IJSES
Volume 9, Issue 7, pp. 105-109, 2025.
International Journal of Scientific Engineering and Science
ISSN (Online): 2456-7361

# Flakes Based Yam with Green Bean and Tilapia Composite

Ali Umar Dhani[1], Candra Buwana Gumelar[2], Dyah Ilminingtyas Wahyu Handayani[3]
[1, 2,3]Faculty of Agriculture Technology, Universitas 17 Agustus 1945 Semarang 50235
* Corresponding author
*Email address: ali-umardhani@untagsmg.ac.id

***Abstract***— *The making of yam-based flakes in this study was carried out by adding mung beans (Vigna radiata) and tilapia (Oreochromis niloticus). This study used yam flour as the raw material used by the Kusuka Ubiku industry in the production of Hasil Bumiku yam flour. The red tilapia meat flakes product based on purple yam flour and mung bean flour was acceptable based on the results of the hedonic test where all treatments received an average score above 3 (neutral) in all aspects, namely taste, color, texture and aroma. The ranking test showed that the formulation or treatment (F4) 26% yam flour: 52% mung bean flour: 21% tapioca flour received the highest score based on the taste aspect, while for the texture aspect the highest formulation was the control treatment (F1) 0% yam flour: 0% mung bean flour: 100% tapioca flour. The addition of tapioca flour is very important as a binding agent and affects the texture. In making red tilapia fish meat flakes based on purple yam flour and green bean flour, tapioca flour is still needed with almost the same percentage, namely 20% to 22% as making flakes with raw materials in general.*

***Keywords***— *Flakes, uwi, mung beans, tilapia.*

## I. INTRODUCTION

Diabetes is a serious problem in various countries, including Indonesia. More than 90% of diabetes cases are type 2 diabetes, characterized by elevated blood sugar levels due to decreased insulin secretion by pancreatic beta cells and/or impaired insulin function (insulin resistance). (Restyana Noor F., 2015), Type 2 diabetes can be managed by exercising and limiting sugar intake or consuming foods with low sugar content. The high number of diabetes sufferers in Indonesia presents an opportunity to create ready-to-eat food products that are safe for diabetics.

Flakes are a practical snack commonly consumed in the morning for breakfast, with added milk, like cereal or oatmeal, to meet energy needs before activities. Cereal flakes are generally made from corn and wheat, but this study uses flakes made from yam to empower local food potential and create a practical food that meets nutritional standards and is safe for consumption by the elderly and diabetics. Flakes are a ready-to-eat food, typically served as a breakfast or breakfast cereal (Hildayanti, 2012). Breakfast cereal products were first developed in the United States by John Harvey Kellogg in 1895. This invention was then produced and introduced to the public in 1906. Until now, breakfast cereal products continue to develop and there are many different types on the market (Widyasitoresmi, 2010).

The yam tuber (Dioscorea alata) grows abundantly in Indonesia but is rarely used for food, despite its high carbohydrate content. Yams are low in sugar and high in fiber, thus preventing spikes in blood sugar levels, especially in people with diabetes. They contain vitamin C and minerals (Wanasundera and Ravindran 1994; Lebot et al. 2005), are beneficial for healthy gut microflora (Hsu et al. 2006), and contain antioxidants equivalent to or higher than 100 µg of BHA (butylhydroxyanisole) and α-tocopherol (Lubag et al., 2008). The protein content of yams is 0.6%–2.0%, so additional ingredients are needed to achieve the calorie and protein content required for flakes.

This research used yam flour under the trademark "Hasil Bumiku" produced by "Kusuka Ubiku" Banguntapan, Bantul, Yogyakarta, which has obtained trade permit P-IRT No. 2063402010662-23 and halal certificate from LPPOM MUI No. 12070005651218. “Hasan Bumiku” yam flour has been produced stably, this can be seen from the ease of finding this product in online stores with a large stock. The local yam tuber species (Dioscorea alata) utilized as the raw material for this flour is brown skinned, hairy, and has yellow flesh with uneven purple tinges.

In this study, yam-based flakes were made by adding mung beans (Vigna radiata) and tilapia (Oreochromis niloticus). Mung beans (Vigna radiata) were chosen as an additional ingredient because they contain 364 calories and 24% protein per 100 grams (DABM-1964-TKPI Ministry of Health, 2019). Mung beans are rich in the amino acid lysine (Mubarak, 2005). Tilapia was added because it contains 20% protein with amino acids patterned close to the human body's needs. Fish meat also contains unsaturated fatty acids with low cholesterol levels, vitamins, and minerals needed by the human body (Adawiyah, 2007).

This study aims to: (1) create yam-based flakes that meet energy needs with high protein, resistant starch, and fiber content to prevent blood sugar spikes (2) determine the chemical and sensory characteristics of yam-based flakes with a composite of mung beans and tilapia meat.
Hypothesis: The use of yam flour in making flakes affects the chemical properties (water content, protein, ash, fat, carbohydrate, crude fiber, antioxidant activity, and caloric value) and sensory assessment of the taste, color, aroma, and texture of yam-based flakes.

## II. RESEARCH METHOD

### *A. Research Materials and Tools*

International Journal of Scientific Engineering and Science
Volume 9, Issue 7, pp. 105-109, 2025. ISSN (Online): 2456-7361

*1. Research Materials*

The materials used to make the flakes were yam flour, mung bean flour, tilapia fish, wheat flour, tapioca starch, salt, sucrose sugar as a control, water, and stevia sugar. The materials used in the chemical analysis were filter paper, thread, cotton, distilled water, concentrated H2SO4, NaOH, 0.02 N HCl, K2SO4, 95% alcohol, HBO3, BCR-MR, Na2SO3, HgO, HBO3, and N-hexane. Standard chemicals for analysis (pa).

*2. Research Tools*

The tools used to make the flakes were a knife, cutting board, scale, pan, chopper, stuffer, stove, label, spoon, thermometer, sieve, basin, soldering iron, small bowl, meat grinder, mortar, scissors, thread, and tongs. The tools used for chemical analysis include labels, analytical balances, mortars, spatulas, Erlenmeyer flasks, tongs, Kjeldahl flasks, oven binders, heaters, desiccators, Soxhlet tubes, porcelain dishes, vacuum pumps, Buchner funnels, and furnaces. The tools used in sensory testing include sensory test forms, stationery, and labels.

*B. Research Procedure*

This research is a laboratory experiment with the following stages: formula creation, yam flour, mung bean flour, tilapia steaming and meat extraction, and processing flakes based on yam, mung beans, and tilapia. Research Parameters: Sensory testing was conducted to assess taste, aroma, color, and texture.

Twenty-five semi-trained panelists were used. The scoring scale used was (1) dislike very much, (2) dislike, (3) slightly dislike, (4) neutral, (5) slightly like, (6) like, and (7) very like.

*C. Research Design*

The experimental design used in this study was a Completely Randomized Design (CRD) with four treatments and three replications, resulting in 12 experimental units. The treatments used in this study were variations in the processing of yam flour as the basic ingredient in making flakes:

1. F1 control treatment (0%)
2. F2 treatment using yam flour at 37.5%
3. F3 treatment using yam flour at 62.5%
4. F4 treatment using yam flour at 100%

The data obtained from the analysis were tested using Analysis of Variance (ANOVA) with a 95% confidence level. If differences were found between treatments, further testing was conducted using Duncan's Multiple Range Test (DMRT) to determine which was significantly different.

## III. Results and Discussion

*Flakes Making Process*

The process of making red tilapia fish flakes based on purple yam flour and mung bean flour begins with preparing tilapia fillets. The tilapia is cleaned and washed, then sliced to obtain meat and skin without scales or bones. Tilapia fillets do not require perfectly intact fillets, but the most important thing is to ensure they are free of scales and bones. Tilapia fillets must also be washed thoroughly and steamed immediately, as they are more susceptible to bacterial contamination than whole fish with scales. The tilapia fillets are steamed at 80-90°C for 15 minutes, then removed and allowed to cool until steam-free before being placed in a sealed container or jar.

Figure 1. Steaming the Fillet Meat

The ingredients are mixed by adding water little by little, 100 to 150 ml, or ⅓ of the total water (300 ml), as kneading the dough will be more difficult if the dough is too runny. The most important thing to pay attention to during the kneading stage is the mashing of the steamed tilapia. By beating the steamed tilapia with a spoon until it forms fine flakes, it is mashed together with the remaining ingredients. Once the tilapia is smooth, the remaining water is added to the dough and stirred until smooth. The total weight of the dough after mixing the ingredients and adding water is 404.5 grams.

Figure 2. Kneading the Dough

Boiling or heating the dough is done to break down the starch from the yam flour and tapioca flour, so that a thick dough is obtained. In the process of boiling the dough, it is best to use a non-stick or Teflon pan and stir continuously to prevent the dough from burning. Boiling takes 8-10 minutes or the dough from room temperature to reach a temperature of 80°C. After the temperature of the dough reaches 80°C, turn off the heat and continue stirring the dough using a spatula until the dough is no longer steaming. After the heating process, the weight of the thick dough is 334.6 (F1); 327.9 gr (F2); 323.3 (F3); 314.8 gr (F4).

Figure 3. Heating the Dough

The baking process is crucial for the results of red tilapia fish flakes made from purple yam flour and mung bean flour. The dough is baked carefully, paying close attention to the baking time and temperature of the baking machine. Too long

IJSES
Volume 9, Issue 7, pp. 105-109, 2025.
International Journal of Scientific Engineering and Science
ISSN (Online): 2456-7361

a baking time will result in burnt flakes, while insufficient baking time and temperature will result in crumbling, soft, or flaky dough. The application of oil during the baking process also significantly impacts the quality of the flakes. If the oil on the baking surface dries out, the baking machine will be difficult to open. Flakes can also crumble or separate into two pieces due to sticking to both surfaces when opened if the baking temperature and time are insufficient, combined with insufficient oil on the baking surface.


Figure 4. Baking with ice cream cone maker (Sonifer SF-6034)

Baking takes 5-6 minutes for each product. Put 15 grams of dough in the middle of the baking surface after the baking machine has reached its optimal temperature at mid-temperature. Then turn the temperature up to maximum and shut the lid. The baking machine takes 2-3 minutes to bake until the indicator light comes on, but if the machine is opened immediately after the indicator light comes on, the dough is still a bit soft, therefore it takes an additional time of ± 1 minute at max temperature (then set the temperature to mid), and an additional ± 1 minute again at mid temperature. During baking, steam and water droplets will come out of the machine which indicates evaporation and shrinkage of the material. The weight of the product obtained after baking is 120.58 grams (F1); 127.10 grams (F2); 135.46 grams (F3); 139.77 grams (F4).

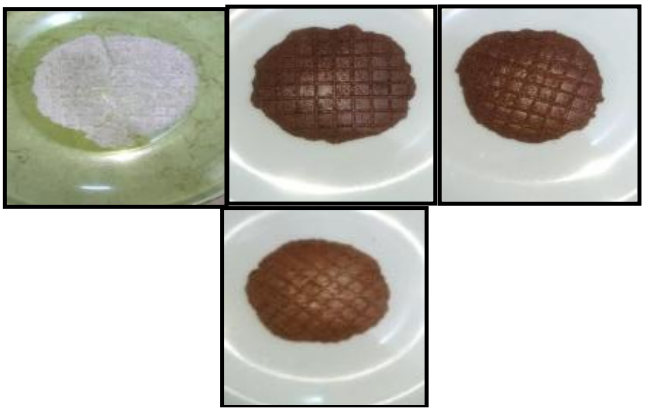

Figure 5. Flakes Products

TABLE 1. Dough Weight Shrinkage

| Treatment | Initial dough | Warmup | Roasting |
|---|---|---|---|
| F1 | 404,5 gr | 334,6 gr | 120,58 |
| F2 | 404,5 gr | 327,9 gr | 127,10 |
| F3 | 404,5 gr | 323,3 gr | 135,46 |
| F4 | 404,5 | 314,8 | 139,77 |

*Sensory Testing*

*Hedonic Testing*

Hedonic testing is an affective test (acceptance testing) for a product's taste, texture, aroma, and flavor, using a scale of (1) dislike very much, (2) dislike very much, (3) neutral, (4) like very much, and (5) like very much. The results of the hedonic test analysis of red tilapia fish flakes based on purple yam flour and mung bean flour on 30 respondents or semi-trained and untrained panelists covered aspects of color, aroma, texture, and flavor.

TABLE 2. Color Hedonic Analysis Results Table

| Sample | F1 | F2 | F3 | F4 |
|---|---|---|---|---|
| **Rata-rata** | $3,37^{a}$ | $3,53^{ab}$ | $3,83^{b}$ | $3,90^{b}$ |
| **Std. Dev** | 1,033 | 0,819 | 0,699 | 0,548 |

From table 2, the average score for the color parameters of each treatment is 3.37 (F1); 3.53 (F2); 3.83 (F3); and 3.90 (F4). The results of the statistical analysis show a significant difference between treatments, namely treatments (F1) and (F2) are significantly different from treatments (F3) and (F4). From all treatments, it was concluded that the color score for the flakes product was neutral (3).

*Aroma*

TABLE 3. Aroma Hedonic Analysis Results

| Sample | F1 | F2 | F3 | F4 |
|---|---|---|---|---|
| **Average** | $2,90^{a}$ | $3,27^{ab}$ | $3,57^{bc}$ | $3,83^{c}$ |
| **Std. Dev** | 0,923 | 0,923 | 0,923 | 0,923 |

From table 3, the average score for the aroma parameters of each treatment is 2.90 (F1); 3.27 (F2); 3.57 (F3); and 3.83 (F4). The results of the statistical analysis show a significant difference between the treatments. The highest score for the aroma parameter is aimed at treatment (F4), namely 3.84, which means it tends to be neutral-like (3-4), and the lowest score is aimed at treatment (F1), namely 2.90, which means dislike - neutral (2-3).

*Texture*

TABLE 4. Texture Hedonic Analysis Results Table

| Sample | F1 | F2 | F3 | F4 |
|---|---|---|---|---|
| **Average** | 3,93 | 3,77 | 3,60 | 4,00 |
| **Std. Dev** | 1,015 | 1,015 | 1,015 | 0,015 |

According to the statistical analysis, there was no discernible difference between the therapies. From Table 9, the average score for the aroma parameter for each treatment was 3.93 (F1); 3.77 (F2); 3.60 (F3); and 4.00 (F4). The highest score for the texture parameter was given to treatment (F4), namely 4.00, which means a tendency to like (4), and the lowest score was given to treatment (F3), namely 3.60, which means neutral (3).

*Flavor*

TABLE 5. Flavor Hedonic Analysis Results Table

| Sample | F1 | F2 | F3 | F4 |
|---|---|---|---|---|
| **Average** | 3,67 | 3,57 | 3,73 | 4,10 |
| **Std. Dev** | 0,884 | 0,884 | 0,884 | 0,884 |

According to the statistical study, there was no discernible difference between the therapies. From Table 9, it is known that the average score for the aroma parameter for each treatment

was 3.67 (F1); 3.57 (F2); 3.73 (F3); and 4.10 (F4). The highest score for the taste parameter was aimed at treatment (F4), namely 4.10, which means tending to like (4), and the lowest score was aimed at treatment (F2), namely 3.57, which means tending to be neutral-like (3-4).

*Ranking Test*

The ranking test is a discriminatory test used to rank product treatment results based on the best scores in sensory testing. In this study, the ranking test covered taste and texture, with taste scores of (1) not savory, (2) savory, and (3) very savory, while texture scores were (1) not crunchy, (2) crunchy, and (3) very crunchy. The results of the ranking test analysis of red tilapia fish flakes based on purple yam flour and mung bean flour for 30 semi-trained and untrained panelists are shown in the table.

*Flavour*

TABLE 6. Taste Ranking Test Analysis Results Table

| Sample | F1 | F2 | F3 | F4 |
|---|---|---|---|---|
| **Average** | 2,13 | 2,03 | 1,93 | 2,20 |
| **Std. Dev** | 0,571 | 0,669 | 0,583 | 0,610 |

The statistical analysis results showed no significant differences between treatments. Table 10 shows the average scores for the taste ranking test for each treatment were 2.13 (F1); 2.03 (F2); 1.93 (F3); and 2.20 (F4). The ranking order, starting from the best based on taste, was treatment (F4) - (F1) - (F2) - (F3).

*Texture*

TABLE 7. Texture Ranking Test Analysis Results

| Sample | F1 | F2 | F3 | F4 |
|---|---|---|---|---|
| Average | 2,57 | 2,17 | 2,10 | 2,00 |
| Std. Dev | 0,568 | 0,592 | 0,662 | 0,525 |

The statistical analysis results showed no significant difference between treatments. Table 11 shows that the average scores for the texture ranking test for each treatment were 2.57 (F1); 2.17 (F2); 2.10 (F3); and 2.00 (F4). The ranking order, starting from the best based on texture, was treatment (F1) - (F2) - (F3) - (F4).

## IV. Conclusions And Suggestions

*Conclusion*

Based on the research results, it can be concluded that:

1. Red tilapia fish flakes based on purple yam flour and mung bean flour are acceptable based on the hedonic test results, where all treatments received an average score above 3 (neutral) in all aspects, namely taste, color, texture, and aroma.
2. The ranking test showed that the formulation or treatment (F4) of 26% yam flour: 52% mung bean flour: 21% tapioca flour received the highest score in terms of taste, while the highest formulation in terms of texture was the control treatment (F1) of 0% yam flour: 0% mung bean flour: 100% tapioca flour.
3. The addition of tapioca flour is very important as a binding agent and affects texture. Making red tilapia fish flakes based on purple yam flour and mung bean flour still requires the addition of tapioca flour at a percentage similar to 20% to 22%, as with flakes made with other raw materials in general.

*Recommendations*

1. Analysis of protein, carbohydrates, calories, fiber, and resistant starch is necessary.
2. Formula modifications and further research are needed to obtain a flake formulation that meets flake quality requirements.

## References

[1] A.E. Mubarak (2005). Nutritional composition and antinutritional factors of mung bean seeds (*Phaseolus aureus*) as affected by some home traditional processes. Food Chemistry
[2] A.J.M Lubag, A.C. Laurena, E.M.T. Mendoza (2008). Antioxidants of Purple and White Greater Yam (*Dioscorea alata* L.) Varieties from the Philippines. Philippine J of Sci.
[3] Anonim. https://4.bp.blogspot.com/-BbALZeXANco/XFMg1-q86ZI (Diakses pada 26 September 2022)
[4] Anonim. https://idnmedis.com/ikan-nila-mentah (Diakses pada 11 Februari 2021)
[5] Anonim. https://cf.shopee.co.id/file/f1cbd4638ef354b9e1ba9d99fa90910b (Diakses pada 09 November 2020)
[6] AOAC (2005). Official of Analysis of The Association of Official Analytical Chemistry. Arlington: AOAC Inc.
[7] Badan Pusat Statistik (2015). Luas Panen Kacang Hijau Menurut Provinsi. Badan Pusat Statistik. Jakarta Pusat.
[8] Badan Pusat Statistik (2015). Produksi Kacang Hijau Menurut Provinsi. Badan Pusat Statistik. Jakarta Pusat.
[9] Badan Pusat Statistik (2015). Produktivitas Kacang Hijau Menurut Provinsi. Badan Pusat Statistik. Jakarta Pusat.
[10] B. Kartika, P. Hastuti dan W. Supartono (1988). Pedoman Uji Inderawi Bahan Pangan. Pusat Antar Universitas Pangan dan Gizi.Yogyakarta.
[11] C.C. Hsu, Y.C. Huang, M.C. Yin, S.J. Lin. (2006). Effect of yam (*Dioscorea alata* compared to *Dioscorea japonica*) on gastrointestinal function and antioxidant activity in mice. J of Food Sci.
[12] deMan, M. John (1997). *Kimia Makanan*. Bandung : ITB
[13] D. Prawiranegara (1996). Daftar Komposisi Bahan Makanan. Direktorat Gizi Departemen Kesehatan RI. Bhratara. Jakarta
[14] D. Sastrapradja, .S. Adisoemarto, K. Kartawinata, S. Sastrapradja dan M.A. Rifai. (1989). Keanekaragaman Hayati Untuk Kelangsungan Hidup bangsa. Puslitbang Bioteknologi – LIPI. Bogor.
**[15]** E. Fataip (2020). Penduduk Lansia Jateng Tertinggi Kedua. http://andrafarm.com/ andra.php?_i=0-tanaman kelompok&topik=gizi&kelompok (Diakses 30 Oktober 2020)
[16] E.A. Udensi, H.O. Oselebe, and O.O. Iweala (2008). The investigation of chemical composition and functional properties of water yam (*Dioscorea alata*): effect of varietal differences. Pakistan J. of Nutrition.
[17] E. Fataip (2020). Penduduk Lansia Jateng Tertinggi Kedua. http://andrafarm.com/ andra.php? i=0-tanaman kelompok&topik=gizi&kelompok (Diakses 30 Oktober 2020)
[18] F. Amalia (2013). Formulasi Flakes Pati Garut dan Tepung Ikan Lele Dumbo (*Clarias gariepinus*) sebagai Pangan Kaya Energi Protein dan Mineral untuk Lansia. Skripsi. Departemen Gizi Masyarakat. Fakultas Ekologi Manusia. Institut Pertanian Bogor.
[19] F.G. Winarno (2004). Kimia Pangan dan Gizi.PT Gramedia Pustaka Utama. Jakarta.
[20] Flach, M., and F. Rumawas., 1996. Plant resources of South-East Asia No 9, Plants yielding non-seed carbohydrates, Bogor.
[21] Hildayanti (2012). Studi Pembuatan Flakes Jewawut. Skripsi. Universitas Hasanuddin : Makassar
[22] H.S. Widyasitoresmi (2010). Formulasi dan Karakterisasi Flake Berbasis Sorgum (*Sorghum bicolor* L.) dan Ubi Jalar Ungu (*Ipomoea batatas* L.). Skripsi. Institut Pertanian Bogor.
[23] I.D. Gisca, Bernadheta., dan R. Arintina (2013). Penambahan Gembili Pada Flakes Jewawut Ikan Gabus Sebagai Alternatif Makanan Tambahan Anak Gizi Kurang. Program Studi Ilmu Gizi. Fakultas Kedokteran. Universitas Diponegoro. Semarang.
[24] IITIS (2009). *Dioscorea alata* L. taxanomy serial no. 43372. ITIS http://www.itis.gov. (Diakses 12 Desember 2021).

[25] I. Khairullah, Mawardi, M. Sarwani (2006). Sumberdaya Hayati Pertanian Lahan Rawa Dalam Karakteristik Dan Pengelolaan Lahan Rawa, Balai Besar Penelitian dan Pengembangan Sumber Daya Lahan Pertanian.
[26] Iriawan (2012). Pembuatan Fish Flake Dari Ikan Lele (*Clarias* sp.) Sebagai Makanan Siap Saji. Skripsi. Fakultas Perikanan dan Ilmu Kelautan, Institut Pertanian Bogor, Bogor.
[27] International Diabetes Federation. IDF Diabetes Atlas 10th Edition 2020. IDF; 2019.
[28] J.F. Rogers, R.C. Cole and J.D. Smith (2004). An Illustrated Guide to Fish Preparation Tropical Product. Insitute London.
[29] J.P.D Wanasundera and G. Ravindran (1994) Nutritional assesment of yam (*Dioscorea alata*) tubers. Plant Foods of Human Nutrition.
[30] J. Rakocy (2005), Tank Culture of Tilapia. The Fish Site. https://thefishsite.com/ articles/tank-culture-of-tilapia (Diakses 10 November 2021)
[31] J.W. Purseglove (1972). Tropical crops monocotyledons. Longman, London.
[32] K. Amri dan Khairuman (2002). Buku Pintar Budidaya 15 Ikan Konsumsi. Agromedia. Jakarta.
[33] K. Amri dan Khairuman (2003). Budidaya Ikan Nila Secara Intensif. Jakarta: Agromedia Pustaka
[34] K.A. Buckle, R.A. Edwards, G.H. Fleet dan M. Woonton (1987). Ilmu Pangan.Universitas Indonesia Press. Jakarta.
[35] K.W. Pratiwi (2016). Formulasi Tepung Ubi Jalar Cilembu (*Ipomoea batatas* (L.) dan Tepung Jagung (*Zea Mays*) Terfermentasi Terhadap Sifat Kimia dan Sensori *Flakes*. Fakultas Pertanian. Universitas Lampung. Bandar Lampung.
[36] L. Suprapti (2005). Tepung Tapioka Pembuatan dan Pemanfaatannya. Penerbit Kasinius. Yogyakarta.
[37] M.Z. Sugandhi, Z. Arief, D. Widiantara, T. (2016). Pengaruh Perbandingan Tepung Biji Kacang Koro Pedang (Canavalia ensiformis) Terhadap Karakteristik Flakes. Universitas Pasundan. Bandung.
[38] N.A. Campbell & J. B. Reece. (2008). Biologi, Edisi Kedelapan Jilid 3. Terjemahan: Damaring Tyas Wulandari. Jakarta: Erlangga.
[39] N. Imanningsih (2013). Potensi umbi dioskorea (*Dioscorea alata*) untuk mencegah aterosklerosis pada kelinci percobaan. Disertasi. Bogor. Institut Pertanian Bogor.
[40] P. Lingga, B. Sarwono, F. Rahardi, P. C. Rahardja, J. J. Afriastini, R. Wudianto dan W. H.Apriadji. 1986. Bertanam ubi-ubian. Penebar Swadaya, Jakarta.
[41] Prihatman (2009). Budidaya Ikan Nila Secara Intensif. Jakarta: Gramedia.
[42] Purwono dan R. Hartono (2005). Kacang Hijau. Penebar Swadaya. Jakarta.
[43] P. Suptijah, Gushagia dan D. Sukarsa, D (2008) Kajian Efek Daya Hambat Kitosan Terhadap Kemunduran Mutu Fillet Ikan Patin Pada Penyimpanan Suhu Ruang. Buletin Teknologi Hasil Perikanan.
[44] Razif dan Astawan (2009). Macam-macam jenis tepung terigu. Jurusan Teknik Kimia Fakultas Teknik Universitas Diponegoro. Semarang.
[45] R. Adawiyah. (2007). Pengolahan dan Pengawetan Ikan. PT Bumi Aksara. Jakarta.
[46] R.A. Widiyanti (2015). Pemanfaatan Kelapa Menjadi VCO (Virgin Coconut Oil)sebagai Antibiotik Kesehatan dalam Upaya Mendukung Visi Indonesia Sehat 2015. Prosiding Seminar Nasional Pendidikan Biologi 2015.
[47] R. N. Fatimah (2015). Diabetes Melitus Tipe 2. J Majority Volume 4 Nomor 5.
[48] R. Nurcahyani (2016). Eksperimen Pembuatan Cookies Tepung Kacang Hijau Substitusi Tepung Bonggol Pisang. Skripsi. Jurusan Pendidikan Kesejahteraan Keluarga Fakultas Teknik Universitas Negeri Semarang.
[49] R. Syarif dan H. Halid (1991).Teknologi Penyimpanan Pangan. Penerbit Arcan. Jakarta.
[50] S. Koswara, (2009). Teknologi Tepat Guna Pengolahan Singkong, Pisang, dan Talas. Ebookpangan.com.
[51] Soemarno (2007). Rancangan Teknologi Proses Pengolahan Tapioka dan ProdukProduknya. Magister Teknik Kimia. Universitas Brawijaya. Malang.
[52] S. Sandi dan A. Saputra (2012). The Effect of Effective Microorganisms-4 (Em 4) Addition on the Physical Quality of Sugar Cane Shoots Silage. In International Seminar on Animal Industry.
[53] Standar Nasional indonesia, 1996. Mutu dan Cara Uji Flakes. SNI 01-4270- (1996). Badan Standarisasi nasional, Jakarta.
[54] Sukmawati, N. D. (1987). Perubahan Kabohidrat Umbi Uwi (*Dioscorea alata* L) Selama Penyimpanan. Bogor.
[55] S. Winarti., Jariyah, dan Y. Purnomo, Y. (2007). Proses Pembuatan VCO (Virgin Coconut Oil) Secara Enzimatis Menggunakan Papain Kasar. Jurnal Teknologi Pertanian. Volume 8.
[56] TKPI. (2019). Tabel Komposisi Pangan Indonesia. https://m.andrafarm.com/ (diakses 17 Januari 2022)
[57] T.I. Sari, E. Herdiana dan T. Amelia, T (2010). Pembuatan VCO dengan Metode Enzimatis dan Konversinya Menjadi Sabun Padat Transparan. Jurnal Teknik Kimia. Volume 17 Nomor 3.
[58] V. Lebot, R. Malapa, T. Molisale and J.L. Marchand. (2005). Physico-chemical characterisation of yam (*Dioscorea alata* L.) tubers from Vanuatu. Genetic Resources and Crop Evolution.
[59] W.C iptadi (1980). Umbi ketela pohon sebagai bahanbahan pangan industri. Fateta Institut Pertanian Bogor.