Journal of Applied Nutrition and Dietetic
Volume 6, Number 1, June 2026
P-ISSN: 2797-7412
DOI : 10.30867/jand.v6i1.929

Effects of Takokak (Solanum torvum Sw.) Addition on the Sensory Acceptability and Antioxidant Activity of Kepok Banana (Musa paradisiaca L.) Flour Cookies

Uzra Alifya*[1], Ichsan[2]
[1]Diploma in Nutrition, Department of Nutrition, Poltekkes Kemenkes, Aceh.
[2]Department of Nutrition, Poltekkes Kemenkes, Aceh.
*Correspondence email: uzraalifya@gmail.com

Submitted : 23/06/2025 *Accepted: 01/06/2026* *Published: 30/06/2026*

--

Abstract

Takokak (*Solanum torvum* Sw.) and kepok banana (*Musa paradisiaca* L.) are rich in antioxidant compounds with potential health benefits, yet their utilization in functional food products remains limited. This study aimed to evaluate the effect of incorporating takokak fruit into cookies formulated with kepok banana flour on sensory acceptability and antioxidant activity. A non-factorial Completely Randomized Design (CRD) with three formulations and three replications was employed. Sensory evaluation was conducted using a hedonic test by semi-trained panelists to assess color, aroma, taste, and texture. Antioxidant activity was determined using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay. Data were analyzed using analysis of variance (ANOVA), followed by Duncan's Multiple Range Test. The formulation containing 140 g of kepok banana flour and 10 g of takokak fruit (FA) achieved the highest acceptability for taste, aroma, and texture, whereas the formulation containing 120 g of kepok banana flour and 30 g of takokak fruit (FC) was most preferred for color. The incorporation of takokak fruit had no significant effect on color or aroma but significantly influenced taste, texture, and antioxidant activity ($p < 0.05$). These findings indicate that takokak fruit can be successfully incorporated into kepok banana flour cookies to enhance their antioxidant properties while maintaining acceptable sensory quality. Further studies should investigate pre-treatment methods to reduce the characteristic bitterness of takokak fruit and optimize the nutritional and functional properties of the final product.

Keywords: antioxidant activity, cookies, functional food, kepok banana flour, *Solanum torvum*

Introduction

Oxidative stress, caused by an imbalance between reactive oxygen species (ROS) and the body's antioxidant defense system, contributes to the development of numerous chronic diseases, including cardiovascular diseases, diabetes mellitus, neurodegenerative disorders, and cancer. Dietary antioxidants can neutralize free radicals by donating electrons, thereby preventing oxidative damage to cellular components. Consequently, increasing attention has been directed toward plant-derived antioxidants as functional food ingredients because of their health-promoting properties (Lobo et al., 2010; Singh et al., 2016).

Takokak (*Solanum torvum* Sw.) is an underutilized tropical fruit widely distributed in Southeast Asia and recognized for its nutritional and medicinal properties. The fruit contains phenolic compounds, flavonoids, glycoalkaloids, steroidal saponins, vitamins, and minerals that contribute to its antioxidant capacity. Previous studies have demonstrated that *S. torvum* exhibits strong free radical scavenging activity using the 2,2-diphenyl-1-picrylhydrazyl

Journal of Applied Nutrition and Dietetic
Volume 6, Number 1, June 2026
P-ISSN: 2797-7412
DOI : 10.30867/jand.v6i1.929

(DPPH) assay, indicating its potential as a natural source of antioxidants for functional food applications (Abdulkadir et al., 2016; Darkwah et al., 2020). However, its utilization in processed food products remains limited.

Kepok banana (*Musa paradisiaca* L.) is another indigenous commodity with considerable nutritional and functional potential. Banana flour contains resistant starch, dietary fiber, phenolic compounds, carotenoids, vitamins, and minerals, making it a promising alternative to wheat flour in bakery products. Previous studies have reported that banana flour improves the nutritional quality, antioxidant capacity, and functional properties of baked products while supporting the development of gluten-reduced or functional foods (Khoozani et al., 2019; Singh et al., 2016). More recently, banana flour has also been shown to enhance the physicochemical, sensory, and bioactive properties of cookies, supporting its application as a functional ingredient in bakery products (Karaman et al., 2025).

Cookies are among the most popular bakery products because of their long shelf life, convenient consumption, and wide consumer acceptance. Their relatively simple formulation allows the incorporation of functional ingredients rich in bioactive compounds without substantially altering the manufacturing process. Several studies have demonstrated that fortification with fruit- or plant-based ingredients can improve the antioxidant activity and nutritional quality of cookies, although the level of substitution may influence sensory attributes such as color, aroma, taste, and texture (Ajila et al., 2008; Adeola & Ohizua, 2018).

Although the antioxidant properties of *Solanum torvum* and banana flour have been reported separately, studies investigating their combined application in cookie formulations are still scarce. Evaluating the incorporation of takokak fruit into kepok banana flour cookies may provide valuable information for developing antioxidant-rich bakery products while promoting the utilization of local food resources. Therefore, this study aimed to evaluate the effects of takokak (*Solanum torvum* Sw.) addition on the sensory acceptability and antioxidant activity of cookies prepared from kepok banana (*Musa paradisiaca* L.) flour.

Methods

Experimental Design

This study employed an experimental design using a non-factorial Completely Randomized Design (CRD) consisting of three treatment formulations with three replications, resulting in a total of nine experimental units. The treatments differed in the proportion of takokak (*Solanum torvum* Sw.) fruit incorporated into cookies prepared from kepok banana (*Musa paradisiaca* L.) flour, as follows: FA (140 g kepok banana flour + 10 g takokak fruit), FB (130 g kepok banana flour + 20 g takokak fruit), and FC (120 g kepok banana flour + 30 g takokak fruit).

Sensory Evaluation

Sensory acceptability was evaluated using a hedonic test based on four attributes: color, aroma, taste, and texture. The evaluation was conducted at the Food Laboratory, Department of Nutrition, Poltekkes Kemenkes Aceh. Thirty semi-trained panelists, consisting of undergraduate nutrition students who had completed the Food Technology course, participated in the sensory evaluation. Each panelist evaluated all cookie formulations using a five-point hedonic scale, where 1 = dislike very much, 2 = dislike, 3 = neither like nor dislike, 4 = like, and 5 = like very much.

Determination of Antioxidant Activity

The antioxidant activity of the cookie samples was determined using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay at the Instrumentation and Chemical Research Laboratory, Department of Chemistry, Syiah Kuala University. Briefly, the sample extract was

Journal of Applied Nutrition and Dietetic
Volume 6, Number 1, June 2026
P-ISSN: 2797-7412
DOI : 10.30867/jand.v6i1.929

mixed with DPPH solution, homogenized, and incubated under dark conditions for the specified reaction time. The absorbance of the reaction mixture was measured using a UV–Visible spectrophotometer at **517 nm**.
The antioxidant activity was expressed as the **IC_{50} value (µg/mL)**, defined as the concentration of sample required to inhibit 50% of DPPH free radicals. IC_{50} values were obtained from the linear regression equation between sample concentration and percentage inhibition. Lower IC_{50} values indicate stronger antioxidant activity.

Statistical Analysis

Data obtained from the sensory evaluation and antioxidant activity (IC_{50}) analyses were statistically analyzed using one-way analysis of variance (ANOVA). When significant differences among treatments were detected ($p < 0.05$), Duncan's Multiple Range Test (DMRT) was performed to compare treatment means. Statistical analyses were conducted using **IBM SPSS Statistics.**

Results

Sensory Acceptability

The sensory acceptability of kepok banana (*Musa paradisiaca* L.) flour cookies fortified with takokak (*Solanum torvum* Sw.) fruit was evaluated using a hedonic test based on four attributes: color, taste, aroma, and texture.

Table 1. Sensory evaluation of cookie color.

Cookie formulation	Mean	*p*-value
Kepok banana flour 140 g + takokak fruit 10 g (FA)	3.88^{a}	
Kepok banana flour 130 g + takokak fruit 20 g (FB)	3.91^{a}	0.686
Kepok banana flour 120 g + takokak fruit 30 g (FC)	3.98^{a}	

Values followed by different superscript letters within the same column are significantly different according to Duncan's Multiple Range Test ($p < 0.05$).

The mean hedonic scores for color ranged from 3.88 to 3.98, indicating that all cookie formulations were generally **slightly liked** by the panelists. The highest color acceptance was observed in formulation FC (3.98), whereas formulation FA received the lowest score (3.88). One-way ANOVA showed that the addition of takokak fruit had **no significant effect** on cookie color ($p = 0.686$), indicating that increasing the proportion of takokak fruit did not alter the panelists' perception of color.

Table 2. Sensory evaluation of cookie taste.

Cookie formulation	Mean	*p*-value
Kepok banana flour 140 g + takokak fruit 10 g (FA)	4.11^{b}	
Kepok banana flour 130 g + takokak fruit 20 g (FB)	3.77^{a}	<0.001
Kepok banana flour 120 g + takokak fruit 30 g (FC)	3.56^{a}	

Values followed by different superscript letters within the same column are significantly different according to Duncan's Multiple Range Test ($p < 0.05$).

The mean hedonic scores for taste ranged from 3.56 to 4.11, corresponding to the **slightly liked** to **liked** categories. Formulation FA obtained the highest taste acceptance, whereas formulation FC received the lowest score. Statistical analysis revealed that takokak fruit

Journal of Applied Nutrition and Dietetic
Volume 6, Number 1, June 2026
P-ISSN: 2797-7412
DOI : 10.30867/jand.v6i1.929

addition had a **significant effect** on the taste of the cookies ($p < 0.001$). Duncan's Multiple Range Test further indicated that formulation FA differed significantly from formulations FB and FC, while no significant difference was observed between FB and FC. These findings suggest that increasing the proportion of takokak fruit reduced the sensory acceptability of cookie taste, likely due to the characteristic bitter flavor associated with takokak fruit.

Duncan's Multiple Range Test showed that formulations FB and FC were not significantly different in terms of taste, as indicated by the same superscript letter (a). In contrast, formulation FA was significantly different from both FB and FC (superscript b) and achieved the highest mean taste score (4.11), indicating that cookies containing 10 g of takokak fruit were the most preferred by the panelists. The results suggest that increasing the proportion of takokak fruit adversely affected taste acceptability, possibly due to the fruit's characteristic bitter flavor.

Table 3. Duncan's Multiple Range Test for the taste scores of cookies.

Cookie formulation	*N*	Subset 1 (a)	Subset 2 (b)
Kepok banana flour 120 g + takokak fruit 30 g (FC)	90	3.56^{a}	
Kepok banana flour 130 g + takokak fruit 20 g (FB)	90	3.77^{a}	
Kepok banana flour 140 g + takokak fruit 10 g (FA)	90		4.11^{b}

Values followed by different superscript letters within the same column are significantly different according to Duncan's Multiple Range Test ($p < 0.05$).

Table 4. Sensory evaluation of cookie aroma.

Cookie formulation	Mean	*p*-value
Kepok banana flour 140 g + takokak fruit 10 g (FA)	3.98^{a}	
Kepok banana flour 130 g + takokak fruit 20 g (FB)	3.74^{a}	0.074
Kepok banana flour 120 g + takokak fruit 30 g (FC)	3.72^{a}	

Values followed by different superscript letters within the same column are significantly different according to Duncan's Multiple Range Test ($p < 0.05$).

The mean hedonic scores for aroma ranged from 3.72 to 3.98, indicating that all formulations were generally **slightly liked** by the panelists. Formulation FA received the highest aroma score, whereas formulation FC received the lowest. One-way ANOVA revealed that the addition of takokak fruit had **no significant effect** on aroma ($p = 0.074$), indicating that increasing the amount of takokak fruit did not significantly alter the aroma acceptability of the cookies.

Table 5. Sensory evaluation of cookie texture.

Cookie formulation	Mean	*p*-value
Kepok banana flour 140 g + takokak fruit 10 g (FA)	4.16^{b}	
Kepok banana flour 130 g + takokak fruit 20 g (FB)	4.02^{b}	0.001
Kepok banana flour 120 g + takokak fruit 30 g (FC)	3.66^{a}	

Values followed by different superscript letters within the same column are significantly different according to Duncan's Multiple Range Test ($p < 0.05$).

The mean texture scores ranged from 3.66 to 4.16, corresponding to the **slightly liked** to **liked** categories. Formulation FA showed the highest texture acceptability, followed by FB, whereas FC received the lowest score. ANOVA indicated that the addition of takokak fruit significantly

Journal of Applied Nutrition and Dietetic
Volume 6, Number 1, June 2026
P-ISSN: 2797-7412
DOI : 10.30867/jand.v6i1.929

affected cookie texture (p = 0.001), suggesting that higher levels of takokak fruit reduced texture acceptability.

Table 6. Duncan's Multiple Range Test for the texture scores of cookies.

Cookie formulation	*N*	Subset 1 (a)	Subset 2 (b)
Kepok banana flour 120 g + takokak fruit 30 g (FC)	90	3.66^{a}	
Kepok banana flour 130 g + takokak fruit 20 g (FB)	90		4.02^{b}
Kepok banana flour 140 g + takokak fruit 10 g (FA)	90		4.16^{b}

Duncan's Multiple Range Test demonstrated that formulations FA and FB were not significantly different in terms of texture, as both shared the same superscript letter (b). In contrast, formulation FC differed significantly from the other two formulations (superscript a) and had the lowest mean texture score (3.66). These findings indicate that increasing the proportion of takokak fruit to 30 g reduced the texture acceptability of the cookies, whereas formulations containing 10 g and 20 g of takokak fruit maintained comparable and more acceptable texture characteristics.

Antioxidant Activity

The antioxidant activity of the cookie formulations, expressed as IC_{50} values determined by the DPPH assay, ranged from 6.51 to 22.48 µg/mL. Formulation FC exhibited the lowest IC_{50} value (6.51 µg/mL), indicating the **highest antioxidant activity**, followed by FB (17.57 µg/mL), whereas FA showed the highest IC_{50} value (22.48 µg/mL), indicating the **lowest antioxidant activity**. One-way ANOVA demonstrated that the addition of takokak fruit significantly affected the antioxidant activity of the cookies ($p < 0.001$). These findings indicate that increasing the proportion of takokak fruit significantly enhanced the antioxidant capacity of the cookie formulations.

Table 7. Antioxidant activity (DPPH IC_{50}) of kepok banana flour cookies fortified with takokak fruit.

Cookie formulation	IC_{50} (µg/mL)	*p*-value
Kepok banana flour 140 g + takokak fruit 10 g (FA)	22.48^{c}	
Kepok banana flour 130 g + takokak fruit 20 g (FB)	17.57^{b}	<0.001
Kepok banana flour 120 g + takokak fruit 30 g (FC)	6.51^{a}	

Values followed by different superscript letters within the same column are significantly different according to Duncan's Multiple Range Test ($p < 0.05$).

Duncan's Multiple Range Test showed that all three formulations differed significantly from one another ($p < 0.05$). Formulation FC had the lowest IC_{50} value and therefore exhibited the strongest antioxidant activity, whereas formulation FA had the highest IC_{50} value, indicating the weakest antioxidant activity. The progressive decrease in IC_{50} values with increasing levels of takokak fruit suggests that fortification with takokak fruit effectively improved the antioxidant properties of kepok banana flour cookies.

Journal of Applied Nutrition and Dietetic
Volume 6, Number 1, June 2026
P-ISSN: 2797-7412
DOI : 10.30867/jand.v6i1.929

Table 8. Duncan's Multiple Range Test for the antioxidant activity (IC_{50}) of cookies.

Cookie formulation	N	Subset 1 (a)	Subset 2 (b)	Subset 3 (c)
Kepok banana flour 120 g + takokak fruit 30 g (FC)	3	6.51[a]		
Kepok banana flour 130 g + takokak fruit 20 g (FB)	3		17.57[b]	
Kepok banana flour 140 g + takokak fruit 10 g (FA)	3			22.48[c]

Values followed by different superscript letters within the same column are significantly different according to Duncan's Multiple Range Test ($p < 0.05$).

Discussion
Organoleptic Characteristics
Color

The addition of takokak (*Solanum torvum* Sw.) fruit did not significantly affect the color acceptability of kepok banana flour cookies. Although formulation FC received the highest mean color score, all formulations were similarly accepted by the panelists. The darker brown color observed with increasing levels of takokak fruit may be attributed to the combined effects of natural plant pigments and non-enzymatic browning reactions, particularly the Maillard reaction and caramelization during baking. Phenolic compounds naturally present in takokak fruit may also contribute to color development through oxidation and thermal degradation. Similar findings have been reported in bakery products fortified with fruit- and vegetable-based ingredients, where increased phenolic content resulted in darker products without significantly reducing consumer acceptance (Ajila et al., 2008; Khoozani et al., 2019).

Taste

Taste was significantly influenced by the level of takokak fruit addition. Formulation FA, containing the lowest amount of takokak fruit (10 g), received the highest sensory score, whereas increasing the proportion of takokak fruit reduced taste acceptability. This finding is likely associated with the presence of phenolic compounds, tannins, and glycoalkaloids in *S. torvum*, which impart bitter and astringent sensations. Tannins interact with salivary proteins, producing a dry and puckering mouthfeel that may reduce consumer preference. Although takokak fruit is a promising functional ingredient because of its high antioxidant potential, appropriate pre-treatment methods are required to minimize undesirable sensory characteristics while preserving its bioactive compounds (Darkwah et al., 2020).

Aroma

The addition of takokak fruit had no significant effect on cookie aroma, although formulation FA obtained the highest mean aroma score. The characteristic aroma of takokak fruit is associated with its bioactive constituents, including steroidal alkaloids and volatile phytochemicals. However, the baking process may reduce the intensity of these volatile compounds through thermal degradation, thereby minimizing differences among formulations. Consequently, the aroma remained generally acceptable despite increasing levels of takokak fruit.

Texture

Texture was significantly affected by takokak fruit incorporation. Formulations FA and FB showed comparable texture acceptability and were preferred over FC. Increasing the proportion of takokak fruit while reducing banana flour may have altered the moisture balance

Journal of Applied Nutrition and Dietetic
Volume 6, Number 1, June 2026
P-ISSN: 2797-7412
DOI : 10.30867/jand.v6i1.929

and weakened the structural matrix of the cookie dough, resulting in a denser and less desirable texture. The incorporation of plant materials rich in dietary fiber is known to modify dough rheology and textural characteristics by affecting water absorption and gluten replacement in bakery products (Khoozani et al., 2019; Adeola & Ohizua, 2018). Therefore, optimization of the proportion of takokak fruit is essential to maintain desirable textural properties.

Antioxidant Activity

The addition of takokak fruit significantly increased the antioxidant activity of the cookies, as indicated by the progressive reduction in IC_{50} values from FA (22.48 µg/mL) to FB (17.57 µg/mL) and FC (6.51 µg/mL). Since lower IC_{50} values represent stronger free radical scavenging capacity, formulation FC exhibited the highest antioxidant activity. According to the classification proposed by Tristantini et al. (2016), all formulations were categorized as having very strong antioxidant activity because their IC_{50} values were below 50 µg/mL.

The enhanced antioxidant activity is likely attributable to the higher concentration of phenolic compounds, flavonoids, and other antioxidant phytochemicals naturally present in takokak fruit. These compounds effectively donate hydrogen atoms or electrons to stabilize DPPH free radicals, thereby increasing radical scavenging activity. Similar findings have been reported for *Solanum torvum*, which has been identified as a rich source of phenolic antioxidants with considerable free radical scavenging capacity (Abdulkadir et al., 2016; Darkwah et al., 2020). These results demonstrate that takokak fruit has promising potential as a functional ingredient for the development of antioxidant-rich bakery products.

Conclusion

The incorporation of takokak (*Solanum torvum* Sw.) into kepok banana (*Musa paradisiaca* L.) flour cookies significantly influenced taste, texture, and antioxidant activity but did not significantly affect color or aroma. Increasing the proportion of takokak fruit progressively enhanced antioxidant activity, as reflected by lower IC_{50} values, with the formulation containing 30 g of takokak fruit exhibiting the strongest free radical scavenging capacity. However, the highest sensory acceptability was achieved by the formulation containing 10 g of takokak fruit, indicating a trade-off between functional properties and consumer preference. Overall, the results suggest that takokak fruit is a promising natural source of antioxidants for functional bakery products. Appropriate processing strategies are required to improve its sensory characteristics while maintaining its bioactive compounds, thereby supporting the development of nutritious, antioxidant-rich cookies based on locally available food resources.

References

Abdulkadir, A. R., Mat, N., Hasan, M. M., & Jahan, M. S. (2016). In vitro antioxidant activity of the ethanolic extract from fruit, stem, and leaf of Solanum torvum. ScienceAsia, 42(3), 184–189. https://doi.org/10.2306/scienceasia1513-1874.2016.42.184

Adeola, A. A., & Ohizua, E. R. (2018). Physical, chemical and sensory properties of biscuits prepared from flour blends of unripe cooking banana, pigeon pea and sweet potato. Food Science & Nutrition, 6(3), 532–540.

Journal of Applied Nutrition and Dietetic
Volume 6, Number 1, June 2026
P-ISSN: 2797-7412
DOI : 10.30867/jand.v6i1.929

Ajila, C. M., Leelavathi, K., & Rao, U. J. S. P. (2008). Improvement of dietary fiber content and antioxidant properties in soft dough biscuits with the incorporation of mango peel powder. Journal of Cereal Science, 48(2), 319–326.

Darkwah, W. K., Koomson, D. A., Miwornunyuie, N., Nkoom, M., & Puplampu, J. B. (2020). Review: Phytochemistry and medicinal properties of Solanum torvum fruits. All Life, 13(1), 498–506. https://doi.org/10.1080/26895293.2020.1817799

Dewa, F., Sari Lubis, M., Indrayani Dalimunthe, G., & Yuniarti, R. (2024). Formulasi Tablet Hisap Serbuk Rimbang (Solanum torvum Sw.). Jurnal Farmasi, Sains, Dan Kesehatan, 3 (2), 171–182.

Faisal, H., Andry, M., Lumbantoruan, J. M., & Farmasi, P. S. (2024). Pemanfaatan Ekstrak Buah Takokak (Solanum torvum Sw.) Pada Formulasi Minuman Suplemen Sebagai Sumber Antioksidan 1,. 22 (02), 222–237.

Fu, V., Apridamayanti, P., & Luliana, S. (2023). Aktivitas Antioksidan Ekstrak Air Kombinasi Kulit Pisang Kepok (Musa paradisiaca L.) dan Nanas (Ananas comosus L.) dengan Metode DPPH dan FRAP. 3 (2), 235–246.

Holinesti, R., & Santri, R. (2022). Pengaruh Substitusi Tepung Pisang Kepok dan Ekstrak Buah Takokak Terhadap Kualitas Chocochip Cookies. Jurnal Pendidikan Tata Boga Dan Teknologi, 3 (3), 159.

Khoozani, A. A., Birch, J., & Bekhit, A. E. D. A. (2019). Production, application and health effects of banana pulp and peel flour in the food industry. Journal of Food Science and Technology, 56(2), 548–559.

Lobo, V., Patil, A., Phatak, A., & Chandra, N. (2010). Free radicals, antioxidants and functional foods: Impact on human health. Pharmacognosy Reviews, 4(8), 118–126.

Malau, M. S., Vonny, D. A. N., & Johan, S. (2022). Pemanfaatan Tepung Pisang Kepok Dan Tepung Tempe Dalam Pembuatan Cookies. 21 (2), 79–85.

Melisa, N., Hartianti, I., Prakoso, V. F., Teruna, H. Y., & Hendra, R. (2018). Aktivitas Antioksidan Dan Toksisitas Ekstrak Daun Coleus Scutellarioides. MPI (Media Pharmaceutica Indonesiana), 2 (1), 9–12.

Nuaeni, I., Proverawati, A., & Prasetyo, T. J. (2022). Karakteristik Sensori Cookies Bersubstitusi Tepung Pisang Kepok Dan Disuplementasi Tepung Cangkang Telur Ayam. Journal of Nutrition College, 11 (1), 74–86.

Pangondian Harahap, A., Rambe, R., Paramitha, R., & Yulanda, Y. (2022). Standarisasi Dan Perbandingan Uji Aktivitas Antioksidan Dari Ekstrak Etanol Dan Dekok Daun Senggani (Melastoma malabathricum L.) Dengan Menggunakan metode DPPH. Forte Journal, 2 (1), 11–21.

Singh, B., Singh, J. P., Kaur, A., & Singh, N. (2016). Bioactive compounds in banana and their associated health benefits: A review. Food Chemistry, 206, 1–11.

Tristantini, D., Ismawati, A., Pradana, B. T., & Jonathan, J. G. (2016). Pengujian aktivitas antioksidan menggunakan metode DPPH pada ekstrak daun tanjung (Mimusops elengi L.). Prosiding Seminar Nasional Teknik Kimia "Kejuangan", Yogyakarta.