Jurnal Farmasi dan Herbal	Vol.8.2	Edition: April 2026
	http://ejournal.delihusada.ac.id/index.php/JPFH	
Received: 16 April 2026	Revised: 19 April 2026	Accepted: 21 April 2026

Formulation and Acceptability of CelGar Jelly

A Functional Jelly Candy Derived from Garlic and Celery

Jerry Maratis[1], Syarifah Syarifah[2], Saphira Aurelia Huzaen[3], Latricia Aina Hidayat[3], Amanda Farren Nazreen[4], Laila M[5]
Jurusan D3 Farmasi, Fakultas Pertanian, Universitas Tidar, Kota Magelang, Jawa Tengah
Email:Jerry123@gmail.com

Abstract

Hypertension is a major global health concern due to its often asymptomatic progression and its association with serious complications such as stroke, heart failure, and kidney disease. This study aimed to develop a functional food product, CelGar jelly, formulated from celery (Apium graveolens L.) and garlic (Allium sativum L.), which are traditionally recognized for their potential antihypertensive properties. Three types of tests were conducted to evaluate the product. A hedonic (sensory) test involving 20 untrained panelists assessed consumer acceptance based on color, aroma, taste, and texture using a five-point hedonic scale. Laboratory analysis was performed to determine the moisture and ash content to ensure compliance with food quality standards. In addition, a functional test using a quasi-experimental one-group pretest–posttest design involved 12 respondents with hypertension to evaluate changes in blood pressure before and after the intervention. The results showed that CelGar jelly was generally acceptable to panelists, and the laboratory analysis confirmed that its moisture and ash content met the Indonesian National Standard for jelly candy. The functional test indicated a statistically significant reduction in systolic blood pressure, while no significant change was observed in diastolic blood pressure. These findings suggest that CelGar jelly has potential as a functional food product supporting blood pressure management, although further studies with larger samples are needed to confirm its health benefits

Keywords: celery, garlic, herbs, hypertension, jelly

1. PENDAHULUAN

Hypertension causes 45% of deaths from heart disease (1). Hypertension, or high blood pressure, is a significant global health issue(2) and remains one of the most omnipresent medical conditions observed in both developed and developing nations. It is classified into categories such as prehypertension, stage 1, and stage 2 hypertension based on the levels of systolic and diastolic blood pressure.A diagnosis of hypertension is made if a person's systolic blood pressure is ≥140 mmHg or their diastolic blood pressure is ≥90 mmHg, or both, on repeated examinations (3,4). Approximately 17 million deaths per year worldwide are caused by cardiovascular disease, accounting for one-third of all deaths. While lifestyle changes are typically the first step in managing hypertension, medication becomes necessary when blood pressure is uncontrollable (5). Common drug treatments include diuretics, beta-blockers, calcium channel blockers, and inhibitors of the renin-angiotensin system, used either individually or in combination. The choice of antihypertensive therapy is typically determined by the patient's clinical condition and individual health needs (6).

In Indonesia, The prevalence of hypertension is 34.1%, an increase of approximately 9% compared to 25.8% in 2013 health research data(7) and around 15 million people suffer from hypertension, but only 4% manage to keep it under control. The prevalence ranges between 7% and

22%. Preventive include minimizing risk factors, such as reducing salt intake. If these measures are overlooked, the likelihood of developing hypertension increases. To help reduce hypertension rates, health centers should actively educate the public through health promotion and counseling programs, both individually and in group settings, particularly by addressing common risk factors such as smoking, alcohol consumption, obesity, genetic predisposition, stress, high salt intake, and excessive consumption of certain seafood such as shrimp and shellfish. Symptoms may include dizziness, neck tension, tingling, heart palpitations, shortness of breath, and headaches. In addition to increasing the risk of heart disease, hypertension can also lead to complications involving the nervous system, kidneys, and blood vessels. Patients who have higher blood pressure will have a greater overall health risk (8).

Hypertension can be treated with pharmacological and non-pharmacological therapies. Non-pharmacological therapies can include the use of plants proven to contain compounds that can lower blood pressure (9,10). One of the non-handling methods pharmacological treatment of hypertension is with complementary therapy. Therapeutic use natural complements include herbal therapy. There are many herbal therapies used by the public to treat hypertension because it has an effect fewer sides (11). Indonesians have a tradition of using traditional herbal remedies to treat hypertension and various ailments. They use herbal plants as part of their cultural heritage and traditional medicine. These plants are also industrial units in the discovery of chemical compounds. These compounds can function as immune system boosters and enhance the body's natural healing abilities. Herbal plants can be used in the treatment of hypertension because they contain active substances with pharmacological and prophylactic properties (12). Two main ingredients play an important role in helping to manage and control hypertension: garlic and celery. Both have been studied for their potential health benefits and are known to support healthier blood pressure levels when included as part of a balanced diet(8). Traditional herbal practices in Indonesia also utilize combinations of garlic and celery to help manage blood pressure. For example, a preparation from South Sulawesi uses juice made from one clove of garlic and one head (13), while in Lampung a mixture containing approximately 0.5 ounce of garlic and 0.5 ounce of celery is commonly used for the same purpose (14).

Garlic (*Allium sativum L.*) has traditionally been used in cooking and to treat high blood pressure and heart disease (15,16). Garlic supplements have been discovered to effectively lower blood pressure in individuals with hypertension, offering results comparable to those of standard first-line antihypertensive drugs. Specifically, Kyolic aged garlic extract has shown additional cardiovascular benefits, including reducing arterial stiffness, high cholesterol, and blood clotting tendencies. Moreover, garlic's prebiotic components contribute to improved gut health by enhancing the diversity and richness of gut microbiota (17).

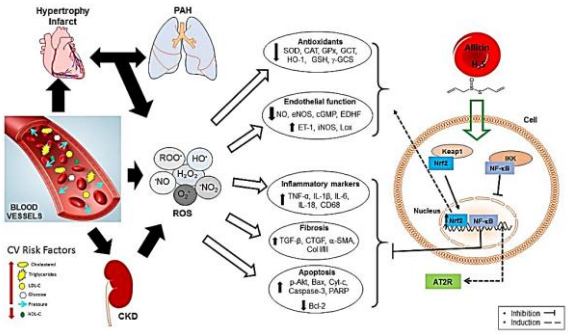

Figure 1 the cellular mechanism of action of garlic
Source: Adapted from Sánchez-Gloria (2022)

Recent investigations have highlighted the therapeutic potential of allicin, a sulfur-containing compound derived from garlic, in modulating cellular processes relevant to the prevention and management of cerebrovascular diseases (CVD) and their associated risk factors. Allicin exerts its effects by attenuating oxidative stress and inflammatory responses, while simultaneously enhancing vascular function through the regulation of the Nrf2 and NF-κB signaling pathways (18). The cellular mechanism underlying these actions is illustrated in Figure 1, providing a visual

overview of allicin's multifaceted role at the molecular level.

Celery (*Apium graveolens L.*) contains active compounds that have been shown to help lower blood pressure (9). One of the antihypertensive agents in the chronic treatment of high blood pressure is celery leaf extract (15). Celery has long been utilized in traditional Chinese medicine and is increasingly acknowledged for its potential to lower blood pressure. This therapeutic effect is attributed to a wide spectrum of bioactive compounds, including apigenin, nitrates, potassium, asparagine, mannitol, magnesium, phthalides, apiin, 3-n-butylphthalide, and phytosterols. These constituents contribute to blood pressure regulation through several mechanisms, such as facilitating diuresis, promoting vascular relaxation, inhibiting vasoconstriction, and reducing the likelihood of atherosclerotic development (9). Celery (*Apium graveolens L.*) and garlic (*Allium sativum L.*) have the effect of lowering blood pressure because they contain alkaloids, saponins, phenols, and tannins. Saponins function as diuretics by reducing plasma volume by removing water and electrolytes, especially sodium, thereby reducing cardiac output. Tannins are included in natural polyphenols that function as inhibitors of the angiotensin-converting enzyme (ACE). Phenolic compounds isolated from various plants and several pure flavonoids function as inhibitors of ACE activity, thereby causing a decrease in blood pressure (15).

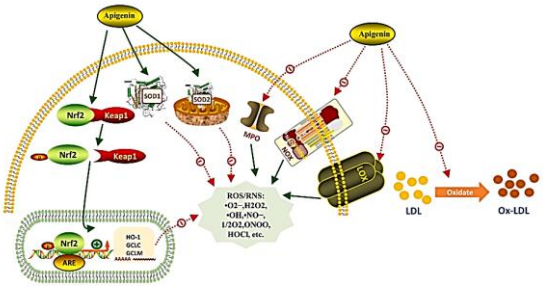

Figure 2 the cellular mechanism of action of celery
Source: Adapted from Jiang & Huang (2025)

The figure 2 shows the celery's cellular mechanism of action because it contains apigenin which causes a decrease in oxidative stress, increased endothelial function, and vasodilation, which ultimately reduces blood pressure (19).

Many people consume unhealthy sweet snacks. Existing functional foods targeting hypertension are often limited by poor sensory acceptance, highlighting a critical gap for a pleasant-tasting, evidence-based functional snack, which this study addresses through the development of CelGar Jelly formulated with garlic and celery. Jelly candy is a type of confectionery known for its soft and chewy consistency, which is achieved through the use of gelling substance during production. These gelling substances play a significant role in determining the final quality of the candy. Gel formation happens when polymer chains bond or cross-link, creating a three-dimensional structure that traps water and gives the candy its firm texture. In jelly candy production, hydrocolloids are commonly used as a gelling substance. Some typical examples of hydrocolloids include agar, gum, starch, gelatin, carrageenan, and pectin. In addition to serving as an enjoyable confection, this jelly candy is developed with the intention of supporting public health by contributing to hypertension prevention (20). By using these two ingredients, garlic and celery, we can develop a jelly candy that not only tastes good but also has the potential to help prevent hypertension when consumed regularly as part of a healthy lifestyle.

METHODS

Study Design

This study employed a descriptive quantitative approach combined with a product development process to formulate and evaluate CelGar Jelly, a functional jelly candy containing garlic (*Allium sativum L.*) and celery (*Apium graveolens L.*). The research consisted of three main stages: product formulation and preparation, sensory evaluation, laboratory analysis, and a preliminary functional test to assess potential effects on blood pressure.

Materials

The ingredients used in the formulation of CelGar Jelly included granulated sugar (600

g), powdered gelatin (3 packs, Swallow brand), Nutrijel (1 pack, plain flavor), celery powder (5 g), garlic powder (5 g), and distilled water (600 ml). All ingredients were food-grade and obtained from local commercial suppliers.

Preparation of CelGar Jelly

CelGar Jelly was prepared following a standardized procedure. Granulated sugar, powdered gelatin, and Nutrijel were mixed in a saucepan and dissolved in 600 ml of water. The mixture was heated at medium temperature with continuous stirring until boiling to ensure complete dissolution. After reaching boiling temperature, the heat was reduced and celery powder (5 g) and garlic powder (5 g) were added. The mixture was stirred gently for approximately one minute to ensure uniform distribution of the herbal components. The solution was then poured into molds and allowed to cool at room temperature until solidified. The formed jelly pieces were removed from the molds and arranged on a baking tray. Drying was conducted in an oven at 30 °C for six hours to reduce moisture content and obtain a chewy jelly texture.

Sensory Evaluation (Hedonic Test)

A hedonic test was conducted to evaluate consumer acceptance of CelGar Jelly. The evaluation involved 20 untrained panelists representing potential consumers. The sensory assessment examined four attributes: color, aroma, taste, and texture. Panelists evaluated each attribute using a five-point hedonic scale, where 1 = strongly dislike, 2 = dislike, 3 = neither like nor dislike, 4 = like, and 5 = strongly like. Sensory testing was conducted in a well-lit and ventilated room, and panelists recorded their responses independently using a structured questionnaire. (21). Sensory testing is conducted in product development because shape, color, texture, taste (22), and consistency can influence quality and consumer acceptance (23).

Inclusion and Exclusion Criteria for Panelists

Panelists were selected based on predefined inclusion and exclusion criteria. Inclusion criteria included individuals aged ≥18 years, willing to participate, able to perceive taste and aroma normally, and without known allergies to garlic or celery. Individuals with taste or smell disorders, acute illness, or allergies to the ingredients were excluded. A total of 20 untrained panelists meeting these criteria participated in the sensory evaluation.

Laboratory Analysis

Laboratory testing was conducted to determine the moisture content and ash content of the CelGar Jelly product. These parameters were analyzed to assess the product's quality and compliance with the Indonesian National Standard (SNI 3547-2-2008) for jelly candy. The results were compared with the maximum permissible limits specified in the standard.

Functional Test

A preliminary functional test was performed to examine the potential effect of CelGar Jelly consumption on blood pressure. The study used a quasi-experimental one-group pretest–posttest design. Participants were selected using purposive sampling based on the following inclusion criteria: adults aged 25–50 years, diagnosed with hypertension, willing to participate in the study, and without known allergies to garlic or celery. A total of 10 respondents with hypertension participated in the intervention. Participants consumed one serving of CelGar Jelly per day for three consecutive days. Blood pressure measurements were taken before the intervention (pretest) and after the intervention period (posttest) using a digital blood pressure monitor.

Data Analysis

Sensory evaluation data were analyzed descriptively by calculating the mean and standard deviation for each sensory attribute. Laboratory test results were compared with the national standard requirements for jelly candy quality. For the functional test, statistical analysis was conducted to compare blood pressure measurements before and after the intervention. Normality of the data was assessed using the Shapiro–Wilk test. A paired t-test was used for normally distributed data, while the Wilcoxon signed-rank test was applied for non-normally

distributed data. Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

a. Sensory Evaluation (Hedonic Test)

The results of hedonic test parameters can be seein in Table 1. Diagram contains results of answer of the panelist about product. A 1–5 hedonic scale is used to assess the panelists' level of liking. The five scales are 1=Strongly Dislike, 2=Dislike, 3=Somewhat Like, 4=Like, 5=Very Like.

Table 1 Hedonic Test Results of CelGar Jelly (n = 20 panelists)

	Total score	Mean±SD
Color	80	4±0.65
Flavor	80	4±0.72
Texture	62	3,1±0.72
Taste	62	3,1±0.65

Based on the average results of the questionnaire on the appearance of Celgar jelly, panelists liked the color, and flavor. Color and flavor received higher acceptability scores (4.00 ± 0.65), while texture and taste showed moderate acceptance (mean ± SD = 3.10 ± 1.02). The results showed that the color, flavor, texture and taste were accepted and well-liked by the panelits, however improvements were needed to texture and taste.

The relatively high acceptability of color and flavor suggests that the formulation of CelGar Jelly produced an appealing visual appearance and pleasant aroma. The combination of sugar with garlic and celery components contributed to the characteristic flavor profile of the product. However, the moderate scores obtained for texture and taste indicate that improvements may be needed to enhance overall product palatability. Similar findings have been reported in other studies on herbal-based jelly products, where the incorporation of plant extracts may influence the texture and taste characteristics of confectionery products. The jelly formulation may also increase consumer acceptance compared with direct consumption of raw garlic and celery, which often have strong and less preferred flavors. Transforming these ingredients into a jelly-based confectionery product may therefore improve consumer compliance in consuming functional foods containing herbal ingredients.

b. Laboratory Examination

Table 2 Analysis of Moisture Content and Ash Content of CelGar Jelly

No	Parameter	Result	Standard
1	Water content	16% b/b	Max 20%
2	Ash content	1,8% b/b	Max 3%

From the results of laboratory examinations, table 2 shows the water content of CelGar Jelly is 16% and the ash content is 1.8%, all of which comply with the quality requirements of SNI 3547-2-2008, indicating acceptable product quality. The moisture content within the standard range suggests adequate water stability in the product, which may contribute to maintaining product texture and shelf stability. The ash content reflects the total mineral content remaining after combustion. The relatively low ash content observed in this study indicates that the formulation does not contain excessive inorganic residues and suggests good ingredient quality and processing conditions. However, additional analyses such as pH, total soluble solids, microbial contamination, and storage stability were not conducted in this study. Therefore, the present findings should be interpreted as preliminary evidence of product feasibility rather than comprehensive indicators of product safety and shelf-life stability.

c. Functional Test

A preliminary functional test was conducted to evaluate the potential effect of CelGar Jelly consumption on blood pressure in respondents diagnosed with hypertension.

Table 3. Characteristics of Respondents

Variable	Total	Proportion (%)
Age (y old)		
25-34	5	50
35-44	3	30
45-54	2	10
Gender		
Male	6	60
Female	4	40

Table 3 shows that the characteristics of the respondents, the majority age is 25-34 years old as much as 50%, and the majority gender is male 60%.

Table 4. The Effect of Giving CelGar Jelly on Blood Pressure

Variable	Treatment	N	Min	Max	Mean±SD	P-Value
Systolic (mmHg)	Pre	10	111	138	125.40±9.143	0.005
	Post	10	110	135	120.70±8.757	
Diastolic (mmHg)	Pre	10	62	94	82.70±10.045	0.819
	Post	10	70	93	82.20±7.391	

Normality test of the difference scores (post–pre values) was assessed using the Shapiro–Wilk test due to the small sample size (n = 10). Systolic difference scores were normally distributed, while diastolic difference scores were not. Therefore, paired t-test and Wilcoxon signed-rank test were used.

Based on table 4, the Paired t test, it was obtained p-value is calculated for systolic blood pressure of 0.005< α(0.05). Blood pressure diastole is calculated with p-value 0.819> α (0.05). The findings showed a statistically significant decrease in systolic blood pressure after the intervention, while no significant change was observed in diastolic blood pressure among the respondents in Depok. These findings are consistent with previous studies reporting that celery extract and garlic supplementation may contribute to reductions in blood pressure among hypertensive individuals (14),(15). For example, previous clinical studies have reported that garlic supplementation can reduce systolic and diastolic blood pressure by approximately 10 mmHg and 8 mmHg(24). Similarly, celery extract has been shown to support blood pressure regulation through mechanisms including vasodilation, diuresis, and antioxidant activity. However, this research was intended as a preliminary pilot study to assess the feasibility of the intervention and to obtain initial evidence regarding the potential effect of CelGar Jelly on blood pressure.

The reduction in systolic blood pressure may be associated with the bioactive compounds present in garlic and celery. Garlic contains allicin, which has antioxidant and anti-inflammatory properties and has been reported to improve endothelial function and vascular relaxation (17). Celery contains apigenin, a flavonoid that may promote vasodilation and exhibit diuretic effects, which may contribute to blood pressure reduction. Moreover, Celery and garlic contain saponins and tannins. The saponins have the potential as diuretics, Tannins have an inhibitory action on the angiotensin-converting enzyme (ACE) which can help lower blood pressure (9,14,15,18). Nevertheless, the present study should be interpreted with caution due to several limitations, including the small sample size, short intervention period, and absence of a control group. Therefore, further studies involving larger populations, longer intervention periods, and randomized controlled designs are needed to confirm the potential antihypertensive effects of CelGar Jelly.

Study Limitations

This study used simple research methods and a small number of respondents (limited

to a school setting), making it unrepresentative of the population. This study was limited to sensory evaluation and formulation feasibility, while comprehensive physicochemical and microbiological analyses, including pH, total soluble solids, and microbial load, were not fully assessed. Future studies should incorporate detailed physicochemical and microbiological analyses to validate product safety, stability, and functional quality.

CONCLUSION

This study demonstrated that CelGar Jelly, formulated from garlic (Allium sativum L.) and celery (Apium graveolens L.), was sensorially acceptable based on hedonic evaluation and met basic quality parameters, including moisture and ash content standards according to SNI 3547-2-2008. The preliminary functional test indicated a statistically significant reduction in systolic blood pressure following short-term consumption, although no significant change was observed in diastolic blood pressure. Due to the small sample size and short intervention period, these findings should be interpreted as preliminary. Further studies with larger sample sizes and longer intervention periods are needed to evaluate the potential role of CelGar Jelly as a functional food supporting blood pressure management.

ETHICAL APPLICATION

This research received ethical approval from the Esa Unggul University Code of Ethics Enforcement Council Research Ethics Commission (No. 0925-05.004 /DPKE-KEP/FINAL-EA/UEU/V/2025), issued on May 5,2025).

REFERENCE

1. World Health Organization. A global brief on Hypertension World Health Day 2013. 2013;1–40.
2. Purborini N, Kartikawati ND, Hidayah N, Arumi ER. Review Article Association Between Adherence To Hypertension Medication And Self-Management Among Hypertension Patients In Puskesmas Magelang Trengah: A Cross-Sectional Survey. 2025;17(3):1–6.
3. Weber MA, Schiffrin EL, White WB, Mann S, Lindholm LH, Kenerson JG, et al. Clinical Practice Guidelines for the Management of Hypertension in the Community: A Statement by the American Society of Hypertension and the International Society of Hypertension Clinical Practice Guidelines for the Management of Hypertension in the Comm. J Clin Hypertens. 2014;16(1):14–26.
4. Delacroix S, Chokka RG. Hypertension: Pathophysiology and Treatment. J Neurol Neurophysiol. 2014;05(06).
5. Lenggogeni DP, Yeni F, Malini H, Anyati R. Health Literacy and Medication Adherence Among Patients With Hypertension. J Keperawatan Soedirman. 2024;19(3):198–202.
6. Dixit A. Hypertension : an Overview Hypertension : an Overview. Eur Chem Bull. 2017;6(September):393–
7. Badan Penelitian dan Pengembangan Kesehatan KK. Riset Kesehatan Dasar (RISKESDAS 2018). 2018;
8. Eny Dwimawati, Fitri Dian Nila Sari, Evamona Sinuraya, Purwaningsih. Prevalence and Determinants of Hypertension in Indonesia. Indian J Forensic Med Toxicol. 2021;15(4):1065–71.
9. Oktarina R, Rahmawaty S. The Use of Celery (Apium Graveolens L.) for Reducing Blood Pressure in Individual with Hypertension in Indonesia: A Review Paper. In: Proceedings of the 4th International Conference Current Breakthrough in Pharmacy (ICB-Pharma 2022) [Internet]. Atlantis Press International BV; 2023. Available from: http://dx.doi.org/10.2991/978-94-6463-050-3_22
10. Rohmana O, Rochayat AS, Iskandar A, Polytechnic H, Java W. Reduction of Systolic And Diastolic Blood Pressure In Hypertensive Elderly Following Ergonomic And Isometric Handgrip Exercise. 2025;20(2):91–6.
11. Latuconsina ND, Amiruddin R,

Sirajuddin S. Efek Pemberian Bawang Putih Dan Seledri Terhadap Tekanan Darah Pasien Hipertensi Di Puskesmas Batua Kota Makassar. J Kesehat Masy Mulawarman. 2019;1(1):01.

12. Febyanesti AR, Widjanarko B, Shaluhiyah Z. Traditional Medicinal Plants for the Prevention and Treatment of Hypertension : A Literature Review. 2025;14(4):250–60.

13. Badan Pengawas Obat dan Makanan (BPOM). Formularium Ramuan Oat Tradisional Indonesia. 2011.

14. Badan Pengawas Obat Dan Makanan Republik Indonesia (BPOM). Formularium Rmuan Etnomedicine Obat Asli Indonesia Volume III. Vol. 3. 2013. 1 p.

15. Rosa R, Rivai H. Phytochemical and Antihypertensive Tests of Celery (Apium graveolens L.) and Garlic (Allium sativum L.) Formula. Int J Pharm Sci Med. 2021;6(7):40–9.

16. Douaouya L, Bouzerna N. Effect Of Garlic (Allium Sativum L) On Biochemical Parameters And Histopathology Of Pancreas Of Alloxan-Induced Diabetic Rats. 2016;8(6):6–10.

17. Ried K. Garlic lowers blood pressure in hypertensive subjects, improves arterial stiffness and gut microbiota: A review and meta-analysis. Exp Ther Med. 2019;1472–8.

18. Sánchez-Gloria JL, Arellano-Buendía AS, Juárez-Rojas JG, García-Arroyo FE, Argüello-García R, Sánchez-Muñoz F, et al. Cellular Mechanisms Underlying the Cardioprotective Role of Allicin on Cardiovascular Diseases. Int J Mol Sci. 2022;23(16).

19. Jiang X, Huang H. The therapeutic potential of apigenin against atherosclerosis. Heliyon [Internet]. 2025;11(1):e41272. Available from: https://doi.org/10.1016/j.heliyon.2024.e41272

20. Soedirga LC, Marchellin. Physicochemical Properties of Jelly Candy Made with Pectin from Red Dragon Fruit Peel in Combination with Carrageenan. Caraka Tani J Sustain Agric. 2022;37(1):1–14.

21. Singh-Ackbarali D, Maharaj R. Sensory Evaluation as a Tool in Determining Acceptability of Innovative Products Developed by Undergraduate Students in Food Science and Technology at The University of Trinidad and Tobago. J Curric Teach. 2014;3(1):10–27.

22. Styaningrum SD, Sari M, Desty E, Puspaningtyas A, Nidyarini T, Frelly A. Analisis warna, tekstur, organoleptik serta kesukaan pada kukis growol dengan variasi penambahan inulin Analysis of color, texture, organoleptic, and preference for growol cookies with variations in the addition of inulin. Ilmu Gizi Indones. 2023;6(2):115–24.

23. Silva SS e, Queiroz RA de, Guedes SF, Lima IASI, Loss RA. Garlic jelly: preparation, physicochemical and sensory evaluation. Sci Electron Arch. 2021;14(9):32–8.

24. Badan Pengawas Obat dan Makanan (BPOM). The Power of Obat Asli Indonesia Bawang Putih (Allium sativum). 2016.