



Prebiotic Potential of Pumpkin and Sweet Potato in Flour and Fluid and the Acceptability of Processed Products

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Abstract

Introduction: Functional foods are included in the composition of foods that are not only essential for life but also important for supporting the prevention and reduction of disease risk factors for some diseases or the enhancement of certain biological functions. In addition to its delicious taste, pumpkin contains many nutrients, such as vitamin A (beta carotene), vitamin B, vitamin C, carbohydrates, fiber, folic acid, iron, protein, calcium, and potassium. **Material and Methods:** The study was divided into two treatment groups consisting of making yellow sweet potato cookies and yellow sweet potato drinks. An acceptability test was conducted with 30 children by panellists, and an inulin content test was conducted at the Laboratorium Gizi Dinas Kesehatan, Province Jawa Timur. Statistical analysis using Wilcoxon signed rank tests **Results:** The results of this study showed that the prebiotic content of flour was high in yellow sweet potatoes at 7.77%. The prebiotic content of cookies is highest in yellow sweet potato cookies at 3.33%, while the prebiotic content in beverage products is highest in yellow pumpkin-based drinks at 1.5%. Based on organoleptic tests on cookies and drinks, the most preferred food products are those made from yellow sweet potatoes. **Conclusion:** Yellow sweet potatoes can be utilized as a functional food ingredient that acts as a prebiotic.

Keywords: -Cookies, drink, functional food, prebiotic

Introduction

Functional foods were first introduced in Japan around the mid-1980s. Functional foods are included in the composition of foods that are not only essential for life, but also important for supporting the prevention and reduction of disease risk factors for some diseases or the enhancement of certain biological functions. Food or parts of food have the advantage of being both a source of nutritional fulfilment and a cure for health, including health care and disease prevention. Several food ingredients have potential as functional foods, such as pumpkin and sweet potatoes (Antarini, 2011).

Pumpkin is one type of vegetable that belongs to the Cucurbitaceae group. This type of vegetable is familiar to the people of Indonesia; even nowadays, many people make food preparations with pumpkin as the basic ingredient. Pumpkin fruit has a delicious flavor and distinctive aroma, as well as a soft pulp texture when cooked. In addition to its delicious taste, pumpkin contains many nutrients, such as vitamin A (beta carotene), vitamin B, vitamin C, carbohydrates, fiber, folic acid, iron, protein, calcium, and potassium. The nutritional content is certainly very beneficial for health. Pumpkin puree has bioactive components such as polysaccharides, proteins, peptides, paraaminobenzoic acid, phenol components, and sterols (Kuhlmann & Mills, 1999).

Sweet potato is a local food that has quite a variety of types. Sweet potato is a food source of carbohydrates and a fairly high source of calories. In addition, sweet potatoes also have potential as a functional food that is prebiotic. Prebiotics are food components that cannot be digested by digestive enzymes (nondigestible food ingredients) and that have a good influence on the host by triggering selective activity and growth of one or more types of colon-dwelling bacteria. Prebiotics are generally carbohydrates that are not digested and not absorbed, usually in the form of oligosaccharides and dietary fiber.

Research by the Argo Industrial Center in 2006 was conducted to determine the analysis of sweet potato oligosaccharides in the form of flour crude extracts of various types of sweet potatoes. The results showed that the type of sweet potato with the highest prebiotic content was the type of quarter white sweet potato and beta-1 red sweet potato, each with Rafinosa levels of 0.1457% and 0.1427%, Stakiosa levels of 0.0202% and 0.0309%, and Maltohexosa levels of 0.1060% and 0.0945%. Some foodstuffs can be consumed either in flour form or in liquid form. Similarly, pumpkin and sweet potatoes can also be consumed in liquid form. For this reason, this study aims to determine the difference in prebiotic carbohydrate content of yellow pumpkin and red sweet potato in flour and liquid form (Hassan, 2014).

The carbohydrate content of pumpkin flour (77.65%) was lower than that of banana flour (84.01%), breadfruit flour (84.03%), cassava flour (87.87%), and sweet potato flour (86.95%). Thus, the glycemic index content of pumpkin is lower than that of other carbohydrate sources. Food with a low glycemic index will help improve health (Widowati, 2011; Astawana & Widowati, 2011). While the carbohydrate content in sweet potatoes is included in the glycemic index of 45 and is classified as low, meaning that the carbohydrates in sweet potatoes are not easily converted into sugar.

Oligosaccharides (raffinose, stachiose, verbascose, lactulose, galactosyl-sucrose, galactosyl-lactose, and xylo-oligosaccharides) cannot be digested in the gut because humans do not have the enzymes to digest them. This indigestible food composition is called prebiotics. On the other hand, there are beneficial microbes that can digest them. These microbes are live bacteria that have a beneficial effect on health by improving the balance of intestinal microflora, called probiotics (Widyaningsih, 2011; Kurniati, 2016). Probiotics can increase the production of mucin in the intestinal mucosa, thereby increasing the innate immunity response, which has advantages in treating diarrheal diseases in children (Applegate *et al.*, 2013). The management of nutritional support is often constrained by the assumption that when children suffer from diarrhea, it is necessary to stop giving daily food and drinks, including breast milk. The results of Assistance Activities for Malnourished Toddlers in Surabaya City from 2010–2017 show a tendency for mothers of toddlers to be worried about giving food when their children have diarrhea. Activity data shows that at the beginning of the assistance activities, a total of 65% of toddlers suffering from diarrhea, their food reduced because the mother was worried that the diarrhea would not recover soon (Fariadi *et al.*, 2016; Putri *et al.*, 2023).

Based on this, it is necessary to come up with a food / drink that is therapeutic through the use of food ingredients that have prebiotic potential so that the incidence of diarrhea can be shortened and prevented by improving the condition of the intestinal mucosa in toddlers. Therefore, in this study, the prebiotic content of pumpkin and sweet potato will be distinguished between pumpkin and sweet potato in the form of flour, which will be processed products, and in liquid or beverage form.

Material and Methods

Materials

Ingredients

The ingredients used are yellow pumpkin and yellow sweet potato, as well as the ingredients used to make processed foods from yellow pumpkin and sweet potato.

1. The tools used for making flour are an oven, blender, sifter, knife, and cutting board.
2. Tools used for prebiotic content testing are an analytical balance, kjeldahl flask, glassware (Erlenmeyer, burette, volumetric pipette, drop pipette, measuring flask), distillator, condenser, electric heater, and destructor.
3. Tools used for the acceptability test include plastic plates, forks, drinking water, and acceptability test forms.

Panelist

In the acceptability test, child panellists were untrained panellists, namely MI Al Karim class V students totalling 30 children. The acceptability test was conducted over two days. The first day was to test processed products made from pumpkin and sweet potato flour. The second day was to test processed products from pumpkin and sweet potatoes in liquid form.

Flour Preparation

The pumpkin and yellow sweet potato flour was made at the Food Technology Laboratory of Surabaya Nutrition Academy. In the process of making flour, pumpkin and yellow sweet potato were peeled from their skins until they were clean, then weighed with digital scales. After weighing, the pumpkin and yellow sweet potato were washed and then shredded using a vegetable shredder. The shredded pumpkin and yellow sweet potato were placed evenly in a greased baking dish. Next, it was put into the oven manually (the oven was preheated). The oven was constantly monitored and turned over to prevent scorching. The temperature is controlled between 70-75°C for ± 5 hours. When it is evenly dry with a moisture content of $\pm 13\%$, it is removed and then blended using a dry blender until smooth. Once smooth, sieving is done. The sieve results can already be used for further processed products.

Cookies Preparation

The first step in making cookies is to prepare all the ingredients needed, namely, margarine, butter, powdered sugar, whole eggs, vanilla, medium protein wheat flour, pumpkin flour, cornstarch, milk flour, baking powder, chocolate powder, and choco chips. Next, margarine, butter and powdered sugar are put in a basin then mixed until well blended (should not be too long). Then eggs are added one by one while mixing until smooth. Vanilla and milk flour are added and mixed until smooth. Next, flour, pumpkin/yellow sweet potato flour, cornstarch, baking powder, chocolate powder are added and mixed until smooth. The dough is put for 30 minutes so that it does not expand if the cookies are molded. The baking sheet is smeared with margarine and the top is sprinkled with flour so that the printed cookies are not sticky. Cookie dough is printed on a baking sheet and then decorated with choco chips. Cookies are baked in a preheated oven for 30 minutes.

Beverage Preparation

The first step is to prepare all the ingredients needed, namely pumpkin/yellow sweet potato, water, liquid UHT milk, sugar and liquid vanilla. Next, the required ingredients are cut and peeled. Ingredients that have been peeled, weighed and recorded the weight. Next, the ingredients are blanched in boiling water for about 1 - 3 minutes. Then removed and allowed to cool slightly. After cooling, it is blended with water (the ratio of water and ingredients is 2: 1). The next step of the blender process is filtered with a filter cloth until only the juice from the material (yellow pumpkin / yellow sweet potato). The pumpkin/yellow sweet potato juice is boiled together with liquid UHT milk and sugar. Stirred until evenly mixed. Liquid vanilla is then added. Lifted and drained. Should be served cold.

Statistical Analysis

The data collected were presented descriptively, then analyzed with an ordinal scale. To determine the difference in *panellists'* acceptance of processed products, Wilcoxon test was conducted.

Results

Prebiotic Flour Content

Table 1.Prebiotic Content of Pumpkin and Yellow Sweet Potato Flour

Sample	Liquid	Result (ppm)	Content (%)	Unit
Pumpkin Flour	10	781.13	5.82	%b/b
Yellow Sweet Potato Flour	10	809.73	7.77	%b/b

Table 1 shows that the prebiotic (inulin) content of yellow sweet potato flour is higher than that of pumpkin flour. This is due to the higher water content of pumpkin than yellow sweet potato. This is quite beneficial in terms of economic value, because the price of a yellow sweet potato is cheaper than that of a pumpkin. This economic value is also supported by the fact that the shrinkage from basic ingredients to flour is less in yellow sweet potatoes than in yellow pumpkin.

*Prebiotic Content of Cookies***Table 2.**Prebiotic Content of Pumpkin and Yellow Sweet Potato Cookies

Sample	Liquid	Result (ppm)	Content (%)	Unit
Pumpkin Cookies	10	332.16	3.27	%b/b
Yellow Sweet Potato Cookies	10	336.17	3.33	%b/b

The results obtained show that the prebiotic (inulin) content is not too different between cookies from yellow pumpkin and yellow sweet potato. The prebiotic (inulin) content of yellow sweet potato cookies, which is slightly higher than pumpkin cookies, can be explained by the fact that when in the form of flour, the prebiotic content of yellow sweet potato is higher than pumpkin. Thus, the potential to provide prebiotic content in yellow sweet potato cookies is quite possibly higher than that in yellow pumpkin cookies. (Table 2)

*Prebiotic Content of Beverages***Table 3.**Prebiotic Content of Pumpkin and Yellow Sweet Potato Beverages

Sample	Liquid	Result (ppm)	Content (%)	Unit
Pumpkin Beverages	10	597.75	1.5	%b/b
Yellow Sweet Potato Beverages	10	179.64	0.45	%b/b

The prebiotic content of the beverages as a whole was lower than that of the cookies, both beverage products with pumpkin and yellow sweet potato ingredients, as shown in Table 3. Unlike processed products in the form of flour or flour products in the form of cookies, where the prebiotic content (inulin) of pumpkin is lower than that of yellow sweet potato, in this beverage product, the beverage from pumpkin is higher in prebiotic content than the beverage from yellow sweet potato. This can happen because the water content of pumpkin is higher than that of yellow sweet potato, so it is possible that the prebiotics are also contained in the water component of the pumpkin. Thus, when pumpkin, which has a relatively high water content, is made into a beverage or liquid, the water from the pumpkin also becomes part of the liquid component of the beverage product, which in turn can further increase the prebiotic content compared to beverages made from yellow sweet potatoes.

Acceptability of Processed Products**Acceptability of Cookies Processed Products****Table 4.** Acceptability Results of Pumpkin and Yellow Sweet Potato Cookies and Drinks

Sample	Aroma	Flavor	Colour
Pumpkin Cookies	63.3%	76.7%	73.3%
Yellow Sweet Potato Cookies	73.3%	76.6%	53.3%
Pumpkin Beverages	46.7%	56.7%	53.3%
Yellow Sweet Potato Beverages	83.3%	93.3%	73.3%

Aroma

Aroma is a compound released by food ingredients that can be recognized by the sense of smell. The aroma of food determines the enjoyment of food ingredients. The results of the acceptability test of the level of liking of the aroma of pumpkin and yellow sweet potato cookies on 30 *panellists* can be seen in Table 4. Based on table 4, it can be seen that there are 22 *panellists* (73.3%) who stated that they really like the aroma of yellow sweet potato cookies, while only 19 *panellists* (63.3%) stated that they really like yellow pumpkin cookies. Thus, it can be seen that from the aroma parameter, yellow sweet potato cookies are more preferred than pumpkin cookies, although the mode of preference for aroma characteristics is both at parameter 3 or very similar. The results of the Wilcoxon Signed Ranks Test statistical test showed that there was no difference in the level of liking of the aroma of pumpkin cookies and yellow sweet potato cookies ($p = 0.491$, $\alpha = 0.05$).

Texture

Texture is one of the most important quality indicators in cookies. One of the textures in cookies includes crispness. The results of the acceptability test on the level of liking for the crispness of pumpkin and yellow sweet potato cookies in 30 *panellists* can be seen in Table 4, which shows that in pumpkin cookies, there are 22 *panellists* (73.3%) who stated that they really like the crispness of the cookies. While those who expressed dislike for the crispness of pumpkin cookies were two *panellists*

(6.7%), It was also seen that there were no *panellists* who stated that they did not like the crispness of the yellow sweet potato cookies. The parameters of like and very like for the crispness of yellow sweet potato cookies are relatively the same. This indicates that the crispness of yellow sweet potato cookies is relatively more favourable than the crispness of pumpkin cookies. The moisture content factor is likely to play a role here, namely that the moisture content in pumpkin is higher than in yellow sweet potato, which results in the crispness of the cookies produced. If baking is done longer on pumpkin cookies in the hope of further suppressing the water content, it is feared that there will be emptiness in the cookies produced, which results in a taste that tends to produce a slightly bitter effect. The Wilcoxon Signed Ranks Test statistical test for differences in the level of crispness/texture shows a p value = 0.397, which means that there is no difference in the level of crispness of pumpkin cookies with yellow sweet potato cookies at $\alpha = 0.05$.

Flavor

Taste is a fairly important factor in a food product besides appearance and colour. The results of the acceptability test on the level of liking for the taste of pumpkin and yellow sweet potato cookies among 30 *panellists* can be seen in Table 4. Based on Table 4, it can be seen that in pumpkin and yellow sweet potato cookies, there are both 23 *panellists* (73.3%) who stated that they really like the taste of cookies. While those who expressed dislike for the taste of pumpkin cookies were 1 panelist (3.3%), in yellow sweet potato cookies, there were 2 *panellists* (6.7%) who expressed dislike. Overall, it can be seen that the level of liking for the taste of pumpkin and yellow sweet potato cookies is relatively the same. Similar to other parameters, the level of liking for the taste of cookies also shows no difference between pumpkin cookies and yellow sweet potato cookies through the Wilcoxon Signed Ranks Test statistical test, which gives a value of $p = 0.813$.

Acceptability of Processed Beverage Products

Colour

The colour produced from both pumpkin and yellow sweet potato-based drinks is relatively the same, even though it is almost difficult to distinguish. The results of the acceptability test can be seen in Table 4. Table 4 shows that the assessment of beverage *colour* acceptance really likes more yellow sweet potato drinks than drinks from yellow pumpkin. Regarding the actual *colour* of the drink, it is not too different, so the assessment by *panellists* also shows results that are not too different. The Wilcoxon Signed Ranks Test statistical test shows a p value = 0.462, which means that there is no difference in the level of beverage *colour* liking between drinks from yellow pumpkin and drinks from yellow sweet potato at $\alpha = 0.05$.

Aroma

The aroma of the beverages produced from pumpkin and yellow sweet potatoes showed a more visible difference. For drinks from yellow sweet potatoes, no *panellists* expressed dislike. On the contrary, the highest percentage of very like aroma ratings was given to drinks from this yellow sweet potato. The complete data can be seen in Table 4. The Wilcoxon Signed Ranks Test statistical test shows a p value = 0.002, which means that there is a difference in the level of liking of the aroma of drinks between drinks from yellow pumpkin and drinks from yellow sweet potatoes at $\alpha = 0.05$. The difference in aroma lies in the presence of a distinctive odor in the pumpkin, which apparently causes the pumpkin drink to be relatively less preferred compared to the yellow sweet potato drink.

Flavor

The level of taste preference in pumpkin and yellow sweet potato drinks is the same as the aroma parameter, which shows a difference based on the assessment by *panellists* as shown in Table 4. The results of the Wilcoxon Signed Ranks Test statistical test showed that there was a difference in the level of liking for the taste of pumpkin drinks and yellow sweet potato cookies ($p = 0.001$; $\alpha = 0.05$). The results of this test emphasize that the drink from yellow sweet potato is more preferred than the drink from yellow pumpkin, and the difference is very significant based on the statistical test conducted. However, information on prebiotic content needs to be conveyed, because although the acceptability of the yellow pumpkin drink is less *favourable* than the yellow sweet potato drink, the prebiotic content of the yellow pumpkin drink is higher than that of the yellow sweet potato drink, namely 1.5% b/v for yellow pumpkin and 0.45% b/v for yellow sweet potato. Colour produced from both pumpkin and yellow sweet potato-based drinks is relatively the same, even almost difficult to distinguish. The results of the acceptability test can be seen in Table 4. Table 4 shows that the assessment of beverage *colour* acceptance really likes more on yellow sweet potato drinks than drinks from yellow pumpkin. Regarding the actual *colour* of the drink is not too different, so the

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Discussion

A yellow sweet potato is a type of sweet potato with yellow, light yellow, or yellowish white flesh. Yellow sweet potatoes are high in beta-carotene and have a complete nutritional content. Sweet potatoes are a local food with low calories and high fiber. Yellow sweet potatoes have a physiological function in the form of anthocyanins, which include anti-cancer substances classified as free radical compounds and carotenoids as antioxidants (Tamara & Gusnadi, 2023; Elfiyani & Santosa, 2023).

Aroma is one of the quality test indexes that uses the sense of smell to assess the quality of a product. The fragrant aroma in a product comes from the ingredients used, which are caused by the formation of volatile compounds as a result of the maillard reaction between sugar and amino acids.

Based on the results of the study, it can be seen that the aroma of yellow sweet potato cookies and yellow sweet potato drinks is highly preferred. This is in line with research conducted by (Kining *et al*, 2021) which states that the substitution of sweet potato flour produces a languorous aroma that is characteristic of sweet potatoes. However, in this study, there were several heating processes so that the languorous aroma produced by sweet potatoes was not too disturbing. Research conducted previously stated that *panellists* had no effect on the aroma of sweet potatoes with 100% substitution because the pigments of carotenoid compounds, beta carotene, and anthocyanins have heat-resistant properties so that they will disappear during the cooking process (Elwinet *al*, 2022).

Based on research conducted previously on processed products in the form of pineapple, the aroma produced from Nabikajau's Pineapple is the distinctive aroma of pineapple and a slight smell of yellow sweet potato that arises because the starch content in sweet potatoes in the heating process is broken down into shorter glucose chains so that it can cause sweet potato aroma (Nurminah *et al*, 2019). Another factor that affects the aroma of Pineapple is the addition of wheat flour, margarine, sugar, and egg yolks to the Nabikajau Pineapple dough, resulting in a fragrant pineapple aroma that is preferred by *panellists*. The addition of margarine to cookies can strengthen the aroma of the cookies produced. Fat is an important component in making cookies because it functions as an aroma enhancer (Retno, 2023).

Cookies and yellow sweet potato drinks are one of the functional foods that can improve health and can be enjoyed by various groups. The results of the research on taste attributes are in line with research (Ciagusbandiah, & Rindiani, 2019), which states that cake made with 100% sweet potato

flour produces a strong sweet potato flavor, is slightly bitter, and has a savory and sweet taste in its preparations. Based on research conducted previously on processed products in the form of pineapple, the savory taste produced in pineapple comes from the addition of margarine to the dough, while the sweet taste in pineapple is obtained from the addition of sweet potato flour, which contains high enough sugar, so that in the process of making processed products made from sweet potato flour, it can reduce the use of sugar by 20% (Suarningsih et al., 2022).

Cookies and yellow sweet potato drinks have a very favourable level among *panellists* because, in the process, sweet potato flour has a bright yellow *colour*, is then mixed with margarine, and is baked. The *colour* change that occurs is due to damage to the anthocyanin pigment because, in the processing process, the anthocyanin *colour* resistance becomes faded and darker. The addition of more sweet potatoes produces a more attractive *colour* for cookies and drinks.

Conclusion

In Based on the results of the research conducted, the conclusion is that yellow sweet potato can be utilized as a functional food ingredient that acts as a prebiotic.

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Conflict of Interest

The authors declare no conflict of interest

References

- Antarini, A. A. N. (2011). Sinbiotik antara prebiotik dan probiotik. *Jurnal Ilmu Gizi*, 2(2), 148-155.
- Applegate, J. A., Fischer Walker, C. L., Ambikapathi, R., & Black, R. E. (2013). Systematic review of probiotics for the treatment of community-acquired acute diarrhea in children. *BMC public health*, 13(3), 1-8. <https://doi.org/10.1186/1471-2458-13-S3-S16>
- Astawana, M., & Widowati, S. (2011). Evaluation of nutrition and glycemic index of sweet potatoes and its appropriate processing to hypoglycemic foods. *Indonesian Journal of Agricultural Science* 12(1), 40-46
- Ciagusbandiah, C., & Rindiani, R. (2019, December). Cake Tepung Ubi Jalar Ungu Sebagai Makanan Selingan Yang Mengandung Antioksidan. In *Prosiding Seminar Nasional INAHCO 2019* (Vol. 1).
- Elfiyani, E., & Santosa, B. (2023). Pembuatan Dan Analisa Usaha Minuman Sinbiotik Dari Ubi Jalar Kuning (Ipomoea Batatas L.)| Kajian Konsentrasi Starter Dan Lama Fermentasi: Manufacture And Business Analysis Of Synbiotic Drink From Yellow Sweet Potato (Ipomoea Batatas L.)| Study Of Starter Concentration And Fermentation Time. *Journal Of Industrial Engineering & Technology Innovation*, 1(1), 43-53. <https://doi.org/10.61105/jieti.v1i1.18>
- Elwin, Shalihy, W., Pratiwi, I., & Masriani. (2022). Study of partial substitution of wheat flour with sweet potato flour in the manufacture of dry noodles to support local food diversification. *Jurnal Triton*, 13(1), 43-51. <https://doi.org/10.47687/jt.v13i1.228>
- Fariadi, H., Kanto, S., & Mardiyono, M. (2016). Persepsi Masyarakat Miskin terhadap Pelayanan Kesehatan Bidang Gizi (Studi Kasus di Wilayah Puskesmas Sidotopo Surabaya Utara). *Jurnal Pamator: Jurnal Ilmiah Universitas Trunojoyo*, 9(2).
- Hassan, Z. H. (2014). Aneka tepung berbasis bahan baku lokal sebagai sumber pangan fungsional dalam upaya meningkatkan nilai tambah produk pangan lokal. *Jurnal Pangan*, 23(1), 93-107. <https://doi.org/10.33964/jp.v23i1.54>
- Kining, E., Alvita, L. R., & Husain, H. (2021). Pengaruh Subtitusi Tepung Terigu Dengan Ubi Jalar Ungu (Ipomoea batatas Poiret) Dan Rumput Laut (Euchema cottonii) Terhadap Kualitas Mie Basah. *Jurnal Gizi Dan Kuliner (Journal of Nutrition and Culinary)*, 1(2), 26-36.
- Kuhlmann, U., & Mills, N. J. (1999). Comparative analysis of the reproductive attributes of three commercially-produced Trichogramma species (Hymenoptera: Trichogrammatidae). *Biocontrol Science and Technology*, 9(3), 335-346. <https://doi.org/10.1080/09583159929596>

- Kurniati, A. M. (2016). Mikrobiota Saluran Cerna: Tinjauan dari Aspek Pemilihan Asupan Makanan. *Jurnal Kedokteran Universitas Lampung*, 1(2), 380-384. <https://doi.org/10.23960/jkunila12380-384>
- Nurminah, M., & Nainggolan, R. (2019). Effect of Composite Flour (Wheat and Orange Sweet Potato Flour) on the Physicochemical and Sensory of Cookies. In *Proceedings of the International Conference on Natural Resources and Technology (ICONART 2019)* (pp. 156-159). <https://doi.org/10.5220/0008548101560159>
- Putri, N. A., & Suprayoga, S. (2023). Implementasi Kebijakan Penurunan Stunting Di Kota Surabaya (Studi Kecamatan Bubutan). *JISP (Jurnal Inovasi Sektor Publik)*, 3(3), 52-63. <https://doi.org/10.38156/jisp.v3i3.211>
- Retno Wahyuningsih, W. (2023). Pengaruh Substitusi Tepung Terigu dengan Tepung Ubi Jalar Terhadap Sifat Organoleptik dan Sifat Kimia Pineapple Nabikajau. *Jurnal Ilmu Gizi Indonesia (JIGZI)*, 4(1). <https://doi.org/10.57084/jigzi.v4i1.1027>
- Suarningsih, N. P. Y., Suranadi, L., Chandradewi, A. A. S. P., & Sofiyatin, R. (2022). Pengaruh Substitusi Tepung Terigu dengan Tepung Ubi Jalar terhadap Sifat Organoleptik dan Sifat Kimia Pineapple Nabikajau. *Student Journal of Nutrition (SJ Nutrition)*, 1(1), 26-32. <https://doi.org/10.32807/sjn.v1i1.6>
- Tamara, R., & Gusnadi, D. (2023). Inovasi Kue Dodongkal Berbasis Ubi Jalar Kuning. *Media Bina Ilmiah*, 18(3), 731-738.
- Widiyaningsih, E. N. (2011). Peran probiotik untuk kesehatan. *Jurnal Kesehatan*, 4(1), 14-20. <http://hdl.handle.net/11617/2931>
- Widowati, S. (2011). Diversifikasi konsumsi pangan berbasis ubi jalar. *Jurnal Pangan*, 20(1), 49-61. <https://doi.org/10.33964/jp.v20i1.12>