

## Distillation of Essential Oil Through Portable Distiller To The Partners of The Program For Disseminating Technology Product To Community

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### Abstract

Partner I has customary forests of 210 ha with various rare plants such as Tengkawang, Gaharu, Forest Orchids, palm, Bornean Ironwood, Resak, etc. They are being developed as aromatic raw ingredients (perfume). Partner II is a cultivated Agarwood farmer left by an irresponsible company. The total of Agarwood stands for essential oil is 9,220 trees ranging from 5 to 10 years. Constraints, distillation technology is needed in order to produce essential oil. The technology solution applied to partners is a portable distiller obtained from a grant; Steam Pressure Agarwood Destilator (SPAD), applicable, efficient, and effective Chipper Agarwood (CA) equipped with Good Manufacturing Practice (GMP)-based essential oil production procedures. The results of distillation training for partners were through direct practice; classification, sorting, resizing raw Gaharu for ingredients, installing SPAD machine, 20 hours process, and discussions about raw ingredients and market, purification, packing of essential oil of 0.05% yields (5 ml) (partner II) and 0.03% -0.05% yields (3 -5 ml) (partner I) as well as the basic practice of making perfume. The essential oil products produced by partners from the training potentially have a prospect in increasing the economic and social impact as well as the building of home industry partners. They are ready to start production with a business orientation.

*Keywords: - essential oil, distiller, agarwood*

### 1. Introduction

The target partner I of the Program for Disseminating Technology Product to Community (DPTM) are the community living in the Pangajid Customary Forest, Sahan Village, Seluas District, Bengkayang Regency supervised by the West Kalimantan Institute for Research and Development of Forest Product Technology (INTAN). Community groups were fostered based on traditional cultural characters and local wisdom to be independent in increasing their economic level through an environmentally friendly Sociopreneur program by processing Tengkawang for food, cosmetics, and medicine. In an area of 210 ha, there are various rare plants such as ten Tengkawang, Agarwood, Forest Orchids, palm, Bornean Ironwood, Resak, etc. Another plant other than Tengkawang that is being focused on being developed as the aromatic raw ingredient (perfume) is Forest Orchids and Agarwood. They are potential plant to be extracted for essential oil (EO).

The target partner II of DPTM is a group of cultivated Agarwood farming communities that were left behind by irresponsible companies. The total Agarwood stands that have the potential to be processed for essential oil is 9,220 trees (aged 5-10

years). The location of the agarwood plantation is in Sungai Palah Village, Ratu Sepudak Village, Galing District, Sambas Regency. The challenge encountered in the EO production process was the distillation technology and production procedures. Therefore, one of the technology solutions applied to partners was a portable distiller machine; Steam Pressure Agarwood Distiller (SPAD), which is equipped with a Chipper Agarwood (CA) Machine and production procedures through direct practice in the field and home industry.

The SPAD is a portable distillation tool using the pressurized steam method, characterized by the safety valve  $\frac{3}{4}$  (Figure 1. SPAD), (Asta et al, 2016) : Distiller frame, elbow plate 40x40x3 mm, H. 40 cm, Ø 50 cm, condenser tube frame, elbow plate 40x40x3mm, H.60 cm, Ø 55 cm, distiller tube, stainless steel series 304, thickness 2 mm, Ø 48 cm, H. 60 cm, tube cap with height 25 cm, capacity 10 kg, stainless steel condenser tube series 301, thickness 2 mm, Ø 58 cm, H. 90 cm, stainless steel faucets (pressure drain cleaner), pressure gauge indicator, safety valve  $\frac{3}{4}$ , spiral condenser; stainless steel  $\frac{3}{4}$  thickness of 1 mm, measuring cup, and burner; Include regulator, portable; easily mobilized to other potential places, production

time is only 16-20 hours/process, compared to other methods of 60-72 hours, practical, easy to operate, and low maintenance costs, and the maximum quality and with market standards of Agarwood oil.

The CA specifications is, the steel blade of 5 cm x 20 cm x 5 mm, elbow plate frame of 40 mm x 40 mm x 3 mm, with the height of 120 cm, dynamo 2 HP, and the capacity of 100 kg/5 hours.



Figure 1: SPAD

## 2. Methodology

### 2.1 Location

The DPTM activities were carried out in two areas, namely in the Pangajid Customary Forest, Sahan Village, Bengkayang Regency, and Agarwood cultivation areas, Sui Palah Village, Galing District, Sambas Regency. The activities were carried out from April 2018 to November 2018.

The Procedure of Phase I of the DPTM Program were socialization, preparation, partner participation, and product description:

- a. Socialization with partner I and partner II: discussion of the implementation of the program, description of main duties and function of each proposing team (partners I and II).
- b. Preparation for the DPTM program with partners I and II: production management, production sites, raw ingredients, Standard Operating Procedure for production, labor, and pure EO products.
- c. Participation of partners in the program: training on all series of distillation processes starting from raw ingredient preparation to EO production.

### 2.2 Phase II: DPTM Program Implementation

The implementation of the EO distillation program with partners I and II was based on the business discipline and principles summarized in the training material for three days. Essential oil

production guide: Agarwood and Orchids.

#### i. Staged:

- a) Tool and Ingredient Preparation: Machetes, axes, sacks, rapia rope, tarpaulin, scales, pens, markers, notebooks, dropping pipettes, measuring cups, Erlenmeyer, tissue, Agarwood trees ready for harvest, and orchids.
- b) Sorting and classification, soaking of raw ingredients, especially Orchids can be processed directly for distillation without soaking.

#### ii. Work Procedures:

Agarwood raw ingredient preparation:

- a) The ideal Agarwood tree was selected and harvested with the criteria of Ø 15 cm UP, 2-5 years after injection. The resin line in the hole and the area around the injection showed poor vegetative growth (stunted leaves) and the breakup of the bark if it was pulled.
- b) Cut the Agarwood tree and take the sapwood using a tool (ax/machete) based on the quality of the Agarwood resin (resin color and resin content). The relationship between resin content and Agarwood quality, the relationship between chemical compounds and Agarwood quality (Pasaribu, et al., 2015). The yield of Agarwood resin is strongly influenced by the quality of the Agarwood. Both have a linear relationship in that the resin yield increases with the increase in the quality of Agarwood (Pasaribu, et al., 2015).

Sorting, classification, and treatment of raw ingredients:

- a) Separate the low-grade Agarwood sapwood (low-graded ingredients, ant heap) [organoleptic testing: resin color, and texture; solid/porous] with middle UP grade (carving process) [low-graded ingredients, C, TK, BC (medium), B, AB, A, A Super, Singking].
- b) Especially for large parts of ingredients, it must be reduced to a size of  $\pm 2-4 \text{ cm}^2$ .
- c) Soak the resized low-grade raw ingredients for 2-4 weeks. Then the raw ingredients were made into powder using a CA machine. The purpose of soaking was to separate the oil glands from the parenchyma cells so that the parenchyma cells become soft and add to the aroma, the unique aroma of the oil. Initially, ingredients soaked for one month and distilled have an unpleasant aroma. However, after being stored for a while, the aroma will change back to its

higher origin strong aroma and tightly attached to the skin (Ramlan, 2008).

- d) The next process was the production of Agarwood oil based on Standard Operating Procedures (SOP) for the Process of Agarwood Oil Production (Asta and Erwin, 2018). Meanwhile, for Orchid distillation, the same SOP was also used, while the differences were the raw ingredient (fresh flowers) and pressure used (1 BAR).

### 3. Finding and Analysis

The application and implementation of technology products to the community is a program for knowledge transfer of appropriate technology through the grants of SPAD machine, CA, training and coaching in the EO production process, especially Agarwood and Orchids, as well as other aromatic plants through a distillation process that has not previously been processed into EO products. The description of the working mechanism of the technology product is as follows:

#### i. Pre-production

- a) Source of raw ingredients (natural or cultivated) and quality of raw ingredients (low grade, medium grade, and carving waste), which are indicators in determining the level of EO yield to be produced. Distillation through the vacuum method with a pressure of 2-4 BAR for 16 hours yields Agarwood oil yield 0.03%-0.05% (low-grade ingredient) and 0.07-0.10% (carving waste) (Asta and Erwin, 2016).
- b) Soaking of raw ingredients was done for 2-4 weeks in order to facilitate the release of EO during the distillation process. The purpose of immersion is to soften the wood tissue, remove primary metabolite compounds (sap/gum) not to affect the quality of EO.
- c) The level of skill and experience of workers in the EO production process using a portable SPAD machine must be ensured because the main requirements for EO are the smell of smell-hard fragrance, color, and viscosity.

#### ii. Technology

The working principle of the SPAD engine is generally the same as other general distillations, the difference is the valve that functions as a pressure control (ideal: 2-4 BAR) from boiling water vapor around 199,22-398.44° C (Second Convention of IUPAC) [IAPWS] in the distillatory tube to carry maximum oil particles in a period of 16-20 hours (steam method without a valve takes

30-60 hours), without the scent of burnt (top note must be dominant), water vapor brings the oil directly into the spiral condenser tube and change from the vapor phase to the dew phase. Thus, the oil clumps appear in the purification tube/container/glass. The final process was sludge deposition, repeated purification, EO aging treatment, and packing. The pressurized system has the advantage of having a higher amount of oil, but if you are not careful, the oil tends to be black and burnt due to the high temperature and pressure (Yuliansyah and Kholik, 2004).

#### iii. The benefits of technology products.

In general, the benefits of technology products for partners and the surrounding community are:

- a) Partners can process/produce the EO ingredients directly and independently based on the availability of raw ingredients in each area.
- b) Expediting the EO production process in small, medium, and large quantities in a very efficient, effective, and sustainable manner.
- c) The resulting EO product is homogeneous and has distinctive characteristics, namely, reddish-black, smell-hard fragrance, and can last up to 12 hours on the skin after use. This characteristic of EO is highly favored by the UAE market.

#### iv. Economic and social impact.

Based on the results of the program, the EO products produced have a good prospect for increasing the economic impact. The description is as follows:

- a) One unit of SPAD and CA machine can drive 6 families/week (5 times production), resulting in pure EO  $\pm$  25-37.5 ml (yield 0.05-0.075%) for IDR 100-125 K/1 ml Agarwood EO and IDR 35-75 K/100 ml orchid EO. Thus, each weekly rotation can have a direct economic impact on 18-30 individuals (6 families have 2-4 children on average) and within 1 month will have a direct economic impact on 72-120 individuals in target partners I and II. Furthermore, the partner estimates that within 1 month, it can carry out the production process for 20-22 times of production.
- b) Increased improvement in partner income will be correlated with positive changes in the social impacts of partner older, you are alone while my mother and her mother and

the general public, from behavior, patterns of conserving and developing raw ingredients, individual and community social relations, participating and taking an active role in coaching and running other programs, be it individual, group or government program.

v. Contribution to other sectors

The contribution of other sectors can synergize with the BUMDes program and in the future, it is expected that it can become one of the regional superior products and can open jobs for the general public in the large-scale agricultural sector, increase the number of children in these areas to attend school, increase awareness of the importance of health, and other business sectors will also act as the regional economy starts to develop.

#### 4. Conclusion

The conclusions of the implementation of the DPTM program for Partner I and Partner II are as follows:

- a. Producing portable distillation machine; two units of SPAD and two units of CA.
- b. The EO distillation technology provided is a concrete solution for partners in solving problems they encountered.
- c. Partners played an active role, had high enthusiasm, were very positive in receiving EO distillation applied science knowledge; they understood the prospects and business opportunities of EO.
- d. The partners understood and were able to carry out the EO production process completely and correctly such as the raw ingredients, raw ingredient treatment, operating, maintaining VAD and CA machines, repeated purification, EO aging treatment, packing, and basic perfume manufacturing methods.
- e. EO products produced by partners from the results of training have a good prospect and opportunities for increasing economic and social impact
- f. The establishment and operation of Partner II production unit in the EO business and the supply of raw ingredients for extract resin

from Agarwood waste distillation, with an average production target per month; EO 100-500 ml and 1,000–5,000 kg of Agarwood distilled waste.

- g. Partner I in the Sahan Village was focused on developing the EO business unit for perfume and collaborating with Village-owned enterprises (BUMDES) of Sahan Village.

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