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EFFECT OF VARIETY AND FERMENTATION ON TARO FLOUR PROXIMATE

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Abstract
Taro flour has higher protein and lower fat than rice flour. Fermentation has an important role in the degradation of complex compounds into simple compounds so that they are easily soluble. The research aims to determine the best taro varieties and determine the effect of fermentation on the taro flour proximate. The research used taro varieties Pratama 1, 2, and 3. Fermentation was carried out using tape yeast for 0 and 72 hours. The experimental design used a randomized design with 6 treatments and 4 replications. Proximate analysis was carried out on taro flour. The analysis results were tested using ANOVA. Next, a follow-up test was used to determine whether there were real differences between the various treatments using the DMRT test (Duncan Multiple Range Test). The research results showed that there were significant differences between treatments. The highest weight of flour of the Pratama 3 variety without fermentation. The highest water content is 9.67% of the Pratama 3 variety without fermentation. Ash content of Pratama 1 variety without fermentation. The highest fat content in Pratama 3 without fermentation. The highest protein content in Pratama 3 with fermentation. The highest carbohydrate content in Pratama 1 with fermentation.

Keywords: Fermentation, Taro, Variety.

1. Introduction

Taro is one of the food crops that is often found in the district Banjarnegara. Taro is a type of tuber. Taro can be used into various kinds of food preparations, one of which is taro flour which has high commercial value. Taro flour has a higher protein content value and has a low fat content when compared to native flour from rice (Hadijah & Adriani, 2020). Processing taro into flour is one of the things efforts to extend the shelf life of taro.

Processing taro into taro flour too can increase the economic value of taro as well as an effort to diversify taro processing. Several studies that have been carried out regarding taro flour state that Taro flour in the process of making lamb meatballs can substitute for the use of flour flour as much as 50% in one process stage (Nubatonis et al., 2022).

Research (Mulyati, 2015) taro flour can be used as an ingredient in making baked brownies composite with the addition of sweet potato flour. According to research (Rostianti et al., 2018), Taro flour produced from the Beneng taro variety has low protein content compared to wheat flour. In research (Prakarsa, 2016), comparing flour Fermented taro uses Aspergillus Oryzae and lactobacillus bacteria platarum with taro flour without fermentation. Taro has various types and in Indonesia taro is divided into three types namely Bogor taro (Colocasia esculenta), kimpul or Belitung taro which has the name Latin Xanthosoma sagittifolium) and Padang taro which has the Latin name Colocasia gigantean. Recently, the Pratama variety of taro has been developed with the Pratam type 1, Primary 2 and Primary 3. Physical characteristics can be observed and there are differences between them 1 type of variety with other varieties.

The fermentation process is a process of breaking down the sugar content in the ingredients so it's easy to digest. The fermentation process has an important role in degradation of complex compounds present in materials into simple compounds so that dissolves easily (Sofia Murtini et al., 2016). There is a process Fermentation in processing taro flour is expected to degrade complex compounds so it has a better proximate value compared to flour taro without fermentation. Based on the background above, the problem

that underlies this research can be formulated is to find out which taro variety produces the best proximate content of taro flour and to find out how fermentation affects the proximate content of taro flour produced. The expected benefit of this research is to be able to find out the best taro varieties that can be used in processing taro flour so that it can increase the shelf life and economic value of taro.

2. Methods

This research uses taro varieties Pratama 1, Pratama 2, and Pratama 3. Process Fermentation was carried out using tape yeast for a time of 0 and 72 hours. Study planned to be implemented in the Agricultural Product Processing Laboratory and Production Unit Banjarnegara Polytechnic Agroindustry Study Program. This research was carried out for 3 (three) month. This research applies experimental research methods. The experimental design used was a completely randomized design of 6 treatments with 4 replications. Flour The finished taro is subjected to proximate analysis including water content, ash content, fat, protein and carbohydrate. The results of the analysis were then tested using ANOVA to determine the effect between treatments. Next, a follow-up test is used to determine whether there is a difference significant difference between various treatments using the DMRT (Duncan Multiple Range Test). The materials used in this research include taro, yeast tape, and water. The flour produced was analyzed proximately to determine the quality of taro flour generated. Analysis of water content and ash content using the thermogravimetric method, analysis fat using the Soxhlet method, protein analysis using the Kjeldhal method and analysis carbohydrates using total sugar analysis with the phenol method.

3. Results and Discussion

Tepung talas diolah dengan pengeringan talas segar menggunakan udara panas sehingga terjasi agregat butiran pati selama proses penyimpanan. Proses pengolahan tepung talas mengakibatkan denaturasi parsial pada protein sehingga memiliki daya rekat yang lebih tinggi dibandingkan dengan talas segar (Deguchi et al., 2021). Taro is a tuber that has the advantage that the starch in taro is easy to digest because it has very small starch granules, namely 1-4μm (Saputri et al., 2018). According to (Hadijah & Adriani, 2020), taro flour has a better nutritional composition compared to rice flour. Taro flour has a lower fat content than rice flour and has a higher protein content at relatively the same water content. Taro flour is made using taro ingredients of the Pratama 1 variety, pratama 2, and pratama 3. The process of processing taro flour is divided into 2, namely without fermentation and using fermentation with the addition of yeast tape for a long fermentation time for 72 hours. Processing taro flour begins with selecting the taro based on its variety, peeling the taro skin, washing, reducing the size and separating the taro into 2, namely fermented and non-fermented. Processing taro flour by fermentation using yeast tape is soaked for 72 hours then dried. Meanwhile, those without fermentation were dried using a cabinet dryer at a temperature of 80 C for 4 hours. After the drying process until dry chips are formed, the flouring process is then carried out until it becomes taro flour. Processing of taro flour is done by fermentation and without fermentation. Processing taro flour uses different varieties to find out whether there is an influence on the flour produced. The taro that will be made into flour is peeled, the skin is cleaned and then washed thoroughly using running water. The

taro is then sliced thinly using a slicer. After thinly slicing the taro, it is dried using a food dehydrator at 60 °C for 4 hours, then ground and sieved. The finished taro flour is packaged using OPP plastic and weighed. Fermented taro flour, after being thinly sliced, is soaked in air with yeast added. The fermentation process is carried out for 72 hours. The results of research on taro flour can be seen in the following table

Table 1. Weight Of Taro Flour Produced By Treatment

Treatment	Pratama 1 (gr)	Pratama 2 (gr)	Pratama 3 (gr)
Non Fermentation	104	114	108
	117	100	130
	119	73	121
	104	142	116
Fermentation	53	62	91
	44	54	63
	53	63	74
	57	63	90

The weight of the flour obtained was carried out by an Anova test and the following results were obtained:

Table 2. ANOVA analysis of flour weight

Treatment	Flour Weight
P1F0	111.0000 c
P2F0	107.2500 c
P3F0	118.7500 c
P1F1	51.7500 a
P2F1	60.5000 ab
P3F1	79.5000 b

From the analysis table, it was found that there were significant differences between treatments in the flour produced. The highest flour weight was obtained using pratam 3 variety taro without fermentation. The fermentation treatment carried out in processing mocaf flour produces less flour compared to flour carried out without fermentation. According to (Adi Wira Kusuma et al., 2020), fermentation has the basic principle of activating certain microbes so that it can change the properties and structure of the resulting material to be more beneficial by involving bacterial, yeast and mold microbes. According to (Siletty et al., 2022), processing taro flour using the best cinebar variety in 72 hour fermentation compared with different fermentation times and in closed container conditions. According to (Tari et al., 2021), the fermentation process affects the water content, yield and free fat content of the VCO studied. According to (Adamafio et al., 2010) fermentation can reduce the starch and fat content in fermented cassava skin.

The results of the proximate analysis can be seen in the following table

Table 3. Table of proximate analysis results

Code	Water content (%)	Ash content (%)	Fat (%)	Protein (%)	Carbohydrates (%)
V1F0	9.45	2.98	0.85	4.74	81.98
V1F1	9.01	2.44	0.70	4.98	82.88
V2F0	9.27	2.40	0.89	6.39	81.05
V2F1	9.64	2.65	0.58	6.53	80.60
V3F0	9.67	2.63	0.98	7.57	79.15
V3F1	9.21	2.75	0.65	7.71	79.67
Method	oven	tanur	soxhlet	kjeldhal	By different

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From the proximate analysis data obtained on average, the highest water content was 9.67% obtained from processing taro flour using Pratama 3 variety without fermentation and the lowest water content was obtained from processing Pratama 1 variety taro with tape yeast fermentation and a fermentation time of 72 hours. Water content was analyzed using the oven method by heating for 24 hours at a temperature of 105 °C. . According to (Akbar, 2019), the water content component in food is an important component that can affect the shelf life of food. The lower the water content of the taro flour produced, the longer the shelf life of the flour will be if good packaging and storage is carried out. According to (Akbar, 2019), the water content component in food is an important component that can affect the shelf life of food. The lower the water content of the taro flour produced, the longer the shelf life of the flour will be if good packaging and storage is carried out. The ash content was analyzed using the kiln method and the highest ash content was obtained from Pratama 1 variety taro without fermentation at 2.98% and the lowest ash content was obtained when processing taro flour using Pratama 2 variety taro without fermentation at 2.40%. The results of the ash content analysis were lower than research (Permata et al., 2019) with an ash content of 3.28% using taro tales. The results of the ash content are above the standard quality of SNI 3751-2009 for wheat flour, namely a maximum of 0.7%. High ash content indicates that there are impurities in the flour caused by poor processing.

The fat content obtained from taro flour was analyzed using the Soxhlet method with the results of the highest fat content being found in flour made from taro Pratama 3 without fermentation treatment at 0.98% and the lowest fat content at 0.58% obtained from flour made from taro Pratama 2 using fermentation. . Protein content testing was obtained using the kjeldhal method with the highest protein content obtained in Pratama 3 variety taro flour with 72 hour fermentation. Meanwhile, the lowest protein content was found in pratama 1 variety taro flour without fermentation. Carbohydrate testing on taro flour was carried out using the by different method which obtained the highest results for Pratama variety 1 taro flour with fermentation and the lowest carbohydrate content was obtained for Pratama 3 taro flour without fermentation. According to (Marchamtia Sarah Nur Awalia Fajari & Qurrohman, 2021), taro flour has a high carbohydrate content of between 70 -80% compared to other flours.The proximate of taro flour without fermentation treatment can be seen in figure 1 and the proximate of taro flour using fermentation for 72 hours can be seen in figure 2:

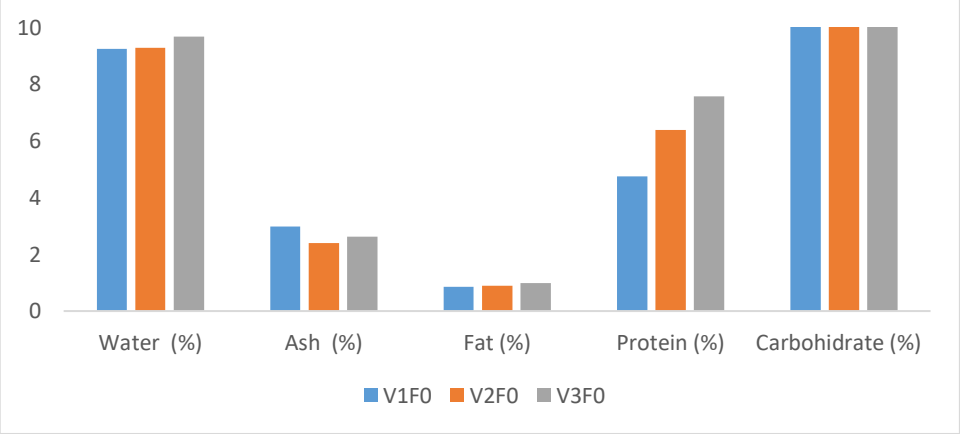

Figure 1. Proximate graph of taro flour without fermentation

The proximate graph of taro flour without fermentation shows that the highest water content was found in Pratama 3 variety taro at 9.67%. The highest ash content was found in Pratama 1 variety taro flour at 2.98% and the highest fat content was found in Pratama 3 variety taro flour at 0.98%. The highest protein content in taro flour variety 3 was 7.57% and the highest carbohydrate content in taro flour using pratama 1 variety was 9.81%.

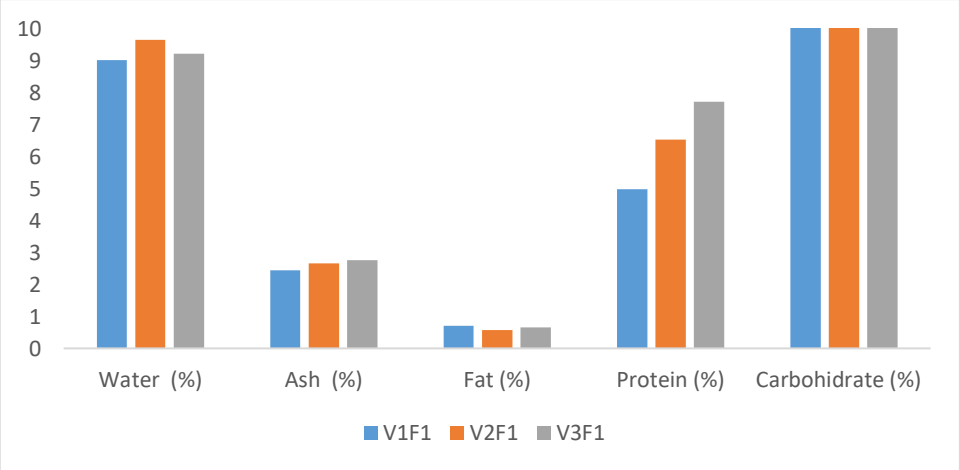

Figure 2. Proximate graph of fermented taro flour

According to (Nurani et al., 2013), the long fermentation time to produce modified flour will take place optimally if the active microbes are able to produce cellulase enzymes. The proximate graph of taro flour using fermentation shows that the highest water content was found in Pratama 2 variety taro at 9.64%. The highest ash content was found in Pratama 3 variety taro flour at 2.75% and the highest fat content was found in Pratama 1 variety taro flour at 0.70%. The highest protein content in taro flour variety 3 was 7.71% and the highest carbohydrate content in taro flour using pratama 1 variety was 8.82%.

From the research results, it was found that the water content was below 12%, which is in accordance with the 2019 SNI standard regarding quality assurance for flour. Ash content is a mineral element that remains after the material is burned until it is carbon free. This ash content can also be interpreted as a component that does not evaporate easily, which remains during the combustion process and the incandescence of organic compounds. Fat is a macro compound that has the highest energy value compared to carbohydrates and protein. Fat is also widely used as a flavor and provides a better texture to products, but this fat can also be used as a parameter for spoilage of food ingredients with its rancidity. The increase in protein levels is obtained from the activity of protease enzymes produced by microbes in the fermentation process. The longer fermentation time causes the population of Lactobacillus plantarum to increase, thereby increasing the dissolved protein levels (Tandrianto et al., 2014). Carbohydrates in flour consist of carbohydrates in the form of simple sugars, pentoses, dextrins, cellulose and starch. Starch is the main component of carbohydrates which is very important in determining flour quality requirements. Processing taro flour using a fermentation and non-fermentation process produces different weights of flour. During the fermentation process, the cellulose in the cassava is destroyed to a soft texture and the walls of the starch granules are punctured. The longer the fermentation time, up to a certain time, the more the cellulose walls will break, resulting in a decrease in yield

(Darmawan et al., 2013). From the research results, the protein content produced was lower than research conducted by (Bintanah et al., 2021) namely 9.29% using clear taro. The low protein content in taro flour is less than 10% resulting in lower swelling power of the flour. According to (Nurhidayanti et al., 2023), taro flour per 100 grams has a protein content of 3.9%. According to (Hasnelly, Ina Siti Nurminabari, 2020), taro has a high amylose content ranging from 20 – 25%.

4. Conclusion

The results of research on the weight of taro flour produced using fermentation and without fermentation had a significant effect. The amount of flour produced using fermentation weighs less than taro flour produced without the fermentation process. The taro used to produce the best weight of flour uses Pratama 3 variety taro without fermentation. The proximate results of taro flour based on the highest water content were obtained from Pratama 3 variety taro without fermentation and the lowest water content used Pratama 1 variety taro with fermentation. The highest ash content was obtained from Pratama 1 variety taro without fermentation and the lowest ash content was obtained from Pratama 3 variety taro with fermentation. The highest fat content was obtained from Pratama 3 variety taro without fermentation and the lowest fat content was obtained from Pratama 3 variety taro with fermentation. The highest protein content was obtained from Pratama 3 variety taro with fermentation and the lowest protein content was obtained from Pratama 2 variety taro without fermentation. The highest carbohydrate content was obtained from Pratama 1 variety taro with fermentation and the lowest carbohydrate content was obtained from Pratama 3 variety taro without fermentation. The results of research on the weight of taro flour produced using fermentation and without fermentation had a real effect. The amount of flour produced through fermentation weighs less than taro flour produced without the fermentation process. The taro used to produce the best weight of flour uses Pratama 3 variety taro without fermentation. The proxy results for taro flour based on the highest water content were obtained from the Pratama 3 variety taro without fermentation and the lowest water content was obtained from the Pratama 1 variety taro with fermentation. The highest ash content was obtained in Pratama 1 taro variety without fermentation and the lowest ash content was obtained in Pratama 3 taro variety with fermentation. The highest fat content was obtained in the Pratama 3 variety taro without fermentation and the lowest fat content was obtained in the Pratama 3 variety taro with fermentation. The highest protein content was obtained in Pratama 3 taro variety with fermentation and the lowest protein content was obtained in Pratama 2 taro variety without fermentation. The highest carbohydrate content was obtained in Pratama 1 taro variety with fermentation and the lowest carbohydrate content was obtained in Pratama 3 taro variety without fermentation. It is hoped that the results of this research will provide options for the taro varieties used and the fermentation process carried out which can produce taro flour with the best proximate content. The obstacle in this research is that the results of the best proximate analysis of taro flour cannot be produced by 1 type of taro variety used. This means that it cannot be determined which taro variety is the best. The high levels of ash produced and the low levels of protein produced by taro flour are probably caused by a lack of cleanliness in the processing process and a lack of yeast. Further research is needed regarding the length of fermentation with a

more varied time span as well as the amount of yeast and type of yeast used to determine the effectiveness of fermentation and the best taro varieties.

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