical and organoleptic quality. Chemical quality includes water content, total sugar and pH of jelly candy. Physical qualities include hardness, elasticity and stickiness, while the organoleptic qualities were tested for the preference level of its colour, aroma, taste, shape, texture, and overall value of jelly candy.

Analysis Data

ANOVA was used to analyze data collected from the treatments based on a completely randomized design. If a significant difference was found, Duncan's multiple area test would be performed (Steel *et al.*, 1997) as a follow-up test. Organoleptic test data were explained by descriptive analysis.

Results and Discussion

Water Content

The water content in the jelly candy ranged from 21.76 -23.79 % (Table 2). The water content percentage in the jelly candy exceeds the water content jelly candy specified in SNI 3547-2-200 8, namely 20%. In comparison, the water content of commercial jelly candy is 19.35 % (according to SNI standards). The high water content within the formulated jelly candy was due to the low gel formation of split bovine hide gelatin. Skin tissues cannot hold fluid; therefore, they will release water or experience syneresis. Cross-linking polymer chains to produce a continuous three-dimensional network is known as gelling. This network can also capture water, building a rigid, sturdy structure (Atmaka *et al.*, 2013).

The results showed that T1 and control had lower water content than T2, T3, T4 and T5. T1 uses commercial gelatin, and control is a commercial jelly candy with higher gelling properties, while T2, T3, T4, and T5 use split bovine hide gelatin with low gelling properties. The T1 water content exceeds the SNI limit because the candy hardening process used room temperature, which was 26 ^{o}C for one night, so evaporation was not optimal. Moisture content affects the food quality and shelf life because it is related to microbial activity while jelly candy is stored. The low water content will extend the shelf life (Mahardika *et al.*, 2014).

Jelly Candy pH

Table 2 shows the pH of jelly candy research between 5.26-5.95. The results of the variance analysis between treatments did not show a significant difference because the pH of commercial gelatin and split bovine hide gelatin was almost the same, namely 5.68 and 5.41, and the addition of citric acid in each treatment was 0.5%. The variance results were significantly different from the commercial jelly candy (control), and the pH value was lower than the pH of the research candy. This lower pH may be because the gelatin used as an ingredient in commercial jelly candy has a lower pH than split bovine hide gelatin or because of the addition of more than 0.5 grams of citric acid. In addition to providing taste, adding citric acid will also lower the pH. Jelly candy with an acidic pH can be stored in time for a long time because it can inhibit the growth of putrefactive bacteria (Muawanah *et al.*, 2012). Adding caster sugar can also extend storage because sugar can function as a food preservative aside from adding sweetness.

Table 2. Duncan test results for physical and chemical parameters of the jelly candies

Parameter	Test	Comparison of Bovine Split Hide and Commercial Gelatin Candies					
		T1	T2	T3	T4	T5	Control
Water content (%)	1	21.76	23.60	22.31	23.57	22.66	19.34
	2	21.93	23.79	22.19	23.46	22.79	19.31
	3	21.83	23.55	22.37	23.50	22.71	19.39
Total		65,52	70,94	66,87	70.53	68,16	58.04
Average		$21.84^{e} \pm 0.05$	$23.65^{c} \pm 0.13$	$22,29^{d} \pm 0.09$	$23.51^{c} \pm 0.06$	$22.72^{b} \pm 0.06$	$19.35^{a} \pm 0.04$
Total sugar content (%)	1	61.28	63.05	65.18	64.23	63.37	56.74
	2	61.43	63.19	65.04	64.52	63.51	57.02
	3	61.35	63.11	65.12	64.48	63.46	56.89
Total		184.06	189.35	195.34	193.23	190.34	170.65
Average		61.35 ± 0.08	63.1 ± 0.07	65.11 ± 0.06	64.41 ± 0.16	63.45 ± 0.07	56.88 ± 0.14
pH	1	5.65	5.49	5.40	5.34	5.92	3.98
	2	5.60	5.48	5.37	5.33	5.26	3.95
	3	5.58	5.48	5.35	5.33	5.26	3.93
Total		16.83	16.45	16.12	16.00	15.81	11.86
Flat		$5.61^{b} \pm 0.04$	$5.48^{b} \pm 0.01$	$5.37^{b} \pm 0.03$	$5.33^{b} \pm 0.01$	$5.27^{b} \pm 0.02$	$3.95^{a} \pm 0.03$
Hardness (N)	1	31.85	21.23	15.31	7.48	6.47	28.71
	2	31.17	21.35	15.87	7.21	6.38	28.15
	3	31.45	22.20	15.54	7.24	6.40	28.69
Total		94.47	64.58	46.72	21.93	19.25	85.55
Average		$31.49^{f} \pm 0.34$	$21.53^{d} \pm 0.53$	$15.57^{c} \pm 0.28$	$7.31^{b} \pm 0.15$	$6.42^{a} \pm 0.05$	$28.52^{e} \pm 0.31$
Elasticity (N)	1	27.51	18.19	13.64	4.59	3.65	19.85
	2	27.43	19.04	13.75	4.70	3.87	19.68
	3	27.47	18.82	13.38	4.61	3.89	19.97
Total		82.41	56.05	40.77	13.90	11.41	59.50
Average		$27.47^{f} \pm 0.04$	$18.68^{d} \pm 0.44$	$13.59^{c} \pm 0.19$	$4.63^{b} \pm 0.06$	$3.80^{a} \pm 0.13$	$19.83^{e} \pm 0.15$
Stickiness (N)	1	29.21	19.86	15.18	6.02	5.14	24.37
	2	29.28	20.61	15.43	6.16	5.47	24.04
	3	29.25	20.54	15.50	6.20	5.38	24.21
Total		87.74	61.01	46.11	18.38	15.99	72.82
Average		$29.25^{f} \pm 0.04$	$20.34^{d} \pm 0.41$	$15.37^{c} \pm 0.17$	$6.13^{b} \pm 0.10$	$5.33^{a} \pm 0.17$	$24.27^{e} \pm 0.17$

Note: Values in the same row with different letters indicate a significant difference (P<0.05).
T1 = 16% commercial gelatin + 0% split bovine hide gelatin; T2 = 12% commercial gelatin + 4% split bovine hide gelatin;
T3 = 8% commercial gelatin + 8% split bovine hide gelatin; T4 = 4% commercial gelatin + 12% split bovine hide gelatin;
T5 = 0% commercial gelatin + 16% split bovine hide gelatin, Control = commercial jelly candy

Jelly Candy Physical Test

Physical tests for hardness, elasticity and stickiness are presented in Table 2. Hardness test results data decreases with the reduction of commercial gelatin. The gel strength of the gelatin used influences the hardness of jelly candy. Split bovine skin gelatin has a gel strength of 153.5 Bloom, meanwhile commercial gelatin 215 Bloom. The highest hardness of jelly *candy* was 31.49 N with 100% commercial gelatin treatment, while the lowest was 6.42 N using 100 % split bovine hide gelatin. Analysis results variance showed a significant difference in candy hardness jelly. The hardness of commercial jelly candy was 28.52 N, higher than that of jelly candy treated with a combination of split bovine skin gelatin and commercial gelatin. This result is because split bovine hide gelatin is softer than commercial gelatin, so jelly candy products have a lower hardness.

The hardness results of candy jelly are bigger than that of the research conducted by Sinurat *et al*. (2014), which shows that the best hardness on jelly candy is with the addition of 4.5% jelly powder, with a hardness value of 246.5 g (2.42N). This result is also different from the results obtained by Mahardika *et al*. (2014), with a hardness of 414 g (4.06 N), and the results of research by Utomo *et al*. (2014) with 470.7 g (4.62 N).

Elasticity is the main parameter of jelly candies. Assessment of the jelly candy firmness is in the range of 3.65–27.51 N (Table 2). The average elasticity of jelly candy decreased with the increasing addition of split bovine hide gelatin. The elasticity is directly proportional to the strength of the gelatin gel. The higher the strength of the gelatin gel, the higher the elasticity of the jelly candy. The gelatin concentration in the mixture is very important in gel formation. The more gelatin that is applied, the chewier the resulting candy will be because it will produce a strong gel resulting in harder and chewier candy. In contrast, the lower the application of gelatin will make soft candy difficult to form (Zulfajri *et al*., 2018).

The highest average elasticity is found in the treatment that only uses commercial gelatin (27.47 N), while the lowest is found in candies that use split bovine hide gelatin (3.80 N). In comparison, while commercial jelly candy had an elasticity value of 19.83 N, gelatin can form a good gel, so adding commercial gelatin to jelly candy increases the elasticity (Nuriswanto *et al*., 2015). Commercial gelatin is made from a bovine hide with higher gel strength than a split bovine hide. According to Rashati and Eryani (2019), a combination of the two gelling agents, gelatin and carrageenan, will affect the organoleptic, physical properties of the jelly candies' elasticity.

The results of the tackiness test obtained 5.14 - 29.28 N (Table 2). The stickiness decreased with the decrease in the percentage of commercial gelatin and the increase in split bovine hide gelatin. Hydrocolloids have properties such as a film former that can withstand water transmission. Reducing the addition of commercial gelatin decreases the stickiness of the candy, which indicates that split bovine hide gelatin has a lower water-holding capacity than commercial gelatin, so the jelly candy is wetter and becomes sticky. Hydrocolloids are polymer components that absorb and bind water from animals, vegetables or microbes (Herawati, 2018).

Jelly Candy Sensory Test

The jelly candy sensory test aimed to measure the level of preference of panelists for jelly candy made from split bovine hide gelatin, which was varied with the addition of commercial gelatin. Sensory tests include colour, aroma, shape, taste, texture and overall tests (Table 3), while the results of jelly candy can be seen in Figure 1**.**

Table 3. Duncan test results candy sensory test jelly from split bovine skin gelatin with additional variations of commercial gelatin

Variable	T 1	T2	T3	T4	T5	Control
Color Criteria	4.3 ± 0.68 ^{c} Like	3.9 ± 0.88 ^{b} Like	3.5 ± 0.53 ^{b} Like	3.0 ± 0.82 ^{b} Enough like	2.2 ± 0.92 ^{a} Do not like	4.4 ± 0.95 ^{c} Like
Aroma Criteria	3.7 ± 0.68 ^{a} Like	3.7 ± 0.82 ^{a} Like	3.6 ± 0.84 ^{a} Like	3.2 ± 0.92 ^{a} Enough like	3.2 ± 0.95 ^{a} Enough like	3.8 ± 0.79 ^{a} Like
Form Criteria	4.2 ± 0.79 ^{b} Like	4.1 ± 0.74 ^{b} Like	3.9 ± 0.74 ^{b} Like	3.7 ± 0.68 ^{b} Like	2.2 ± 0.92 ^{a} Do not like	3.6 ± 1.17 ^{b} Like
Flavor Criteria	3.3 ± 1.06 ^{a} Enough like	3.1 ± 0.84 ^{a} Enough like	3.5 ± 0.97 ^{a} Like	3.1 ± 0.99 ^{a} Enough like	2.7 ± 1.60 ^{a} Enough like	4.2 ± 0.79 ^{b} Like
Texture Criteria	1.9 ± 0.67 ^{a} Do not like	3.1 ± 1.10 ^{b} Enough like	3.6 ± 0.84 ^{c} Like	3.2 ± 0.92 ^{b} Enough like	2.4 ± 1.27 ^{a} Do not like	3.6 ± 0.97 ^{c} Like
Whole Criteria	2.8 ± 0.79 ^{a} Enough like	3.5 ± 0.85 ^{b} Like	3.5 ± 0.53 ^{b} Like	3.3 ± 0.82 ^{b} Enough like	2.4 ± 0.84 ^{a} Do not like	3.8 ± 0.79 ^{c} Like

Description : Different letters in the same row indicates a significant difference (P≥0.05)
T1 = 16% commercial gelatin + 0% split bovine hide gelatin; T2 = commercial gelatin 12% + split bovinehide gelatin;
T3 = 8% commercial gelatin + split bovinehide gelatin 8%; T4 = 4% commercial gelatin + 12% split bovinehide gelatin;
T5 = 0% commercial gelatin + 16% split bovinehide gelatin, Control = commercial jelly candy.

T1 T2 T3

T4 T5 Control

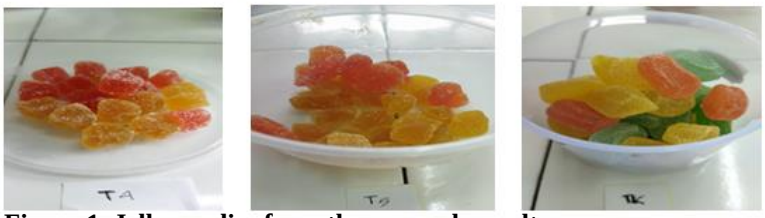

Figure 1. Jelly candies from the research results

Note: T1 = 16% Commercial Gelatin, 0% split bovine hide gelatin; T2 = 12% commercial gelatin, 4% split bovine hide gelatin; T3 = gelatin Commercial 8%, gelatin split bovine hide 8%; T4 = 4% Commercial Gelatin, 12% split bovine hide gelatin; T5 = 0% Commercial Gelatin, bovine hide gelatin splits 16%; Control = Commercial jelly candy.

Jelly Candy Colour

Colour determines the attractiveness of consumers to consume products. Colour change in a food product indicates that the product has decreased quality (Ahmad & Mujdalipah, 2017). The average preference level for candy colours research jelly is 2.2-4.3, with criteria ranging from dislike to like. The lowest hedonic test value is in the T5 treatment, with a slightly darker colour than other treatments. Dyes are polar compounds that can be bound by hydrocolloids, such as split bovine hide gelatin, so the colour of the jelly candy produced is slightly darker. According to Wijaya *et al*. (2012), hydrocolloids such as dyes can bind polar molecules in gel form.

Jelly Candy Aroma

The panellist's assessment results for aroma were 3.2-3.8 with the liking criteria for T1, T2, T3 and control, while T4 and T5 responses were 'quite like'. Panellists still liked jelly candy products with up to 8% commercial gelatin, while jelly candy products with only 0% and 4% commercial gelatin received 'quite like' responses. The decrease in the addition of commercial gelatin means an increase in the use of split bovine hide gelatin. The smell of split bovine hide gelatin was more pungent, so the panellists did not like the aroma of jelly candy products. Merging two different gelatins can reduce the fishy smell of the gelatin.

Jelly Candy Flavour

The taste test criteria for T3 and control are 'like', while T1, T2, T4, and T5 are 'quite like'. Formula T3, a combination of 8% commercial gelatin and 8% split bovine hide gelatin, is preferred by the panellists just like commercial jelly candy. The T3 jelly candy tastes sweet and sour, and the aroma of pineapple and strawberry is distinctive compared to other jelly candy treatments. The flavour is an important factor in determining the taste and whether the product is accepted by consumers (Wijaya *et al.*, 2012). Even though the product has a good appearance and shape, consumers still will not accept it if they do not like the taste. Taste is an important part of consumer buying interest (Saputra *et al.*, 2015).

Jelly Candy Shape

Organoleptic test results of the shape of the jelly candy are presented in Table 3. The shape is the design of the food product, which is assessed by the sense of sight. An attractive form of food product design will be sent to the visual nerve, stimulating the taste buds to feel it. The candy shape organoleptic test results ranged from 2.2 to 4.2, from dislike to like. The highest value of the organoleptic test results is T1, and the lowest is T5, while those that are close to commercial jelly candy are T3 and T4. The T1 treatment used 16% commercial gelatin, which gives the jelly candy a compact and uniform shape because commercial gelatin has a gel with high enough strength to provide a stable shape. In the T5 treatment, the organoleptic test value was low, and the panelists did not like it because of its irregular shape. Making jelly candy using only split bovine hide gelatin gives jelly candy an irregular shape due to its low gel strength, so it does not give a compact jelly candy shape. According to Mufida *et al.* (2020), jelly candy is determined by the gel strength value of the

gelatin. The results of his research reported that the best hedonic test was obtained by adding gelatin with high gel strength.

Jelly Candy Texture

The texture is a characteristic of a material or product that the taste and touch senses can feel. The product texture is an important factor in conveying the taste of product features (Ahmad & Mujdalipah, 2017). Mark organoleptic test texture candy average jelly with the addition of commercial gelatin is shown in Table 3. The average value of panelists liking texture ranged from 1.9 (dislike) to 3.6 (like). Panelists liked the texture of the T3 jelly candy, which has a formula of 8% split bovine hide gelatin and 8% commercial gelatin, which are formulas that produce a soft and elastic texture. This T3 treatment produced the same texture test values as commercial jelly candy. The lowest value of the texture test is in the formula T1 (1.9) and T5 (2.9). The T1 jelly candy was made from 16% commercial gelatin, so it had a texture that tended to be stiff and hard. The T5 treatment, made from 16% split bovine hide gelatin, produced soft and mushy jelly candy that the panelists disliked. Panelists liked soft and elastic jelly candy as in the T2, T3 and T4 treatments made from various split bovine hide gelatin and commercial gelatin.

Total Value of Candy Jelly

The organoleptic test from the total value of the jelly candy result is shown in Table 3. The average R score ranges from 2.4 - 3.8, from dislike to quite like and like responses. The T3 treatment with the addition of 8% commercial gelatin and 8% split bovine hide gelatin was the most preferred by the panelists because T3 showed the results of the "liked" test value for all parameters, namely color, aroma, taste, shape, texture as well as overall value. This overall perception means the 8% commercial gelatin and split bovine hide gelatin 8% variation is the right formula to produce jelly candy products.

The overall score on the T1 criterion shows that the panelists liked jelly candy from only commercial gelatin. Jelly candy made only from commercial gelatin produces products with color, aroma, and shape preferred by the panelists. At the same time, the taste and overall were quite liked, and the texture was not liked because it was too hard. The overall assessment of the T5 treatment indicated that the panellists did not like candy jelly made using only gelatin of split bovine skin. The panellists quite liked the taste but did not like the colour, shape, texture and overall value. This dislike can be caused by the texture of the jelly candy, which tends to be soft, with irregular shapes and darker colors.

Conclusion

Split bovine hide gelatin can be made into jelly candy by combining commercial gelatin as much as 8% and 8% split bovine hide gelatin. Panellists like jelly candy from a combination of commercial gelatin and split bovine hide gelatin as it has a compact, uniform shape, bright colour, soft texture, elastic and is overall favoured by panellists.

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