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Effect of butterfly-pea powder (*Clitoria ternatea L.*) and drying temperature towards physicochemical characteristics of butterfly-pea milk powder with vacuum drying method

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Abstract

Dairy product can be process into ready to drink or ready to serve. Dairy product that needs to be dissolved first usually powdered by drying. The drying method could be done using the vacuum Drying Method. This study used a 3x3 factorial design in a randomized block design which consisted of 2 factors, namely factor T (sea flower powder concentration) which consisted of 3 levels, namely t1: 0.2%, t: 0.3%, and t3: 0.4%, dan factor P (variation of drying temperature) which consisted of 3 levels, namely p1: 50 °C, p2: 60 °C and p4: 70 °C. The responses tested in this study were chemical responses including water content, antioxidant activity, pH. Physical responses include dissolution time, insoluble, hygroscopicity, L* a* b* color intensity, yield amount, and viscosity. Organoleptic responses include color, aroma, taste, and viscosity. The effect of different sea flower powder concentration affects the antioxidant activity, pH, and color intensity. The variation of drying temperature affects the water content, dissolution time, insoluble, hygroscopicity, and color intensity. The interaction between sea flower powder concentration and variation of drying temperature affects the antioxidant activity and color intensity.

Keywords: dairy product powder; butterfly pea; drying temperature; vacuum drying.

Practical Application: Concentration of natural dyes used in the manufacture of Butterfly pea milk powder.

1 Introduction

Butterfly pea (*Clitoria ternatea L.*) is one of the wild plants that are often found in the yard of the house. The butterfly pea (*Clitoria ternatea L.*) has anthocyanin pigments that produce the blue color in the butterfly pea. Based on Suebkhampet & Sotthibandhu (2011), the blue color of the butterfly pea is due to the presence of anthocyanin pigments which can also be used as natural dyes in food. Butterfly pea (*Clitoria ternatea L.*) contains phenolic compounds that can act as antioxidants by donating hydrogen so as to stabilize the electron deficiency in free radicals (Andriani & Murtisiwi, 2020).

Natural food coloring can be obtained from flowers, plants, and fruits. Natural dyes are found from pigments contained in fruits, plants, and flowers. One of the pigments as natural dyes is anthocyanin pigment. According to Pratiwi & Priyani (2019), anthocyanins are polar compounds that are easier to extract in acidic conditions. Anthocyanins have benefits as antioxidants and free radical scavengers, so they play a role in preventing aging, cancer, and degenerative diseases and others. According to Saati et al. (2016), anthocyanins are pigment compounds that are amphoteric, contributing to red, pink, purple and blue colors. The nature of its easy solubility in water makes anthocyanin pigments as natural ingredients that are widely used for consumption because they are easily absorbed by the body.

Antioxidants in butterfly pea are very beneficial for the body because they can be an antidote to free radicals so that they can reduce or even prevent the occurrence of cancer and degenerative diseases in the body. According to Saati et al. (2016), antioxidants are substances that are anti against other substances that work as oxidants. Antioxidants have an important role in helping prevent damage to healthy cells due to the presence of these free radicals.

Milk can be processed into packaged milk products that can be consumed directly or milk products that must be brewed before consumption. Dairy products that must be brewed before consumption are usually processed into powder. Powdered milk products are subjected to a drying process to remove the water content in the product, so that as a result of the drying process, milk products are produced in powder form.

Drying is the process of removing the water content contained in a material. The drying process is carried out to produce solid and dry food, so that the volume of the material is more compact, easy and space-saving in transportation, besides

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that it can reduce costs and reduce difficulties in packaging, handling, transporting and storing. Drying is basically a process of reducing the water content of a material or a relatively small separation of the material using heat energy. The result of the drying process is a dry material that has a lower moisture content (Atuonwu et al., 2011).

Making instant powder drinks can be done in an easy and inexpensive method by cooking in a pan that mixes fruit juice and sucrose and stirred until it becomes dry and in the form of a fine powder (Gabriela et al., 2020). This method can be carried out using the co-crystallization method. Co-crystallization is an encapsulation technique that utilizes sucrose or other sugars to introduce components or compounds into and between the sucrose crystals. This method is carried out by drying.

Milk powder quality is complex because it is dependent on a complex combination of physical and functional properties of milk powder (Sharma et al., 2012). For example, the dissolution behaviour of the milk powder is driven by its physical properties, such as particle size distribution and bulk density, and functional properties such as dispersibility (Oldfield & Singh, 2005).

2 Materials, tools and research methods

2.1 Ingredient

The ingredients used in the process of making butterfly pea milk powder drink are powdered butterfly pea obtained from Cihanjuang Village, Bandung City, fresh cow's milk obtained from Cattle Farms in Cihanjuang Village, Bandung City, and trehalose disaccharide sugar filler. The materials used for analysis in the research were distilled water, 2,2-Diphenyl-1-picrylhydrazil, ethanol pa, methanol pa, quercetin, pigment powder.

2.2 Tools

The tools used in the process of making butterfly pea milk powder drink are rotary drum dryer, drying oven, blender, tray, container, spatula, filter, digital scale.

The tools used for analysis in the research are oven, beaker, dropper, sized pipette, sized pipette, funnel, burette, filler, stative, clamp, measuring flask, stirring rod, desiccator, analytical balance, pliers crucible, porcelain cup, paper filter, pH meter, magnetic stirrer, viscometer, PSA (Particle Size Analyzer) and SEM (Scanning Electron Microscope) tools.

2.3 Research methods

This research consists of 2 stages of research, the first stage is preliminary research and the second stage is the main research.

2.4 Research design

The research design used was a 3x3 factorial pattern with 2 replications, so that it consisted of 18 experimental treatment units. Each powdered butterfly pea concentration factor has 3 levels, namely 0.2%; 0.3%; and 0.4%. The drying temperature variation factor has 3 levels, namely 50 °C, 60 °C, and 70 °C.

2.5 Preliminary research

In a preliminary study, it was conducted to obtain a drying time that was in accordance with the SNI for powdered milk in the main study. In this preliminary study, the process of making powdered butterfly pea and determining the drying time according to the SNI for powdered milk was carried out. The response used in the preliminary study is the water content of the gravimetric method. The treatment which has a moisture content of <5% is in accordance with the SNI for powdered milk.

2.6 Main research

The main research was carried out to determine the effect of the powdered butterfly pea concentration factor and the drying temperature variation factor. The responses included the water content of the gravimetric method, the antioxidant activity of the DPPH method, the pH value using a pH meter, the water soluble and insoluble time test, the level of hygroscopicity, color intensity, yield amount, viscosity, PSA (Particle Size Analyzer) and SEM (Scanning Electron Microscope) tools. Organoleptic response using hedonic test on the attributes of taste, aroma, viscosity, and color. The response data was then processed using the Statistical Package for the Social Science (SPSS) application.

3 Results and discussion

3.1 Preliminary research results

Based on the results of preliminary research, then the length of time drying which will be used as the dependent variable in the main research, namely drying for 6 hours, this is because the water content of the sample is in accordance with the SNI for powdered milk, which is a maximum of 5%. Determination of the drying time of 6 hours was indicated by the presence of antioxidants in the butterfly pea milk powder drink. According to Rusnayanti (2018), antioxidants cannot withstand temperatures that are too high and drying times are too long, so in this study using a drying time of 6 hours. The results of the preliminary research can be seen in Table 1.

3.2 Main research results

In the main research, the application of *Statistical Package for the Social Science* (SPSS) to obtain Analysis of Variation (ANOVA) and Duncan's Advanced Test.

Table 1. Preliminary Research Results of Water Content on the Butterfly Pea Milk Powder.

Concentration	Temperature	Drying Time	Results (%)
(t1) 0.2% w/v	(p1) 50 °C	(l1) 4 hours	7.12
		(l2) 6 hours	4.75
		(l3) 8 hours	3.84
	(p2) 60 °C	(l1) 4 hours	6.78
		(l2) 6 hours	3.54
		(l3) 8 hours	2.25
	(p3) 70 °C	(l1) 4 hours	6.45
		(l2) 6 hours	2.87
		(l3) 8 hours	1.89

3.3 Chemical response analysis results

Chemical responses in this study include the water content of the gravimetric method, the antioxidant activity of the DPPH method, and the pH value using a pH meter.

Moisture content gravimetric method

Based on the ANOVA table, it is known that the Sig (P-Value) is 0.001 (< = 0.05) so it can be concluded that in terms of the water content of the gravimetric method, the concentration of powdered butterfly pea, variations in drying temperature, and the interaction between the two have a significant effect, so further tests need to be carried out (Table 2). Duncan. The results of the lowest water content of the gravimetric method in butterfly pea milk in the t3p3 treatment with a value ranging from 2.10. The results of the highest water content gravimetric method in butterfly pea milk in the t1p1 treatment with a value ranging from 4.83.

Increasing the drying temperature can affect the moisture content of the product. This is in accordance with the statement from Budiarto et al (2022) that an increase in the drying temperature will reduce the water content of instant drinks because the higher the drying temperature, the lower the water content of the ingredients. This is because many water molecules are evaporated.

pH value using a pH meter

The pH value is one of the parameters that indicates the level of acidity or alkalinity of a sample (Table 3).

Based on the ANOVA table, it is known that the Sig (P-Value) is 0.000 (< = 0.05) so it can be concluded that in terms of the pH value of powdered butterfly pea concentration, variations in drying temperature, and the interaction between the two have a significant effect, Duncan's further test needs to be carried out.

The addition of powdered pea flower concentration can affect the pH. This is in accordance with the statement of Supriatna et al. (2022) which stated that the addition of the concentration of powdered butterfly pea had a very significant effect on pH. The addition of the concentration of powdered peas can lower the pH.

Variations in drying temperature in powdered milk powder drink can also affect pH. This is due to the process of evaporation of water due to the drying temperature. This is in accordance with the statement of Choirunisa et al. (2014), which states that the higher the drying temperature, the resulting pH tends to decrease. The decrease in pH is due to the drying temperature which plays a role in the evaporation of water.

Table 2. The Results of Water Content on the Butterfly Pea Milk Powder.

Treatment	Water Content
t1p1	4.83 ± 0.028
t2p1	4.74 ± 0.049
t3p1	4.26 ± 0.049
t1p2	3.81 ± 0.035
t2p2	3.40 ± 0.021
t3p2	3.29 ± 0.014
t1p3	2.78 ± 0.049
t2p3	2.60 ± 0.042
t3p3	2.10 ± 0.042

4 Results of physical response analysis

Physical responses in this study include:test water soluble time and insoluble part, degree of hygroscopicity, color intensity, amount of yield, viscosity,PSA (Particle Size Analyzer) and SEM (Scanning Electron Microscope) tools.

4.1 Water soluble time test

In the process of serving powdered drinks, water is needed as a solvent so that it can be consumed. Therefore, powder drinks are closely related to water. The increase in water content in food will form bonds that cause clumps to form and result in a longer time to break bonds between particles (Permata & Sayuti, 2016).

Based on the ANOVA table, it is known that Sig (P-Value) is 0.000 and 0.009 (< = 0.05) so it can be concluded that in terms of water soluble time the effect of powdered butterfly pea concentration and variations in drying temperature have a significant effect, so it is necessary to carry out further Duncan tests (Table 4).

4.2 Insoluble part

In the manufacture of powdered milk drinks are closely related to the insoluble part of water. Based on SNI 2970:2015 Powdered Milk states that the insoluble index of powdered milk is a

Table 3. The Results of pH on the Butterfly Pea Milk Powder.

Treatment	pH
t1p3	6.30 ± 0.014
t2p3	6.22 ± 0.028
t3p3	6.16 ± 0.000
t2p2	6.14 ± 0.021
t3p2	6.14 ± 0.014
t1p2	6.09 ± 0.001
t1p1	6.04 ± 0.007
t2p1	6.02 ± 0.001
t3p1	6.01 ± 0.001

Table 4. The Results of Dissolving Time on the Butterfly Pea Milk Powder.

Treatment	Late Time
t1p1	27.17 ± 0.113^{a}
t1p2	27.12 ± 0.064^{a}
t1p3	27.10 ± 0.057^{a}
t2p1	27.23 ± 0.014^{ab}
t2p2	27.20 ± 0.021^{ab}
t2p3	27.13 ± 0.000^{a}
t3p1	28,30 ± 0.134^{b}
t3p2	28.23 ± 0.198^{b}
t3p3	28.11 ± 0.001^{b}

Description: Mean treatment marked with the same letter is not significantly different according to Duncan Test at 5% level.

maximum of 1.0 mL (Badan Standar Nasional, 2015). The water insoluble part is a solid in a food material that is insoluble in water (Table 5).

Based on the ANOVA table, it is known that the Sig (P-Value) is 0.175 (> = 0.05) so it can be concluded in terms of the water insoluble part that the effect of powdered butterfly pea concentration and variations in drying temperature has no significant effect, so there is no need for Duncan's further test.

Based on the resulting data, it can be seen that in the test of the water insoluble part, the treatment that has the most water insoluble part values is the t3p1 and t2p1 treatments with the insoluble part value of 0.59%. The treatment that had the least water insoluble part value was t1p3 treatment with a water insoluble part value of 0.32%.

4.3 Hygroscopicity level

Based on the ANOVA table, it is known that Sig (P-Value) is 0.006 (> = 0.05) so it can be concluded that in terms of hygroscopicity, the effect of powdered butterfly pea concentration and variations in drying temperature has a significant effect, so Duncan's further test needs to be carried out (Table 6).

Hygroscopicity is a parameter that indicates the ability of a material to attract moisture from the surrounding air to bind to the material particles or be retained in the pores between the material particles (Fauzi et al., 2017).

Hygroscopicity level has several categories, including hygroscopicity level < 10% (less than 10%) belonging to non-hygroscopic materials, hygroscopicity level 10.1-15% belonging to slightly hygroscopic materials, hygroscopicity level 15.1-20% are classified as hygroscopic materials, the hygroscopicity level of 20.1-25% belongs to the highly hygroscopic materials, and the hygroscopicity level > 25% belongs to the very hygroscopic materials (GEA Niro Research Laboratory, 2005).

4.4 Color intensity

Based on the ANOVA table, it is known that Sig (P-Value) is 0.000 (> = 0.05) so it can be concluded that in L* color notation the effect of powdered butterfly pea concentration and variations in drying temperature has a significant effect, so Duncan's further test needs to be carried out (Table 7).

The L* notation states the level of brightness (lightness) in instant powder drinks. The L* value ranges from 0 or black to 100 or white (Widyasanti et al., 2018).

The drying temperature also has an effect on the brightness of a sample. The degree of brightness of a sample can decrease due to variations in drying temperature. This is in accordance with the statement from Fajarwati et al. (2017), which states that the higher the drying temperature, the lower the L* value or the lower the brightness level.

The notation a* denotes a mixed color of red and green. The a* value ranges from 0 to 80 which can be expressed as a red color, while the a* value ranges from -80 to 0 indicates a green color (Widyasanti et al., 2018).

Table 5. The Results of Water Insoluble Parts on the Butterfly Pea Milk Powder.

Treatment	Part No Water Soluble (%)
t1p1	0.50 ±0.078[a]
t1p2	0.39 ± 0.000[a]
t1p3	0.33 ± 0.007[a]
t2p1	0.59 ± 0.007[a]
t2p2	0.48 ± 0.042[a]
t2p3	0.39 ± 0.007[a]
t3p1	0.59 ± 0.007[a]
t3p2	0.46 ± 0.021[a]
t3p3	0.47 ± 0.007[a]

Description: Mean treatment marked with the same letter is not significantly different according to Duncan Test at 5% level.

Table 6. The Results of Hygroscopicity Level on the Butterfly Pea Milk Powder.

Treatment	Hygroscoppcity
t1p1	13.96 ± 0.021
t1p2	13.21 ± 0.014
t1p3	12.88 ± 0.007
t2p1	13.95 ± 0.000
t2p2	13.19 ± 0.007
t2p3	12.81 ± 0.007
t3p1	13.92 ± 0.014
t3p2	13.21 ± 0.007
t3p3	12.80 ± 0.014

Table 7. The Results of Color Intensity on the Butterfly Pea Milk Powder.

Treatment	L*	a*	b*
t1p1	64.23 ± 0.007	65.80 ± 0.035	-20.83 ± 0.032
t1p2	59.21 ± 0.007	48.19 ± 0.035	-20.75 ± 0.053
t1p3	44.60 ± 0.001	35.91 ± 0.035	-18.35 ± 0.007
t2p1	64.00 ± 0.001	65.56 ± 0.028	-20.04 ± 0.014
t2p2	58.92 ± 0.007	48.22 ± 0.028	-20.63 ± 0.035
t2p3	44.59 ± 0.001	35.86 ± 0.042	-18.44 ± 0.078
t3p1	64.12 ± 0.007	65.35 ± 0.014	-20.69 ± 0.021
t3p2	59.41 ± 0.007	48.17 ± 0.007	-20.80 ± 0.202
t3p3	44.71 ± 0.001	36.02 ± 0.014	-18.70 ± 0.301

The higher the drying temperature, the lower the-a value. This could be due to the fact that anthocyanins can change shape due to drying temperature. Changes in the shape of the structure into khalkones whose rings are open are labile (Adams, 1973). High temperature can cause anthocyanin color loss. This is caused by the loss of glycosyl contained in anthocyanins due to hydrolysis of glycosidic bonds (Hayati et al., 2012).

The b* notation denotes a mixed color of blue and yellow. The b* value ranges from 0 to 70 which can be expressed as yellow, while the b* value ranges from -70 to 0 which represents blue (Widyasanti et al., 2018).

The concentration of powdered butterfly pea can affect the notation value b. This is because the powdered butterfly pea has anthocyanin pigment which acts as a color giver. The addition of various powdered butterfly pea concentrations can affect the value of b notation, where the higher the concentration of butterfly pea given, the higher the value of b notation. This is in accordance with the statement of Loppies et al. (2020), which states that the diversity of anthocyanins causes the resulting color to be different, this can occur due to differences in groups in the basic structure.

4.5 Calculation of yield

Based on the ANOVA table, it is known that Sig (P-Value) is 0.947 (> = 0.05) so it can be concluded in terms of calculating the amount of yield that the effect of powdered butterfly pea concentration and variations in drying temperature has no significant effect, so there is no need for Duncan's further test (Table 8).

Yield is one of the important parameters in the product manufacturing process. Yield is the ratio between the amount (quantity) of the final product and the raw materials used. The higher the yield value, the higher the value of the final product of butterfly pea milk.

The resulting yield can be influenced by the presence of water content in a material. The drying process can cause the water content during the processing to decrease, causing a decrease in the amount of yield (Winarno, 2017). Based on this, it can be seen that the water contained in a material can affect the weight of the material, where the material that has gone through the drying process will produce less weight so that it affects the amount of yield in the final product.

4.6 Viscosity

Based on the ANOVA table, it is known that the Sig (P-Value) is 0.757 (> = 0.05) so it can be concluded in terms of viscosity that the effect of powdered butterfly pea concentration and variations in drying temperature has no significant effect, so there is no need for Duncan's further test (Table 9).

Viscosity is closely related to drying temperature. The higher the drying temperature, the higher the viscosity of a product, it can be concluded that the viscosity of a product can be affected by variations in drying temperature. The addition of powdered pea flower concentration did not affect the viscosity.

4.7 Particle Size Analyzer (PSA)

Particle Size Analyzer (PSA) is an instrument used to determine the character of the particle size distribution in a sample. The sample used can be in the form of solid, suspension, or emulsion. Testing of particle size distribution using the Dynamic Light Scattering method on stable colloid/liquid samples, or nanoparticle powder dispersed in a liquid medium. The sample must be stable i.e. not precipitate or react during the test.

Based on the Figure 1, the results of the characterization of the selected samples using PSA on a micron scale with a concentration of 0.4% powdered butterfly pea were obtained, with a drying temperature of 60 °C in the range of 5,131-25,670µm, so that the average was 15.401 µm. According to Hariadi et al. (2020), the size of the particle diameter of a powder can be influenced by the drying method used, as well as the process of destruction or dissolving of the sample. The smaller the particle size of a powder, the faster the dissolution time and the better powder solubility.

Table 8. The Results of Yield on the Butterfly Pea Milk Powder.

Treatment	Yield (%)
t1p1	9.39 ± 0.042[a]
t1p2	9.38 ± 0.141[a]
t1p3	9.33 ± 0.014[a]
t2p1	9.35 ± 0.014[a]
t2p2	9.29 ± 0.042[a]
t2p3	9.26 ± 0.057[a]
t3p1	9.08 ± 0.064[a]
t3p2	9.00 ± 0.071[a]
t3p3	8.99 ± 0.141[a]

Description: Mean treatment marked with the same letter is not significantly different according to Duncan Test at 5% level

Table 9. Results of Viscosity on the Butterfly Pea Milk Powder.

Treatment	Viscosity (cp)
t1p1	11.00 ± 0.283[a]
t1p2	10.02 ± 1.103[a]
t1p3	8.84 ± 0.396[a]
t2p1	11.53 ± 0.502[a]
t2p2	10.82 ± 0.184[a]
t2p3	8.94 ± 0.523[a]
t3p1	11.44 ± 0.658[a]
t3p2	9.47 ± 1.754[a]
t3p3	8.35 ± 1.655[a]

Description: Mean treatment marked with the same letter is not significantly different according to Duncan Test at 5% level.

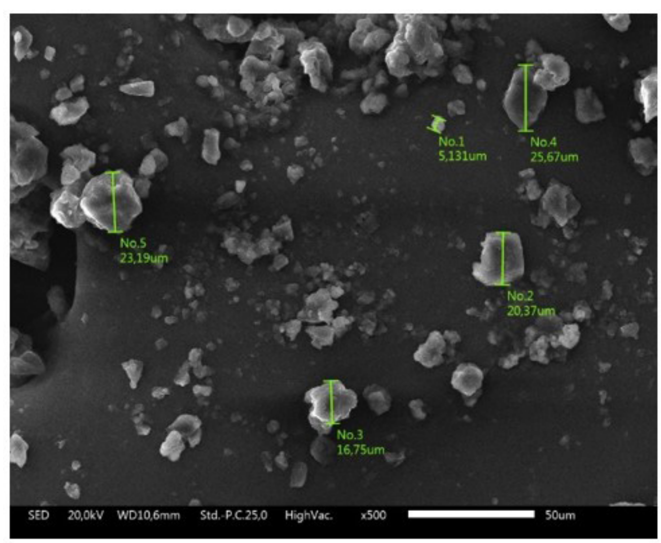

Figure 1. Particle Diameter Measurement with 500x.

4.8 Scanning Electron Microscope (SEM)

Morphological observations of the butterfly pea milk powder drink were carried out using a Scanning Electron Microscopy (SEM) instrument. This observation aims to see the size and shape of the particles in the butterfly pea milk powder drink. The sample used in the form of milk powder drink butterfly pea which has a coating process first to produce conductivity, the coating process is carried out using a conductive material, namely Au or gold. According to Adhika et al. (2019) other conductive materials that can be used are C or carbon and Pt or platinum. Coating of samples with conductive material can be done using a sputtering machine. Then the sample was put into a vacuum chamber to see the morphology of the butterfly pea milk powder drink (Figure 2).

Based on the results of nanoencapsulation using the SEM Tool above, it shows that the butterfly pea milk powder drink sample has an uneven aggregate shape with a smooth surface. In the results of nanoencapsulation with the SEM tool, it produces an uneven and thorough shape on the sample of the butterfly pea milk powder drink.

4.9 Antioxidant activity of DPPH method

Based on the Table 10, the sample of butterfly pea milk powder drink with a concentration of 0.4% butterfly pea powder and a drying temperature variation of 60 °C has an IC50 value of 1532,498 ppm. There is a classification of antioxidants that can be divided into several categories based on the IC50 value, including very strong antioxidants having IC50 values <50 ppm (less than 50 ppm), strong antioxidants having IC50 values between 50-100 ppm, moderate antioxidants which have IC50 values between 101-150 ppm, weak antioxidants which have IC50 values between 151-200 ppm.

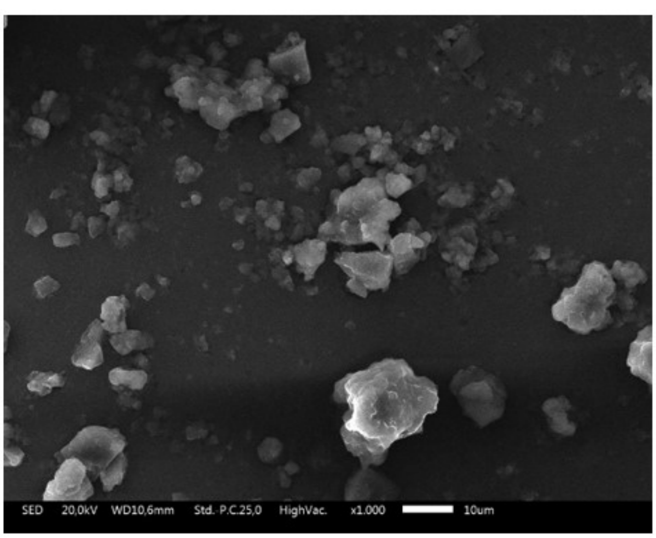

Figure 2. Results of Nano encapsulation with SEM with 1,000x.

Table 10. Results of Antioxidant Activity Analysis of Selected Samples.

Sample	Antioxidant Activity in IC_{50}. Value (ppm)
Pea flower milk powder drink	1,532.498 ± 3.350

Antioxidants are compounds that can inhibit or delay molecular oxidation reactions by inhibiting the initiation or propagation of chain oxidation reactions. The chemical structure of antioxidants, sources of free radicals, and physico-chemical properties of different sample preparations can provide various test results of antioxidant activity (Maesaroh et al., 2018).

The drying temperature can affect the antioxidant activity of the butterfly pea milk powder drink. The higher the drying temperature, the lower the antioxidant activity that can counteract free radicals. This is in accordance with Sidoretno & Fauzana's (2018) statement which states that antioxidant activity can be affected by drying temperature. If the drying temperature is too high, it will damage the antioxidants contained in the product, this is due to the antioxidant properties which are very easily damaged by heating.

5 Results of physical response analysis

The organoleptic responses in this study include the attributes of color, Flavor, and taste.

Based on the ANOVA table, it is known that Sig (P-Value) is 0.00 (< = 0.05) so it can be concluded that in terms of color attributes, powdered butterfly pea concentration, drying temperature variations, and the interaction between the two have a significant effect, so further tests need to be carried out Duncan (Table 11).

The higher the concentration of powdered butterfly pea that is given, the darker the color of the brewed butterfly pea milk which can be caused by the dissolution of the powdered butterfly pea. It is proven that with boiling water, the powdered butterfly pea will dissolve more easily (Kusuma, 2019).

Variations in drying temperature have no effect on the color change of the butterfly pea milk, this is because the anthocyanins in the butterfly pea are stable during the drying process. According to Angriani (2019), the anthocyanins in the butterfly pea are stable during hot air drying and do not experience a significant decrease in color intensity during the evaporation and pasteurization processes.

Based on the ANOVA table, it is known that the Sig (P-Value) is 0.303 (> = 0.05) so it can be concluded that in terms of aroma attributes the effect of powdered butterfly pea concentration and variations in drying temperature have no significant effect, so

Table 11. Organoleptic Results of Butterfly Pea Milk Drink.

Treatment	Color	Flavor	Taste
t1p1	6.55 ± 0.004	6.65 ± 0.025[a]	6.00 ± 0.055[a]
t1p2	6.27 ± 0.003	6.57 ± 0.002[a]	6.15 ± 0.067[a]
t1p3	6.35 ± 0.003	6.33 ± 0.027[a]	6.13 ± 0.072[a]
t2p1	6.50 ± 0.001	6.70 ± 0.056[a]	6.23 ± 0.005[a]
t2p2	6.40 ± 0.000	6.60 ± 0.055[a]	6.52 ± 0.012[a]
t2p3	6.63 ± 0.001	6.82 ± 0.006[a]	6.60 ± 0.066[a]
t3p1	6.43 ± 0.001	6.83 ± 0.063[a]	6.60 ± 0.001[a]
t3p2	6.18 ± 0.002	7.03 ± 0.009[a]	6.60 ± 0.013[a]
t3p3	6.15 ± 0.003	7.03 ± 0.027[a]	6.62 ± 0.008[a]

Description: Mean treatment marked with the same letter is not significantly different according to Duncan Test at 5% level.

there is no need for Duncan's further test. Based on the table of the average results of the original organoleptic aroma attribute data, it can be concluded that in the treatment t3p2 (0.4% eggplant concentration and drying temperature 60 °C) and t3p3 (0.4% eggplant concentration and 70 °C drying temperature) more favored with a value of 7.03, while the t1p3 treatment (0.2% butterfly pea concentration and drying temperature of 70 °C) tended to be less favored by the panelists with a value of 6.33.

The addition of powdered butterfly pea concentration does not add or change the aroma present in the butterfly pea milk, this is in accordance with the statement from Melati & Rahmadani (2020) which states that the butterfly pea is unscented, so the aroma of processed food depends on the added ingredients.

Based on the ANOVA table, it is known that the Sig (P-Value) is 0.777 (> = 0.05) so it can be concluded that in terms of taste attributes the effect of powdered butterfly pea concentration and variations in drying temperature have no significant effect, so there is no need for Duncan's further test. Based on the table of the average results of the original organoleptic data on taste attributes, it can be concluded that the t3p3 treatment (0.4% butterfly pea concentration and 70 °C drying temperature) is preferred with a value of 6.62, while in the t1p1 treatment (0.0 yam flower concentration). 2% and a drying temperature of 50 °C) tended to be less favored by the panelists with a value of 6.00.

The addition of powdered butterfly pea concentration did not add or change the taste of the butterfly pea milk, this is in accordance with the statement from Fizriani et al. (2021) which states that the addition of butterfly pea to the manufacture of cendol does not have a significant effect on taste preferences. According to Marpaung (2020a, b), butterfly pea has a taste that may not be liked, but the taste is easily covered by the addition of other ingredients.

Based on the ANOVA table, it is known that Sig (P-Value) is 0.042 (< = 0.05) so it can be concluded that in terms of viscosity attributes, powdered butterfly pea concentration, drying temperature variations, and the interaction between the two have a significant effect, so Duncan's further test needs to be carried out.

Based on the table above, it can be concluded that the results of the organoleptic test on the viscosity attribute of the panelists preferred the butterfly pea milk with the t3p2 treatment the average value of 2.70 while the t1p1 treatment got the lowest average value of 2.51.

Viscosity is closely related to drying temperature. The higher the drying temperature, the higher the viscosity of a product, it can be concluded that the viscosity of a product can be affected by variations in drying temperature. The addition of powdered pea flower concentration did not affect the viscosity.

6 Conclusion

1. The concentration of butterfly pea powder has an effect on antioxidant activity, pH, water soluble time and color intensity of the butterfly pea milk powder drink;
2. Variations in drying temperature affect the water content, water soluble time, level of hygroscopicity, and color intensity of the butterfly pea milk powder drink;
3. The interaction between powdered butterfly pea concentration and variations in drying temperature affected the antioxidant activity and color intensity;
4. The selected sample is t3p2 at a concentration of 0.4% powdered butterfly pea milk and a drying temperature variation of 60 °C has a water content of 3.30%, antioxidant activity has an IC50 value of 1532,498, a pH value of 6.13, water soluble time for 28.42 seconds, the water insoluble part is 0.45%, the hygroscopicity level is 13.20%, the L* color is 59.40, the a* color is 48.17, the b* color is -20.81, the number of yield of 9.05%, viscosity of 10.71 Cp.

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