

A nutrient analysis of various taro varieties in the Sangihe Islands region

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ABSTRACT

The Sangihe-Talaud region hosts several taro varieties whose nutritional composition in raw, steamed, and fried states remain unknown. This study examined these varieties, their processing methods, and their impact on taro's nutritional components, encompassing energy, protein, fat, carbohydrates, dietary fiber, ash, calcium, phosphorus, iron, vitamin C, moisture content, and sensory preferences. The investigation encompassed Macape Marramu, Macape Darrana, and Allae Mawira taro types subjected to raw, steamed, and fried treatments. In this study, the researchers employed a complete randomized design with two factors and four replications. The findings revealed diverse effects of treatments and their interactions on taro's nutritional profile. Treatment A₁B₂ yielded the highest energy content at 116.6. The maximum protein content was observed in treatment A₂B₂. Treatment A₃B₂ exhibited the highest fat content at 6.87, whereas A₁B₁, while not significantly different from A₂B₁ You₃B₁, showed lower fat content. Treatment A₂B₂ registered the highest carbohydrate content at 89.27. Treatment A₁B₂ produced in the highest dietary fiber at 4.28. The lowest ash content was in treatment A₁B₁, while the highest was observed in treatment A₃B₂ at 1.07. Treatment A₃B₂ recorded the highest calcium at 125%. The maximum phosphorus content was noted in treatment A₃B₂, whereas the minimum was in A₂B₀. Treatment A₃B₂ exhibited the highest iron content. The richest vitamin C content emerged in treatment A₂B₂ at 15.79. The lowest moisture content was observed in treatment A₁B₂, which was not significantly different from A₂B₂ (Macape Darrana; fried). Meanwhile, the highest moisture content was observed in treatment A₂B₀.

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1. INTRODUCTION

Taro (*Colocasia esculenta* [L.] Schott) stands as a vital food source, providing not only the tuberous root for carbohydrate intake but also other essential nutrients, fulfilling caloric needs. Addressing food scarcity remains an ongoing global challenge, particularly in developing countries with rapidly growing populations. One approach to bolstering food resources involves harnessing natural assets and agricultural yields, thereby promoting the utilization of new food sources and diversification efforts (Aremu et al., 2021).

Several countries, such as the Philippines, Colombia, Japan, Brazil, and the United States, have widely adopted taro utilization. In Hawaii, taro serves as a primary food source for the population, while its tuberous roots are processed into raw materials for the food industry (Junaidi et al., 2024). In Indonesia, particularly on Java and Madura islands, various forms of taro exist, each bearing distinct regional names. For instance, based on maturity until the tubers are ready for harvest, taro is categorized as follows: (1) "talas genjah" (Java), "talas hawara" (West Java), or "talas nyama" (Madura) for taros requiring 3-5 months until harvest, and (2) "talas jero" (Java), "talas leuir" (West Java), or "talas jombang" (Madura) for taros requiring 8-12 months until completion.

The variation in taro names across different regions is sometimes based on the size of the tubers. In Javanese culture, taro is categorized as follows: (1) "talas pandan" (taros with small tubers), (2) "talas beureum" or "talas ronjok" (taros lacking tubers), and (3) "talas bull" (taros possessing large tubers) (Lantemona & Boka, 2023). In Indonesia, taro tubers serve as a staple food, notably in several areas (eg, Sorong Regency [Papua] and Maluku). Beyond a primary food source, taro is consumed in various forms, such as boiled, steamed, mashed, taro chips, sweet dishes like "kolak," and others (Sakhale & Giri, 2019). Taro flour, extracted for use as an alternative to wheat flour, finds application in making bread, cakes, thickeners, and even specialized foods like baby food (Giri et al., 2019).

Considering the current situation in which food shortages may arise due to prolonged monetary and economic crises in Indonesia, it becomes crucial to highlight alternative food sources that can be consumed by the public yet have unknown nutritional content (Olivia et al., 2020). In North Sulawesi, specifically in Sangihe Islands Regency and Talaud Islands Regency, several taro varieties are yet to undergo assessment for their nutritional content, whether raw, steamed, or fried, despite being a staple food in the areas. Moreover, the available foundational data on taro's nutritional value is generally limited (Sparrow et al., 2020).

Considering this reality, it is highly essential to conduct research to gather basic nutritional data for various types of taros, whether they are raw, steamed, or fried (Savin-Baden & Major, 2023). This information could prove valuable for individuals in need, as well as for both the food and non-food industries. It would aid them in selecting the suitable type of taro and its processing method based on their specific needs (Nagar et al., 2021).

2. METHOD

The material used was 7 month old taro tubers obtained from farmers in Ammat village, Rainis District, Sangihe Talaud Regency. There are three types of local taro used in the research, namely, Macapo marramu, which has rather dark green leaves, purple-white veins, purple midribs and purple tubers, Macape darrana, which has green leaves, yellowish-white veins at the base and purple and pale yellow tubers, Allae mawira, has slightly dark green leaves, white leaf veins, yellowish green midrib and white tubers. Materials for analysis are concentrated sulfuric acid, mercury oxide, calcium sulfate, sodium hydroxide solution, sodium thiosulfate, saturated boric acid solution, 0.02 N HCl solution, diethyl ether, antifram agent, asbestos, 95% alcohol, ammonium oxalate, methyl red, acetic acid, ammonium hydroxide, sulfuric acid, potassium permanganate, molybdate solution, aminaphtholsulphoric acid solution, standard phosphorus solution, saturated potassium persulfate solution (KS₂O₈), potassium tycyanate (KSCN) 3 N, standard iron solution, starch 1%, iodine 0.01 N, distilled water. The tools used are a calorimeter, a complete Kjeldahl water heater connected to a steam sucker via an aspirator, a Kjeldahl flask, a burette, a Soxhlet extraction tool, an electric heater, an oven, an analytical scale, a 600 ml Erlenmeyer, a return cooler, filter paper, a spatula, a desiccator, a cup. ashing, ashing furnace, spectrophotometer. Hypothesis testing was carried out using the F. Ho test: $A_1' = 0$, it is suspected that the type, processing method and interaction do not have a different influence on the nutritional content of taro. H1: $A_1' = 0$, it is suspected that the types of processing methods and their interactions have different influences on the nutritional content of taro. If from the analysis the calculated F variance is smaller than the F table ($F_{hit} < F_{table}$), then Ho is accepted. But if F count is greater than F table ($F_{hit} > F_{table}$) then Ho is rejected. If from the analysis there is no variation, the calculated F is greater than the F table, which means there is a significant difference, then the analysis is continued to find out which treatment has the most significant effect using the "Least Significant Difference Test."

3. RESULTS AND DISCUSSION

3.1 Energy

Table 1. Energy Content in 100 grams of Taro (Cal)

Treatment	Test				Average
	1	2	3	4	
A1 B0	97.5	97.4	97.6	97.48	97.50
A1 B1	92.9	92.86	92.92	92.85	92.88
A1 B2	117.58	115.96	116.60	116.26	116.6
A2 B0	93.1	93.15	93.08	93.12	93.11
A2 B1	91.7	91.78	91.83	91.76	91.77
A2 B2	115.91	114.48	115	115.28	115.17
A3 B0	87.6	87.68	87.72	87.64	87.66
A3 B1	83.42	83.46	83.39	83.38	83.41
A3 B2	107.67	114.02	115.98	116.09	113.44

The results of statistical analysis of taro energy in the appendix show very significant differences in all treatments, thus the null hypothesis is rejected and the alternative hypothesis is accepted. The taro types macape marramu (A1), macape darrana (A2) and Allae mawira (A3) have the highest energy obtained from the processing method by frying (B2) and the lowest by steaming (B1). The treatment that produces the highest energy is A, B₂(macape marramu, fried 116.6) and lowest at A3 B1 (allae mawira, steamed). Fried taro generally produces the highest energy because both carbohydrates, fat and protein increase, especially fat which may be obtained from the cooking oil used. This automatically increases the energy content of the taro and is in accordance with the opinion of Setyadi, & Ninsix, (2019) that the important components for producing energy are carbohydrates per gram producing 4 cal, fat 9 cal and protein 2 cal. Steamed taro produces less energy than raw or fried. This is due to the decrease in protein and fat content, although carbohydrates (char hydrate) increase, the possibility of the starch contained being converted into glucose by heating so that the energy produced also decreases. This is in accordance with Alifianita (2022) that polysaccharides such as starch are found in many cereals and tubers.

3.2 Proteins

Table 2. Protein content in 100 gr of taro (gr)

Treatment	Test				Average
	1	2	3	4	
A1 B0	1.46	1.42	1.48	1.45	1.45 a
A1 B1	0.87	0.86	0.87	0.86	0.87 b
A1 B2	0.61	0.62	0.62	0.62	0.62 c
A2 B0	0.75	0.82	0.81	0.78	0.79 d
A2 B1	0.78	0.79	0.82	0.79	0.80 e
A2 B2	0.23	0.23	0.24	0.25	0.24 f
A3 B0	1.30	1.37	1.31	1.36	1.34 g
A3 B1	0.87	1.01	0.97	0.88	0.93 h
A3 B2	0.86	0.84	0.9	0.88	0.87 i

The results of statistical analysis of taro protein in Appendix 2 show very significant differences for all treatments and their interactions. Thus, the null hypothesis is rejected and the alternative hypothesis is accepted. Taro types macape marramu (A1), macape darrana (A2) and allae mawira (A3), the highest protein was obtained from raw taro (Bo) and the lowest from frying (B2). The BNT test results showed that treatments A, B (raw macape marranu) were very significantly different from the other treatments and gave the highest protein yield, namely 1.45, while the lowest was in treatment A₂B₂(macape darranu, fried) namely 0.24.

The protein content of taro that is fried has decreased, this may be due to the genetic differences in each type of taro so that the process of dissolving the protein is also not the same. This is in accordance with the opinion of Antar Lina (1991). Too much heat will result in a loss of taste and a decrease in nutritional value. There are three types of reactions that reduce nutritional value if heating is not done properly, namely Amino Acid Oxidation, changes in amino acid bonds, so that absorption is disrupted and new bonds are formed which digestive enzymes are no longer

able to digest. Too much heating causes burning, as does frying for too long (Ihromi, S., Marianah & Susandi, 2018).

3.3 Fat

Table 3. Fat content in 100 gr of taro (gr)

Treatment	Test				Average
	1	2	3	4	
A1 B0	0.13	0.12	0.12	0.14	0.13 a
A1 B1	0.04	0.04	0.03	0.05	0.04 b
A1 B2	6.54	6.4	6.43	6.38	6.44 c
A2 B0	0.21	0.17	0.18	0.20	0.19 d
A2 B1	0.06	0.04	0.05	0.06	0.05 b
A2 B2	5.9	5.97	6	5.92	5.95 e
A3 B0	0.11	0.15	0.13	0.12	0.13 a
A3 B1	0.08	0.06	0.08	0.07	0.07 b
A3 B2	6.87	6.77	6.98	6.87	6.87 f

The results of the statistical analysis of taro fat in Appendix 3 show very significant differences between all treatments and their interactions. Thus, the null hypothesis is rejected and the alternative hypothesis is accepted. Taro types Macape marramu (A1), Macape darrana (A2) and Allae mawira (A3). The highest fat is obtained by frying (B2) and the lowest by steaming (B1). The BNT test results show that the A3 B2 treatment is very significantly different from the other treatments and. gave the highest fat yield, namely 6.87, while treatment A1 B1 (macape marramu, steamed) gave the lowest fat yield even though this treatment was not significantly different from A2 B1 (macape darrana, steamed), and A3 B1 (allae mawira, steamed).

The results of this research state that fat is not only formed by one type of glyceride molecule, but is a mixture of various glycerides (Melani et al., 2022). The differences in fatty acids contained in fats cause differences in their properties. Fats that contain long chain fatty acids will have a higher melting point. compared to short chain fatty acids. Apart from that, the higher the degree of unsaturation, the lower the melting point of the fat (Tuarita, 2017).

3.4 Carbohydrates (Charcoal Hydrates)

Table 4. Carbohydrate content in 100 gr of taro (gr)

Treatment	Test				Average
	1	2	3	4	
A1 B0	26.33	26.0	25.99	26.02	26.09 a
A1 B1	27.15	27.15	27.43	27.28	27.25 b
A1 B2	88.3	88.41	88.38	88.46	88.39 c
A2 B0	24.27	24.24	24.06	24.24	24.20 d
A2 B1	28.13	28.02	28.02	28.03	28.05 e
A2 B2	89.16	89.48	89.18	89.25	89.27 f
A3 B0	25.6	25.27	25.64	25.58	25.52 a
A3 B1	26.85	27.41	27.09	27.39	27.19 b
A3 B2	86.53	86.89	86.46	86.48	86.59 g

The results of statistical analysis of carbohydrates from taro in Appendix 4 show very significant differences in all treatments and their interactions. Thus, the null hypothesis is rejected and the alternative hypothesis is accepted. Taro types are macape marramu (A1), macape darrana (A2) and alla mawira (A3). The highest carbohydrates are obtained from the fried processing method (B2) and the lowest from raw or unprocessed (B0). Treatment A2 B2 (macape darrana, fried) gave the highest result, namely 89.27, while the lowest carbohydrate was obtained from treatment A2 B0 (macape darrana, raw) and this treatment was very significantly different from the other treatments.

According to Antarline (1991) each carbohydrate source material contains starch in different amounts because the genetic characteristics of each ingredient are not the same and thus the carbohydrate content is different. Steamed taro generally experiences an increase in carbohydrates, this is due to the water evaporating during heating so that the water content of the taro decreases which results in an increase in total solids, in this case carbohydrates, as well as for fried taro, the decrease in water automatically increases the total solids content including carbohydrates. . This is in accordance with Prihatiningrum's opinion which states that reducing the water content in food ingredients will cause the ingredients to contain compounds such as protein, carbohydrates, fats and minerals in higher concentrations. Data on carbohydrates from taro

presented by the Directorate of Nutrition of the Indonesian Ministry of Health (1981) is greater than that produced by these three types of taro, especially raw.

3.5 Fiber

Table 5. Fiber Content in 100 gr of Taro (gr)

Treatment	Test				Average
	1	2	3	4	
A1 B0	1.62	1.69	1.60	1.65	1.64 a
A1 B1	1.02	1,036	1.01	1.04	1.03 b
A1 B2	4.3	4.27	4.28	4.27	4.28 c
A2 B0	1.53	1.61	1.62	1.58	1.59 a
A2 B1	1.17	1.18	1.16	1.21	1.18 d
A2 B2	3.81	3.84	3.82	3.82	3.82 e
A3 B0	1.85	1.90	1.73	1.88	1.84 f
A3 B1	1.43	1.67	1.56	1.58	1.56 a
A3 B2	4.31	4.1	4.14	4.15	4.18 g

The results of statistical analysis of taro fiber in Appendix 5 show very significant differences in all treatments and their interactions. Thus, the null hypothesis is rejected. Taro types are macape marramu (A1), macape darrana (A2) and allae mawira (A3). The highest fiber is obtained by frying (B2) and the lowest by steaming (B1). The treatment that produced the highest fiber was A1 B2 (macape marramu, fried), namely 4.28 and this treatment was very significantly different from the other treatments, while the lowest fiber was produced by treatment A1 B1 (macape marramu, steamed). Fiber is the part of food that is not systematically digested (Ardaningsih, 2021), whereas (PRAMESSHELLY, 2019) defines crude fiber as insoluble materials left behind after acid and alkaline hydrolysis (boiling food with a solution of sulfuric acid and sodium hydroxide).

3.6 Ash

Table 6. Ash content in 100 gr of taro (gr)

Treatment	Test				Average
	1	2	3	4	
A1 B0	0.92	0.85	0.99	0.88	0.91 a
A1 B1	0.75	0.81	0.79	0.78	0.78 b
A1 B2	0.8	0.81	0.82	0.80	0.81 b
A2 B0	0.91	0.88	0.93	1.02	0.94 c
A2 B1	0.89	0.95	0.92	0.94	0.93 ac
A2 B2	0.82	0.76	0.76	0.80	0.79 b
A3 B0	1.18	0.97	1.10	1.02	1.07 e
A3 B1	30.91	1.03	0.95	0.98	0.97 d
A3 B2	0.89	0.94	0.97	0.95	0.94 cd

The results of statistical analysis of taro ash content in Appendix 6 show very significant differences in all interaction treatments, thus hypothesis 0 is rejected. The three types of taro above generally produce the highest ash content in the raw form (B₀). The treatment that produced the lowest ash was A1B1 (macape marramu, steamed) although this treatment was not significantly different from treatments A1B2 and A2B2. Raw allae mawira type taro produced the highest ash content, namely 1.07, and this treatment was very different from other treatments. The decrease in ash in steamed and fried taro may be because when it is steamed/heated, there is a loss of minerals which also decreases.

3.7 Calcium

Table 7. Calcium content in 100 gr (mg)

Treatment	Test				Average
	1	2	3	4	
A1 B0	28.39	28.53	28.58	28.52	28.51 a
A1 B1	28.28	27.92	23.98	27.87	28.01 a
A1 B2	103.52	102.02	102.79	102.37	102.68 b
A2 B0	26.08	26.42	26.31	26.10	26.23 ac
A2 B1	25.33	25.23	25.34	25.54	25.36 c
A2 B2	71.52	70.91	71.05	71.32	71.2 d
A3 B0	29.33	28.86	29.22	29.18	29.15 a
A3 B1	29.67	29.72	29.54	30.21	29.79 a
A3 B2	126.52	123.80	126.18	125.92	125.6 e

The results of statistical analysis of calcium from taro in Appendix 7 show very significant differences between all treatments and their interactions, thus the null hypothesis is rejected. For taro types macape marramu (A1), macape darrana (A2) and allae mawira (A3), the highest calcium content is obtained by frying (B2). Meanwhile, the lowest was the steamed method (B1), although when compared with the raw/unprocessed method (BO), the results were not significantly different.

3.8 Phosphorus

Table 8. Phosphorus content in 100 gr of taro (mg)

Treatment	Test				Average
	1	2	3	4	
A1 B0	54.24	53.57	54.06	53.54	53.85 ab
A1 B1	54.36	54.25	54.39	54.33	54.33 b
A1 B2	183.7	181.09	182.42	181.71	182.23 c
A2 B0	48.95	49.08	49.45	48.85	49.08 d
A2 B1	52.93	53.07	52.82	52.87	52.92 a
A2 B2	177.66	175.64	176.36	176.76	176.61 e
A3 B0	58.67	58.51	59.26	58.83	58.82 f
A3 B1	57.09	57.28	57.04	56.89	57.08 g
A3 B2	215.54	210.69	214.24	214.64	213.78 h

The results of statistical analysis of the phosphorus content of taro in Appendix 8 show very significant differences between all treatments and their interactions, thus the null hypothesis is rejected. Macape marramu type taro (A1) has the highest phosphorus content obtained by frying (B2) while the lowest is found in raw taro (without processing).

3.9 Ferrum (iron)

Table 9. Iron content in 100 gr of taro (mg)

Treatment	Test				Average
	1	2	3	4	
A1 B0	1.08	1.07	1.09	1.07	1.08 a
A1 B1	1.08	1.08	1.11	1.09	1.09 a
A1 B2	4.22	4.12	4.21	4.1	4.16 c
A2 B0	0.99	0.98	0.94	0.96	0.97 b
A2 B1	0.92	0.97	0.96	0.94	0.95 b
A2 B2	3.73	3.67	3.68	3.7	3.7 d
A3 B0	1.04	1.01	1.07	1.06	1.05 ab
A3 B1	1.08	1.08	1.08	1.07	1.08 a
A3 B2	4.77	4.45	4.49	4.71	4.61 e

The results of statistical analysis of iron from taro in Appendix 9 show very significant differences for all treatments and their interactions, thus the null hypothesis is rejected. Macape marramu (A1), macape darrana (A2) and mawira (A3) types of taro had the highest iron content obtained by frying (B2) while for raw/unprocessed (BO) and steamed (B1) the results were not significantly different.

3.10 Vitamin C

Table 10. Vitamin C content in 100 gr of taro (mg)

Treatment	Test				Average
	1	2	3	4	
A1 B0	4.33	3.98	4.29	4.12	4.18 a
A1 B1	4.26	4.26	4.31	4.32	4.29 a
A1 B2	15.35	15.21	15.28	15.22	15.27 g
A2 B0	3.88	3.88	4.02	3.92	3.93 b
A2 B1	3.08	3.04	3.12	3.07	3.078 c
A2 B2	15.88	15.69	15.75	15.84	15.79 d
A3 B0	4.17	3.81	3.74	3.98	3.93 e
A3 B1	3.17	3.02	2.95	3.01	3.04 c
A3 B2	13.20	12/83	13.16	13.10	13.07 f

The results of statistical analysis of the vitamin C content of taro in Appendix 10 show very significant differences between all treatments and their interactions, thus the null hypothesis is rejected. The three types of taro above have the highest vitamin C content obtained from processing by frying (B2) while the lowest is by steaming, although in macape marramu the difference is not significant between raw and steamed. The BNT test results showed that treatment A2B2 (macape darrana, fried) provided the highest vitamin C results, while treatment A3B1 (allae mawira, steamed), although the results were not significantly different from A2B1 (macape darrana,

steamed) provided the lowest vitamin C. Taro steamed in treatments A2B1 (macape darrana, steamed) and A3B1 (allae mawira, steamed) experienced a decrease, possibly due to the water-soluble nature of vitamin C, so that with the reduction in water in the taro, even though it was small, the vitamin C content decreased.

3.11 Water

Table 11. Water content in 100 grams of taro (mg)

Treatment	Test				Average
	1	2	3	4	
A1 B0	71.16	71.61	71.42	71.51	71.43
A1 B1	71.19	71.13	70.88	71.03	71.06
A1 B2	3.75	3.76	3.75	3.74	3.75
A2 B0	73.86	73.89	74.03	73.76	73.89
A2 B1	70.14	70.20	70.19	70.18	70.18
A2 B2	3.89	3.56	3.82	3.78	3.76
A3 B0	71.81	72.24	71.82	71.92	71.95
A3 B1	71.29	70.49	70.91	70.68	70.84
A3 B2	4.85	4.56	4.69	4.82	4.71

The results of the statistical analysis of the water content of taro in Appendix 11 show that there are very real differences between all treatments and their interactions. Thus, the null hypothesis is rejected. Macape marramu (A1), macape darrana (A2) and allae mawira (A3) types of taro had the lowest water content obtained by frying (82) while the highest was found in raw/unprocessed (BO). The BNT test results showed that the A1 B2 (macape marramu, fried) treatment contained the lowest water content even though these treatments were not significantly different from A2 B2 (macape darrana, fried). The highest water content was obtained in the A2 BO (macape darrana, raw) treatment which was very significantly different from the other treatments. Water is distributed in dry or concentrated food in various forms, water may be found as a liquid containing dissolved substances when the food is wet and associated with other components. (Tarigan, 2021).

3.12 Sensory Analysis

Table 12. Taro Likeability Level

Treatment	Test		Average
	1	2	
A1B1	3.85	3.7	3.85
A1B2	4.25	4.2	4.25
A2B1	3.25	3.2	3.25
A2B2	4.2	4.0	4.10 d
A3B1	3.45	3.45	3.45 e
A3B2	3.7	3.75	3.75 a

The results of statistical analysis of the level of liking in Appendix 13 show that there are very significant differences between all treatments and their interactions, thus the null hypothesis is rejected. The fried processing method provides a higher level of preference for all types of taro. The BNT test results showed that treatment A1 B2 (macape marramu, fried) gave the highest level of liking, namely 4.23 (like to really like). while the lowest was in treatment A2 B1 (macape darrana, steamed) namely 3.23 (slightly like to like). The only steamed taro that was macape marramu gave the highest score, namely 3.78 (slightly like it to like it) and tended to like it more, which means this taro is well accepted for consumption. Meanwhile, consumer acceptance of the macape darrana and allae mawira types generally tends to be slightly favorable, which means the level of acceptance is not very good.

Data presented by the nutrition directorate of the Indonesian Ministry of Health (1981), especially for raw malea taro, contain energy, protein, fat, carbohydrates, calcium, phosphorus and the edible parts which are greater than the three types of taro, namely fiber, ash, iron, vitamin C, and water is smaller. Researched while the differences in the data obtained between the nutrition directorate of the Indonesian Ministry of Health (1981) and those studied were caused by the existence of unequal genetic characteristics in each type of taro, and this is in accordance with the opinion (Solihah & Wijaya, 2020).

4. CONCLUSION

The type of taro, processing method and interaction have a very real influence on the nutritional content, energy, protein, fat, carbohydrates, calcium, phosphorus, the edible parts produced by these three types of taro, especially the raw ones, are smaller than data from the Directorate. Ministry of Health of the Republic of Indonesia, while fiber, ash, iron, vitamin C and water are greater. The highest nutritional content of the three types of taro is obtained by frying except for protein, ash and water which decreases. Steamed taro is obtained by energy, fat, fiber, calcium and vitamin C were the lowest. Analysis of the level of liking showed that the fried taro macape marramu got the highest score of 4.23 (liked it to very like it) while the lowest was the steamed macape darrana, namely 3.23 (liked it a little to like it).

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