

## Downstream of Aromatherapy Oil for Relaxation and Reduction of Tantrum Intensity in Children with Autism

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### Abstract

*Tantrums are characteristic of emotional outburst behavior in autism and cannot be eliminated or cured. One of the alternative treatments to calm autism tantrums is through the use of essential oils using ingredients that have good properties for people with autism. Cocoa beans contain polyphenol compounds, theobromine, flavanols, amino acids tryptophan have good properties for people with autism. The eugenol compound content of clove flowers has a very distinctive aroma and is useful as a stimulant, local anesthetic, antiemetic, antiseptic, and antispasmodic. The utilization of cocoa beans and cloves has the potential to be used as essential oils. This activity aims to produce aromatherapy oil from natural ingredients, namely cocoa beans and cloves, mapping product excellence, and marketing mapping. The production of aromatherapy oil is carried out by making cocoa bean and clove oil through soxhlet extraction and product testing. Product testing was carried out by pH test, organoleptic test, and GC-MS test. The results of the calculation of  $B/C > 0$  and  $R/C > 1$ , so the aromatherapy oil business is feasible to continue and develop.*

**Keywords** autism, aromatherapy, cloves, cocoa beans, essential oils

### INTRODUCTION

Children with autism have behaviors that are different from other normal children. The cause of autism is due to impaired brain development in children who are unable to communicate and express their feelings and desires. The characteristic of autistic children whose emotional state is often unstable is also known as tantrum. Tantrum is a characteristic of children with autism that is described as uncontrollable emotional outburst behavior and results in a rapidly changing mood due to the inability to express their needs in the form of words (Pranoto, 2022). Tantrums are manifested in a variety of behaviors such as crying, hitting, kicking, screaming, biting, throwing things, arching the body, and banging the head. The prevalence of tantrums has increased from 87% of children aged 18-24 months to 91% of children aged 30-36 months (Nengsih, 2019). Parents' actions such as scolding the child, getting emotional, letting the child tantrum, and even locking the child in the room are still often done when the child experiences tantrums. Improper handling of autism tantrums will certainly have an impact on psychological development (Alawiyah & Salsabila, 2021).

Autism cases are estimated to increase every year, based on the number of public hospital visits to child development clinics (Utami et al., 2018). Data from the Central Bureau of Statistics noted that the total population in Indonesia of 270.2 million has a comparison to the number of people with autism, which is around 3.2 million (Central Bureau of Statistics, 2020). The number of people with autism in various parts of the world has increased dramatically (Utami et al., 2018). According to data taken from the World Health Organization (WHO) in 2021 predicts that 1 in 160 children worldwide has autism.



Autism cannot be cured, but efforts can be made when autism tantrums, one of which is through the use of essential oils using ingredients that are good for people with autism (Dolah et al., 2022). Essential oils that have been circulating in the market today still have shortcomings so that there is a need for improvement innovation. Similar products in the form of essential oils intended specifically for autism and the general public with psychological stress problems on the market currently use synthetic chemicals. If synthetic aromatherapy is inhaled for a long time, it will result in damage to nerve tissue due to a mixture of chemicals (Irianti & Nuranto, 2021).

According to research conducted by Williams et al. (2006) there are two ways essential oils help autistic children: creating contact and releasing emotions. The use of lavender, geranium, and clary sage has been suggested to reduce stress and anxiety. Research also shows that massage therapy can make autistic children feel quite comfortable. The use of essential oils can improve the balance of brainwave activity and neurological growth as part of autism therapy (Dolah et al., 2022). Lavender, vetiver, and cedarwood are the most widely used. The aroma of essential oils has a significant ability to stimulate the limbic region of the brain.

The use of aromatherapy in children with disabilities helps to promote good sleep patterns. According to Harrison in Dolah et al. (2022), aromatherapy can be used to calm anxious people, and suggested oils, such as lavender and sandalwood, are often used to avoid suffering or solitude. The study by Ellwood (2001) used aromatherapy, as well as foot and hand massage on primary school-aged, non-verbal children with autism. According to the study, lavender oil helped the children appear more comfortable, and the gentle massage reduced the children's tactile defenses and built their trust in adults. The use of oil and massage resulted in improved communication skills. In addition, Richler (2007) proposed a similar idea of improving interaction using aromatherapy massage. Sanderson and Ruddle (1992) examined whether joint attention behaviors in a group of four children with autistic spectrum disorder and significant learning disabilities could be improved by using aromatherapy massage. Aromatherapy massage was incorporated into the children's daily schedule and their reactions were observed. The findings showed that there was an improvement in the children's behavior during the aromatherapy massage and other aspects of their behavior also showed changes during the process. Other gains involved included increasing the use of eye contact to attract attention, exchanging activities and materials with adults, developing tolerance to the physical closeness of others, and initiating massage through non-verbal means.

Indonesia is the third largest cocoa producer and the largest clove producer in the world (Ingesti & Kusumawati, 2022; Anwar, 2017). This potential can be utilized to open a potential business because both plants contain compounds that are good for health. *Theobroma cacao* or better known as cacao is one of the plantation commodities in Indonesia. Cocoa beans contain 2-3% theobromine which serves to calm, create a sense of comfort and relaxation. Cocoa beans contain polyphenolic compounds that function as antioxidants and contain more natural flavonoids. Polyphenolic compounds include

catechins, epicatechins, procyanidins and anthocyanidins. The content of flavanol compounds in cocoa beans serves to calm nervous tension (Ali, 2018). There is a link between the amino acid compound tryptophan and serotonin levels. Tryptophan is a precursor to the neurotransmitter serotonin which can affect mood (Claresta & Purwoko, 2017).

Cloves belong to the Myrtaceae tribe which is widely grown in several countries including Indonesia. This plant has the potential as an essential oil producer. Clove oil can be obtained from clove flowers, clove flower stalks or handles and from clove leaves. The content of essential oil in clove flowers reaches 21.3% with eugenol levels between 78-95%, from flower stalks or handles reaches 6% with eugenol levels between 89-95%, and from clove leaves reaches 2-3% with eugenol levels between 80-85%. Clove oil contains a large amount of eugenol which is stimulant, local anesthetic, carminative, antiemetic, antiseptic, and antispasmodic (Musta & Nurliana, 2019). Clove plants have uses, namely in addition to being a cooking spice as well as herbal medicine for various diseases. Clove plants can be utilized as a source of clove oil for the pharmaceutical industry, cosmetics and others. This is because clove plants have a distinctive aroma derived from essential oils (Tulungen, 2019). Therefore, these materials have the potential to be used as raw materials for essential oils for people with autism.

Based on the results of the study, a new innovation was made to aromatherapy essential oil products, namely aromatherapy oil, essential oil made from natural ingredients, namely cocoa beans and clove flowers so that it is safe to use, does not provide side effects, and can be practically carried anywhere and anytime because it is packaged in a roll on bottle. Compared to similar products already on the market, aromatherapy oil products have advantages in terms of ingredients and usage so that they have the opportunity to be accepted in the market and are worthy of being a potential business.

## **METHOD**

### **Tools and Materials**

The tools used in the production of aromatherapy oil include 20 mesh sieving, 80 mesh sieving, blender, universal pH, extraction container bottle, tray, test tube brush, vacuum evaporation, rotary evaporator, measuring pipette, funnel, erlenmeyer, beaker, measuring cup, mask, and latex gloves for work safety in the lab. Materials needed are cocoa beans, clove flowers, n-hexane, boiling stones, roll on bottles, filter paper.

### **Cocoa Bean Oil Manufacturing**

The production of essential oil from cocoa beans begins by preparing raw materials in the form of cocoa beans that have been dried in the sun for 2-3 days. Then, the cocoa beans are pulverized using a blender and sieved using an 80 mesh sieve. The sieved cocoa powder was then put into filter paper as much as 40 grams for one extraction, then extracted with 400 mL of n-hexane solvent. The extraction process lasts up to five cycles or until the extracted oil is concentrated in color. The result of the extraction process, which is still a mixture of cocoa oil and solvent, is separated by a vacuum evaporation method using a rotary



evaporator. This separation process aims to make the extract obtained more concentrated. The extraction results are put into a round bottom flask then assemble the rotary evaporator tool and set the temperature in accordance with the boiling point of the solvent. The remaining solvent will be evaporated and collected into the collection flask. The evaporated solvent is caused by the heating process in the water chamber. This separation process lasts for approximately 1 hour with a temperature of 50°C.

### **Making Clove Oil**

The raw materials used are dried and mashed clove flowers, then sieved using a 20 mesh sieve. Extraction was carried out using 400 mL of n-hexane solvent and 40 grams of crushed clove flowers. Extraction was carried out at a temperature of 150-160 ° C until the color of the solvent became the same as before. The cycles that occur in the extraction of clove flowers reach 15 cycles with a time of ± 80 minutes. After the extraction process, the filtrate of clove flower oil was obtained. The filtrate is then purified with a soxhlet extractor at 150-160°C until the solvent no longer drips and pure clove flower oil is obtained.

### **Aromatherapy Oil Formulation**

After obtaining pure oil in cocoa beans and cloves, followed by GC-MS (Gas Chromatography-Mass Spectrometry) test which aims to determine the content of compounds in each cocoa oil and clove oil. The next stage is to conduct organoleptic tests so that the aromatherapy oil products produced are in accordance with the wishes and preferences of consumers. The test resulted in a formulation of 30% cocoa oil, 60% clove oil, 10% Virgin Coconut Oil (VCO). Furthermore, a pH test was carried out to ensure the safety of using the product on the skin so that an evaluation could be carried out. The evaluation aims to find out the ingredients, tools, and manufacturing steps that can cause the product to be unsafe because it causes side effects. However, if the product is safe to use, it will continue with the finalization stage so that the product is ready to be marketed.

### **Calculation of Business Financial Analysis**

In knowing the level of business feasibility, several indicators are used, including Revenue Cost (R/C), Benefit Cost (B/C) Ratio, and Return On Investment (ROI).

**a. Revenue Cost (R/C)**

$$R/C = \frac{\text{Total income/month}}{\text{Total cost/month}}$$

**b. Benefit Cost (B/C) Ratio**

$$B/C = \frac{\text{Operating profit}}{\text{Venture capital}}$$

**c. Return On Investment (ROI)**

$$ROI = \frac{\text{Operating profit}}{\text{Venture capital}} \times 100\%$$



## RESULTS AND DISCUSSION

### Research Results and Market Orientation

The results of a survey conducted through google form with 125 respondents produced data that as many as 44% of respondents often use aromatherapy oil, 64% of respondents like roll on packaging, 52% of respondents stated that they were interested in aromatherapy oil made from cocoa beans and cloves, 67% of respondents agreed with the price of aromatherapy oil for autism in the range of Rp 50,000-100,000, and 84% of respondents liked online purchases at Shopee. The results of market research and orientation show that aromatherapy oil is in high demand by the public. In addition, aromatherapy oils made from cocoa beans and cloves are quite attractive so that aromatherapy oil products have the opportunity to be accepted in the market.

### Products

This product is an aromatherapy oil with benefits as a stress reliever while easing tantrums in people with autism. This product uses natural ingredients, namely cocoa bean extract and cloves. The aromatherapy oil is packaged using a 10 mL roll on bottle. This product is marketed at a price of Rp 55,000 which is obtained from the calculation of Cost of Goods Manufactured with a mark up of 36%.

### Product Design and Manufacture

Packaging design of aromatherapy oil products is divided into primary, secondary, and tertiary packaging. The primary packaging is a 10 mL roll-on bottle made of glass covered with a sticker label measuring 6.2 cm × 4.9 cm so that it is easy to apply to the body and light to carry around. Each bottle of roll on is packaged using secondary packaging in the form of ivory cardboard measuring 2.3 cm × 2.3 cm × 9 cm. The packaging is equipped with an attractive design so that it can attract consumers to use this product. In addition, there is a tertiary package with a package size of 10 cm × 7.4 cm × 9.6 cm containing 12 roll on bottles that have been packaged in secondary packaging, making it easier for consumers if they want to buy this product in large quantities.



Figure 1 Aromatherapy Oil Products



As seen in Figure 1, each tertiary package of aromatherapy oil products consists of 12 rolls on bottles packed with secondary packaging. The stages of using aromatherapy oil begin with opening the cap of the roll on bottle, then applying and gently massaging on the thoracic spine, back of the neck, and back of the ears. This product is not recommended for use by children less than two years old, and avoid using the product on the face and nose area.

### Product Testing Results

Product testing aims to determine the safety of the product to be used as its function. Testing is also used to determine product standardization. Another benefit of testing is to convince consumers of the products that have been produced.

#### 1) *Organoleptic Testing*

The main tool used in organoleptic test measurements as product acceptability is the human senses (Lestari et al., 2020). This test uses three samples of aromatherapy spreadable oil. Tests were conducted on 25 respondents from the general public and children with autism with questions grouped into four, namely, very like, like, dislike, and dislike. The organoleptic test results are shown in Table 1.

**Table 1** Organoleptic Test Results

Sample Number	Question			
	Disliked (%)	Enough Disliked (%)	Likes (%)	Very Like (%)
1	12	0	32	56
2	0	8	20	72
3	4	16	48	32

The organoleptic test used 25 respondents from among people with autism and the general public with a predominance of people with autism, namely 76%. The selection of respondents from among children with autism aims to obtain results with high objectivity. Table 1. shows that in Sample 1 with a composition of 40% clove oil, 50% cocoa oil, 10% VCO, the results of respondents' assessment of the aroma of the sample were 88% who answered like to like very much and 12% who answered dislike. In Sample 2, with a composition of 60% clove oil, 30% cocoa oil, 10% VCO, as many as 92% of respondents answered like to very like the aroma, and only 8% answered less like. In Sample 3, with 30% clove oil, 60% cocoa oil, 10% VCO, 80% responded that they liked it very much, 4% did not like it, and 16% responded that they did not like the aroma. From this description, the best results in this test were obtained in Sample 2, where 92% of respondents answered like to like very much, and only 8% answered less like. This can show that the composition in Sample 2 has the potential and contribution to be used as aromatherapy oil.

#### 2) *pH test*

The pH test uses a universal pH paper indicator by dipping in the aromatherapy oil spread sample. The range of pH value requirements for preparations that meet the

requirements of SNI No. 06-2588 is 4.5-6.5. This test aims to determine the acid and base levels of the preparation. The level of pH acidity is an important parameter to ensure that the preparation does not cause skin irritation. The results of testing the pH of aromatherapy spread oil show that it meets the requirements of SNI No. 06-2588, namely pH 6.

### 3) Content Test

This test was conducted to show the chemical composition of cocoa oil and clove oil. Gas-Chromatography test results show that cocoa oil contains a component in the form of the amino acid tryptophan which has a relationship with serotonin levels in the brain. Cocoa oil contains theobromine and polyphenols. The theobromine compound is psychologically influential in providing a calming and relaxing effect. Polyphenols contain many natural flavonoids that play an important role in brain nerve tissue. Meanwhile, tests show that clove oil contains a component in the form of menthol which is greater than 73%. Menthol is beneficial to provide warmth and calmness due to the distinctive aroma of cloves. Thus, the combination of the two chemical components with predetermined proportions has the potential to be used as aromatherapy oil for people with autism and the general public who have unstable emotional levels that are prone to anxiety and stress.

### Product Advantages

The advantages and uniqueness of the product are carried out through Strengths, Weakness, Opportunities, Threats (SWOT) analysis presented in Table 2. Based on SWOT analysis, aromatherapy oil products have several advantages over products that are already in circulation. Aromatherapy oil products are made from natural ingredients, namely cocoa beans and cloves, so they are safe to use compared to similar products that use synthetic chemicals. The packaging used is a roll-on bottle so it is easy to travel.

**Table 2** SWOT analysis

Analysis	Result
<i>Strength</i>	<ul style="list-style-type: none"> <li>● The product provides a sense of calm during autism tantrums.</li> <li>● Made from natural ingredients, it is safe to use.</li> <li>● The product is based on cocoa bean and clove extracts that have a relaxing effect on users.</li> <li>● The product is very efficient, making it easy to travel with autism.</li> </ul>
<i>Weakness</i>	<ul style="list-style-type: none"> <li>● The product is still a new product that does not yet have a brand image in the market.</li> </ul>
<i>Opportunity</i>	<ul style="list-style-type: none"> <li>● The availability of raw materials is abundant, which facilitates the production process.</li> <li>● Open market access and social media as marketing media.</li> </ul>
<i>Threat</i>	<ul style="list-style-type: none"> <li>● The number of competitors with similar products.</li> </ul>



The advantages of aromatherapy oil products over similar products that have been widely circulated lie in terms of ingredients, selling price, and how to use. This product uses natural ingredients as raw materials, namely cocoa beans and cloves so that it is safe to use and does not cause side effects. This product has an economical selling price compared to comparable products with the same volume in each package. The packaging of aromatherapy oil products is a roll-on bottle with a volume of 10 mL so that it is practical to use. Aromatherapy oil products can compete to provide their advantages to the public.

### **Business Feasibility**

Business feasibility analysis is a way to see how feasible a business is from an economic, technical, and financial perspective (Nurmalina et al., 2018). The results of business analysis can be used as an evaluation in determining decisions so as to avoid losses and as material for developing business continuity. The results of the business feasibility analysis of aromatherapy oil products are presented in Table 3. The total cost budget used is Rp 8,125,000 which is the result of funding from Belmawa and Brawijaya University and there is no funding assistance from outside parties. The capital is used for the purchase of production tools and materials, transportation costs, administrative costs, health protocol equipment costs, and other supporting needs.

**Table 3** Business Feasibility Analysis

<b>Type of Analysis</b>	<b>Calculation Result</b>
Production Break Even Point (BEP)	1069
BEP Price	Rp 58.792.654
Cost of Goods Sold (COGS)	Rp 49.449
Selling Price	Rp 55.000
<i>Payback period</i>	15,4
<i>Revenue Cost (R/C)</i>	1,33
<i>Benefit Cost (B/C) Ratio</i>	0,33
<i>Return on Investment (ROI)</i>	33%

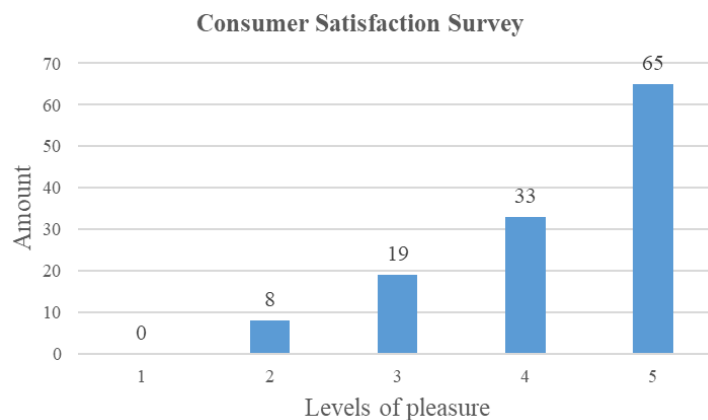
Based on the business feasibility analysis listed in Table 3. with a profit of 20% on each product, the production BEP is obtained at 1069 per month. The COGS value obtained is IDR 49,449 so that aromatherapy oil products will be sold at a price of IDR 55,000 per bottle. The payback period value is 15.4, so the first business capital will be returned within 15.4 months. Based on the literature (Hawurubun et al., 2020), a business is said to be feasible if it has a benefit cost ratio that shows the relationship between the relative costs and benefits of the business with a value of more than one ( $B/C > 1$ ). The revenue cost ratio value is a measure of efficiency by comparing company expenditures with revenues whose value is more than zero ( $R/C > 0$ ). The R/C value obtained is 1.33, which means that for every Rp 100 of costs incurred, the revenue obtained is Rp 133. Because the R/C value is greater than 1, this business has the potential to be developed. In addition, the B/C value



obtained is 0.33, which means that for every Rp 100 of production costs incurred, the profit obtained is Rp 33. The B/C value of more than zero indicates that a business has the potential to be developed and aromatherapy oil products have a B/C value of more than 0, so the business is feasible to develop.

### Consumer Satisfaction Analysis

Analysis of consumer satisfaction is carried out through a survey approach to consumers who have purchased aromatherapy oil products and respondents who directly use product samples. Based on a survey conducted to 125 respondents, it shows that the product is accepted by the majority with the respondents' answers obtained the highest level of preference, namely 5 as many as 65 respondents. The large number of respondents at the highest level of favorability indicates the potential and high acceptability of aromatherapy oil products. The survey results regarding consumer satisfaction with the product can be seen in Figure 2.



**Figure 2** Graph of consumer satisfaction survey results on aromatherapy oil products

## CLOSING

### Conclusion

1. Product manufacturing has been successfully carried out by utilizing cocoa beans and cloves to produce aromatherapy oil as an alternative product in handling autism tantrums that have a calming and relaxing effect.
2. The advantages and uniqueness of the product are determined by the Strength, Weakness, Opportunity, Threat (SWOT) methods and comparing the product with several other products on the market.
3. The results of the calculation of  $B/C > 0$  and  $R/C > 1$ , so the business is feasible to continue and develop.

### Acknowledgment

This research was funded by (2383/E2/DT.01.00/2023) from the Ministry of Education, Culture, Research and Technology, Jakarta, Indonesia through the Entrepreneurship scheme Student Creativity Program. The author and co-authors would like to show appreciation to Ministry of Education, Culture, Research and Technology, SLB



Autis Laboratorium State University of Malang for their willingness to cooperate and support this research.

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DOI: <https://doi.org/10.54443/sj.v2i5.228>

