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# ANALYSIS OF THE PHYTOCHEMICAL POTENTIAL OF *Moringa oleifera* LEAF TEA FORMULATION AND NATURAL SPICES AS AN ALTERNATIVE TO STUNTING PREVENTION

## Analisis Potensi Fitokimia Formulasi Teh Daun Kelor (*Moringa oleifera*) dan Rempah-Rempah Alami Sebagai Alternatif untuk Pencegahan Stunting

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**ABSTRACT**
Stunting prevention efforts require a locally focused, nutrient-rich, and easily accessible approach. This study aims to analyze the phytochemical potential of moringa tea (*Moringa oleifera*) and various natural spices such as ginger, turmeric, lemongrass, and galangal as natural alternatives in stunting prevention. The research will be carried out from June to December 2024. The methods used include qualitative phytochemical tests to identify active compounds such as flavonoids, tannins, saponins, alkaloids, and terpenoids/steroids; the formulation of moringa leaf tea and natural spices; and a literature review and meta-analysis of the role of these bioactives in supporting the nutritional status and immune system of children. The results of the analysis showed that moringa tea and spices contain a variety of bioactive compounds with antioxidant, anti-inflammatory, and immunostimulant properties that have the potential to support optimal growth of children. Based on the results of meta-analysis and literature studies, it can be concluded that the phytochemical content of Moringa leaf tea has the potential to prevent stunting in mothers and children. Further research is needed to test the effectiveness of the formula and optimal dosage in clinical applications.

**Keywords:** *Stunting, Moringa oleifera, Natural Spices, Phytochemicals*

**ABSTRAK**
Upaya pencegahan stunting membutuhkan pendekatan berbasis pangan lokal yang kaya nutrisi dan mudah diakses. Studi ini bertujuan untuk menganalisis potensi fitokimia teh moringa (Moringa oleifera) dan berbagai rempah alami seperti jahe, kunyit, serai, dan lengkuas sebagai alternatif alami dalam pencegahan stunting. Penelitian akan dilakukan dari Juni-Desember 2024. Metode yang digunakan meliputi uji fitokimia kualitatif untuk mengidentifikasi senyawa aktif seperti flavonoid, tanin, saponin, alkaloid, dan terpenoid/steroid, formulasi teh daun moringa dan rempah alami, serta tinjauan literatur dan meta-analisis peran bioaktif ini dalam mendukung status gizi dan sistem imun anak. Hasil analisis menunjukkan bahwa teh moringa dan rempah-rempah mengandung berbagai senyawa bioaktif dengan sifat antioksidan, anti-inflamasi, dan imunostimulan yang berpotensi mendukung pertumbuhan optimal anak. Berdasarkan hasil meta-analisis dan studi literatur, dapat disimpulkan bahwa kandungan fitokimia the rempah daun kelor berpotensi mencegah stunting pada anak. Diperlukan penelitian lebih lanjut untuk menguji efektivitas formula dan dosis optimal dalam aplikasi klinis.

**Kata Kunci:** *Stunting, Moringa oleifera, Rempah Alami, Fitokimia*

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## INTRODUCTION

Stunting is one of the global nutrition problems that is being handled by various countries and organizations in the world. Data from the UNICEF/WHO/WB Joint Child Malnutrition Estimates (JME) that in 2021 there were 149 million children under five declared stunted, 45 million children under five wasting, and 39 million overweight toddlers. The Ambitious World Health Assembly targets a 40% reduction in stunting globally across the country. Indonesia is one of the countries with the second highest prevalence of stunting (after Cambodia) in the Southeast Asian region and is ranked 108th out of 132 countries in the world. The results of the 2021 Indonesian Nutrition Status Study state that the prevalence of stunting in toddlers is still high, at 24.4% (Ministry of Health 2021; Saepudin, 2024).

The incidence of stunting is caused by various factors, one of which is the lack of nutritional intake that occurs in the first 1000 days of life (1000 HPK). Children have the potential to experience stunting since pregnancy due to malnutrition during pregnancy. The cause of stunting also occurs if they suffer from anemia during pregnancy (Kartini, 2018; Khotimah, 2023). Pregnant women need to consume highly nutritious food, both macro and micro, as well as antioxidants. One of the preventive aspects that can be done and become a priority in accordance with the direction of the Ministry of Health is the food aspect.

According to Marhaeni (2021), moringa leaves can be used as food ingredients that have a fairly high nutritional content or the term is superfood. Consuming this superfood can improve a person's nutritional status and immunity because of the many bioactive compounds found in moringa leaves. The results of Minantyo et al.'s (2019) research show that moringa leaves have a large nutritional content. The protein content of moringa leaves is 26.2 g, calcium is 2,095 mg, iron is 27.1 mg, and provitamin A is quite high, which is 16800 mg (Su & Chen, 2020). In addition, the results of research by More et al. (2020) show that moringa leaves have 40 natural antioxidants. Given the content of these nutrients, moringa leaves can be used as herbal or traditional medicine (Marhaeni, 2021).

During the period of improving the nutrition of a child affected by stunting, moringa leaves can be used as nutritional support and immune boosters for the body of stunted children so that the health of stunted children can be maintained and avoid disease (Putra et al., 2021). Several researchers who have used moringa leaves as a stunting prevention product, namely Istiqomah and Jannah (2021) make moringa pudding; Ishmah et al., (2023) make moringa nuggets; Kustiani et al., (2022) make moringa flour; and Swari et al., (2023) make moringa ice cream. In addition, the content of natural spices such as ginger (Leslie & Gunawan, 2023), lemongrass (Najmah & Kurniawati, 2023), galangal (Ifandi & Alfiza, 2023) and turmeric (Zakaria et al., 2023) also have phytochemical compounds that have potential in the process of preventing stunting disease.

Based on several previous studies (Basri et al., 2021), the use of Moringa oleifera combined with natural spices has the potential to be a supplement in pregnant women and toddlers as a prevention of stunting disease. This study aimed to evaluate the potential of moringa leaf tea combined with natural spices as an alternative approach to preventing stunting, based on phytochemical analysis, and to develop a formulation of moringa tea and natural spices as a herbal beverage.

## MATERIALS AND METHODS

### Optimization and Manufacturing of Natural Spice Moringa Leaf Simplicia Powder

The simplicia powder begins with the process of washing all ingredients using water with a basin container, then thinly slice the ingredients using a knife on a placemat except moringa leaves, and finally the drying process. Optimization is carried out on moringa leaves to see the best results in terms of color production, then the results of optimization of the drying method that have been selected are used for natural spices, method optimization includes drying using sunlight for 2 days, using aluminum foil base, using an oven with a temperature of

40°C for 16 hours with an aluminum foil base and using a dehydrator with a temperature of 55°C for 5 hours with a cloth gauze base. After the material is dry, then the material is smoothed into powder using a grinder at a different time, the finished powder is stored in ziplock plastic, then sealed so that it is durable in storage. The process of making spiced Moringa tea powder is shown in **Figure 1**.

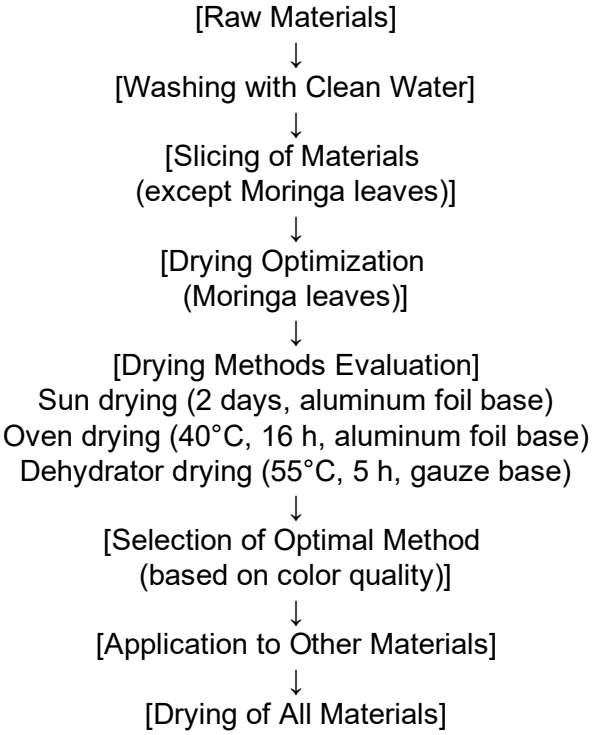


**Figure 1.** Process Optimization and Manufacturing of Natural Spice Moringa Leaf Simplicia Powder

**Moringa Leaf Tea Formulation and Natural Spices**

The powder that has been dried, then formulated by calculating the composition of each ingredient, taking into account simple organoleptics, including the color, taste and aroma of spiced moringa leaf tea. The ingredients include moringa powder, ginger powder, lemongrass powder, turmeric powder, galangal powder, and sugar (Table 1). The results of the formulation were then tested in simple organoleptics by packaging them into tea bags and then brewed in hot water, choosing which formulation met the characteristic criteria of the formula, then the formulation results were packaged into tea bags of tea bags of moringa leaves and natural spices.

**Moringa Leaf Extraction and Natural Spices**

Moringa leaf powder and natural spices are taken as much as 100 g and put into the erlenmeyer to be macerated and dissolved with 500 mL of 96% ethanol in a ratio of 1:5. Erlenmeyer is covered with aluminum foil and wrapped in plastic wrap, then put into an incubator shaker at 37 °C for 24 hours and a speed of 160 rpm. The sample was filtered after 24 hours and the first filtrate and pulp were obtained, then the first pulp was macerated with 96% ethanol for 24 hours. The sample was filtered with filter paper and a second filtrate and pulp were produced (Wijanarko et al., 2020).

The filtrate obtained from maceration is fed into a rotary evaporator at a temperature of 60 °C and a speed of 65 rpm. The viscous extract is put into a porcelain cup and covered with aluminum foil, then ovened at a temperature of 50 °C and observed for 24 hours until the result is obtained in the form of a paste (Wijanarko et al., 2020). The simplicia rendition is calculated by the formula (Wijanarko et al., 2020):

Extract weight = (cup weight + extract) – empty cup weight

**Phytochemical Analysis of Moringa Leaf Tea and Natural Spices**

Sample preparation for qualitative phytochemical analysis including flavonoids, tannins, saponins, and alkaloids was carried out by weighing 50 mg of bandotan leaf extract and then dissolved with 5 mL of 96% ethanol so that the concentration was obtained 10,000 ppm (Ikalinus, et al., 2015). Flavonoid analysis was carried out by diluting the sample to a concentration of 4000 ppm, then taking as much as 2 mL and adding 3 mL of aquaade. Then it is brought to a boil and added with 15 mg of Mg powder, 2 drops of HCl 5N, and 10 drops of amyl alcohol. Flavonoid positive results are yellow, red, or orange in the amyl alcohol layer (Syafitri et al., 2014).

Alkaloid analysis was done by taking 2 mL of extract solution with a concentration of 10,000 ppm and supplemented with 3 mL of aquaade. The solution was added with 1 mL of chloroform, 2 mL of ammonia and then beaten and added with 5 mL of HCl 2 N. The solution was put into 3 different test tubes and each test tube was given 2-3 drops of Dragendrof, Mayer, and Wagner reagents. The positive results of the Dragendrof reaction were orange deposits, the Mayer reaction formed white deposits, and the Wagner reaction formed brown to yellow deposits (Januarti et al., 2017).

Tannin analysis was carried out with the extract diluted to 4000 ppm. The solution is taken as much as 1 mL then added to 5 mL of aqueducts, then boiled and added with 1 % FeCl3 as many as 5 drops. Positive results were formed in greenish-brown or blackish-blue color (Januarti et al., 2017). Saponin analysis was carried out by extracting a concentration of 4000 ppm as much as 2 mL, plus 10 mL of aqueduct and whipped for 30 seconds. The positive result was that foam was formed with a height of about ±1 cm which lasted for approximately 30 seconds (Januarti et al., 2017).

Triterpenoid and steroid analysis was performed by means of diluted extracts up to 4000 ppm. The test is carried out by taking a test solution with a dropper and dripping it in two different drop plates. The first hole is for control and the second hole is for the test solution. Added a drop of anhydrous acetate and 1 drop of H2SO4 on the sample. Positive results of steroid analysis are indicated in green, while triterpenoid tests are red or purple (Ikalinus et al., 2015).

**Data Analysis of Phytochemical Content for the Prevention of Stunting**

The data from the results of phytochemical analysis were qualitatively analyzed and the study literature was then carried out to see the relationship and relationship in the prevention of stunting disease. Furthermore, a description analysis was carried out to see the potential of natural spiced moringa tea as a stunting prevention by looking at the relationship of bioactive compounds in natural spiced moringa tea to stunting prevention with metaanalysis and literature review.

## RESULT AND DISCUSSION

**Optimization and Manufacturing of Natural Spice Moringa Leaf Simplicia Powder**

Based on the results of optimizing drying moringa leaves using 3 different methods, namely drying using dehydrators, ovens and sunlight, after being pureed, different results were obtained in terms of color. The results of the optimization of moringa leaf powder are presented in **Figure 2.**

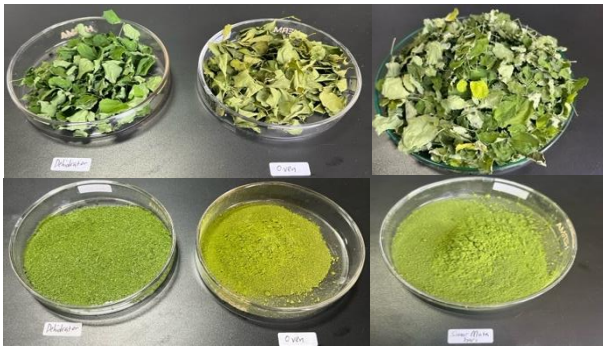

**Figure 2.** Moringa Leaf Powder using Dehydrator (Left), Oven (Middle), and Sunlight (Right)

Based on the optimization results, the dehydrator drying method was chosen as the method of making natural spice powder, then the powder that has been made is packed using ziplock plastic and sealed so that the simplicia powder is durable. The results of making powder using dehydrators on natural spices are presented in **Figure 3**.

**Figure 3.** Ginger Powder (Left), Turmeric, Galangal, Lemongrass and Moringa Leaves (Right)

The results of simplicia powder are then carried out a formulation process to obtain the right composition of spiced moringa tea based on the results of the formula's characteristics. Based on figure 2, the results of the observation of moringa leaf powder from the three methods can be seen that moringa leaf powder dried using a dehydrator has a greener color compared to using an oven and sunlight. Crownful (2024), stated that the drying method using a dehydrator can maintain the color of the product better than other drying methods. This happens because the dehydrator allows for more precise temperature and humidity control, which reduces chemical reactions that can fade the color of the material. So that for drying natural spices, a dehydrator is used (figure 3).

**Moringa Leaf Tea Formulation and Natural Spices**

Based on the results of the formulation by paying attention to the aroma, taste and color of each simplisia, 2 formulations of moringa leaf tea and natural spices were obtained with the details of the formula presented in **Table 1**.

**Table 1.** Moringa Leaf Tea Formulation and Natural Spices

| Simplisia Ingredients | Formula 1 (gr) | Formula 2 (gr) |
|---|---|---|
| Ginger | 1.0 | 1.0 |
| Tumeric | 0.1 | 0.1 |
| Lemongrass | 0.1 | 0.1 |
| Galangal | 0.1 | 0.1 |
| Sugar | 7.7 | 7.7 |
| Moringa | 1.0 | 0.75 |
| Total | 10 | 10 |

Based on the formula that has been obtained, then the characteristics of the formula are carried out with four panelists covering aspects of color, taste and aroma of the formula. The results of the characteristic formula are presented in **Table 2**.

**Table 2.** Sensory Characteristics of Moringa Leaf Tea Formula and Natural Spices

| Formula | Organoleptic Test Aspects | Organoleptic test results |
|---|---|---|
| Formula 1 | Color | Deep green |
| | Flavor | Bitter |
| | Scent | Pungent spices |
| Formula 2 | Color | Bright green |
| | Flavor | Slightly bitter |
| | Scent | Slightly Pungent spices |

The formulation of moringa leaf powder (Moringa oleifera) requires special attention in maintaining the taste, nutritional content, and solubility of the powder. In this process, additives such as lemon, ginger, or honey are often used to improve the taste and add to the health benefits of the product (Nurfina & Sutji, 2021). In this study, several ingredients were used to improve the taste and also improve its functional properties, namely ginger, turmeric, galangal and lemongrass. Sensory tests are essential in determining functional beverage formulas, as sensory evaluations such as taste, aroma, color, and texture help ensure the product is accepted by consumers and has good organoleptic quality (Putri et al., 2019; Wibowo & Hidayat, 2020). There are two formulas that are tested by the sensors in this service, namely formula 1 and formula 2 (Table 2). Formula 2 has a larger proportion of moringa leaf powder. The results of sensory tests show that formula 2 has better sensory characteristics compared to formula 1.

**Extraction and Phytochemical Analysis of Natural Spiced Moringa Leaf Tea Rendemen**

**Table 3.** Composition of sample Moringa leaf spice tea extract

| No | Sample | Powder Weight (g) | Extract Weight (g) | Yield (%) |
|---|---|---|---|---|
| 1 | Moringa Leaf | 300 | 28.43 | 9.24 |
| 2 | Turmeric | 300 | 30.43 | 10.37 |
| 3 | Ginger | 300 | 29.74 | 10.57 |
| 4 | Galangal | 300 | 29.98 | 9.67 |
| 5 | Lemongrass | 300 | 28.64 | 9.37 |

**Qualitative and Quantitative Phytochemical Analysis**

The results of qualitative and quantitative phytochemical screening of Moringa leaf and nature spices extracts can be seen in **Table 4 and Table 5.**

**Table 4.** Quantitative phytochemical analyses of Moringa leaf and nature spices extracts.

| Test | Method | Test Result |
|---|---|---|
| **Alkaloid** | Meyer | + |
| | Wagner | + |
| | Dragendroff | + |
| **Tannin** | Blackish-blue color | + |
| **Saponin** | Foam formed 1 cm | + |
| **Total Flavonoid** | Yellow color forms on the amyl alcohol layer | + |
| **Triterpenoidor steroids** | Formed a bluish green color) | + |

Note: (+): positive, (—): negative.

**Table 5**. Quantitative phytochemical analyses of Moringa leaf and nature spices extracts

| Test | Method | Result |
|---|---|---|
| **Flavonoid** | Spektrofotometer UV-Vis | 0,78% b/b |
| **Fenol** | Spektrofotometer UV-Vis | 35,99% b/b |
| **Saponin** | Spektrofotometer UV-Vis | 2,88% b/b |
| **Tannin** | Spektrofotometer UV-Vis | 0,91% b/b |
| **Alkaloid** | Spektrofotometer UV-Vis | 0,24% b/b |
| **Curcuminoid** | Spektrofotometer UV-Vis | 0,50% b/b |

Alkaloid analysis showed positive results, namely in Meyer reagent there was white precipitation and in Dragendroff reagent there was orange precipitation, while in Wagner reagent brown precipitation was found. The results of analysis tanin showed positive results of tannins with the addition of FeCl3, Fe3+ ions with O- atoms forming covalent bonds because in the OH- function group released the H atom and there was a change in color (Safrida and Rahmah, 2021). The results of positive saponin analysis were characterized by the formation of foam as high as ± 1 cm. The reaction that occurs is that saponins will bind to water to form hydrophilic groups and hydrophobic groups will bond with each other with air so that they can form foam (Bintoro et al., 2017).

The results of the analysis showed that extract was positive on the flavonoid test which was characterized by the formation of yellow color on the amyl alcohol layer (Safrida and Rahmah, 2021). The results of the positive analysis of ethanol extract are the formation of a bluish-green color. The change in color of the extract to green is due to the formation of conjugated double bonds on steroids or brown and orange or purple colors on triterpenoids (Safrida and Rahmah, 2021).

The use of ethanol solvents in maceration uses 96% ethanol, harmless safe properties, and non-toxic (Azis et al., 2014). Ethanol solvents are also extracting compounds with low molecular weight such as saponins and flavonoids and the concentration of 96% ethanol in herbal medicine preparations has the highest percentage of rendancy (Arifianti et al., 2014). The diffusion that occurs in the maceration process occurs in the concentration of the solution in the cell and the solution outside the cell, so that the high concentration solution in the cell will come out and be replaced by a low concentration solution so that the balance occurs inside the cell and outside the cell. The extraction time also affects because the longer the maceration, the higher the yield produced. The longer the reaction between the sample and the solvent used, the better the penetration of the solvent entering the sample so that the more compounds that diffuse out of the cell will be (Wijaya et al., 2018; Hartoyo, et al., 2025).

Based on the results of extraction and phytochemical qualitative tests in table 3, it was found that the phytochemical content in the composition of natural spiced moringa tea (lemongrass, ginger, galangal and turmeric) was positive for saponins, tannins, flavonoids, alkaloids and triterpenoids as well as steroids. This is shown by the positive results in the phytochemical qualitative test shown in table 3. Furthermore, based on the qualitative results of phytochemicals, an analysis of their potential for disease prevention was carried out through metaanalysis and literature studies. Saponins have the potential to interfere with nutrient absorption and cause large amounts of digestive problems. However, at low levels of saponins can reduce the risk of nutrient malabsorption and indigestion (Zhang et al., 2023). Alkaloids have medicinal properties but can be toxic in high amounts. Lower alkaloid concentrations can reduce the potential for toxic effects (Adibah & Jegede, et al., 2024). Alkaloids help to raise immune function (immunomodulators), which is especially important for malnourished individuals (Oluwafemi et al., 2022).

Flavonoids, have antioxidant properties and are essential in protecting against oxidative stress, which is often elevated in malnourished individuals. Antioxidants can also be used in warding off free radicals that may be produced during malnutrition. Antioxidants can help reduce inflammation and cell damage (Ahmed et al., 2022). Flavonoids are most abundant in all parts of the plant, one of which is in the leaves and belongs to the polyphenol group. Flavonoids are able to inhibit lipid oxidation and ward off free radicals. Flavonoids have the ability to be antioxidant, anti-inflammatory, antibacterial and anticancer (Najmah, et al., 2023). Tannins, while potentially beneficial as antioxidants, can interfere with protein digestion and iron absorption. Lower tannin levels, can improve protein digestion and iron absorption in malnourished individuals, which is important for recovery (Zhang et al., 2019). The results of the study, Hidayah et al (2023), show that triterpenoids have significant pharmacological activity, such as

antiviral, antibacterial, anti-inflammatory effects, which act as inhibitors of cholesterol synthesis and as anticancer agents. Cancer is a disease caused by abnormal cells in the body's tissues that grow and develop rapidly and uncontrollably.

**Analysis of Phytochemical Content Data for the Prevention of Stunting Disease**

Based on the meta-analysis and study literature, several phytochemical potentials of natural spiced moringa tea that play a role in the prevention of stunting disease, the results of the phytochemical potential of natural moringa tea are presented in **table 5.**

**Table 5.** Analysis of Phytochemical Content Data in the relatin to preventing stunting

| Simplicia | Potential of Phytochemicals to Prevent Stunting | Reference Source |
|---|---|---|
| **Moringa Leaves** | Anti-inflammatory, Anticarcinogenic, immunomodulator, antioxidant, antiproliferation and antiviral | Saini et al., 2014; Shija et al., 2019; Basri et al., 2021; Brar et al., 2022; Afriza et al., 2023; Budiono & Has, 2025 |
| **Ginger** | Anti-inflammatory, antioxidant, antiproliferative and immunomodulatory | Ali et al., 2008; Kiyama, 2020; Sharma et al., 2021; Unuofin et al., 2021; Fatma & Siddique, 2023; Singh et al., 2023; Edo et al., 2025 |
| **Lemongrass** | Antioxidant, anticancer, antiproliferation, antimicrobial, antiviral | Gaba et al., 2020; Aboagye et al., 2021; Pan et al., 2022; Adhikary et al., 2024; Alharbi et al., 2024; El-Shan,et al., 2024 |
| **Galangal** | Antimicrobial, antioxidant, immunomodulator | Das et al., 2020; Sianipar et al., 2021; Alijobair et al., 2022; Ramanunny et al., 2022; Verma & Sharma, 2022; Amalraj et al., 2023 |
| **Tumeric** | Anti-inflammatory, antioxidant, and immunomodulatory | Permatananda et al., 2021; Abubakar et al., 2022; Oluwafemi et al., 2022; Anyaoku et al., 2023; Cyril, 2023; Hardia et al., 2025 |

Based on table 5, the potential of moringa leaf tea and spices in the prevention of stunting disease includes Anti-inflammatory, Anticarcinogenic, immunomodulator, antioxidant, antiproliferation and antiviral. One of the important factors that contribute to stunting is chronic inflammation, both derived from recurrent infections and inflammatory bowel conditions such as Environmental Enteric Dysfunction (EED). EEDs cause damage to the intestinal mucosa, interfere with nutrient absorption, and increase intestinal permeability (Santoso et al., 2024). Prolonged systemic inflammation causes linear growth retardation, as it affects growth hormone and bone metabolism. Based on the research in table 4, the phytochemical compounds in spiced moringa tea have a function in inhibiting the production of pro-inflammatory cytokines such as TNF-α, IL-6, and IL-1β, inhibiting the activity of COX-2 and prostaglandin enzymes and reducing oxidative stress that triggers inflammation (Sianipar, 2021). So that the anti-inflammatory ability of the phytochemical content of spiced moringa tea can reduce systemic inflammation that may interfere with growth and improve intestinal function and nutrient absorption, especially if EED is the cause of stunting (Raczyńska et al., 2025).

In people with stunting and during pregnancy, the immune system will decline in line with the diet and nutrient consumption of the mother and child, this can increase stunting (Kustiani et al., 2022). Moringa leaf tea spice has secondary metabolite compounds with immuno-modulatory activity such as alkaloids, flavonoids, glycosides, polysaccharides, polyphenols, tannins, terpenoids, saponins and sterols (Sianipar, 2021) Types of immunomodulators consist

of three categories: immuno-adjuvant, immunostimulant, and immunosuppressant. Spiced moringa tea has a role as an immunostimulant, which can increase the body's resistance to infections, can be worked by the stimulated nonspecific immune system (Oluwafemi et al., 2022).

Stunting is the result of chronic disruption of linear growth, one of which is caused by oxidative stress due to persistent inflammation. Oxidative stress occurs when the amount of free radicals (ROS) in the body exceeds the antioxidant capacity (Hasan et al., 2023). This damages intestinal cells, the immune system, and other tissues that are important for growth. According to Zakaria et al (2023) Moringa leaf tea has antioxidant content, this is in accordance with table 4, that flavonoids, tannins and alkaloids are included in the antioxidant group. Antioxidants work in neutralizing free radicals, protecting gut cells and body tissues from damage, reducing inflammation related to oxidative stress, and supporting the immune system, making infections less frequent (Kiyama, 2020; Sharma, et al., 2021; Unuofin, et al., 2021). Based on Marhaeni's (2021) research, spiced moringa tea contains phytochemical compounds that are able to work in the prevention of stunting disease, through maintaining the integrity of intestinal cells, so that nutrient absorption remains optimal, reducing the damaging effects of oxidative stress due to infection or malnutrition, improving nutritional status through the content of micronutrients that support growth, reducing the risk of hormonal disorders that occur due to chronic inflammation and tissue damage (Leslie & Gunawan, 2023).

Based on research conducted by Brar, et al., 2022; Afriza, et al., 2023; Budiono & Has, 2025, shows that the phytochemical compounds contained in spiced moringa tea have antimicrobial, antiviral, anti-inflammatory and anticancer effects that prevent infectious diseases and serious diseases in mothers and children so that they have the potential to cause children to experience stunting. In addition, moringa leaves in spiced moringa tea itself contain many minerals such as calcium, potassium, zinc, magnesium, iron and copper. Vitamins such as beta carotene vitamin A, B vitamins such as folic acid, pyridoxin and nicotinic acid, vitamins C, D, E are also present in moringa leaves. Moringa leaves also contain low calories so they can be used for diets for people with obesity. Moringa leaves contain many minerals that are essential for growth and development, such as calcium. When compared to milk, 8 ounces of milk contain 300-400 mg of calcium while 1000 mg moringa leaves contain more than 4000 mg of calcium (Kustiani et al., 2022).

The health benefits of moringa leaves are influenced by the nutrients contained in them. In addition to antioxidants, moringa leaves also contain vitamins and minerals, including Vitamin B6, Vitamin B2, Vitamin C, Vitamin A, iron and magnesium. A bowl of moringa leaves (± 21 grams) contains 2 grams of vegetable protein (Chalik, 2023). Other studies that have been conducted have also proven that 100 grams of dried moringa leaves contain twice as much protein as yogurt, contain vitamin A seven times higher than carrots, have three times higher potassium content than bananas, have four times higher calcium content than milk, and have seven times higher vitamin C content than oranges. Moringa leaves also contain vitamin B6, iron, magnesium, and riboflavin B2. The diverse content of moringa leaves is what makes moringa leaves get the nickname as a superfood ingredient, which is a functional food that has high nutritional value and is rich in antioxidants that are beneficial to the body, including increasing the fulfillment of nutritional needs in the body. So that spiced moringa tea has the potential to prevent stunting.

## CONCLUSION

Moringa tea has the potential as a stunting prevention agent because it contains phytochemicals in the form of alkaloids, tannins, saponins, flavonoids and triterpenoids or steroids that have roles as anti-inflammatory, immunomodulator, antioxidant, antimicrobial, antiviral and anticancer, so that it can prevent stunting in children.

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