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Potential of Hanjeli (*Coix lacryma*-jobi) as an antifungal Microsporum Gypseum Causes Skin Infections: Extract, Boiled Water, Kombucha, and Bath Soap

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Abstract: Job's tears (*Coix lacryma*-Jobi L.) are known to contain chemical compounds of the alkaloid, flavonoid and tannin groups that have the potential as antifungals. *Microsporum gypseum* is one of the dermatophyte fungi that causes dermatitis, a disease that infects skin of both animals and humans. The study aims to test the activity and determine optimal concentration of Job's tears seed extract, Job's tears seed boiled water, Job's tears leaf kombucha, and Job's tears seed extract bath soap formulation as antifungals against *Microsporum gypseum* which causes skin disease infections. The research method used agar diffusion with the well technique (Agar Well Diffusion), the research parameters included phytochemical tests of the extract, measuring diameter inhibition area. The results phytochemical test obtained alkaloid compounds, and results of activity test of the Job's tears seed extract formulation, Job's tears seed boiled water, Job's tears leaf kombucha, and Job's tears seed extract bath soap obtained optimal diameter of the inhibition area overall at an extract concentration of 40%. Conclusion, activity of ethanol extract of hanjeli seeds, boiled water of hanjeli seeds, hanjeli leaf kombucha, and hanjeli seed extract bath soap at a concentration of 40% have antifungal activity against *Microsporum gypseum* which causes skin diseases.

Keywords: Antifungal; Hanjeli extract; Kombucha; *Microsporum gypseum*; Skin infections

Introduction

Dermatophytosis (ringworm, tinea) is a superficial infection of the skin, nails, and hair caused by the fungi Trichophyton, Microsporum, and Epidermophyton. Dermatitis is a skin inflammation that causes clinical abnormalities in the form of polymorphic itching and scaling with a prevalence of cases in the world of 10% (Maudani et al., 2020). Cases of dermatitis are still reported to be very high in Indonesia, both in animals and humans. *Microsporum gypseum* is a fungus from the dermatophyte group that causes dermatitis. This group of fungi can digest skin keratin (keratinophilic) which can attack the skin layer from the stratum corneum to the stratum basalis (Glabella et al., 2022).

Antifungal is a substance produced by a microbe, which can inhibit or eradicate other types of microbes (fungi), which has the property of being able to kill or inhibit the growth of fungi, while its toxicity to humans is relatively small (Sudan & Sharma, 2022). The use of chemical drugs for dermatitis as antifungals tends to have side effects if used continuously. Fungi that are resistant to certain antifungals cause treatment for

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infectious diseases caused by fungi to take longer (Minarni et al., 2020).

Black cumin seeds have undergone antifungal testing utilizing the well method against Mycosporum gypseum. Flavonoids and saponins, which are secondary metabolites found in black cumin seeds, have antifungal properties. The study's findings demonstrated that, at a 100% concentration, black cumin seeds effectively inhibited the growth of *Mycosporum gypseum* with an inhibition zone of 7.5 mm. Antifungal testing has also been carried out on the herbal plant extract of Mecca basil (*Ocimum gratissimum*) against Mycrosporum gypseum using the disc method (Glabella et al., 2022).

Mecca basil extract contains flavonoids and tannins that have antifungal activity and are effective in inhibiting growth of *Microsporum gypseum* which causes fungal skin infections. Job's tears (*Coix lacryma*-Jobi L.) is a plant from the Poaceae/Graminae family originating from East Asia and Southeast Asia including Indonesia, especially in West Java, namely Ciamis, Tanjung Sari, Cirebon, Sukabumi and Garut. Job's tears herbal medicine is known in Indonesia as jali, japen, jelai and jeten. Potential yield of Job's tears herbal medicine seeds can reach 4-6 tons/ha, if planted with a distance of 100 x 50 cm (Fadilah et al., 2022). The potential of Job's tears herbal medicine plants outside Java is less or even not utilized at all. This can be observed from minimal development of Job's tears mushroom plants (Serlin et al., 2020).

The advantages of millet plants compared to other cereals are that they can tolerate water shortages (Maudani et al., 2020), are more resistant to pests and are responsive to fertilization (Histifarina et al., 2020). Millet seeds contain calories, protein, carbohydrates, fiber, calcium, iron, and several vitamins, such as riboflavin (vitamin B2), thiamine (vitamin B1) and niacin (vitamin B3). The content of protein, fat, vitamin B1, and Ca contained in millet seeds is quite high (Ningsih & Advinda, 2023). Various studies, all parts of the millet plant, from the stems, roots, leaves, and seeds can be used as antibacterial, antifungal, antitumor, and anti-inflammatory drugs. The results of research by Haryani et al. (2024), millet seeds contain flavonoids and tannins. Flavonoids are phenolic compounds that can bind microtubule proteins in cells, thereby inhibiting fungal growth (Patel et al., 2017). Phenols in flavonoids can damage cytoplasmic cells and cause leakage of fungal cell nuclei (Ikenganyia et al., 2017).

Until now there is no data on the antifungal activity of *Microsporum gypseum* from the extract of hanjeli seeds, but the antibacterial activity of hanjeli seed extract has been carried out. Data on antifungal activity of *Microsporum gypseum* from the extract of hanjeli seeds is very important to determine potential for developing hanjeli seeds as a source of treatment, especially for infections that cause skin diseases (dermatophytosis). The results of this study can be used as a solution to the limited use of hanjeli seeds as a treatment for dermatophytosis. The purpose of study was to test the effectiveness of hanjeli seed extract (*Coix lacryma*–jobi) as an antifungal against *Microsporum gypseum* which causes skin infections, and to determine optimal concentration of hanjeli seed extract in inhibiting growth of *Microsporum gypseum* fungi.

Current research developments also do not yet have data on the potential of kombucha made from hanjeli leaves which have growth inhibitory properties against *Microsporum gypseum* fungi. Results of research conducted by Rezaldi et al. (2022) have revealed that kombucha butterfly pea flowers have the potential as an antifungal for dandruff in concentrations of 20%, 30%, and 40% (Firman et al., 2022). According to the findings of further research, kombucha butterfly pea flower shampoo, both gel and liquid, may be an effective anti-dandruff fungus (Agustiansyah et al., 2022; Rezaldi et al., 2025; Rezaldi & Pertiwi, 2022). The results of research conducted by Rezaldi et al. (2023) explained that kombucha butterfly pea flowers can inhibit the growth of pathogenic fungi that cause infections in horticultural commodity plants. The results of research conducted by also explained that kombucha butterfly pea flowers can be used as a natural spray to inhibit the growth of pathogenic fungi for horticultural commodity plants (Rezaldi et al., 2024; Rezaldi et al., 2024).

Talking about the potential of natural materials as environmentally friendly products can be applied as active ingredients of drugs and cosmetics (Rezaldi et al., 2024) especially in inhibiting the growth of *Microsporum gypseum* fungus. One of the pharmaceutical preparations that contains the active ingredient of hanjeli plant extract to inhibit the growth of the skin in the fungus is liquid soap. Liquid soap has various advantages, namely practical, easy to carry anywhere, antimicrobial, has a high appeal to consumers when compared to solid soap (Hussein et al., 2024; Pertiwi et al., 2022). The novelty of this research is very high, so this publication aims or is expected to produce the latest scientific information on the potential of hanjeli seed extract, hanjeli seed decoction, and soap made from hanjeli seed extract in inhibiting the growth of *Microsporum gypseum* fungus.

Method

Time and Place of Research

This research was conducted in September 2024 - February 2025, located at the Biology and Chemistry Laboratory, FMPA - Pakuan University. Sampling was carried out in Cicurug, Sukabumi Regency, Fisheries

Quality Testing Laboratory (UPTD), Serang, Banten, and Kombucha Fermentation House.

The research stages carried out consisted of six stages, namely preparation of tools, materials and mushroom growth media, making nutmeg seed extract, testing secondary metabolite content, rejuvenating *Microsporum gypseum* fungi, determining the minimum inhibitory concentration, testing of millet seed extract, millet seed boiled water, millet leaf kombucha, and millet bath soap as antifungals against Microsporum gypseum, and analysis of research data.

Research Method

This research is an experimental laboratory study where the positive control used for testing *Microsporum gypseum* fungus in hanjeli seed extract, hanjeli seed boiled water, and hanjeli leaf kombucha is ketonazole and the negative control is Na.CMC. The positive control used to test *Microsporum gypseum* fungus is a bath soap that is already available on the market and the negative control is a bath soap base without active ingredients.

Hanjeli Seed Extraction

Ripe/old hanjeli seeds are selected, roasted to open the outer skin of seeds, seed core is collected, then weighed as the wet weight of the simplex, then washed with running water, and drained until no water drips, then sorted wet, placed on the drying cabinet channel at a temperature of 60°C. After drying, seeds are powdered and sieved to reduce particle size. The powder is weighed for its dry weight (Husein et al., 2025).

Maceration was used three times for extraction. A Buchner funnel was used to filter the filtrate after 1000 g of jali seeds were macerated for 72 hours in a 96% ethanol solvent. After the ethanol solvent evaporated and a thick extract formed, the filtrate was concentrated using a rotary vacuum evaporator set to a maximum temperature of 50°C. The resulting filtrate was then transferred into a dark vial bottle, the total extract was weighed, and multiple concentrations were created for testing (Pertiwi et al., 2022).

Making Hanjeli Leaf Kombucha

The important stages that need to be carried out in fermenting hanjeli leaf kombucha include 1) preparing priority tools and materials such as glass jars as incubators that can neutralize the sour taste, white granulated sugar of 20%, 30%, and 40% as a substrate in the fermentation of hanjeli leaf kombucha, nutrients for Scoby, and determinants of the growth inhibition of *Microsporum gypseum* fungus, 2) weighing hanjeli leaves as much as 17.2% in 1 liter, 3) weighing water by 7.2% until 2.4% water remains, 4) adding white granulated sugar according to the treatment, namely 20%, 30%, and 40%, 5) heating the sugar for 10 minutes then putting it in a glass jar in each concentration of white granulated sugar, 6) putting boiled water of butterfly pea flowers in the inner glass jar according to the treatment of each white granulated sugar concentration, 7) cooling the boiled water of hanjeli leaves at temperature of 25^{o}C then adding 1 week old kombucha starter as much as 8% (v/v) in each treatment, 8) closing the glass jar using a cloth cover and rubber band with the aim of creating a fermentation process for the hanjeli leaf kombucha that can run statically for 12 days in room conditions (Fathurrohim et al., 2022), providing a label containing the date and sugar concentration in the hanjeli leaf kombucha according to each treatment (Saddam et al., 2022).

Making Liquid Bath Soap Formulations and Preparations

The formulation and preparation soap using hanjeli seed extract refers to the research results of Rezaldi et al. (2023) and is located in table 1.

Testing the Inhibitory Power of Pathogenic Fungal Growth

Test solutions in the form ethanol extract hanjeli seeds, boiled water of hanjeli seeds, kombucha of hanjeli leaves, and hanjeli seed extract bath soap in concentrations of 10%, 20%, 30% and 40%, 1% Na.CMC solution, bath soap base as a negative control and market bath soap and 200 mg ketokenazole solution as a positive control. Dropping as many as 3 drops each into the varied wells. Incubate the petri dish in an incubator at 37oC for 3 x 24 hours (Rezaldi et al., 2021).

Data Analysis

The observation results are qualitative and quantitative. Qualitative observations include water content tests of nutmeg seed extract, phytochemical tests of nutmeg seed extract presented in table form, while quantitative observations are obtained from the average value of the measurement of antifungal activity inhibition against the growth of Microsporum gypseum fungus from both millet seed extract, millet seed boiled water, millet leaf kombucha, and millet seed extract bath soap analyzed statistically through one-way ANOVA and post hoc follow-up tests.

Table 1. Formulation of Liquid Bath Soap Preparation with Job's Tears Seed Extract

Material	Function	F0 (-)	F1 20%	F2 30%	F3 40%
Hanjeli Seed Plant Extract	Antifungal	0	20	30	40
Olive oil	Soap base	15ml	15ml	15ml	15ml
KOH 40%	Foam maker	8ml	8ml	8ml	8ml
Na-CMC	Thickener	1g	1g	1g	1g
SLS	Surfactant	1ml	1ml	1ml	1ml
Telang infused inolive oil	Fat oil	0.5ml	0.5ml	0.5ml	0.5 ml
Phenoxyethanol	Preservative	0.5ml	0.5ml	0.5ml	0.5ml
	Antioxidant	1ml	1ml	1ml	1ml
BHT					1ml
	Fragrance	1ml	1ml	1ml	1ml
Essense Oil	Fluid	1ml	1ml	1ml	1ml
Castor Oil	Foam Enhancer	1ml	1ml	1ml	1ml
Sodium lactate	Moisturizing	1ml	1ml	1ml	
Stevia Sugar	Soft enhancer	1ml	1ml	1ml	1ml
Yogurt	Enhances slip and silky effect	1ml	1ml	1ml	1ml
Kaolin Clay	when bathing				
Aquadest	Solvent	100	100	100	100

Information: F0 : Soap base without active ingredients as a negative control; F1: Commercially available bath soap as a positive control; F2: Liquid bath soap base with active ingredient of 20% hanjeli seed plant extract; F3 : Liquid bath soap base with active integridient of 30% hanjeli seed plant extract; F4 : Liquid bath soap base with integridient of 40% hanjeli seed plant extract

Result and Discussion

Results of Making Hanjeli Seed Simples

The results of wet sorting and dry sorting of 1 kg of hanjeli seeds produced 900 grams of hanjeli seeds that had uniform size and color and good quality. After going through the sorting stage, the hanjeli seeds were oven-dried and ground, producing 700 grams of hanjeli seed powder. This decrease in mass occurs due to the reduction in water content contained in the hanjeli seeds during the drying process.

Hanjeli Seed Simplicia Quality Test

The results of the quality test of the Hanjeli seed simple powder are in the form of water content and ash content tests.

Table 2. Results of Quality Test of Job's Tears Seed Simple Powder

Test Type	Results	Standard
Water content	3.7 %	≤ 10%
Ash Content	3.25%	≤ 10%

Making Research Material Extracts

The research material was first made into 350 grams of powder, then an extract was made using 96% ethanol solvent with a multilevel maceration method (3 x 24 hours). This is because 96% ethanol solvent is the most suitable solvent for extracting all groups of compounds including secondary metabolite compounds. The results of the extraction in the form of a dilute extract, then a rotary evaporator was carried out to obtain a thick extract that was ready for phytochemical testing, and antifungal testing of Microsporum gypseum.

Phytochemical Test Results of Hanjeli Seed Extract, Hanjeli Seed Decoction, and Hanjeli Leaf Kombucha

Based on the results of phytochemical tests on ethanol extracts of hanjeli seeds, boiled hanjeli seed water, and hanjeli leaf kombucha, the types of secondary metabolites contained in them can be identified, as shown in Figure 1.

Figure 1. Alkaloid group of compounds. Test results for the phytochemical content of hanjeli seed extract, boiled hanjeli seed, and hanjeli leaf kombucha

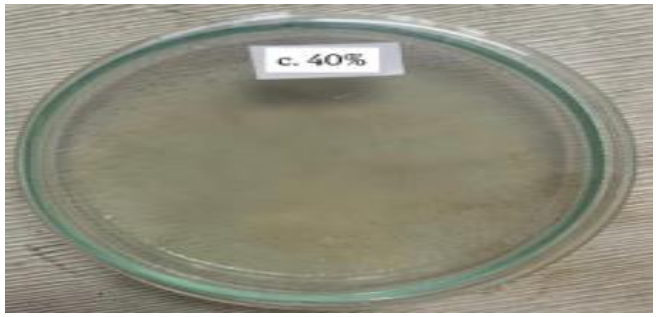

Figure 2. Optimal inhibitory power of 40% concentration of job's tears seed extract against the growth of dermatophyte fungi

Inhibitory Power of Dermatophyte Fungal Growth from Ethanol Extract of Job's Tea Seeds

The results of the concentration test on the inhibition of dermatophyte growth of hanjeli seed extract, boiled hanjeli seed water, hanjeli leaf kombucha, and hanjeli seed extract bath soap were obtained at a concentration of 40%, as shown in Figure 2 below. Using a ruler and caliper, the inhibition zone created in each treatment was measured to determine the diameter of the ethanol extract of millet seeds' inhibitory capacity against the fungus Microsporum gypseum. The full results are displayed in Table 3.

Table 3. Test of Inhibitory Power Diameter of Ethanol Extract of Job's Tears Seeds Against Dermatophyte Fungi

	Microsporum gypseum					
Test	K + (mm)	K10% (mm)	K20% (mm)	K30% (mm)	K40% (mm)	K-(mm)
T1	5	2	4	5	6	0
T2	5	2	3	4	4	0
T3	4	1	2	3	5	0
Average	4.7	1.7	3	4	5	0

Job's Tears seed extract's antifungal activity test findings against Microsporum gypseum at concentrations of 10% to 40% showed that the inhibition zone's average diameter was 1.7 mm at 10%, 3 mm at 20%, 4 mm at 30%, and 5 mm at 40%. This is thought to be because the ethanol extract of Job's Tears seeds contains alkaloids that have antifungal activity with their ability to inhibit fungal growth through the mechanism of inhibiting the esterase enzyme and DNA and RNA polymerase. The chemical content in alkaloids, such as anthraquinones, glycosides, and resins, can penetrate fungal cell wall, disrupting cellular metabolism processes. This disruption causes inhibition of fungal cell growth, and at certain concentrations, can cause fungal cell death. This is in accordance with results of research by Brighenti et al. (2021), that active alkaloid compound can interfere with the specific mechanism of the Microsporum fungus, and kill fungal cells themselves (Abdilah et al., 2022).

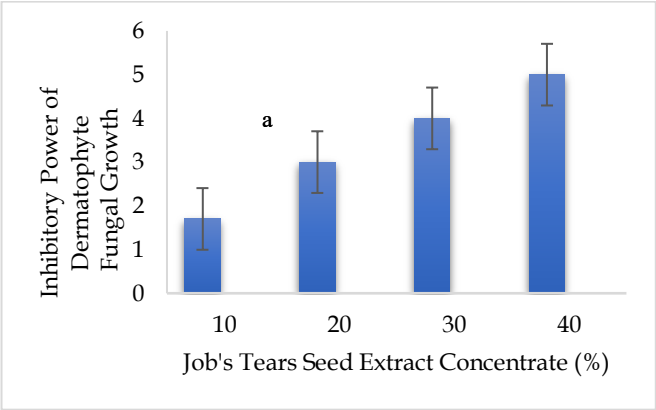

Figure 3. Graph of the Average Diameter of the Inhibition Zone of Job's Tears Seed Extract on the Growth of Dermatophyte Fungi Average ± Standard Error (SE). Information: The same letters above the bar indicate no significant difference based on the 5% DMRT test

The results of the study above have revealed that higher concentration of inhibitory power of dermatophyte fungus growth, higher its potential in inhibiting growth of *Microsporum gypseum* fungus. A very weak category is produced with an average inhibition diameter of 1.7 mm at a 10% hanjeli seed extract concentration. The average inhibition zone diameter with a very weak category is 3 mm at a 20% concentration of hanjeli seed extract, while the average inhibition zone diameter with a very weak category is 4 mm at a 30% concentration. However, the best treatment for preventing the growth of dermatophyte fungi is 40% hanjeli seed extract, which has an average inhibition zone diameter of 5 mm in the moderate category (Rezaldi et al., 2024).

The results of this study are based on one-way ANOVA statistical analysis and continued with post hoc analysis, each of which produced a p value>0.05, as shown in Figure 4 below, stating that the concentrations of 10%, 20% and 30% of millet seed extract were not significantly different as dermatophyte antifungals but were significantly different from the concentration of 40% as dermatophyte antifungals. The results of the post hoc test are in Figure 3.

Inhibitory Power of Dermatophyte Fungus Growth from Boiled Water of Job's Tea Seeds

The result of concentration test on the inhibition of dermatophyte growth of boiled water of millet seeds can be seen in figure 4. Observations regarding the average diameter of the inhibition zone in the form of boiled water from job's tears seeds are shown in table 4.

The results of the antifungal activity test of boiled water of hanjeli seeds against *Microsporum gypseum* at a concentration of 10% - 40%, with an average diameter of the inhibition zone produced respectively of 1.1 mm (10%), 2.3 mm (20%), 3.5 mm (30%), and 4.1 mm (40%). Hanjeli seeds contain secondary metabolite compounds which in this study are alkaloids so that they are able to inhibit growth *Microsporum gypseum* fungi although not as large as in the ethanol extract of hanjeli seeds.

Table 4. Average Diameter of Inhibition Zone of Boiled Water of Job's Millet Seeds

	Microsporum gypseum					
Test	K + (mm)	K10% (mm)	K20% (mm)	K30% (mm)	K40% (mm)	K-(mm)
T1	5	1	3	3.5	4	0
T2	5	1.5	2	3.5	4	0
T3	4	1	2	3.5	4.5	0
Average	4.7	1.1	2.3	3.5	4.1	0

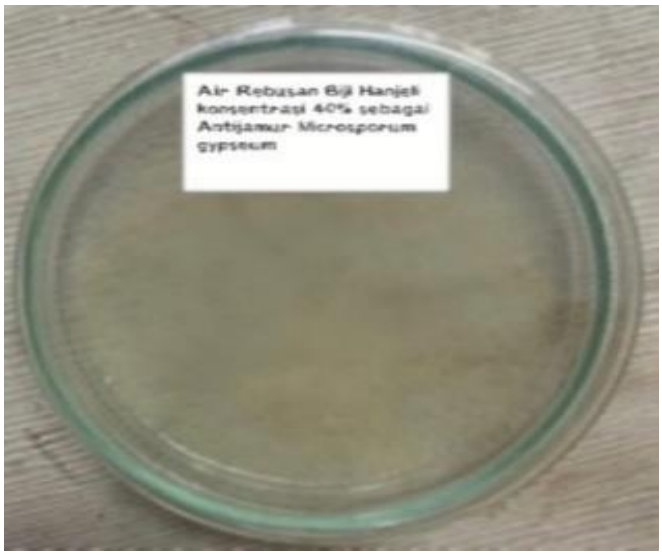

Figure 4. Optimal inhibitory power of boiled hanjeli seed water at a concentration of 40% against the growth of dermatophyte fungi

Concentration of boiled water hanjeli seeds at a concentration of 10% to 40% has a very weak inhibitory power category. This is in principle contained in a theory where the average antibiotic inhibitory power produced exceeds 20 mm has a very strong category, average antibiotic inhibitory power produced between 10 to 20 mm has a strong category. The average inhibitory power of the antibiotic produced is 5 to 10 mm and categorized as moderate, while if average diameter of the antibiotic produced is 1 to 5 mm, it is categorized as weak and if average diameter of antibiotic produced is less than 5 mm, it is categorized as very weak (Mu'jijah et al., 2023).

The results of study based on one-way ANOVA statistical analysis could not be continued with post hoc analysis (Pertiwi et al., 2022) because each produced a p value <0.05 as shown in Figure 5, stating that concentrations 10%, 20%, 30%, to 40% of boiled millet seed water were not significantly different as an anti-dermatophyte fungus.

Table 5. One-way ANOVA test results

Fungi Species	One Way ANOVA Test	Sig
Microsporum gypseum		0.28

Inhibitory Power of Dermatophyte Fungus Growth from Job's Tears Leaf Kombucha

The optimal inhibitory power of kombucha from hanjeli leaves is at a concentration of 40% as shown in Figure 5. The results of observations of average diameter of inhibition zone against growth of dermatophyte fungi from each concentration of kombucha from tears leaf extract are attached in table 5.

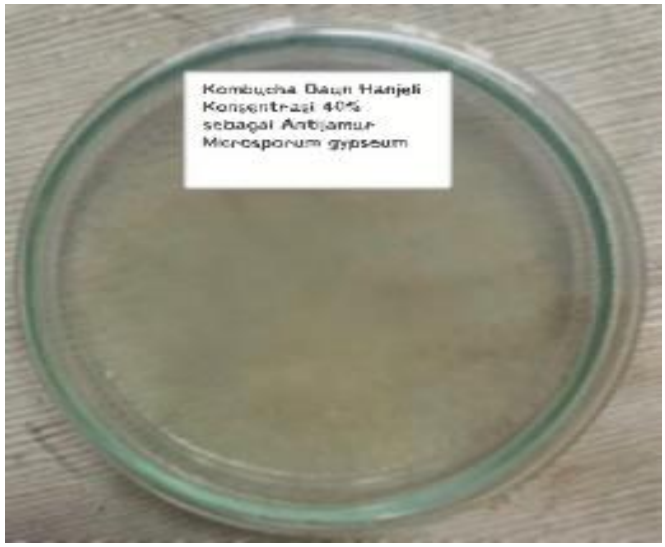

Figure 5. Optimal inhibitory power of 40% concentration of kombucha from hanjeli leaves against the growth of dermatophyte fungi

Table 5. Average Diameter of Inhibition Zone against Dermatophyte Fungal Growth from Each Concentration of Hanjeli leaf Kombucha

	Microsporum gypseum					
Test	K + (mm)	K10% (mm)	K20% (mm)	K30% (mm)	K40% (mm)	K-(mm)
T1	5	2.5	3.5	5	12	0
T2	5	3.0	3.5	5.2	12.3	0
T3	4	3.0	3.5	5.5	12.5	0
Average	4.7	2.8	3.5	5.2	12.2	0

The results of the antifungal activity test of hanjeli leaf kombucha against Microsporum gypseum at a concentration of 10% - 40%, with an average diameter of the inhibition zone produced respectively of 2.8 mm (10%), 3.5 mm (20%), 5.2 mm (30%), and 12.2 mm (40%). Hanjeli leaf kombucha contains phytochemical compounds which in this study are in the form of alkaloids so that they are able to inhibit the growth of Microsporum gypseum fungi and are proven to be better when compared to hanjeli seed extract and hanjeli seed boiled water. The concentration of hanjeli leaf kombucha at a concentration of 10% to 20% has a very weak inhibitory power category.

A concentration of 30% hanjeli leaf kombucha has a moderate category and a concentration of 40% in hanjeli leaf kombucha has a strong category. This is in line with results of research conducted by (Rezaldi et al., 2021) where best way to prevent the formation of harmful bacteria, both gram-positive and gram-negative, is to use kombucha made from butterfly pea flowers at a 40% concentration. Other research results also revealed that the higher the concentration, the greater its potential as a source of antimicrobials and antifungals (Rezaldi et al., 2022). Different concentrations from previous research results are very important in in vitro antibacterial and antifungal testing (Firman Rezaldi et al., 2025).

The study's findings are also supported by statistical analysis testing using a one-way ANOVA with a P value is <0.05. Post hoc analysis, which is shown in Figure 6, is another method of testing. According to the post hoc analysis, kombucha hanjeli leaves at 10% and 20% concentrations did not differ substantially from antifungal dermatophytes, but they did differ considerably from concentrations of 30% and 40%, as seen in Figure 6.

Additionally, as seen in Figure 6 above, kombucha hanjeli leaves at a 20% concentration differed considerably from those at 30% and 40%, but not significantly from those at 10%. The study's findings also demonstrate that kombucha made from hanjeli leaves at a 30% concentration differs noticeably from 10%, 20%, and 40% concentrations. The study's findings, as shown in Figure 6 above, also demonstrate that the 40% concentration of kombucha made from hanjeli leaves differs significantly from the 10%, 20%, and 40% concentrations.

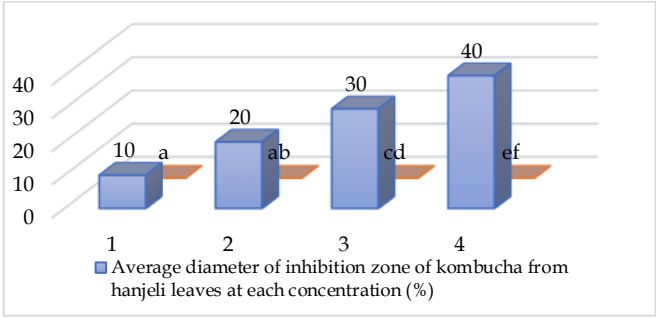

Figure 6. Average diameter of inhibition zone of job's tears kombucha on dermatophyte fungal growth average ± standard error (SE)

Optimal Inhibitory Power of Dermatophyte Fungi from Formulation and Preparation of Ethanol Extract of Job's Tea Seed Bath Soap

Figure 7 displays the soap's ideal inhibitory power after it has been formulated and prepared using millet seed extract. Table 7 displays the findings of observations on the average diameter of the inhibitory zone throughout the formulation and production of soap using millet seed extract.

Figure 7. Optimal inhibitory power of 40% concentration of Job's Tears Seed Extract Bath Soap against the growth of dermatophyte fungi.

Table 7. Average Diameter of Inhibition Zone of Formulation and Preparation of Soap Containing Millet Seed Extract Against the Growth of Dermatophyte Fungi

	Microsporum gypseum					
Test	K + (mm)	K10% (mm)	K20% (mm)	K30% (mm)	K40% (mm)	K-(mm)
T1	18	10	12	14	20	0
T2	19	11	12.2	14	20.5	0
T3	19	11	12.4	14	21	0
Average	18.6	10.6	12.2	14	20.5	0

The formulation and preparation of the soap extract of hanjeli seeds against Microsporum gypseum at a concentration of 10% to 40% yielded antifungal activity test results. The average diameter of the inhibition zone generated was 10.6 mm (10%), 12.2 mm (20%), 14 mm (30%), and 20.5 mm (40%). The study's findings also demonstrated that the soap preparation's capacity to stop the growth of dermatophyte fungi increases with its concentration. This is in line with the results of research conducted by (Ma'ruf et al., 2022; Rezaldi & Ngete, 2025) where inhibiting the growth of *Candida albicans* is best achieved with a 40% dosage of butterfly pea flower kombucha liquid soap.

Solid soap of butterfly pea flower kombucha at a concentration of 40% is the best treatment in inhibiting the growth of *Candida albicans* and *Staphylococcus hominis*, namely bacteria that cause underarm odor (Rezaldi et al., 2024; Rezaldi et al., 2024). The results of this study have also revealed that the extract of hanjeli seeds, boiled water from hanjeli seeds, hanjeli leaf kombucha, and hanjeli seed extract bath soap have sufficient potential as active herbal ingredients and environmentally friendly phytopharmaceutical preparations for long-term application as antimicrobials, antifungals, antioxidants, and antiaging (Putra et al., 2023).

Conclusion

Active compounds through qualitative phytochemical screening of both hanjeli seed extract, hanjeli seed boiled water, and hanjeli leaf kombucha contain alkaloids. Hanjeli seed extract, hanjeli seed boiled water, hanjeli leaf kombucha, and hanjeli seed extract bath soap preparation at a concentration of 40% are optimal treatments as dermatophyte antifungals, especially in inhibiting the growth of Microsporum gypseum.

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