

FORMULATION OF REED DIFFUSER AROMATHERAPY PRODUCTS FROM A COMBINATION OF CINNAMON (*Cinnamomum verum*) AND CITRONELAL ESSENTIAL OIL (*Cymbopogon nardus*) FOR STRESS-REDUCING AROMATHERAPY

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Abstract

Stress is a condition that can be caused by uncontrollable physical demands, environment and social situations. Stress management can be done pharmacologically or non-pharmacologically, but non-pharmacological treatment is considered safer because it causes fewer side effects. One of the non-drug treatment methods that has proven effective is aromatherapy. This study aims to identify the formulation of reed diffuser products that consumers prefer. In addition, to provide information to the public that the combination of cinnamon (*Cinnamomum verum*) and citronella (*Cymbopogon nardus*) essential oils can be used as an alternative to reduce stress. The research methods used in this study were questionnaires, laboratory experiments, and observations. Based on the results of the study, it was found that the stability of reed diffuser essential oil combination of cinnamon (*Cinnamomum verum*) and citronella (*Cymbopogon nardus*) in the organoleptic test has a physically and chemically stable odor and color. As for the results of the hedonic test, it was found that the formula with a concentration of 2: 3 was much preferred by consumers compared to the other four formulas. The preparation of reed diffuser essential oil combination of cinnamon (*Cinnamomum verum*) and citronella (*Cymbopogon nardus*), is affectively used as anti-stress aromatherapy with regular use.

Keywords: Anti -Stress, Aromatherapy, Cinnamon, Citronella, Essential Oil, Reed diffuser

I. INTRODUCTION

Stress is a condition that can be caused by uncontrollable physical demands, environmental and social situations. Stress is a broad concept consisting of challenging or difficult circumstances, physiological or psychological responses to those circumstances. One of the systems that contribute to stressful conditions in both humans and other species, is the immune system (1). According to the World Health Organization, the number of stress cases in the world is quite high, nearly 350 million people experience stress, and is the fourth most common disease in the world. A study on the prevalence of stress conducted by the Health and Safety Executive in the UK revealed that women (54.62%) experienced more stressful events than men (45.38%)(2). Based on research conducted by (3) on 7,143 students from the impact of Covid -19, it shows that 0.9% of students experience severe anxiety, 2.7% moderate anxiety and 21.3% experience mild anxiety. Management can be done pharmacologically or non-pharmacologically, but non-pharmacological treatment is considered safer because it causes fewer side effects. One of the non-drug treatment methods that has proven effective is aromatherapy(4).

Aromatherapy is a treatment or treatment technique using odor techniques with the use of essential oils as aromatherapy(5). Aromatherapy is a therapeutic technique that involves inhaling the aroma of essential oils to help maintain health, refresh and provide tranquility. Aromatherapy is believed to treat respiratory, urinary tract, pain, and mental-emotional disorders, and can provide a calming sensation, thus relieving stress (6). Over time, aromatherapy has become increasingly popular thanks to technological

advances. One of the media for using aromatherapy is the diffuser. A diffuser is a tool used to spread essential oils into the surrounding air by absorbing aromatherapy liquid into a rattan stem (reed) and then spreading the aroma throughout the room. Indonesia is the largest producer of rattan in the world (80% of world production) where 90% is produced by natural forests in Sumatra, Kalimantan, Sulawesi, and around 10% is produced from rattan cultivation. This makes rattan good to be used as a good learning and development material as a stick material for diffuser products.

Essential plants, or plants that produce essential oils, are plants that produce essential oils that are rich in aromatic and fragrant compounds. Cinnamon (*Cinnamomum verum*), is one of the plants that almost all parts of the plant can be used as spices and is one of Indonesia's export commodities. The plant is distributed in Southeast Asia, China and Australia with many varieties such as true cinnamon and *Cinnamomum zeylanicum* from Sri Lanka; *Cinnamomum tamala* from India and Myanmar(7). The main content of essential oils in cinnamon is cinnamaldehyde (60.72%), eugenol (17.62%) and coumarin (13.39%). (8). The active compound eugenol has a mechanism of action as an antidepressant / antistress through the mechanism of inhibition of Monoamine Oxidase-A (MAO-A) and Monoamine Oxidation-B (MAO-B) (9). The scent of cinnamon can improve concentration and performance better. Cinnamon oil, which is rich in cinnamaldehyde, can relieve depression and fatigue. (10). Citronella oil is one of the essential oils that is an export commodity along with other essential oils. Citronella oil from citronella plants (*Cymbopogon winterianus*) is a type of essential oil which is often also called etheric oil or flying oil because of its volatile ability and has different compositions and boiling points(11). Citronella oil is usually made by distilling lemongrass leaves and stems whose main components are citronellal, citronellol and geraniol. These three components of citronella oil are widely used in industry, especially perfumery, cosmetics, perfumes and pharmaceuticals. Citronella oil contains citral compounds that can reduce anxiety levels so it is used as aromatherapy. In addition, citronella oil can also restore homeostasis or an automatic condition where the body remains in a stable condition(12).

The purpose of this study is to determine the formula of reed diffuser products that are favored by consumers. In addition, it is also to provide information to the public that the combination of cinnamon essential oil (*Cinnamomum verum*) and citronella (*Cymbopogon nardus*) can be used as an alternative to reduce stress.

II. METHODOLOGY

The materials and tools used in this study are cinnamon oil, citronella oil, sunflower oil, reed (rattan rod), glass bottles, measuring cups, pipettes and stirrers. The aromatic oil formulation used in this study uses several levels of treatment contained in table 1. Essential oils are produced by the binding of water vapor on cinnamon and citronella. the phase change from vapor to liquid occurs in the condenser, the liquid is a mixture of essential oils and water(13). The essential oil used is obtained from the essential oil extraction process, which is as much as 10 ml.

The manufacture of reed diffuser starts from the process of making sticks from reed by cutting them to a diameter of 1 mm and a length of 20 cm. After that, aromatic oil is made by mixing all the ingredients according to the formulation that has been made.

The research methods used in this research are questionnaires, laboratory experiments, and observations. The first research method is the questionnaire method. This method is used to collect test data as a physical evaluation of the reed diffuser. The tests carried out were organoleptic tests in the form of sensory tests and hedonic tests. The sensory test was conducted to see the color and aroma of the reed diffuser preparation by making direct observations on reed diffuser formulas I, II, III, and IV. Meanwhile, the hedonic test was conducted to see the level of consumer preference regarding the aroma of the reed diffuser preparation. This hedonic test was carried out by filling out a questionnaire by 30 panelists.

The second method is a laboratory experiment with a post-test only control animal test design. The animals used were male mice (*Mus musculus*). This experiment was carried out by paying attention to the body weight, consistency of feces and urine of male mice that were made stressed for approximately 7 days, by reducing chaff, not feeding mice, and shaking mice. This was observed before and after the mice were

stressed. Then an anti-stress test was carried out on male mice using the force swimming test method or a 6-minute swimming test on mice that had previously been exposed to a reed diffuser for 1 hour.

The third method is followed by the observation method, in the form of direct observation of experimental animals to obtain data on the anti-stress effect of reed diffuser on mice using a combination of cinnamon essential oil (*Cinnamomum verum*) and citronella (*Cymbopogon nardus*) on male mice (*Mus musculus*).

III. RESULTS AND DISCUSSION

Aromatic oils are made from two basic ingredients, namely fragrance and solvent. There are two types of solvents: water and oil (14). The results of the organoleptic test observations in the form of sensory tests and hedonic tests are shown in table 2 and table 3. The observation results in table 2 show that the color of reed diffuser preparations from formulations I, II, III, and IV is clear and homogeneous. This means that the addition of essential oil does not affect the color change. While the aroma produced in formulas I, II and III has a distinctive combination of essential oil aroma, namely cinnamon oil (*Cinnamomum verum*) and citronella (*Cymbopogon nardus*), formula IV does not have essential oil aroma, but only the aroma of carrier oil or sunflower oil because this formula is used as a negative dick. Table 3 shows the observation results of the hedonic test which aims to determine the level of consumer preference for the odor or aroma of the reed diffuser preparation. These results show that formulation 0 is a negative control, because it only contains sunflower oil as a carrier, so it does not have a distinctive aroma. Based on the assessment conducted by 30 panelis, Formula I has the highest percentage, which is about 36% like and 30% really like the aroma of reed diffuser. The highest percentage in formula II is 40% liked and 10% really liked the aroma of reed diffuser. The highest percentage in formula III is 40% like and 26% really like the aroma of reed diffuser. The highest percentage in formula IV is 40% ordinary and 20% like the aroma of reed diffuser. So it can be concluded that formula I with a concentration of cinnamon essential oil (*Cinnamomum verum*) 2% and citronella essential oil (*Cymbopogon nardus*) 3%.

Further observations were made on male mice (*Mus musculus*) at the Pharmaceutical Biology Laboratory of the Makassar College of Pharmacy (STIFA), Pharmaceutical Preparation Technology Laboratory, Pharmacology and Toxicology Laboratory, Faculty of Pharmacy, University of Muhammadiyah Makassar resulting in differences in body weight, consistency of feces and urine in mice shown in table 4, table 5 and table 6. Table 4 shows the body weight of mencrit before and 1 day after mencrit was made stressed. The observations show that the body weight of mencrit has decreased and increased. This is because stressful conditions can increase metabolism and nitrogen excretion in minutes, causing the body's endogenous protein and fat stores to be broken down for use as an energy source, resulting in a decrease or maintenance of body weight.

The results of further observations can be seen in table 5, namely the consistency of feces during stress and exposure. Table 5 explains that the feces of K0, K1, K2, K3 and K4 are equally dilute. This is in accordance with research (15) which shows that mice produce large amounts of liquid feces when stressed. Watery stools are caused by mencrit experiencing diarrhea. During times of stress some brain chemicals such as serotonin, cause the intestines to move faster when the mice are anxious. This is what causes the mencrit feces to be watery, while after exposure both in the test group, negative control and positive control both show a solid feces consistency because the mencrit is not in an anxious state.

The last thing that was observed was whether or not the urine came out, the results of which can be seen in table 6. It is known that groups K0, K1, K2, K3 and K4 released urine during the stress process. This is in accordance with research (15) which states that mice excrete large amounts of urine when stressed. Urination occurs because when experiencing stress or anxiety, the adrenal glands will secrete adrenal hormones that make the heart work faster, blood sugar increases so that the body's metabolism will also increase and can increase kidney performance which causes urine production to increase. Group K0 has no change in urination or mice still urinating. This happens because the exposed reed diffuser does not contain active ingredients, while the test group and the positive group show no urination process, because when

exposed to aromatherapy it can suppress the adrenaline hormone so that the mice remains calm and not anxious (16).

After the stress phase, an anti-stress test was carried out on the mice using the force swimming test method or a 6-minute swimming test on mice that had previously been exposed to reed diffuser for 1 hour by looking at the immobility time. The observation results can be seen in table 7 where the K0 mice or as a negative control is exposed to reed diffuser preparations without essential oil, only carrier oil in the form of sunflower oil. It was found that the immobility time shown in the K0 group was very large because the negative control reed diffuser did not contain essential oil. In KI or group I, the mice were exposed to a reed diffuser combination of cinnamon essential oil (*Cinnamomum verum*) 2% and citronella (*Cymbopogon nardus*) 3%, where the five mice showed quite low immobility compared to the negative control. In group KII, the mice were exposed to a reed diffuser combination of cinnamon essential oil (*Cinnamomum verum*) 4% and citronella (*Cymbopogon nardus*) 5% where the five mice showed lower immobility compared to K0 and KI. In group KIII, the mice were exposed to a reed diffuser with a combination of cinnamon essential oil (*Cinnamomum verum*) 6% and citronella (*Cymbopogon nardus*) 7% where the five mice showed lower immobility compared to KI and KII, this was due to the high essential oil content in the reed diffuser formula and directly proportional to the existing theory, namely, the greater the dose given, the lower the immobility time in the mice (17). As for the KIV group, the mice were exposed to lavender reed diffuser as a positive control. The five mice showed very low immobility, this is in accordance with previous research where lavender flowers have anti-stress effects(18). Immobility time in mice is a state of despair in humans and a decrease in interest or motivation(19). Based on the results of research (20),the higher the concentration of essential oils added will increase the anti-stress effect.

One Way Anova test was conducted after normality and homogeneity test as a prerequisite test to see the significance of anti-stress in each test group. This statistical test shows that the higher the concentration of essential oil added will increase the anti-stress effect. This is known from the shorter immobility time in table 7. Based on the results of the above analysis, reed diffuser combination of cinnamon (*Cinnamomum verum*) and citronella (*Cymbopogon nardus*) essential oil has anti-stress effect and in accordance with the existing theory that cinnamon (*Cinnamomum verum*) and citronella (*Cymbopogon nardus*) can be used as aromatherapy to overcome stress.

IV. CONCLUSIONS AND NEWNESS

Based on the results of the research that has been done, it can be concluded that the stability of reed diffuser essential oil combination of cinnamon (*Cinnamomum verum*) and citronella (*Cymbopogon nardus*) in the sensory test is physically and chemically stable both odor and color. Based on the hedonic test results, it is known that consumers prefer the 2 : 3 concentration mixture compared to the other four formulas. The preparation of reed diffuser essential oil combination of cinnamon (*Cinnamomum verum*) and citronella (*Cymbopogon nardus*), effectively used as anti-stress aromatherapy with regular use.

V. REFERENCES

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TABLES AND FIGURES

Table 1 Reed Diffuser Preparation formulations

| Material | Formulation | | | | |
|--|-------------|----|----|----|--|
| | F1 | F2 | F3 | F4 | F5 |
| Cinnamon (<i>Cinnamomum verum</i>) | 2% | 4% | 6% | - | Positive control with Diffuser lavender Preparation |
| Citronella (<i>Cymbopogon nardus</i>) | 3% | 5% | 7% | | |
| Sunflower | 70 | 70 | 70 | 70 | |

Table 2. Organoleptik Research Results

| Group | Organoleptik test | |
|-------------|-------------------|-------|
| | Smell | Color |
| Formula 0 | Characteristic | Clear |
| Formula I | Characteristic | Clear |
| Formula II | Characteristic | Clear |
| Formula III | Characteristic | Clear |
| Formula IV | Characteristic | Clear |

Table 3. Hedonik test result

| | TS | KS | BS | S | SS |
|-------------|-----|-----|------|-----|-----|
| Formula 0 | - | - | 100% | - | - |
| Formula I | 13% | 6% | 13% | 36% | 30% |
| Formula II | 10% | 16% | 23% | 40% | 10% |
| Formula III | 10% | 6% | 16% | 40% | 26% |
| Formula IV | 10% | 30% | 40% | 20% | - |

Table 4. Body Weight Mice

| Formula | Body Weight Mice (Gram) | | | | | | | | | |
|---------|-------------------------|-------|--------|-------|--------|-------|--------|-------|--------|-------|
| | Mice a | | Mice b | | Mice c | | Mice d | | Mice e | |
| | Before | After | Before | After | Before | After | Before | After | Before | After |
| K0 | 27.4 | 22.1 | 27.2 | 17.4 | 26.6 | 21.9 | 24.2 | 17.4 | 30.6 | 23.8 |
| K1 | 26.5 | 21.9 | 30.6 | 22.2 | 27.8 | 22.1 | 30.8 | 24.5 | 30.4 | 26.9 |
| K2 | 26.0 | 24.2 | 26.1 | 23.8 | 24.5 | 17.4 | 30.5 | 27.4 | 26.9 | 24.2 |
| K3 | 28.0 | 24.5 | 29.7 | 22.1 | 30.5 | 25.9 | 27.9 | 24.2 | 28.4 | 17.4 |
| K4 | 30.6 | 26.5 | 27.8 | 24.5 | 21.9 | 17.4 | 27.8 | 23.8 | 30.5 | 24.2 |

Table 5. Observations of Mice Faeces

| Formula | n | Consistency of Mice Faeces | |
|---------|---|----------------------------|-----------|
| | | Before | after |
| K0 | 5 | Watery | Congested |
| K1 | 5 | Watery | Congested |
| K2 | 5 | Watery | Congested |
| K3 | 5 | Watery | Congested |
| K4 | 5 | Watery | Congested |

Table 6. Results of Urine Observation

| Formula | n | Mice Urination | |
|---------|---|----------------|----------------|
| | | Before | after |
| K0 | 5 | There is urine | There is urine |
| K1 | 5 | There is urine | No urine |
| K2 | 5 | There is urine | No urine |
| K3 | 5 | There is urine | No urine |
| K4 | 5 | There is urine | No urine |

Table 7. Results of Immobility Time

| Group | Immobility Time (Second) | | | | |
|-------|--------------------------|-----|-----|-----|-----|
| | A | B | C | D | E |
| K0 | 350 | 341 | 335 | 329 | 288 |
| K1 | 223 | 215 | 208 | 200 | 184 |
| K2 | 170 | 168 | 150 | 145 | 135 |
| K3 | 108 | 100 | 106 | 103 | 85 |
| K4 | 70 | 65 | 63 | 60 | 60 |