INDUSTRIAL TRAINING FINAL REPORT

SESSION: MARCH – JULY 2022

Student Name	: ANIS AMALYN BINTI AMRAN
ID No.	: 2019264624
Student E-mail	:
Handphone No.	:
Organization Name	: Forest Research Institute Malaysia (FRIM)
Address Organization	: Jalan Frim, Institut Penyelidikan Perhutanan Malaysia, 52109 Kuala Lumpur, Selangor.
Supervisor Name	: Saidatul Husni binti Saidin
Department During Attachment	: Natural Division Products
Duration (Date)	: 24 Weeks (20th February – 4th August 2022)
Lecturer Evaluation	: Nor Ain Binti Abu Samah

ACKNOWLEDGEMENT

In the name of Allah, the most Beneficent and most Merciful, all praises to Allah, Lord of the universe and peace be upon His Messenger. I want to acknowledge Him on top of all for blessing me with patience and tenacity of mind to complete the Internship report. It is undeniably a vital requirement for certified Diploma with flying colors and I have received outstanding helps from my quarters which I would like to put on record here with great pleasure and deep gratitude. I am using this opportunity to express my gratitude to UiTM for providing opportunity to pursue the engineering training as partial fulfilment of the requirement for the diploma of Chemical Engineering.

Throughout this training, I am very fortune to be blessed with the guidance and encouragement from my department supervisor and assistant supervisor, Mrs Saidatul and Encik Shafik along with department staff Miss Nadhirah. I am very thankful for their aspiring guidance, invaluably constructive criticism, and friendly advice during my internship period.

I would also like to thank my UiTM Industrial Training Supervisor, Miss Noor Hidayu binti Abdul Rani and Encik Haikal bin Mustafa for his advice and sharing about the relation between the courses that we take and the field of chemical engineering.

In preparing this report, I was in asking with many people especially my supervisor's Mrs Saidatul at Forest Research Institute Malaysia (FRIM). I am also very thankful to my workmates especially in laboratory such as Miss Nadhirah and Encik Shafik for their guidance, advice and also motivation. They have contributed towards my understanding and thoughts.

For me it was valuable experience to be in laboratory of Forest Research Institute Malaysia (FRIM). During the internships I learned many new things that will help me to face the working environment. On top of that, internship is a very challenging and I learnt to be independent with different lifestyle, culture, and language.

Thank you,

ANIS AMALYN BINTI AMRAN

ABSTRACT

This industrial training report of Anis Amalyn binti Amran to undergo an industrial training at FRIM Company within 24 weeks to fulfil the requirements of Apprenticeship (CHE354). The training started from 21st February 2022 and ended on 4th August 2022 which guided by Mrs Saidatul Husni binti Saidin.

The purpose of this program is to fulfil the course order to complete the Diploma as well as graduate from the university. The training refers to work experience that is relevant to professional development prior to graduate. In first chapter this report is defining the term of industrial training and description on industrial training objectives. This part explains the details of objectives of industrial training report and industrial report. In second chapter of report is overview of the company and departments.

The third chapter describes the summary of the duties and various tasks in weekly of industrial training activities that carried out. The next chapter explains the details of the tasks given during the industrial training and the experience gained when conducting the activities. In this chapter it also explains about the problem encountered and the adopted solutions to solve the problems. Besides, it also includes the ethics of working at the FRIM company and the ethical issues might occurred during the industrial training. Perhaps, in these details of the tasks given it also explains the health, environmental and sustainable of the company policies applied where it might be related during the tasks execution.

This training gives students a good experience in improving self-confidence and responsibilities towards the task given during the internship period. This can be considered as a preparation for students before starting their future career path. In a nutshell, this Integrated Internship Program provides students with various work experiences, work cultures and work values which is crucial for students to begin with their future career path.

Last but not least, trainee got opportunities to learn more about the time management whereby with shorter due dates during the internship training which helps trainee to increase their work productivity and critical thinking when completing the task given. Thus, the trainee also can relate the knowledge that they have learn and applied in real life.

LIST OF TABLES

Table 1.1: Industrial Schedule	10
Table 2.1: Operating schedule of firm FRIM	12
Table 3.1: Industrial Training Task Schedule	20
Table 3.2: Weekly Activities	22-26
Table 4.1: Method of Soap Production	28-29
Table 4.2: Sample Preparation for SFE of Aquilaria spp	32-34
Table 4.3: Method of Cleaning Supercritical Fluid Extraction (SFE)	35-37
Table 4.4: Dilution method for GCMS Analysis	38-39
Table 4.5: Yield Calculation of Aquilaria spp	39-40
Table 4.6: List Compounds of Aquilaria spp 1	41
Table 4.7: List Compounds of Aquilaria spp 2	42
Table 4.8: Sample Preparation for SFE of Melada Pahit	43-45
Table 4.9: Drying Melada Pahit using Rotary Evaporator	46-47
Table 4.10: Yield Calculation of Melada Pahit for batch 1 and 2	48
Table 4.11: Yield Calculation of Melada Pahit for batch 3	48
Table 4.12: Yield Calculation of Melada Pahit for all batch	49

LIST OF FIGURES

Figure 2.1: Organization chart for FRIM	16
Figure 2.2: Organization chart for PPH	17
Figure 4.1(a): Soap Production Formulation B	30
Figure 4.1(b): Soap Production Formulation C	30
Figure 4.1(c): Soap Production Formulation D	30
Figure 4.2(a): Aquilaria spp 1	37
Figure 4.2(b): Aquilaria spp 2	37
Figure 4.2(c): Aquilaria spp 3	38
Figure 4.3: GCMS Result Analysis for Aquilaria spp 1	40
Figure 4.4: GCMS Result Analysis for Aquilaria spp 2	41
Figure 4.5: Yield Calculation for batch 1 and 2	47
Figure 4.6: Yield Calculation for batch 3	48
Figure 4.7: Yield Calculation for all batch	49

TABLE OF CONTENTS

		Page
Acknowledgement		1
Abstract / Executive Summary		2
Table of contents		5-7
List of tables		3
List of figures		4
Chapter 1	**INTRODUCTION OF INDUSTRIAL TRAINING**	
1.1	Overview	8-9
1.2	Objective of industrial Training	9-10
1.3	Industrial Training Placement	
	1.3.1 Industrial Schedule	10
	1.3.2 Company Supervisor Information	10
Chapter 2	**COMPANY PROFILE**	
2.1	Forest Research Institute Malaysia (FRIM) Background	11-12
2.2	FRIM History	13
2.3	FRIM Vision and Mission	14
2.4	FRIM Objectives	14
	2.4.1 General Objectives	14
	2.4.2 Operational Objectives	14
2.5	FRIM Organizational Chart	15-17

2.6	FRIM Service Provided to the Client	18
Chapter 3	**OVERVIEW OF THE TRAINING**	
3.1	Introduction	19
3.2	Summary of the training and experience gained	20-22
	3.2.1 Weekly Summary	22-26
Chapter 4	**DETAILS OF EXPERIENCES (Report on Job/Task/Project)**	
4.1	Introduction	27
4.2	Details of the training and experience gained	27-49
	4.2.1 Task 1: Research Journals about SFE	27-28
	4.2.2 Task 4: Soap Production	28-30
	4.2.3 Task 5: Indirect Duties	30-31
	4.2.4 Report on Personal Project for Industrial Training	31-49
	4.2.4.1 Task 2: Run SFE Extraction of Aquilaria	31-42
	4.2.4.2 Task 3: Run SFE Extraction of Melada Pahit	42-49
4.3	Problem encountered and approach adopted for solving problem	49-51
4.4	Professional and ethical issues	51-52
4.5	Health, environmental and sustainable aspect	52-54

Chapter 5 **CONCLUSIONS**

5.1 Conclusions 55

5.2 Suggestions and Recommendations 55-56

References 57

Appendix 58

Chapter 1

INTRODUCTION OF INDUSTRIAL TRAINING

1.1 Overview

Industrial Training (IT) is a compulsory requirement for students in certain programs at all levels of higher education in Institutions of Higher Learning (IHL). To increase the level of graduates able to work, industrial training program was introduced to strengthen the competencies required. Industrial Training (IT) refers to expose students to the real-life experiences of the engineering works and to get them involved in Chemical Engineering projects before graduation. It is one of the requirements for the award of Diploma in Chemical Engineering is that the student MUST complete at least twenty-four (24) weeks with 12 credit hours of Industrial Training within semester six (6) OR after pass all the courses taken from semester 1 to semester 5.

Industrialmanship holds the objective to introduce UiTM students to industrial culture and working environment and at the same time increases students' employability rate by enhancing their industrial skills. They also will undergo several briefings as guidance for the trainee. The duration for this internship is 24 weeks taken place starts on 21st February 2022 until 4th August 2022. It is compulsory for the student to report to the company according to the time and date stated during the Industrial Training briefing. During the internship period, student will be assigned to one (1) Lecturer Evaluation to assessing the student's performance. The logbook and finalized report should be submitted to the college via online and hardcopy due two (2) weeks after internship end.

Industrial Training (IT) courses give students learning opportunities in the world of work to receive practical experience in order to improve the reliability of the market. In preparing the students as an engineering technician, the industrial training helps to produce chemical engineering technician graduates with excellent technical skill and soft skill competency. Theories learnt in all the core and non-core courses can be applied by the students in industrial training, hence expected that students can solve the problem or project assigned by supervisors creatively and innovatively. In addition, the industrial training also helps elevate the students' confidence level, improve communication and teamwork skills. On top of it,

students are expected to demonstrate a high level of integrity, ethics, and accountability in engineering practice.

The listed below are the proposed activities which could be carried by the student during the training period:

a) Project management i.e. project documentation, coordination and planning.
b) Equipment design i.e. heat exchanger, separator, completion equipment accessories and facilities design.
c) Production of oleochemicals, food and beverage, pharmaceutical and biotechnology.
d) Familiarization with the real Piping and Instrumentation Diagram (PID) and Process Flow Diagram (PFD) as well as other related simulation works.
e) Interpretation and inspection of engineering drawings from relevant consultant companies.
f) Equipment stability assessment or troubleshooting and maintenance.
g) Laboratory works i.e. chemical/PVT/properties analysis, design of experiments and other relevant research and development activities.
h) Production and manufacturing assemblies.
i) Site visit for environmental or oil and gas field.

The trainee, Anis Amalyn binti Amran (2019264624), has started working at Natural Products Division from 21st February until 8th August 2022.

1.2 Objective of Industrial Training

The main objective of Industrial Training (IT) is to give students learning opportunities in the world of work to receive practical experience in order to improve the reliability of the market. In preparing the students as an engineering technician, the industrial training helps to produce chemical engineering technician graduates with excellent technical skill and soft skill competency.

The objectives of the industrial training are as follow:

i. To fulfil the award of the degree of University Teknologi Mara (UiTM).
ii. Apply knowledges and theories learnt in classroom in working environments.
iii. Enhancing the interpersonal skill.
iv. Solidifies students' confidence after graduation.
v. Familiarise with the structure of an organisation and its management system.

vi. Acquaint with the various type of equipment used in working environment.

vii. Understand the organisation's work ethics in terms of interpersonal interactions, discipline, rules/regulations, and methods of performing the works.

viii. Promote a symbiotic environment that will encourage interactions.

1.3 Industrial Training Placement

- Address: Forest Research Institute Malaysia (FRIM), 52109 Kepong, Selangor Darul Ehsan.
- Tel: 03-62797000
- Website: www.frim.gov.my
- Business Segment: Research and Development (R&D)

1.3.1 Industrial Schedule

Forest Research Institute Malaysia (FRIM) is a company that operates five days a week with normal 8 hours of working. Table 1.1 shows the industrial schedule that being apply at FRIM.

Table 1.1 Industrial Schedule

Normal working hours	8 hours
Day of working	5 days a week
Work in	7:30 am – 8:00 am
Break hour	**Monday – Thursday** • 1:00 pm to 2:00 pm **Friday** • 12:30 pm to 2:30 pm
Work out	4:30 pm to 5:00 pm

Chapter 2

COMPANY PROFILE

2.1 Forest Research Institute Malaysia (FRIM) Background

The Forest Research Institute Malaysia (FRIM) is one of the world's leading institutions for tropical forestry research. Originally known as FRIM, where it functions as planning and implementing research for the development of the forestry sector and conservation of forest resources, obtaining, and disseminating research information to enhance forest management and the use of forest products and establishing joint research and joint forest development with other bodies within and outside Malaysia. Thus, FRIM research activities are organized under six different divisions which are first is the Forestry and Environment where it helps to develop technologies and provide solutions to support and ensure the sustainable management of resources and ecosystem services of the natural, urban, and recreational forests. Second is the Forestry Biotechnology where it uses to develop technologies and products based on biodiversity resources for forests and herbal plantations for related industries through biotechnological approaches.

Third, is the Forest Products where it focuses on the development of R, D&C towards improvement on durability, service life and utilisation of wood resources and ligno-cellulosic materials available for producing various high quality/value-added products. Fourth is the Forest Biodiversity where it functions to provide and develop key scientific knowledge to safeguard biodiversity and ecosystem services in Malaysia for their wise management and sustainable utilisation. Fifth is the Natural Products where the division that I have been placed in uses to support the national bio-economy agenda via the empowerment of natural product-based industries through bioactive feedstock security. Lastly is the Economic and Strategic Analysis where it uses to conduct socio-economic research and strategic analysis on forestry and environmental issues for national development.

Besides, over the years, FRIM researchers have established a solid track record, winning numerous awards for their work. The International Union of Forestry Research Organizations (IUFRO) Scientific Achievement Award (1995, 2000, & 2010); Toray

International Science Award (1999); Petronas Inventor's Awards (1992 & 1994); National Inventor's Award (1995 & 1997); MINDEX/INNOTEX Award (1995 & 1997) (2009, 2013 & 2018). In 2009, FRIM received the Nikkei Asia Prize for its contribution to environmental protection in the region, as well as the Mahathir Science Award for its contribution to the country's rubberwood industry research and development. FRIM has received numerous awards, including the Brand Laureate Awards (2010-2011 & 2012) for Best Brand in Forestry–Environmental Conservation, the Islamic Development Bank (IDB) Science and Technology Prize 2012, and the National Book Award (2010, 2012, 2013, 2016 & 2019). In addition, FRIM received the 2019 ASEAN Books Award for the best research institution.

Perhaps, FRIM also publishes a wide range of forestry and forest product publications. These publications are widely distributed both within the country and abroad to individuals, commercial organisations, agencies, forestry, and academic institutions. This online catalogue includes FRIM's new titles, backlist, series, and journals, as well as books created in collaboration with other organisations. Some of the publishes are being sell on the FRIM Company official website. On top of that, FRIM institute also apply the normal working hour as shown in Table 2.1. The staff only work during weekday and off day during weekend.

Table 2.1: Operating schedule of firm FRIM

Days	Working Time	Operating Period
Monday to Thursday	8.00 a.m – 1.00 p.m	5 hours
	1.00 p.m – 2.00 p.m (lunch hour)	1 hour
	2.00 p.m – 5.00 p.m	3 hours
Friday	8.00 a.m – 12.30 p.m	4 hour 30 minutes
	12.30 p.mp – 2.30 p.m (lunch hour)	2 hours
	2.30.m – 5.00 p.m	2 hour 30 minutes
		(Total: 9 Hours)
Saturday and Sunday	Weekend Holiday	-

2.2 FRIM History

In 1925, the Regent of Selangor approved the establishment of a forest research institute (FRI) in an area of Kepong that had been stripped of its original forest cover for vegetable farming and mining activities. A year later, Dr. F.W. Foxworthy, the first forest research officer, began establishing a large-scale forest nursery and experimental plantation. In 1922, Messrs. McCartney and Whitty conducted a plane-table survey of 1,500 acres of old mining land in Kepong, suggesting the area as a possible location for a forest school and experimental plantations. In 1929, the Institute's main office building, which housed laboratories, the library, the herbarium, and the museum, as well as staff quarters, was occupied. The building was approved for the first time in 1927. Chemistry, silviculture, botany, economics, and zoology were among the research activities carried out.

In 1951, the main office building now known as the Administration Building was completed. The U-shaped structure was built in a tropical colonial style, with thick pillars and high ceilings. The Institute's nursery was established in 1929 as the "first stop" for species introduced from the wild and grown under observation before being recommended for field planting. In 1926, activities to establish extensive experimental plantations on the Kepong campus began. The plantation trials included approximately 100 indigenous and exotic species. J.G. Watson, a Deputy Conservator and Forest Economist under Dr. F.W. Foxworthy, initiated the development of the *arboreta* at FRIM in 1929. The first two *arboreta* were the *Dipterocarp Arboretum* and the *Non-Dipterocarp Arboretum*; *Dipterocarp* – for trees in the *Dipterocarpaceae* family; *Non-Dipterocarp* – for trees in other tree families.

During the Japanese occupation of Malaya, FRI/FRIM was known as the *Ringyo Shikenjyo* or Forestry Experimental Station (1942-45). However, 37 Forest Department employees were killed during World War II. Their names were engraved on a war memorial headstone, which was installed on FRI grounds on March 6, 1954. On October 1, 1985, the Malaysian Forestry Research and Development Board (MFRDB) Act granted the Forest Research Institute autonomy. Tan Sri Dr Salleh Mohd Nor was appointed as the Institute's first Director-General, and the Institute was renamed Forest Research Institute Malaysia (FRIM).

2.3 FRIM Vision and Mission

- The vision of Forest Research Institute Malaysian (FRIM) by 2030, they want to be a leader in tropical forestry research, development, commercialization, and application.
- Forest Research Institute Malaysia (FRIM) mission is to meet the current and future needs of tropical forestry, it is necessary to increase research and development, transfer technology, and resolve industrial issues scientifically.

2.4 FRIM Objectives

2.4.1 General objectives

- To produce scientific knowledge for the understanding, management, conservation, and utilisation of forest resources.
- To achieve excellence in research and development by utilising cutting-edge scientific equipment.
- To investigate biodiversity in order to create useful products through intensive research and development.
- To create related technology in order to meet the needs of the forestry industry.
- To package research and development findings for client distribution.
- To commercialise research and development findings by transferring technology to all interested parties.
- To provide excellent service in order to meet the needs of clients.
- To establish strategic partnerships with local and international organisations.
- To raise public awareness about the importance of the environment and forest biodiversity conservation.

2.4.2 Operational objectives

- To provide programmes for human resource development in order to produce a class of authoritative and competent scientists.
- To create a work environment that encourages scientists' creative thinking and close relationships with clients.
- To disseminate technological and research products while also providing accurate, professional advice and technical services.
- To offer practical solutions to problems involving the management and utilisation of forest resources and products.

2.5 Organisational Chart

In order to carry out the vision, mission and objective of the council, it is the best way to form an organisation chart that shows the person in leads and the person in charge for every department in Forest Research Institute Malaysia. For FRIM, it is leads by the Director General FRIM, Dr Ismail Bin Hj. Parlan and followed by 12 members of Councillors. The members of councillors will attend themselves when there is a meeting that be needing their contribution and where they will be discussing to give approval towards the proposal or not according to their care area.

There is a total of 24 programme and 17 branch units or department in Forest Research Institute Malaysia building. For every department or unit, it has its own Board of Director that will lead and monitor the working process in each department and unit as shown in Figure 2.1.

For Figure 2.2 it shows the organisation chart of department and assigned department for intern. This Figure 2.2, it also shows the names of the person that is in-charge in Program Pembangunan Herba (PPH) department whom the one that lead and monitor the working process for every application that is requested and at the same time to make sure the movement inside the department is smooth.

2.5 FRIM Organizational Chart

ORGANISATION CHART
FOREST RESEARCH INSTITUTE MALAYSIA (FRIM) 2022

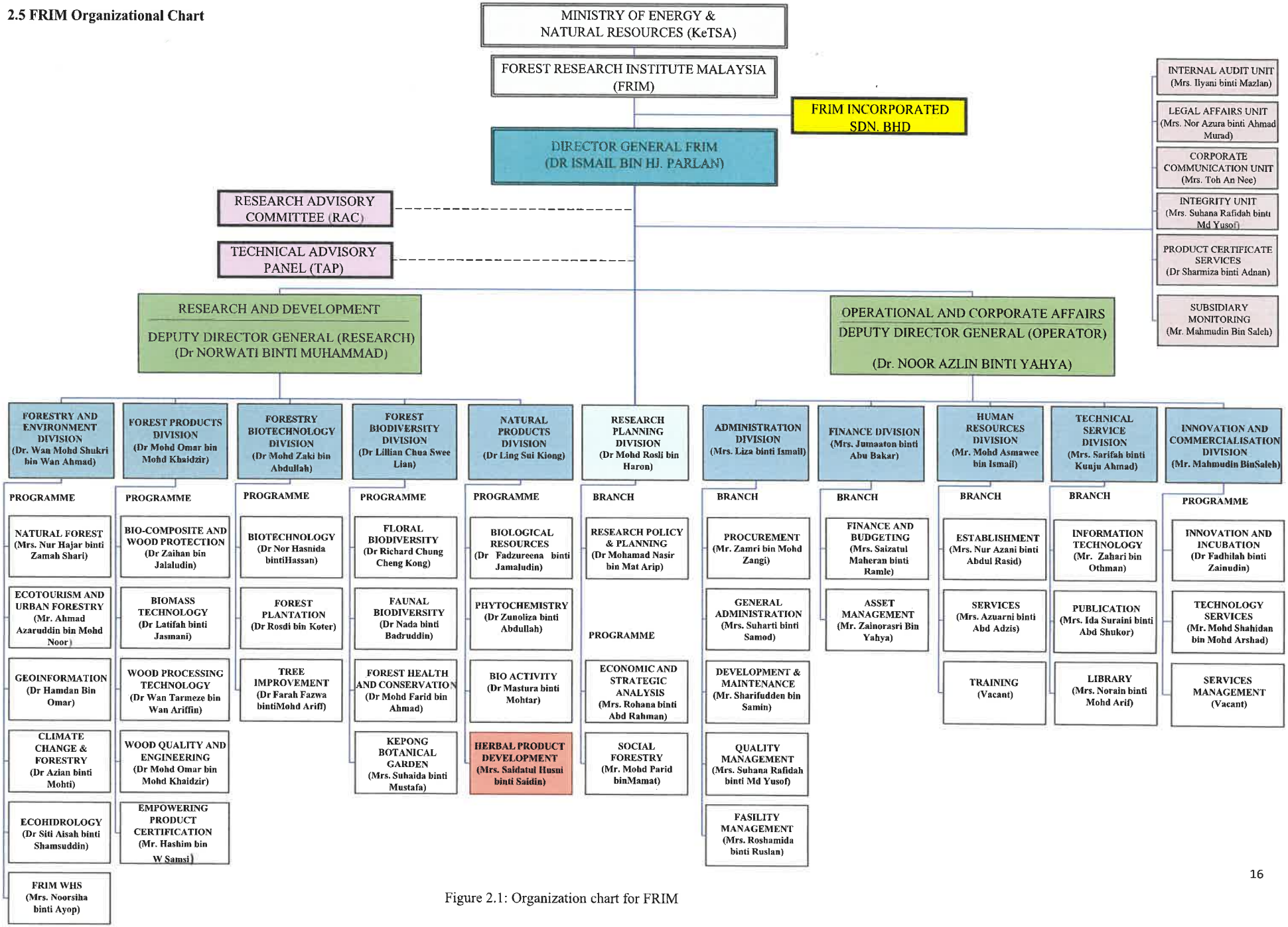


Figure 2.1: Organization chart for FRIM

2.5.1 Organization Chart of PPH

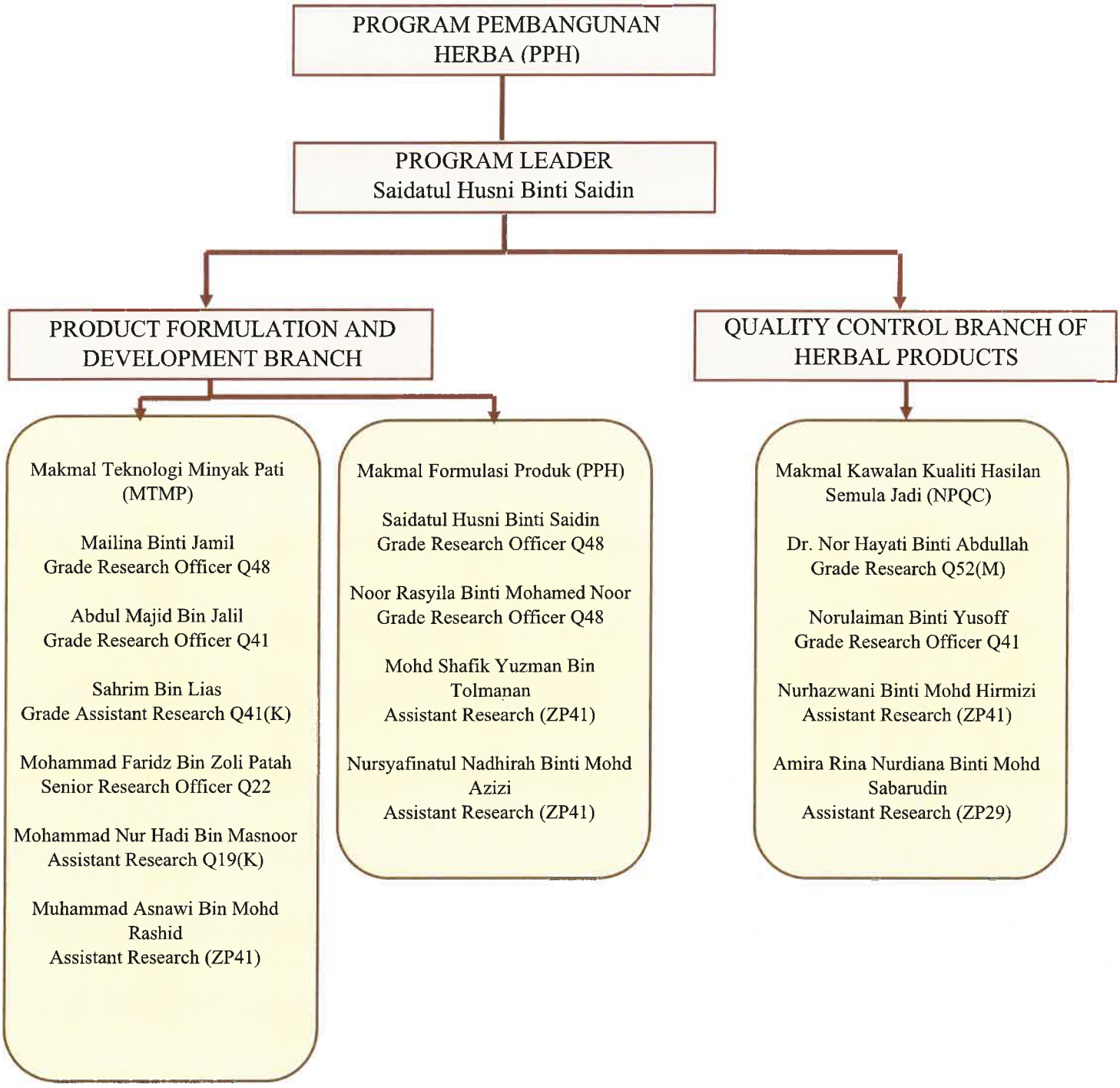


Figure 2.2: Organization chart for PPH

2.6 FRIM Service Provided to the Client

Forest Research Institute Malaysia (FRIM) is today a full spectrum of research and development group, offering services such as technical services, innovation and commercialisation, product certification services, and other services such as Herbal Technology Centre (HTC), where it is one of the excellence centres that contribute significantly to the herbal industry whereby it offers herbal processing as well as finished product manufacturing. Hence, FRIM also open consultancy services where it provides solutions to most technical problems, project management, and services in a variety of fields where FRIM are constantly looking beyond the expectations of their customers in order to provide consultation services wherever they are required. Also, FRIM open for rental of facilities and recreations where it has nature trails, accommodations for reservation of guest house, space rental for corporate event, family day or wedding reception, seminar rooms, photography, and rental for research site areas.

Furthermore, FRIM also offer library service to support the research and development activities of FRIM and lastly FRIM also offer Corporate Social Responsibility (CSR) where it is a concept in which an organization's management accepts an obligation to incorporate decisions and actions that will benefit the community while also benefiting the organisation. In other words, CSR reflects an organization's commitment to improving the well-being of society while also serving to improve the organization's image. FRIM engages in CSR activities to promote its products and image. FRIM also provides corporate bodies with facilities and services to conduct CSR activities on its campus. Asides, FRIM also offers recreational activities such as forest skywalk and FRIM has garden botanic and waterfall where the society can come for a picnic to relax.

Chapter 3

OVERVIEW OF THE TRAINING

3.1 Introduction

During the 24 weeks Integrated Internship Program at FRIM institute, the trainee was assigned under Natural Products Division led by a Head of Department, Dr Ling Sui Kiong. This division is divided into four different programme which are the biological resources, phytochemistry, bio activity and herbal product development.

In Natural Product Division Department, the trainee was placed in the Herbal Product Development Programme led by Mrs Saidatul Husni binti Saidin which is my supervisor. This programme task is to provide information regarding to the extraction process of Aquilaria and Melada Pahit. Trainee was exposed to the equipment related to the extraction of supercritical fluid extraction (SFE) and how the equipment functions and operate. Other than that, the trainee also was assigned to collect information about the parameters required for the extraction SFE process. This is because this project involves the SFE knowledge in order to extract the Aquilaria and Melada Pahit sample and to prevent errors during the extraction process.

Other than that, trainee also been assigned to produce a soap product using fragrant lemongrass. There are three types of formula used to produce the soap which are formula B, formula C and formula D. Each formulas have different chemical volume uses during the production. There are two types of soap uses which are transparent (using glycerine soap) and opaque soap. Besides, as an intern, it is obliged to meet one of the important responsibilities which is the dateline. Dateline is one of the important things while doing practical at FRIM institute because FRIM have already had their vision and mission which they have to provide global standard of work. Being able to meet the dateline is a proof where the staff are not pretending to be good, but they are actually good and keeping promises and keeping their standard.

3.2 Summary of The Industrial Training and Experience Gained

These are the only duties and tasks that doing throughout an industrial training. Table 3.1 shows the journey of an intern schedule activities for the entire 24 weeks of training.

Table 3.1: Industrial Training Task Schedule

Activity	February	March	April	May	June	July	August
• Processing sample and extraction using various methods.							
• Formulation process and product determination.							
• Report execution.							

Task 1: Research journals about supercritical fluid extraction (SFE)

During a training period, the task is assigned to find related journals as a reference during execution of the supercritical fluid extraction process using carbon dioxide liquid. It is important to know the temperature and the pressure used for the extraction process. It is because it does not require a high operating temperature or a long extraction time, but it produces more oil than other extraction methods. Furthermore, because supercritical carbon dioxide (SC-CO_2) evaporates at normal temperature and pressure, it does not necessitate a lengthy extraction time or additional separation steps. Asides from doing research it is required to execute a literature review about supercritical fluid based on the understanding of SFE extraction. The literature review will be revise by supervisor.

Task 2: Run SFE Extraction of Aquilaria spp

The SFE extraction of various Aquilaria is done in order to differentiate and to compare the components of compound inside the agarwood. The extraction of the Aquilaria spp was performed to gain and collect the extracted product from the sample. The duration of the extraction time for Aquilaria spp estimate to be 1 hour 30 minutes for each extraction time. Perhaps, different extraction sample need to be cleaned before performing the next extraction. This is because to prevent from the mixture of the extracted product. After collecting the extracted product, it will be further analyse using the Gas Chromatography-Mass Spectrometry Analysis (GCMS). The task assigned during sfe is to extract the sample, collect the extracted product, do the GCMS analysis and perform a report according to the extraction process.

Task 3: Run SFE of Melada Pahit

The extraction SFE of Melada Pahit is similar with the extraction of the agarwood but it differs from the collected products. The extraction of Melada Pahit is being extract from the sample and the product collected is the sample that had been extracted and not the extracted product from the extraction. But the extracted product from the extraction then will be collected and dry using Rotary Evaporator until it will become saturated liquid. The extracted liquid will be kept for company analysis purposes. Besides, after the extraction has been performed, it was a requirement to execute report based on the task has been assigned. The report states the calculation of the mass in and mass out of the sample and the weight loss during the extraction process. It was done with full supervision since not really master in the task.

Task 4: Soap Production

The soap production is being produced using three formulations. Each formulation differs on the type of materials and the weight of the material used. The task assigned to produce soap is to ensure that which formulation is more suitable in production soap based on the appearance, smell, and the quality. The chosen formulation of production soap will be taught to the Kampung Orang Asli at Negeri Sembilan by Mrs Saidatul Husni binti Saidin. Trainee was invited by supervisor to be a part of the soap production in order to gain the experience.

Task 5: Indirect duties

Clerical works which are indirect such as, do the literature review and reference for the list of trees that could be eaten, contribution to become one of the lotion testers on the skin

which help them to do further analysis based on the quality of the lotion, help packaging 'Cucur Atap' oil for company purposes, invited by supervisor to join talk session about handling equipment by IKA Company.

3.2.1 Weekly Activity (summary of each week)

Table 3.2: Weekly Activity

Week 1	Trainee was reported on duty at 8:30 a.m. on Monday, 21st February 2022. Right after, supervisor briefs about the workflow, job scope and the outcomes from the internship period that will gain after internship has ended. Afterwards, the trainee was being introduced to the staff in Research and Development under Natural products and had a tour around the company with the guidance of the supervisor. During briefing, trainee was being exposed to the equipment related to the extraction of SFE and how the equipment functions and operate. At the first week, the task assigned is to study comprehensively on supercritical fluid extraction (SFE) of agarwood and to collect information about the parameters required for the extraction SFE process.
Week 2	On the second week of training, the task assigned is to run extraction process of Aquilaria spp samples. The extraction is being run under the supervision of Encik Shafik. The extraction performed is to compare the yield percentage and the compound contains from the Aquilaria spp samples. After running the extraction, the sample was collected and being analysed using CGMS equipment in order to gain the data of the results. Every extraction sample for SFE will be cleaned in order to prevent the contamination of the products from previous extraction as well as the results gained. In this week, the trainee also being assigned to help do analysis for solid phase microextraction technique (SPME) with the guidance of Encik Shafik. The SPME analysis is being analyse for FRIM research purposes.
Week 3	• Close contact Covid-19
Week 4	• Quarantine because was tested as patient of Covid-19

Week 5	The trainee is being assigned to help Encik Khair to blend sea holly for institute analysis purposes. In this week, the trainee meets with supervisor Mrs Saidatul to discuss about the data of the Aquilaria spp that had been extract. The discussion led to the execution of report for the extraction that had been performed which consisted of methodology of the SFE extraction, data analysis and the calculation of yield percentage. The calculation performed is being teach by Encik Shafik following the company formula. On Friday, the natural product division do 'gotong-royong' by cleaning the laboratory and wash the apparatus that had been used for the experiment.
Week 6	The trainee is being taught to clean the extractor chamber by Mrs Saidatul. Next, the trainee is being assigned to run SFE extraction for Melada Pahit sample. The extracted product will be collected and being dry using rotary evaporator. Once the product is being dry as saturated liquid it is being kept in bottle samples for FRIM institute purposes.
Week 7	Execute data report of supercritical fluid extraction of Melada Pahit. Next, inform the result to the supervisor for the SFE extraction of Aquilaria spp 3 and Melada Pahit. Supervisor assigned to run SFE extraction of Melada Pahit for the second time.
Week 8	Meet with Mrs Saidatul and Encik Shafik discussing about moisture content contains during the extraction process of Melada Pahit. The discussion also covers about the problem arises during the extraction process whereby due to the increasement weight sample extraction of Melada Pahit after running SFE extraction. Perform moisture analysis to determine the moisture content of the sample that contains inside Melada Pahit sample before running the extraction. Once the extraction had performed the sample is being taken out from the extractor chamber and being kept inside the oven. The extracted product collected is being dry using rotary evaporator. Meet with supervisor to discuss about the data and results of Melada Pahit sample.

Week 9	Present the calculation of the mass balance for Melada Pahit sample to supervisor to revise. Meet with Mrs Saidatul and Encik Shafik to discuss about the differences weight gain for the extracted product. The trainee is being assigned to re-run the extraction process to determine the causes of differences weight gain differs from the duration of the extraction time being held. Supervisor also assigned to find related journals regarding de-fatted process and decaffeination process.
Week 10	Run the third extraction of Melada Pahit and the extracted product is being dry and being kept in bottle sample. Update to supervisor about the extraction that has been performed. The trainee is being assigned to execute comparison table for all extraction of Melada Pahit according to the weight extract, percentage extracted, date and duration extraction process. Send the comparison table to supervisor to revise via e-mail.
Week 11	• A regional holiday of Labour Day and 'Hari Raya Puasa'.
Week 12	The task assigned on week 12 is to develop soap products. The production soap is being guided by Miss Nadhirah using three formulation which formulation B, C and D. Update to Mrs Saidatul about the soap produced via WhatsApp. In the meantime, meet with Encik Shafik and Mrs Saidatul to discuss about the extracted yield weight of Melada Pahit. Brainstorm the possibility of the differences from the aspect of the extraction time. Mrs Saidatul assigned to create a label for the soap product and to produce soap using fragrant lemongrass using 2% and 3%. Update to supervisor about the soap produced.
Week 13	In week 13, the trainee is being task to produce soap using 0.5 gram of lemon oil for fragrant lemon grass. The soap produced is being shown to supervisor to check based on the smell and appearance. Mrs Saidatul suggest producing another fragrant lemon grass soap using 0.1 gram of lemon oil. This is to compare which formula is more suitable and preferable for soap production. Help Miss Nadhirah to prepare the materials for soap production for Mrs Saidatul bring to Negeri Sembilan for the purposes to teach Orang Asli community to produce their own soap.
Week 14	• Hari Raya Feast for Natural Product Division Department and FRIM Company.

Week 15	The trainee is being task to run extraction process of Melada Pahit for University Malaya purposes for 3kg. The extracted product is dry and being weight. The data of the extracted product is being informed to supervisor. Next, run the second 250 gram of sfe extraction of Melada Pahit.
Week 16	Continue to run the third supercritical fluid extraction of Melada Pahit with the supervision of Encik Shafik. Then, dry the extracted product and weight. The result is being updated to the supervisor.
Week 17	On week 17, the trainee is being assigned to help become one of the experiments for the lotion that they have develop. The lotion is being applied on both hand which lotion 1 contains 'gelam' while lotion 2 does not contain 'gelam'. The lotion is being left for an hour and afterwards is being check using cornometer, mexameter and texameter analysis. The analysis is being analyse by Miss Nadhirah and Mrs Saidatul for them to compare which formulation lotion is the best to develop which benefits to patient eczema by reducing the pain.
Week 18	On Monday, the trainee is being assigned to run for the third extraction of Melada Pahit. The extracted result is being updated to supervisor. Help Miss Nadhirah to become one of her experiments for the lotion tester. Mrs Saidatul assigned to execute literature review about the tree that can be eaten from six references book from FRIM institute. Do some research regarding the task assigned and lists all the tree found and send to supervisor to revise via e-mail. On Thursday, continue to run extraction of Melada Pahit for the fourth time. The result is being updated to supervisor. Besides, the trainee also being assigned to do references regarding the research of the tree that can be eaten that has been found from the journal's website.
Week 19	Run the last extraction of Melada Pahit sample. The extracted product is being dry and being weight. The result is being informed to supervisor. The trainee is being invited by Mrs Saidatul to join the course lab given by IKA company about ways to handle equipment in a correct way.

Week 20	Inform supervisor about the finished 3 kg extraction of Melada Pahit. The extracted sample of Melada Pahit will be packed and being sent to UM client for their study purposes. Meet with Mrs Saidatul to discuss about the content needed for industrial training report. Started to do some research about institute services or products provided to the clients.
Week 21	Started to do research about the institute background for industrial report. Meet with Mrs Saidatul to ask about her background achievements towards the FRIM institute throughout her journey of working at FRIM. Send first draft of the industrial training report to supervisor to revise via e-mail.
Week 22	The trainee is being assigned to help packaging 'Cucur Atap' oil for FRIM institute purposes to send to clients. Continue to do the report for industrial training following the guidelines given by the coordinator. Complete the logbook of industrial training.
Week 23	Start to do slide presentation of the industrial training. Send the logbook to the supervisor to revise and sign. Perform extraction of Melada Pahit for 250 grams. The extracted product is being dry and weight. Inform to supervisor about the extraction data.
Week 24	Continue to do the slide presentation. Send the logbook to supervisor to revise and sign. Then, send the attendance given by FRIM institute to supervisor to sign. In the meantime, send the complete report of industrial training to supervisor to revise. On Thursday, the trainee met with Mrs Saidatul to present the industrial training slide presentation. Discuss with supervisor about the content inside the slide presentation. Continue to edit the slide presentation.

Chapter 4

DETAILS OF EXPERIENCES

4.1 Introduction

Trainee are equipped with several equipment and software to help them with their tasks and assignment. First and foremost, some of the tasks it provides with an office pc. The reason why they provide is because, some of the tasks might need to use the company's system which they would not allow it on any other devices such as using an application system. All the system are built-in in the pc so if trainee need to use it, they do not have to download the system or the application itself.

As an intern student, the task assigned for me is a repeated task where I need to do the same extraction process but using different samples. During the extraction process I have been supervised by Encik Shafik, where he teaches me how to run the extraction process using the SFE equipment and software. Before starting to run the extraction process, I need to ensure that the equipment is in a good condition and there is no leaking occurred because it could affect the extraction process and the extracted product. There are few steps to follow before running the extraction process. Perhaps, Mrs Saidatul also assigned me another task which is to develop soap product with a staff name Miss Nadhirah. She gives me the lists of the chemicals needed and teach me to execute the soap. The soap production is also a repeated task where the soap produce is being compared with each other based on the smell, taste, and appearance of the soap.

4.2 Details of the training and experience gained

4.2.1 Task 1: Research journals about supercritical fluid extraction (SFE)

Preparation extraction process of supercritical fluid is commonly needed to ensure the temperature and pressure required in order to run the extraction process smoothly. It is a requirement to understand the flow of the process in order to avoid any problem arising during the extraction. The duration to finish the literature review of the extraction of agarwood is given for a week. The related journals of SFE extraction found is being list and be shown to Mrs

Saidatul to approve whether the journal can be used as a reference for the extraction process. Once it been approved, the task will continue to do the literature review and will be send to Mrs Saidatul to revise via email.

4.2.2 Task 4: Soap Production

There are three formulas of soap production which are formula B, formula C and formula D. The soap produce will be compared to ensure which formula is more suitable in executing the best quality of the soap. The formulation for the soap production is being explained in Table 4.1.

Table 4.1: Methods of Soap Production

<table>
<tr>
<td>For formula B
 
Glycerine Soap

Formula C and D
  
Opaque Soap Weighing process</td>
<td>• For formula B the glycerine soap was cut and being weight for 465.07g.
• For formula C the opaque soap was cut and being weight for 480.1g.
• For formula D the opaque soap was cut and being weight for 465.03g.</td>
</tr>
<tr>
<td> 
Melting process</td>
<td>• The suis of the heater is being turned on.
• The glycerine and opaque soap are being heated until the glycerine soap completely melted.</td>
</tr>
</table>

 Chemicals	• The malachite and lemon essential oil are being weight for 15 gram each meanwhile for aloe vera and abp016 are being weight for 2.5 gram each. • After the glycerine soap has completely melted, malachite, lemon essential oil, aloe vera and abp016 are being poured into glycerine soap to mix it together. • The stirrer switch is being turned on.
 Soap mould	• Once, the mixture is being properly mixed, the heater switch and stirrer is being turned off. • Pour the soap mixture into various shape of mould. • Let it cool until it the soap started to harden.

1. Soap Products

Once the soap hardens, it was being placed on top of A4 paper with labelling as shown in Figure 4.1(a), 4.1(b) and 4.1(c). The labelling is to ensure which type of formulation B, C or D produce. The soap is being left for few days to observe the condition of each formulation soap. The observation is based on the appearance of the soap, smell, and the endurance of the soap from melting. The most suitable formulation chosen will be used to teach Orang Asli community at Negeri Sembilan by Mrs Saidatul Husni.

Figure 4.1(a): Soap Production Formulation B

Figure 4.1(b): Soap Production Formulation C

Figure 4.1(c): Soap Production Formulation D

4.2.3 Task 5: Indirect duties

For indirect duties, the task assigned for me is to do a literature review about tree that can be eaten and is good for health. The information about the tree can be found in the book given by Mrs Saidatul to do research. Once the information has been found, execute a list of the tree found that will give benefits to human health if can be eaten and send to Mrs Saidatul to revise. When the literature review been approved by supervisor, the task is proceeded to do reference about the journal found from the list of the tree.

Next, the duty during my training is become one of the lotion tests for Miss Nadhirah project. There are two types of lotion which lotion one contains of 'gelam' and lotion two does not contains 'gelam'. This lotion produce is to develop a product that could help to lessen the pain for the eczema. The lotion will be tested on both hand skin and will be left for an hour and afterwards will be check using institute monitor consists of cornometer, texameter and mexameter for the skin reading. The reading will execute graphs and will further analyse by Miss Nadhirah.

Asides, trainee also being involved in packaging 'Cucur Atap' oil for company purposes. The oil will be sent to the clients for them to do analysis. In the meantime, trainee also being invited to seminar from IKA company about how to handle equipment in a proper way and ways to minimize error and accident that may be occurred during handling the equipment. The seminar is being held for 2 hours.

4.2.4 Report on Personal Project for Industrial Training

4.2.4.1 Task 2: Run SFE Extraction of Aquilaria spp

1. Introduction of Supercritical Fluid Extraction (SFE)

Supercritical Fluid Extraction or also known as SFE is one of the green extraction methods that has overcome the majority of the shortcomings and limitation of traditional extraction methods. Thus, it is a method of extracting component from a matrix by using supercritical fluids as the extracting solvent. A supercritical fluid is any substance with a temperature and pressure above the critical value but no liquid or gas phase. Furthermore, as the fluids near the critical point, the properties of supercritical fluids may change due to the changes of pressure and temperature, which affects its density. Asides, CO_2 also acts as a cleaning agent, it kills microbial bacteria, moulds, and mildews during the process. Although the yield of supercritical CO_2 is higher than that of other extraction methods, the yield and quality of the product can be easily varied by adjusting the physical properties.

2. Objectives

- To compare the compositions compound and yield percentage of agarwood samples with the reference compositions compound.
- To enhance the quality of the essential oil products, produced.
- To increase understanding in material and energy balance applied in real life process.

3. Method Extraction for SFE of Aquilaria spp

Sample Preparation

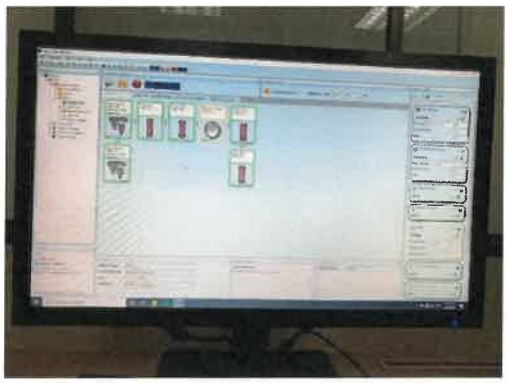
There are three samples of Aquilaria that need to be extract which are Aquilaria spp 1, Aquilaria spp 2 and Aquilaria spp 3 sample extraction.

Table 4.2 shows the procedures are being done in order to run the extraction process:

Table 4.2 Sample Preparation for SFE of Aquilaria spp

 Weighing process	1. The pc is being switched on. 2. First, the extractor chamber is being weight on weighing scale. 3. Next, weight 65g of agarwood woodchip on weighing scale. 4. The agarwood woodchip and extractor chamber are weight together on the weighing scale.
 Record data	5. The weight is being recorded in the SFE logbook.
 Place the wool	6. A piece of wool is being cut using scissor and was placed on top of the agarwood.

 Place the chamber	7. The extractor chamber was placed inside the extractor place.
 Temperature control	8. Wait until the temperature become 3.0.
 SFE equipment	9. The pressure was set at 276 bar meanwhile for the temperature was set at 50°C with the flowrate of 30 L/min. 10. The static duration time was set for 30 minutes while the dynamic duration time was set for 60 minutes. 11. The CO_2 tank is being opened to let the gas flow inside the pump to extract the agarwood.



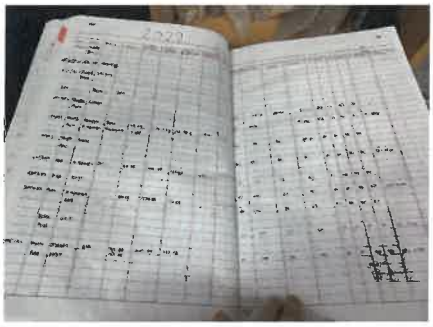
Waters ChromeScope software

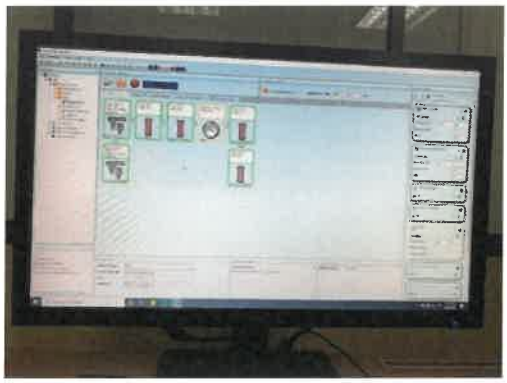
12. After starting the software let it run and wait until it reached its optimum pressure and static warning is shown.
13. The pressure and temperature of each pump was being monitored by using Waters ChromScope software.
14. The valve of CO_2 was closed for 30 minutes to prevent the gas from entering the extractor chamber once the static warning has shown.
15. The dynamic warning will be shown once 30 minutes of static duration time had finished. Then, the CO_2 valve was opened to let the gas flow through the extractor chamber for 60 minutes.
16. The extraction process will automatically stop once the extraction has finished. The CO_2 tank was closed and the product was being collected.
17. The valve was opened in order to let the gas flow outside throughout the pipeline.
18. The valve of the collector tank is being opened to 'depressurized' the software system until the bar is shown to be '0' bar.
19. The Waters ChromScope software is being closed and the computer is being shut down.
20. The step is repeated for A. Sinensis EOTC and A. Sinensis AS2 sample extraction.

4. Cleaning Supercritical Fluid Extraction (SFE) method

- The cleaning method is being applied for all samples extraction in order to avoid any mixed compositions extraction samples after undergoes SFE extraction process.
- The duration time for static and dynamic was set depends on the extraction samples had been extracted.
- The procedures of cleaning are being down are shown in Table 4.3:

Table 4.3 Method of Cleaning Supercritical Fluid Extraction (SFE)

 Record the data	1. Record the data cleaning method depends on sample extraction in SFE logbook.
 Temperature control	2. Wait until the temperature become 3.0.

 Waters ChromeScope software	3. The static duration time was set at 30 minutes while for dynamic was set at 60 minutes. 4. The CO_2 tank is being opened to let the gas flow inside the pump to extract the previous extraction sample had been done. 5. After starting the software let it run and wait until it reached its optimum pressure and static warning is shown. 6. The pressure and temperature of each pump was being monitored by using Waters ChromScope software. 7. The valve of CO_2 was closed for 30 minutes to prevent the gas from entering the extractor chamber once the static warning has shown. 8. The dynamic warning will be shown once 30 minutes of static duration time had finished. Then, the CO_2 valve was opened to let the gas flow through the extractor chamber for 60 minutes.

 SFE equipment	9. Hear if any unusual noises occurred. 10. The extraction process will automatically stop once the extraction has finished. The CO_2 tank was closed and the product was being collected. 11. The valve was opened in order to let the gas flow outside throughout the pipeline. 12. The valve of the collector tank is being opened to 'depressurized' the software system until the bar is shown to be '0' bar. 13. The Waters ChromScope software is being closed and the computer is being shut down.

5. Results extraction using SFE method

Based on Figure 4.2(a), (b) and (c) these are the extracted product for the SFE extraction of Aquilaria spp. The observation of these extracted product of Aquilaria spp species can be concluded that it has the same appearance where it is in a wax form in the extractor chamber, appear in dark yellow in color and have the same pleasant smell. These products will be kept in bottle sample and will be further analyses using GCMS to know the major compound inside the sample.

Figure 4.2(a) Aquilaria spp 1

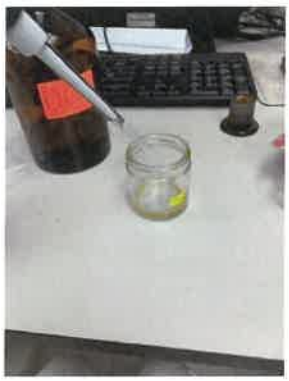
Figure 4.2(b) Aquilaria spp 2

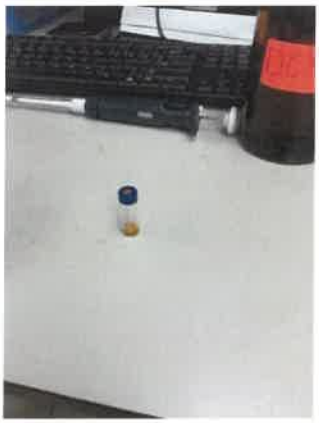
Figure 4.2(c) Aquilaria spp 3

6. Dilution method for Gas Chromatography-Mass Spectrometry Analysis (CGMS)

The extracted sample of Aquilaria spp is then undergo dilution process for Gas Chromatography-Mass Spectrometry (GCMS) Analysis to determine the compound found inside each of the Aquilaria spp sample. GCMS analysis was carried out by FRIM staff. The dilution method is being shown in Table 4.4.

Table 4.4 Dilution method for GCMS

	1. The agarwood sample will be diluted with dichloromethane until it become yellowish liquid in color.

	2. Then, the sample is being transfer into a vial screw for 0.5ml by using micropipette. After, the sample is being placed inside the GCMS and wait for about an hour to collect the data.

7. Data Analysis

After the extraction has been performed, it is a requirement to do calculations of the yield percentage for each extraction processes shown in Table 4.5. The calculations done is to ensure that which sample of Aquilaria spp gives the highest yield percentage among the others. This is because each of the extract process is from different types of Aquilaria spp sample.

Table 4.5 Yield Calculation of Aquialria spp

Yield result of Aquilaria spp 1	**Yield result of Aquilaria spp 2**
Cleaning weight:	**Cleaning weight:**
81.48g – 81.37g = 0.11g	85.59g – 85.54g = 0.05g
Product weight:	**Product weight:**
81.61g – 81.56g = 0.05g	81.66g – 81.6g = 0.06g
Total weight extract:	**Total weight extract:**
0.11g + 0.05g = 0.16g	0.05g + 0.06g = 0.11g
Yield Percentage% :	**Yield Percentage% :**
$= \frac{0.16g}{65.43g}\ x\ 100\%$	$= \frac{0.11g}{67.35g}\ x\ 100\%$
= 0.245%	= 0.163%

Yield result of Aquilaria spp 3

Cleaning weight:

$83.49g - 82.32g = 0.17g$

Product weight:

$82.41g - 82.36g = 0.05g$

Total weight extract:

$0.17g + 0.05g = 0.22g$

Yield Percentage% :

$$= \frac{0.22g}{68.16g} \; x \; 100\%$$

$$= 0.323\%$$

8. GCMS Results Analysis

Figure 4.3 and Table 4.6 is the GCMS graph analysis and the list of compounds for Aquilaria spp 1 meanwhile Figure 4.4 and Table 4.7 is the GCMS graph analysis and list of compounds for Aquilaria spp 2. These graphs will be compared from the aspect of peak and compounds found in the agarwood which is more suitable for the extraction process in order to gain the product that gives highest percentage of yield and good analysis results in order to execute oil production.

1. GCMS Result for Aquilaria spp 1

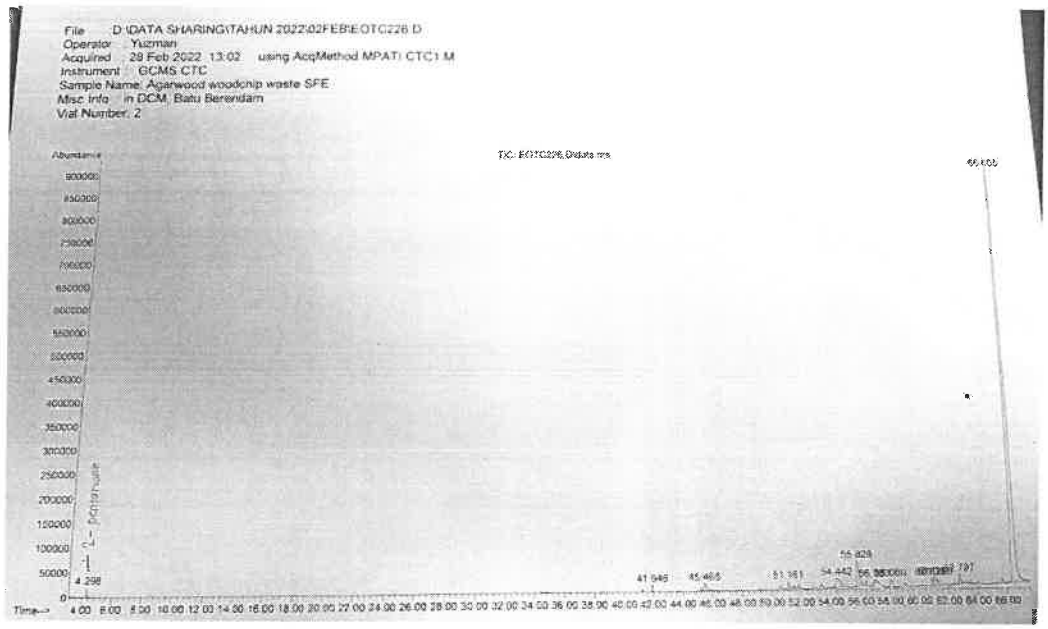


Figure 4.3: GCMS results analysis for Aquilaria spp 1

List of components based on peaks from Figure 4.3:

Table 4.6: List of compounds of Aquilaria spp 1

No.	Compound	Area (%)
1	2-Pentanone	0.45
2	Caryophyllene oxide	0.51
3	Syringaldehyde	1.50
4	Naphthalene	1.23
5	1-Penten-3-one	1.43
6	Di-(2-ethylhexyl) phthalate	82.47

2. GCMS Result for Aquilaria spp 2

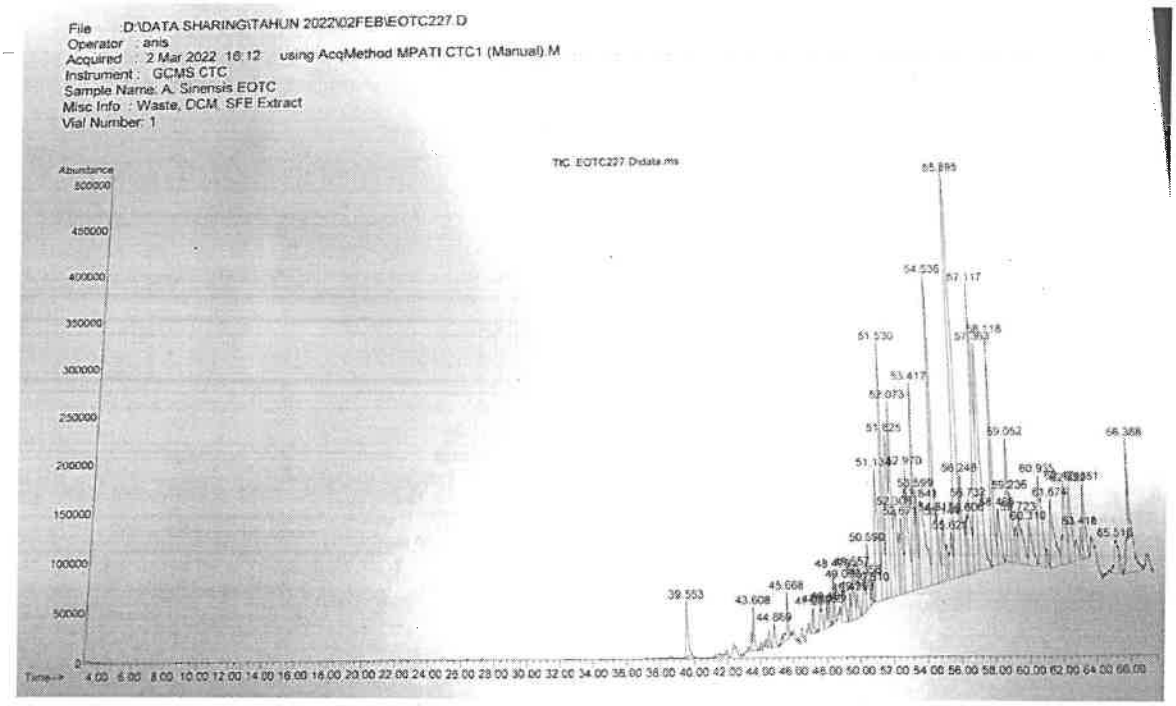


Figure 4.4: GCMS result analysis for Aquilaria spp 2

List of compounds based on peaks from Figure 4.4:

Table 4.7: List of compounds of Aquilaria spp 2

No.	Compound	Area (%)
1	4H-1-Benzopyran-4-one	0.87
3	Bicyclo [4.4.0] dec-1-ene	0.38
4	1H-Indene-3-carboxaldehyde	0.55
5	2(3H)-Naphthalenone	1.00
6	Columellarin<dihydro->	2.92
7	2-propenyl ionone 2; ALLYL IONONE	1.18
8	But-3-enal	2.24
9	Spiro [2.5] octane	0.77
10	AROMADENDRENE	1.70
11	(z)-3-(phenylthio)-1	6.40
12	3-Pentanone	3.76
13	2-Isopropylidene-3-methylhexa-3	1.21
14	Pyrazine	2.10
15	Pentacosane	1.32
16	Tricosane	3.42

4.2.4.2 Task 3: Run SFE of Melada Pahit

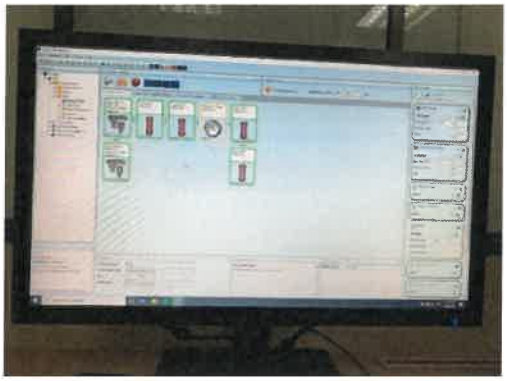
The SFE extraction of Melada Pahit is similar to the extraction of Aquilaria spp but it differs for Melada Pahit where the main product needed is the extract sample. Thus, in this task assigned it involves the knowledge of the materials and energy balance and the thermodynamics concept. The procedures of SFE extraction for Melada Pahit is the same as previous extraction mention in Table 4.2 but it was different from the duration of extraction time, pressure and it has additional step where in this case for extraction of Melada Pahit glass bead is inserted in-between of the sample inside the container before the container and the sample is being weight. This is to allow that the extraction process more sufficient as it functions to allow the path for the extraction to take place.

Table 4.8 shows the procedures are being done in order to run the extraction process:

Table 4.8 Sample Preparation for SFE of Melada Pahit

  Weighing process Glass bead	1. The pc is being switched on. 2. First, the extractor chamber is being weight on weighing scale. 3. Next, weight 250 g of Melada Pahit on weighing scale. 4. Insert the glass bead in between of the sample. 5. The Melada Pahit and extractor chamber are weight together on the weighing scale.
 Record the data	6. The weight is being recorded in the SFE logbook.
 Place the wool	7. A piece of wool is being cut using scissor and was placed on top of the agarwood.

 Place the chamber	8. The extractor chamber was placed inside the extractor place.
 Temperature control	9. Wait until the temperature become 3.0.
 SFE equipment	10. The pressure was set at 207 bar meanwhile for the temperature was set at 50°C with the flowrate of 30 L/min. 11. The static duration time was set for 45 minutes while the dynamic duration time was set for 180 minutes. 12. The CO_2 tank is being opened to let the gas flow inside the pump to extract the agarwood.



Waters ChromeScope software

13. After starting the software let it run and wait until it reached its optimum pressure and static warning is shown.
14. The pressure and temperature of each pump was being monitored by using Waters ChromScope software.
15. The valve of CO_2 was closed for 45 minutes to prevent the gas from entering the extractor chamber once the static warning has shown.
16. The dynamic warning will be shown once 45 minutes of static duration time had finished. Then, the CO_2 valve was opened to let the gas flow through the extractor chamber for 180 minutes.
17. The extraction process will automatically stop once the extraction has finished. The CO_2 tank was closed and the product was being collected.
18. The valve was opened in order to let the gas flow outside throughout the pipeline.
19. The valve of the collector tank is being opened to 'depressurized' the software system until the bar is shown to be '0' bar.
20. The Waters ChromScope software is being closed and the computer is being shut down.

1. Drying Melada Pahit using Rotary Evaporator

The product extraction of Melada Pahit will be collect and dry using Rotary Evaporator. This is to get the saturated liquid appearance and will be kept in bottle samples for FRIM company future research purposes. The observation product of Melada Pahit is light green in color, sticky, in a liquid form and have bitter smell. Table 4.9 show the procedure of drying sample.

Table 4.9: Drying Melada Pahit using Rotary Evaporator

 Rotary Evaporator	1. Execute the Rotary Evaporator equipment as shown. 2. The extraction sample of melada pahit is being put into cylindrical round-bottom flask for drying in water bath. 3. The chiller is being turned on. 4. Then, the water bath is being turned on.
 Drying process	5. Wait for few hours to ensure the extraction sample of melada pahit started to become concentrated and sticky.

 Melada Pahit extracted product	6. After, the sample is being transfer into a small beaker. The beaker is being weight first then the sample and the beaker is being weight together and recorded. 7. The method is repeated for the second and third extraction of melada pahit.

2. Data Analysis

After the extraction has been performed, it is a requirement to do calculations of the yield percentage for each extraction processes shown in Table 4.10, Table 4.11, and Table 4.12. The calculations done is to ensure that the mass in must be equal to mass out. Through this calculation, it can be determined whether the extraction is success or have problems issues regarding to the weight of the extracted product during the extraction process. For the extraction of Melada Pahit procedure is repeated for three times. The moisture content of the sample will be investigated during each extraction process for Melada Pahit. Figure 4.5, Figure 4.6 and Figure 4.7 shows the picture of the extraction process of before and after the extraction.

A) For batch 1 and 2

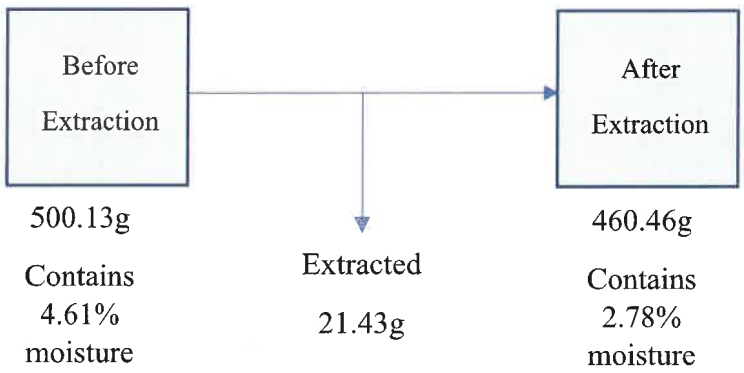


Figure 4.5: Yield Calculation for batch 1 and 2

Table 4.10: Yield Calculation of Melada Pahit for Batch 1 and 2

Before extraction of Melada Pahit	**After extraction of Melada Pahit**
Mass in	Mass out
= 250g + 250.13g	= 460.46g
= 500.13g	Water content
Water content	= 2.78% x 460.46g
= 4.61% x 500.13g	= 12.801g
= 23.056g	Mass out without moisture content
Mass in without moisture content	= 460.46g – 12.801g
= 500.13g – 23.056g	= 447.659g
= 477.074g	

B) For batch 3

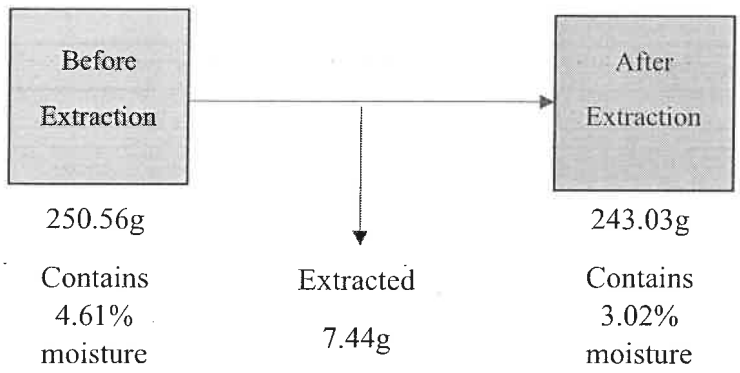


Figure 4.6: Yield Calculation for batch 3

Table 4.11: Yield Calculation of Melada Pahit for Batch 3

Before extraction of Melada Pahit	**After extraction of Melada Pahit**
Mass in	Mass out
= 250.56g	= 243.03g
Water content	Water content
= 4.61% x 250.56g	= 3.02% x 243.03g
= 11.551g	= 7.34g
Mass in without moisture content	Mass out without moisture content
= 250.56g – 11.551g	= 243.03g – 7.34g
= 239.01g	= 235.69g

C) All batch (1,2 & 3)

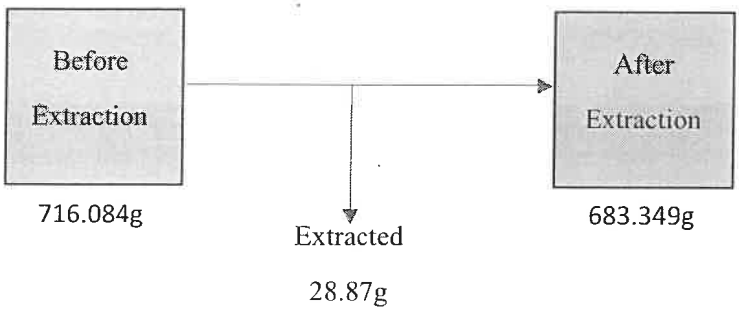


Figure 4.7: Yield Calculation for batch all batch

Table 4.12: Yield Calculation of Melada Pahit for All Batch

Before extraction of Melada Pahit	**After extraction of Melada Pahit**
Mass in = 477.074g + 239.01g = 716.084g	Mass out = 447.659g + 235.69g = 683.349g
Thus, Weight extracted = 716.084g – 683.349g = 32.735g (supposed to get), **Hence,** = 32.735g (expected) – 28.87g (gain) = 3.865g (weight loss)	**Expected Yield** Mass in – Mass out: = 716.084g – 683.349g = 32.735g Yield % $= \frac{32.735g}{716.084g} \; x \; 100\%$ = 4.57%

4.3 Problem Encountered and Approach Adopted for Solving Problem

As a human being, we are not perfect. We make mistakes and we learn from it. During the internship program there are many problems that trainee may encountered in order to complete the task and their internship program. Enclosed are a few problems which trainee have encountered and how do they solve them.

The first problem to be encountered during the internship is Movement Control Orders. Trainees begin the internship on 21st February 2022 which Malaysia currently under recovery Movement Control Order (MCO). The economy went back to normal as in people are allowed

to travel and go to their work but still must follow some of the SOPs given by the government. During the industrial training, some of the colleague and trainee was being tested positive covid. Thus, due to the restriction of the institute rules and government, we manage to handle this by taking a week off for recovery in order to avoid being in contact with other workers. This action is very practical as it can prevent the virus from spreading toward others.

Secondly, there is a communication barrier between trainee and another colleague. The main barrier is that we have a little problem in communicating in English fluently because of lack of practice. Even during study, trainee did their presentation in English but the presentation only last for a few minutes compared to the industrial training. Thus, trainee need to communicate in English fluently all the time. But it can be taking this positively because, it is the opportunity for us to practice our speaking skills and no one is going to judge us at FRIM institute. Trainee will try their best to converse in English and read a lot of English articles and books to increase their skills, vocab, and general knowledge. As a result, trainee will find themselves slightly proficient at using English as their second language. Although our English is not good as Bahasa Malaysia but eventually, we can speak fluently without having trouble to clarify what we are trying to say.

Furthermore, the third problems that trainee faced is rejection crisis. When trainee started the internship, they are been wondering what will happen when they give their opinion and idea then it got rejected. Trainee might feel sad about it, but rejection is a good thing when it views in a positive side. For an example, when trainee was assigned to do supercritical fluid extraction there is an error occurred during the calculation where the mass in is not equivalent to mass out and the differences of the extractions extracted are quite huge. Thus, the calculation that had done is being discuss with supervisor and another colleague. Sometimes trainee have a bad time in understanding what supervisor's explanation about the effects that may contribute to the differences of the extracted extractions which she required trainee to do. In the explanation she covers the topic where trainee had learned in universities which is materials and energy balance much differ, and it took a longer time for us to digest everything that was explained by them. When trainee gave their opinion about the knowledge they know, it seems that they are not really satisfied with their works.

Eventually, trainee understand what the requirements and information are needed to solve the problem during the calculation part, and we found a good way in explaining the calculations to supervisor and she suggested to re-run the extraction process due to the two

theories whereby the different of the extracted weight due to first is the duration time of the extraction and second is the effect of the pressure during the collection of the extracted product. Through this assumption we can conclude that which factors is the major effect of the difference weight of the extracted extractions.

4.4 Professional and ethical issues

Professionals have behavioural standards that are tailored to their specific aims and objectives. These standards also assist discipline members in coordinating their actions or activities and in establishing the public's trust in the discipline. For FRIM institute where it is a research and development (R&D) there are several reasons why it is critical to follow ethical standards in research. First, norms advance research goals such as knowledge, truth, and error avoidance. For instance, prohibitions against fabricating, falsifying, or misrepresenting research data perhaps to promote the truth while minimising error. This is to ensure that all employees and trainees to gives full transparency on their research and record every detail truthfully.

Second, because of FRIM is research that frequently entails a great deal of collaboration and coordination among many different people from various disciplines and institutions, ethical standards promote values that are essential to collaborative work, such as trust, accountability, mutual respect, and fairness. Many ethical norms in FRIM being applied as research, for example, guidelines for authorship, copyright and patenting policies, data sharing policies, and peer review confidentiality rules are intended to protect intellectual property interests while encouraging collaboration. This is because FRIM has its own branch mark as research institution where most of the publication are being published online and some are being sell as journal and books for others to use for their own research purposes. Through this it also contributes to increasing public support for FRIM where people are more likely to fund a research project if they have confidence in the research's quality and integrity. Hence, for FRIM they want to be recognised for their contributions and do not want their ideas to be stolen or leaked prematurely.

Furthermore, the professional ethical that can be found is the leadership skill of the supervisor during assisting the trainees in learning how to operate extraction equipment safely. This demonstrates how effective supervisors communicate with trainees in a positive manner, as well as providing good examples and role models in a company. A supervisor's leadership

skills, on the other hand, are limited in that they only teach trainees in general, rather than in detail and depth. This opens the door for a problem to arise when the trainees handle the project without proper guidance. Employee performance also can be suffering as a result of a lack of leadership ethics. Employees in some cases are so concerned with getting ahead and making money that they disregard procedures and protocol. This can result in additional paperwork and careless errors, requiring the task to be redone.

4.5 Health, environmental and sustainable aspect

More and more businesses across industries are pledging to reduce their environmental impact by creating environmentally conscious workplaces. This entails putting policies and programmes in place to encourage environmentally friendly behaviour. Dr Ismail Parlan, Director General (DG) of the Forest Research Institute Malaysia (FRIM), launched the Institute's Occupational Safety and Health Policy at the first FRIM Monthly Assembly this year. This policy aims to ensure that safety and health issues are addressed effectively and efficiently in order to create a safe and healthy work environment.

This is the highlight of the FRIM institute in order to ensuring that every working man and woman works in a safe and healthy environment whereby complying OSHA policies will contribute to a variety of workplace health and safety standards, ranging from general safety standards to industry-specific standards such as medical care or construction. Besides, FRIM institute also make a seminar about act and regulation when handling the chemical during the lab session for the trainee to be involved in. This seminar exposes the trainee to creating a culture of safety where it encourages the trainee to practice from the basic first aid, to how to handle chemical burns. It also allows employees and trainees to understand hazards not usually within their department, especially in situations where a hazard could affect more than one department such as a chemical leak. This will teach them the emergency procedures that are in place to protect themselves.

On top of that, for every task or project inside the FRIM institute especially lab session it follows the regulations whereby enforcement to the employees and trainees to use protective equipment (PPE) thus providing specific training to the employees and trainees to provide them with an understanding of how to handle emergencies. Following these regulations FRIM institute also do a fire drilling practice for every department to raise alert to the employees and trainees when something related to the hazard occurred. Besides, in the department of

research and development (R&D) it relates to the sustainable development goals of quality education where it specifically entails issues such as appropriate skills development, gender parity, equipment and educational materials and resources. Through education, its enables upward socioeconomic mobility and is a key to escaping poverty. Hence, it helps to reduce inequalities and reach gender equality and is crucial to fostering tolerance and more peaceful societies. For instance, the task assigned is to produce soap formulation and the formulation will being teach to the Orang Asli Community.

During the task assigned of supercritical fluid extraction, trainee learned how the equipment operates and how to handle sfe equipment during extraction. Perhaps, using SFE method is one of the green ways of the FRIM institute to support sustainability as it can shorten the duration of the extraction and reduce the air pollution. Moreover, it related with the mass and energy balance where the sample needed to be viewed comprehensively through examination of various stages of a process, over the whole process and even extending over the total production system from the raw material to the finished product. If mishandling the equipment, it can cause environmental issues where it can release the carbon dioxide which can cause variety of health effects such headaches and dizziness. Perhaps, it can also contribute to the air pollution. To overcome the problem that may arise, before running the extraction process it is a requirement to check the equipment whether it is in a good condition and does not have any leaking occurred. Moreover, during performing the task there are waste chemical needed to be handled wisely. The waste chemical will be stored in a bulk with different labelling according to the chemical reactivity. This is to prevent the employees and trainees to dispose the chemicals in a reckless manner in other words pouring the waste chemical in the sink, likewise, to train the employees and trainees to handle the disposal of chemical waste prudently.

On the whole, if the waste chemical is being dispose in the sink, the chemical residues will flow and be channelled into rivers. This can cause water pollution where clean water will be mixed with toxic waste that can pose a danger to the health of humans, animals, and fish. For safety measures, the company takes step to follow the laws set by OSHA to store chemical waste in bulk chemicals and will be collected and taken by the person in charge who is supposed to manage chemical waste disposal. Through this, it can save the environment. This can be relating that R&D department apply the sustainable development goals of quality education where they want trainees to become learners who are healthy, well-nourished, and eager to participate and learn. On top of that, it can be seen that the company can be related to

the goals of life on land as well as life below water, where through every action they take consider from the aspect of the health and environment. The outcomes, trainee will gain the knowledge and skills during handling the task assigned.

In addition, FRIM also practices of recycling items in order to support the sustainability. During the training, the daily task assigned for the trainee is to help the company to packaging and execute sample products for analysis purposes of their product such oil, various sample of plant, soap products and etc. Just as the packaging on the products where it can contribute to environmental footprint, so does the packaging on the products for company uses. Single-use items namely as plastic bags, cleaning supplies and vial sample generate a lot of waste when an entire office uses and discards them every day. Identifying alternatives to single-use products can have a significant impact on the company's waste over time. This will not only cause harm to the environment but also increase the costs of the company. Purchasing supplies in bulk and investing in reusable items, for example, can help to reduce the packaging waste from products of the employees and trainees use on regular basis.

Similarly, FRIM institute also take initiative by encouraging to lessen the uses of the energy. The employee's practices by turning off the light if it not being use especially for the computer and equipment that had been used will instantly shut down to conserve the energy. Perhaps, the biggest uses of energy in office-based environments are essentials such as lighting, heating, and electrical appliances. Thus, FRIM company is in a forest and the building are made with lot of windows, which make it a good use of the natural light and it can be consider whether they need to have artificial lights on at all. In other words, the company also use the LED bulb where it is one of the practices change in order replacing older lighting with newer, more energy-efficient alternatives.

Chapter 5

CONCLUSIONS

5.1 Conclusions

The Integrated Internship Program at FRIM institute helps student to gain real-time experience to better help them understand their future careers path. This training provides the student with various real working experience, environment, and workload. Through this internship program, student learn to prepare themselves physically, mentally, and emotionally during a time of need. Perhaps, the student learns to survive in real working environment with various experiences they been through during the internship training. All of these experiences will help students when they begin their real career in the future.

Besides, the Integrated Internship Program also helps the student in adapting and preparing with the real working environment: despite of the MCO announcement and the SOP's given by the government throughout the training session. On top of that, students will be able to relate the courses that they have learn and use the knowledge to re-apply in real life working situation. For instance, through the task has been assigned the trainee would be able to relate the subject of Thermodynamics and Mass and Energy balance in order to solve the task given. This will help student to enhance their critical thinking whereas it can help to develop experience besides it can helps to hone soft skills. Last but not least, even though there are many challenges I faced during the internship training: I am glad that I managed to complete the training without having to extend the training session at FRIM institute.

5.2 Suggestion and Recommendation

My personal recommendation is that FRIM institute should hire fresher graduate in the institute, who can contribute new ideas for developing more products that gives benefits to the community. The combination of idea between freshly graduated staff with experienced staff will make the idea more interesting and can be a steppingstone to success better in future. The company should give fresh graduates trust and opportunities to contribute back to the industry. Hence, the company also can expose the students by taking them to experience the site visit where they can learn how to handle and communicate with the suppliers.

Aside from that, another suggestion for the FRIM institute is to propose that Human Resources hold a weekly or monthly meeting with students to ensure that their well-being is not overlooked. It is critical for ensuring students' health, welfare, and fitness within the organisation. In fact, students can learn a lot of new information. Aside from that, another suggestion is that the institute should provide a suitable location or room for trainees to work in. A place to write reports and communicate with other trainees to learn more. Furthermore, as a trainee we hope that supervisors could held trainee motivation sessions in order to make them more competitive and motivated. This can help trainees improve their skills, general knowledge, and expertise.

REFERENCES

1. Journals / Articles

Sulaiman, N., M. Ida Idayu, A. Z. Ramlan, M. Nur Fashya, A. N.Nor Farahiyah, J. Mailina, and others, 'Effects of Extraction Methods on Yield and Chemical Compounds of Gaharu (Aquilaria Malaccensis)', *Journal of Tropical Forest Science*, 27.4 (2015), 413–19

Ibrahim, A.H., S.S. Al-Rawi, A.M.S. Abdul Majid, N.N. Ab. Rahman, K.M. Abo- Salah, and M.O. Ab Kadir, 'Separation and Fractionation of Aquilaria Malaccensis Oil Using Supercritical Fluid Extraction and TThe Cytotoxic Properties of the Extracted Oil', *Procedia Food Science*, 1 (2011), 1953–59 <https://doi.org/10.1016/j.profoo.2011.09.287>

Jok, Veronica Alexander, Nurhaslina Che Radzi, and Ku Halim Ku Hamid, 'Agarwood Oil Yield As A Result of Changes in Cell Morphology Due To Soaking Process', *Procedia - Social and Behavioral Sciences*, 195 (2015), 2443–50 <https://doi.org/10.1016/j.sbspro.2015.06.387>

Lim, Teck Wyn, and N Awang Anak, *Wood for Trees: A Review of the Agarwood (Gaharu) Trade in Malaysia. A Report Commissioned by the CITES Secretariat.*, 2010

Xu, Lili, Xiaori Zhan, Zhaowu Zeng, Rong Chen, Haifeng Li, Tian Xie, and others, 'Recent Advances on Supercritical Fluid Extraction of Essential Oils', *African Journal of Pharmacy and Pharmacology*, 5.9 (2011), 1196–1211 <https://doi.org/10.5897/AJPP11.228>

2. Individual – Mrs Saidatul Husni binti Saidin (Industrial training supervisor)
    - Encik Shafik Yuzman bin Tolmanan (Assistant supervisor)
    - Miss Nursyafinatul Nadhirah binti Mohd Azizi (Assistant supervisor)

Appendix 1

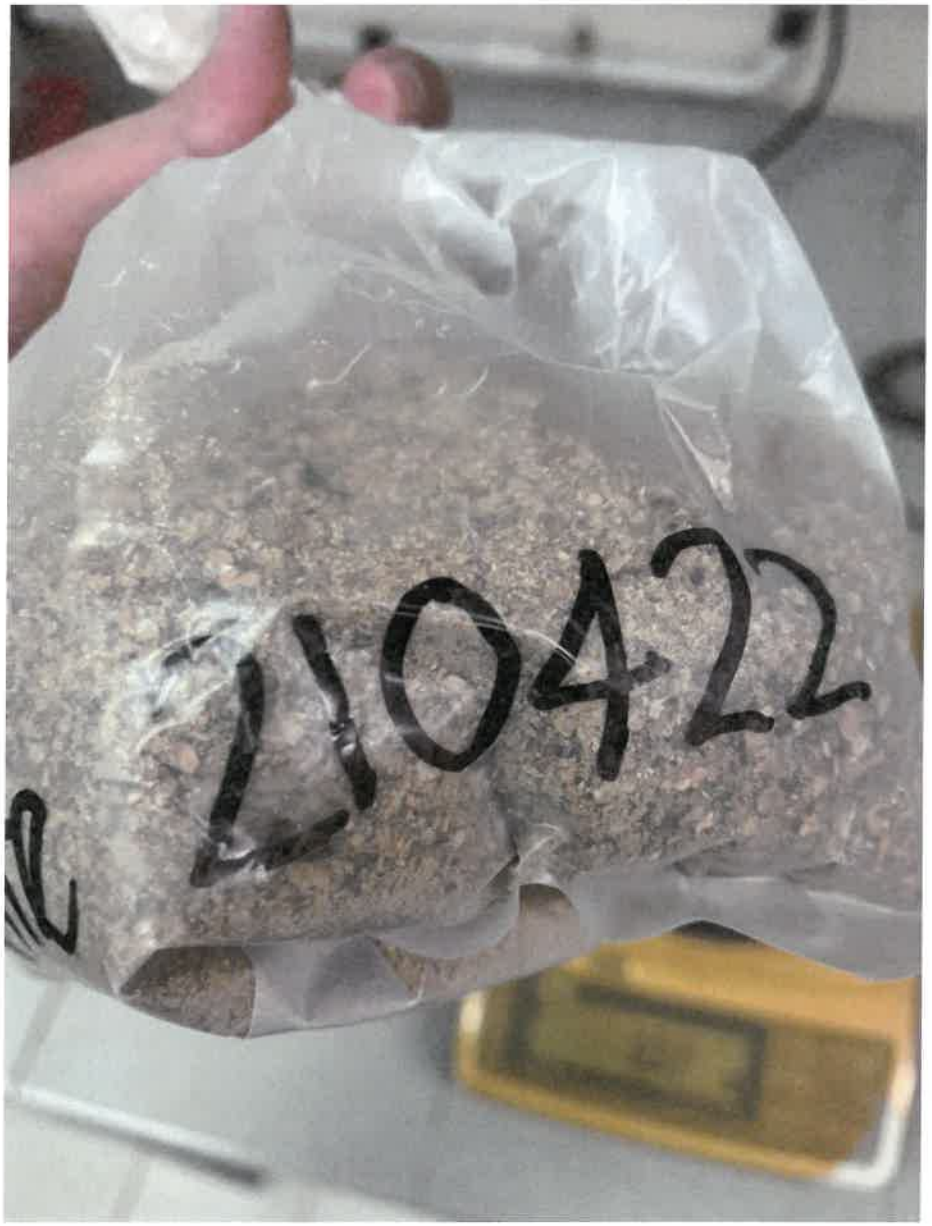


Figure 1: Melada Pahit Sample

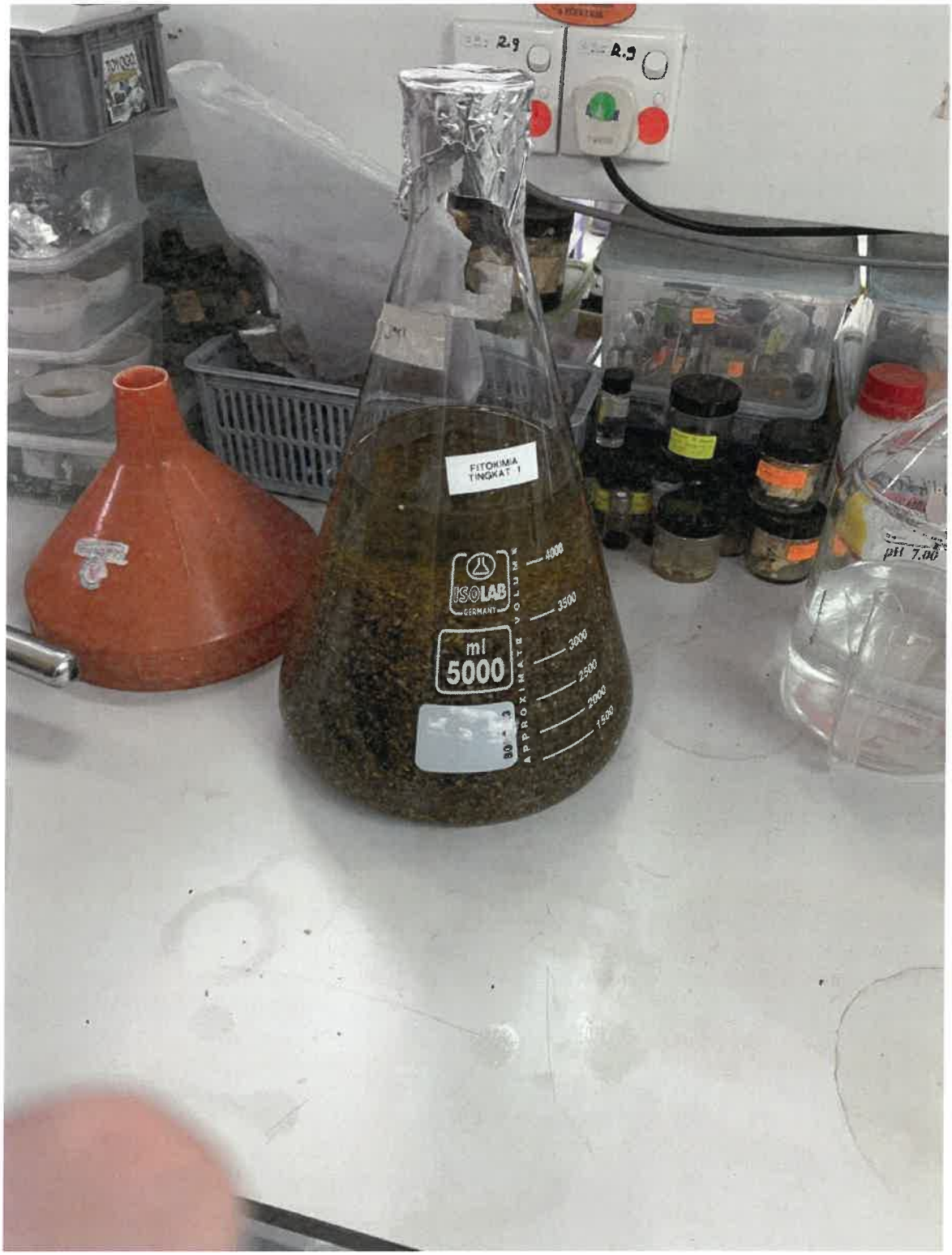


Figure 2: Extraction of Herbal Using Ethanol as Solvent

Figure 3: Separation of Dry Melada Pahit Sample from Glass Bead

Figure 4: Help to Separate Basil Leaves From the Stalk

Figure 5: Moisture Analysis

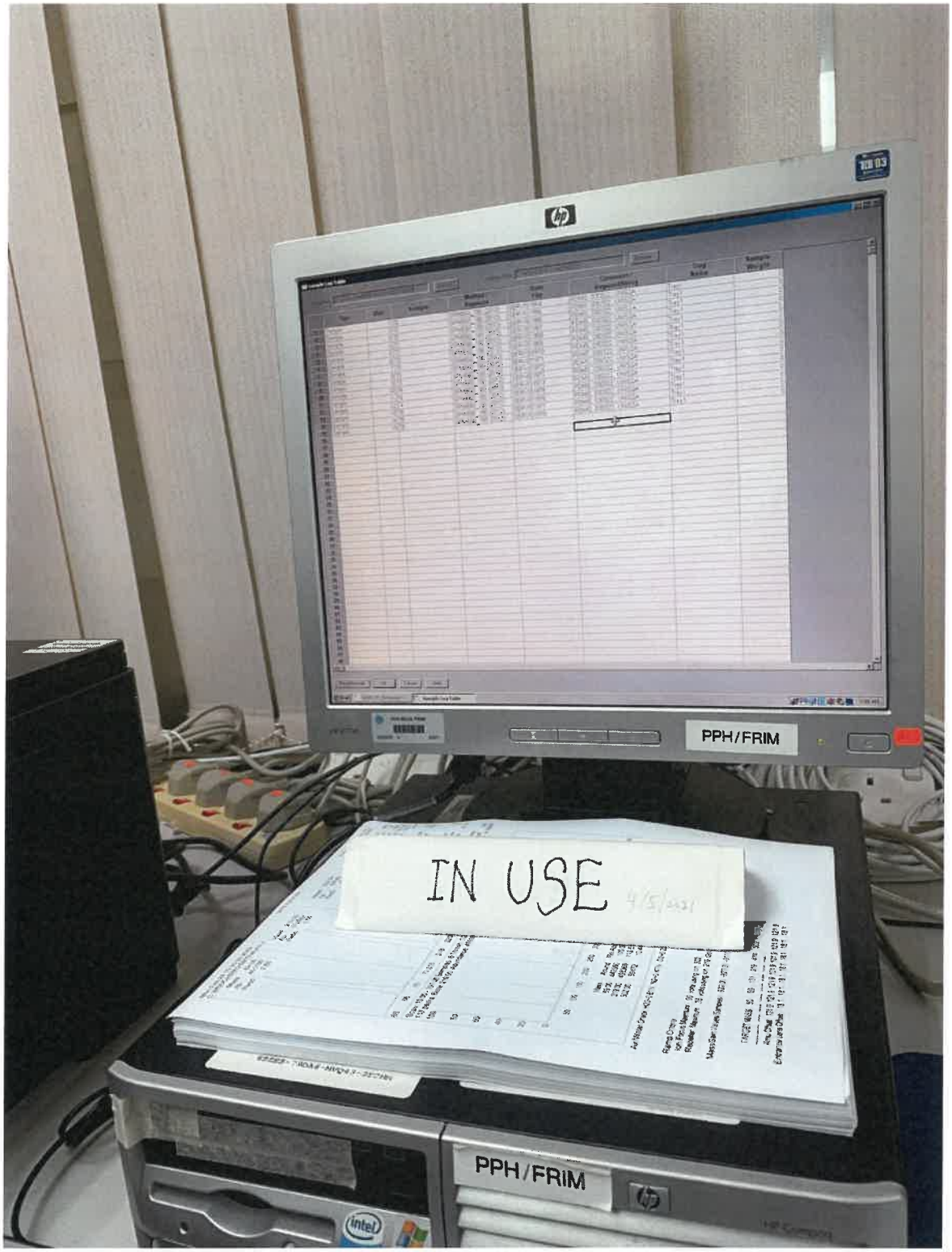


Figure 6: GCMS Analysis

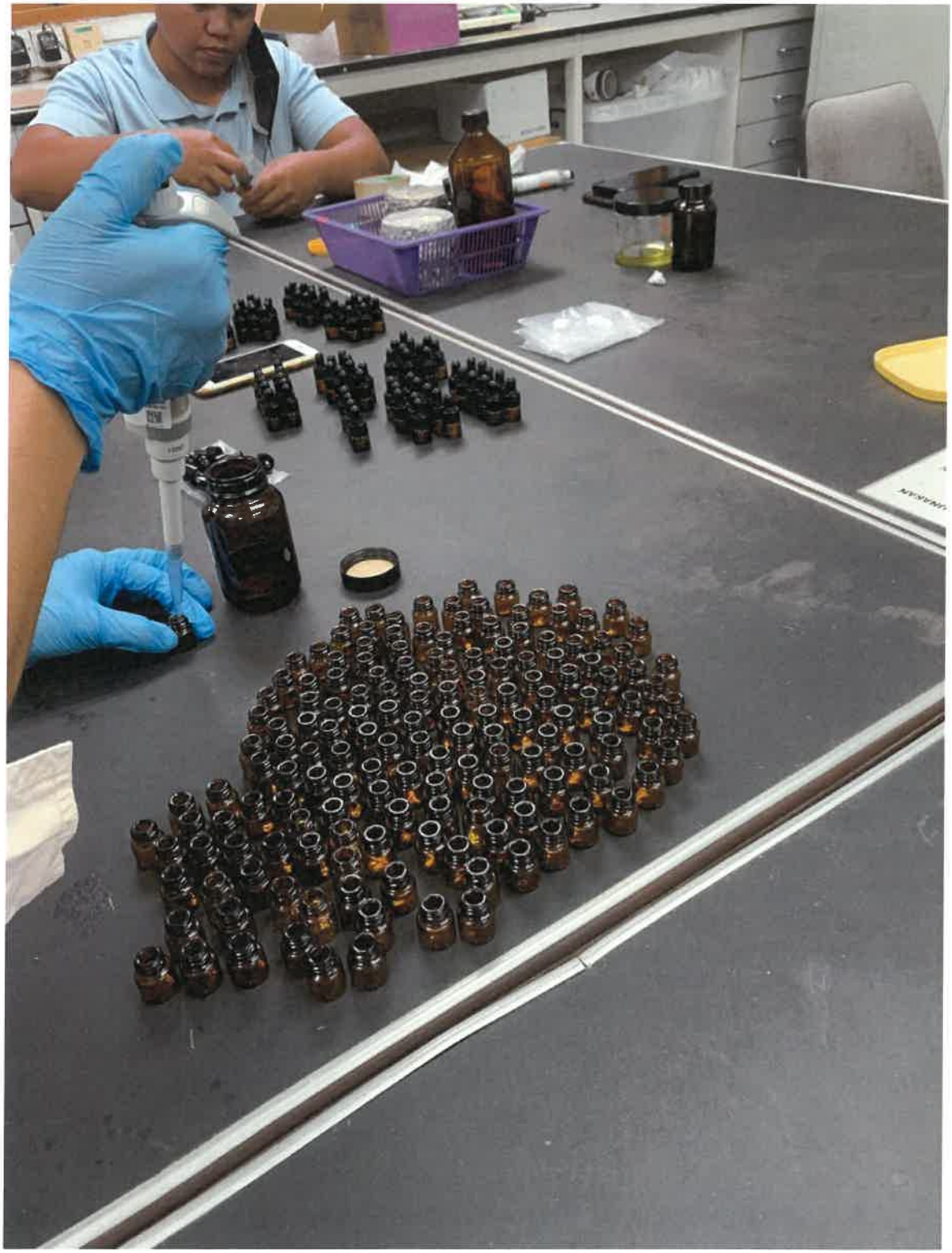


Figure 7: Cucur Atap Essential Oils Packaging

Figure 8: Soap Production Packaging