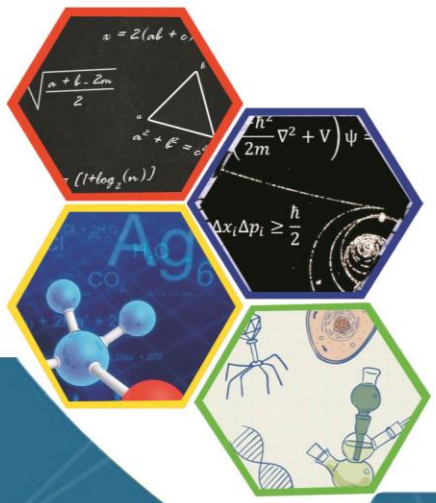
PROCEEDING

The 2nd International Seminar of Basic Science

Natural Science For Exploration The Sea-Island Resources

Ambon, May 31st 2016



Organized by

Faculty of Mathematics and Natural Science

Pattimura University

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The 2nd International Seminar of Basic Science

"Natural Science for Exploration The Sea-Island Resources"

Poka-Ambon, 31st May 2016

Mathematic and Natural Science Faculty
Universitas Pattimura
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Mathematic and Natural Science Faculty
Universitas Pattimura
Ir. M. Putuhena St.
Kampus Poka-Ambon
Pos Code 97233
Email:fmipa_unpatti@gmail.com

2nd edition

Welcoming Address By The Organizing Committee

Today, We have to thank the The Almighty Allah SWT for the implementation of this international seminar. This is the second seminar about Basic Science in The Faculty of MIPA Pattimura University. The seminar under the title “Natural Sciences for Exploration the Sea-Island Resources” will be carried out on May 31st 2016 at Rectorate Building, Pattimura University. There are 200 participants from lecturers, research institute, students, and also there are 34 papers will be presented.

My special thanks refer to the rector of Pattimura University and the Dean of MIPA Faculty, Prof. Dr. Pieter Kakissina, S.Pd., M.Si. I also would like to express my deepest gratitude to Prof. Amanda Reichelt-Brushett, M.Sc., Ph.D. ; Kazuhiko Ishikawa, Ph.D. ; Nicolas Hubert, Ph.D. ; Prof. Dr. Kirbani Sri Brotopuspito ; Prof. Dr. Marjono, M.Phil. ; Gino V. Limon, M.Sc., Ph.D. as the keynote speakers.

The last, We hope this international seminar usefull for all of us, especially Mollucas People and very sorry if any mistake. Thank you very much.

Dr. La Eddy, M.Si.
Chairman of Organizing Committee

Opening Remarks
By Dean of Mathematic and Natural Sciences Faculty

I express my deepest gratitude to The Almighty God for every single blessing He provides us especially in the process of holding the seminar until publishing the proceeding of International Seminar in celebrating the 18th anniversary of MIPA Faculty, Pattimura University. The theme of the anniversary is under the title "Natural Sciences for Exploration the Sea-Island Resources". The reason of choosing this theme is that Maluku is one of five areas in Techno Park Marine in Indonesia. Furthermore, it is expected that this development can be means where the process of innovation, it is the conversion of science and technology into economic value can be worthwhile for public welfare especially coastal communities.

Having the second big variety of biological resources in the world, Indonesia is rich of its marine flora and fauna. These potential resources can be treated as high value products that demand by international market. Basic science of MIPA plays important role in developing the management of sustainable marine biological resources.

The scientific articles in this proceeding are the results of research and they are analyzed scientifically. It is expected that this proceeding can be valuable information in terms of developing science and technology for public welfare, especially people in Maluku.

My special thanks refer to all researchers and reviewers for your brilliant ideas in completing and publishing this proceeding. I also would like to express my gratefulness to the dies committee-anniversary of MIPA Faculty for your creativity and hard working in finishing this proceeding, God Bless you all.

Prof. Dr. Pieter Kakisina, S.Pd., M.Si.
Dean of Mathematic and Natural Sciences Faculty

ACKNOWLEDGMENT

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"The 2nd International Seminar of Basic Science 2016"

Hotel Mutiara Ambon

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PROCEEDINGS
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May, 31st 2016

FTIR SPECTRUM INTERPRETATION OF VEGETABLE THAT CONTAINS PESTICIDE

Diana Julaidy Patty[1,2]*, Grace Loupatty[1,2], and Lorenzya Mairuhu[2]

[1]Solid State Physics Laboratory, Physics Department, Faculty of Mathematics and Natural Sciences
[2]Physics Department, Faculty of Mathematics and Natural Sciences
Universitas Pattimura, Ambon, Moluccas, Indonesia
*Email: dianapatty.dp@gmail.com

ABSTRACT

Analysis of content pesticide from vegetables sample. For content pescticide analysis, by the method of Fourier Transform Infrared Spectroscopy (FTIR). Spectroscopy analysis from FTIR result to show specific absorption band. For pesticide absorption analysis, the begin by analysis that pesticide absorption spectrum is alone by use with KBr's powder mixture. The wavenumber peak in 1585 cm^{-1}, with C=C gruop function and aromatic compound. Absorption spectrum result pesticide from 8 vegetables sample, absorption band position in wavenumber 1645 cm^{-1} with highes absorption 1,90 that is string bean vegetables sample in the market. Detected of C=C group function with alkene and aromatic compound. Aborption of frequency as $0{,}5\times10^{14}$Hz and energy as $3{,}32\times10^{-20}$ Joule.

Keywords *: FTIR, pesticide, vegetables, spectrum, group function*

INTRODUCTION

The health of the human body is something that is very important because with a healthy body we can perform all activities to meet the needs of everyday life. The five components of four of five perfectly healthy, availability of vegetables is a very important thing. We all know that the vegetables contained a wide variety of substances needed by the body, such as iron, potassium, phosphorus, calcium. In vegetables we also find a wide variety of vitamins are very important for the body.

Quality vegetables depends on several factors that when combined will determine the admissibility of these vegetables. The nature of the vegetables that will be consumed can be categorized in two categories of properties are readily observed and properties that are less easily observed. Properties are readily observed include appearance, color, texture and kink. While the properties are less easily observed that the aroma and nutritional value. Both of these properties is already so ingrained in consumers themselves. Most consumers tend to choose vegetables that look perfect in terms of the physical. But sometimes consumers do not take into account in terms of pesticide residue content contained in these plants. If all the vegetables consumed carry pesticide residues will gradually accumulate in the body and will eventually cause various types of diseases.

FTIR spectroscopy is an analytical technique Yag based on the absorption of infrared light by molekuk compound. IR wavelengths relatively short, so it is only capable of causing the molecule to vibrate. Infrared spectroscopy technique used to determine the functional

groups of a compound as well as to detect and determine the purity of the compound and study the ongoing reaction. Commonly used infrared spectroscopy to mengidektifikasi functional groups on a compound mainly of organic compounds. Each absorption at certain wavelengths describe the presence of a specific functional group.

Pesticides (sida, cide = poison) until now is still the primary tool used in pest control. Not used loss, loss of use as well, because essentially no pesticides are actually "target specific". The types of modern insecticide developed from the venom result of natural and synthetic pyrethroids are now as popular as they are highly toxic to all species of fish, so its use will greatly affect the food chain. Moreover, if pyrethroids have persistent properties as well as chlorine hydrocarbons (HC) or organochlorines (eg DDT, chlordane, dieldrin).

Pesticide residues in plants can be derived from the results of the spraying on crops. Insecticide residues found in all body plants such as stems, leaves, fruits, and roots. Lodging in fruits, these residues are on the surface and the flesh of the fruit. Although it has been washed or cooked pesticide residues are still present in foodstuffs. FTIR consists of five major parts:

1. The light source, which is made of filament Nerst or Globar heated using electricity up to a temperature of 1000-1800 °C.
2. Beam Splitter, in the form of a transparent material with a relative index, resulting in 50% of the radiation will be reflected and 59% of the radiation will be forwarded.
3. Interferometer, a major part of the FTIR which serves to form the interferogram which will be forwarded to the detector.
4. Regional trailer, where the reference beam and the trailer into the trailer area and each penetrate cells and the snippet corresponding acaun.
5. The detector, a device that measures the energy radiating through due paas generated. The detector is often used thermocouples.

Overall, the analysis using FTIR spectrophotometer has two major advantages over other conventional methods, namely (Giwangkara, 2007):

1. Can be used on all frequencies of light sources simultaneously so that the analysis can be performed more quickly than using a sequential manner or scanning.
2. The sensitivity of the method of FTIR spectrophotometry outweigh by dispersion, because the incoming radiation into the detector system more because without having to go through a gap (slitless).

The use of infrared spectra to determine the structure of organic compounds is usually between 650-4000 cm^{-1} (from 15.4 to 2.5 μm) which is in the mid-infrared region which is a fundamental area.

MATERIALS AND METHODS

Qualitative Analysis

It is generally useful to classify the whole area into three to four broad areas. One way is to categorize some areas near IR (0.7 to 2.5 μ); fundamental area (2.5 to 5.0 μ); and IR remote areas (50-500 μ). The other way is to classify them as the fingerprint region (6.7 to 14 μ). From both of these classifications seem that in the second category all regions is fundamental, and the most widely used (Sastrohamidjojo, 1991).

Hydrogen stretching regions (3700-2700 cm-1). Peak occurs due to stretching vibration of hydrogen atoms with other atoms. The frequency is much greater so that the interaction can be ignored. Absorption peaks occur in the region 3700-3100 cm-1Therefore stretching vibration of O-H or N-H.

a) In the area of triple bonds (2700-1850 cm^{-1}), the groups absorb limited, such as for the double bond stretching vibration occurs in the area from 2250 to 2225 cm^{-1} (eg for -C = N at 2120 cm^{-1}, -C- = N- at 2260 cm^{-1}). The highlight for SH is at 2600-2550 cm^{-1} for pH at 2240-2350 cm^{-1} and SiH at 2260 to 2090 cm^{-1}.
b) In the area of the double bond (1950 - 1550 cm^{-1}), stretching vibration of carbonyl groups can be characterized here, such as aldehydes, aminola acid, carbonic, all have peaks at 1700 cm^{-1}. Esters, acid halides, acid anhydride anhidida, absorbs at 1770-1725 cm^{-1}.

Regional fingerprints are at 1500-1700 cm^{-1}, which is a little different in structure and molecular structure, will lead to the distribution of absorption peak changed. In this area, to ensure an organic compound is by comparing with The comparison. Pita absorption caused by a variety of interactions, so it may not be able to interpret correctly.

RESULTS AND DISCUSSION

FTIR spectrum pesticides

FTIR spectrum analysis of pesticides from major peaks were identified namely 1350 cm-1, 1400 cm-1, 1550 cm-1, 1650 cm-1, 1700 cm-1, 3650 cm-1 and 3700 cm-1.

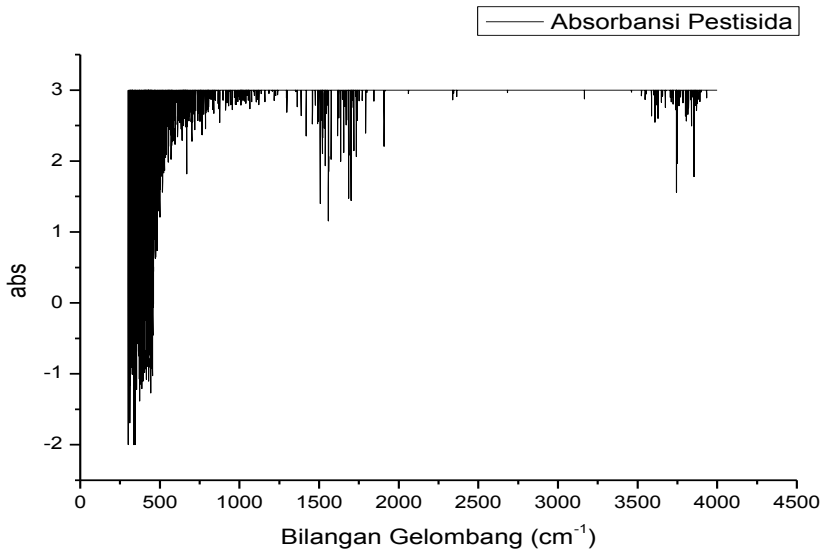
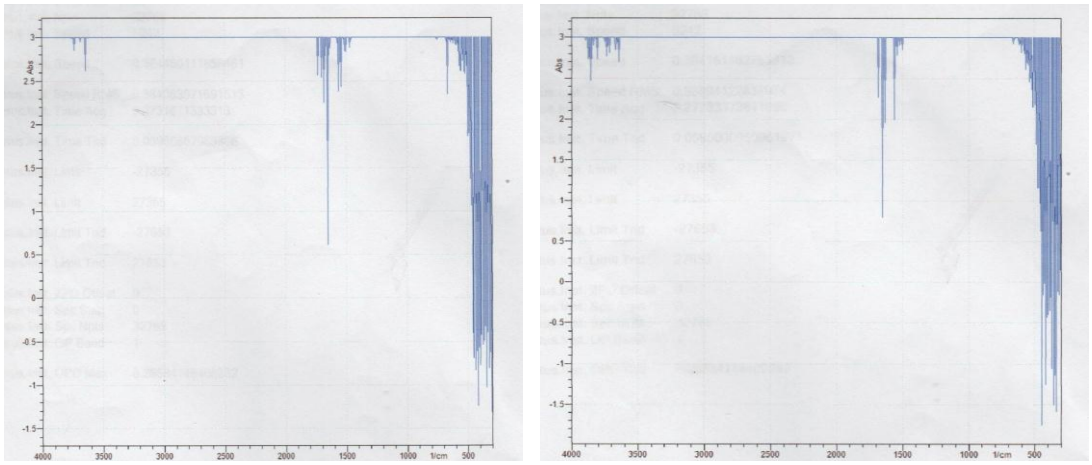


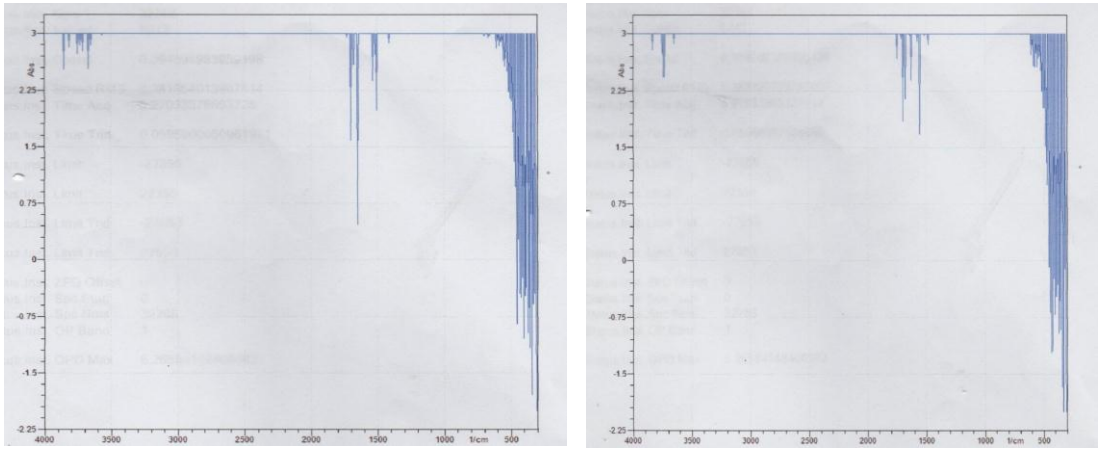
Figure 1. The spectrum of absorption of pesticides

Prominent peaks are shown at wave number 1585 cm-1 with uptake or absorption of 1.2. Identified functional groups which functional groups C = C, including the two double bonds with aromatic compounds. Vibrations that occur with the functional groups are stretching vibration (stretch).



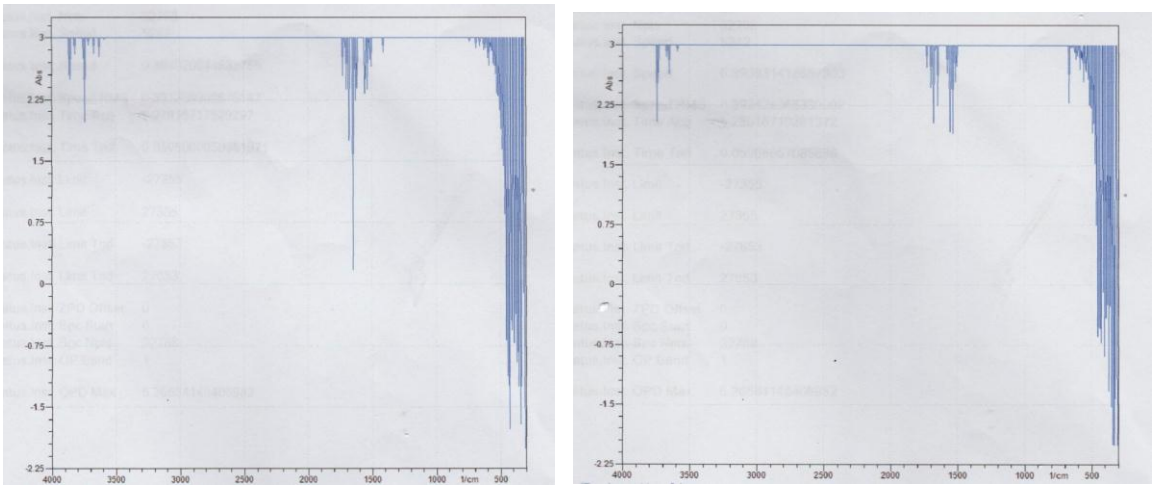
(a) (b)

Figure 2. Spectrum kale vegetable: (a) organic and (b) non-organic



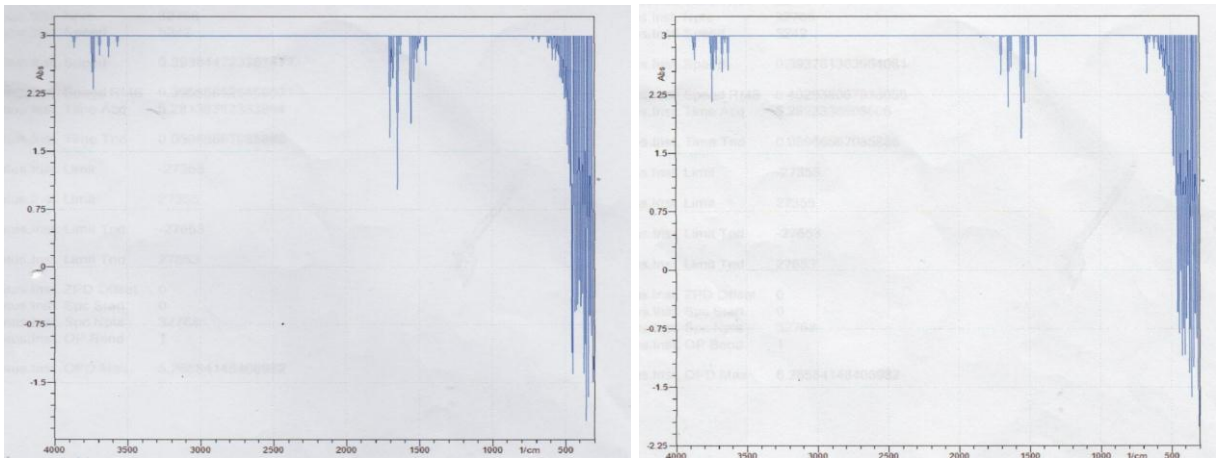
(a) (b)

Figure 3. The spectrum of spinach (a) organic and (b) non-organic



(a) (b)

Figure 4. The spectrum of long bean vegetable samples: (a) organic and (b) non-organic



(a) (b)

Figure 5. Spectrum cabbage (a) organic and (b) non-organic

FTIR spectra of the results on samples of vegetables can be tabulated as follows,

Table 1. Functional group some samples

Sampel	Organic		Non organic
	Wave Number (cm^{-1})	Functiona group	Wave Number (cm^{-1})
Pesticide	1400	C-H Bending	
	1700	C-O stretching	
	2300	C-C stretching	
	3250	C-H stretching	
	3700	O-H stretching	
kale	1650-1700	C-O stretching	1650-1700
	3600-3700	O-H stretching	3600-3700
spinach	1350	C-H Bending	1350
	1650-1700	C-O stretching	1650-1700
	3600-3700	O-H stretching	3600-3700
long bean	1400	C-H Bending	1400
	1650	C-O stretching	1650
	3600-3700	O-H stretching	3600-3700
Cabbage	1400-1550	C-H Bending	1500
	1650	C-O stretching	1700
	3600-3700	O-H stretching	3600

Based on the FTIR spectrum of samples of vegetables, identified containing pesticide absorption, at 1400 cm-1 [C-H Bending], 1700 cm-1 [C-O stretching], and 3600 cm-1 [O-H stretching]. On the spectrum of vegetable spinach, long beans and cauliflower are permeate having the same characteristics.

Once the spectrum is analyzed and we get the wave number range, using Hooke's law we can determine the position of the absorption bands of functional groups C = C by equation (6) (Appendix 2). The position of the calculated absorption band is 1645 cm-1. C = C functional groups absorb infrared radiation at a frequency of 0.5 × 1014 Hz. Because detected compounds that absorb energy from the infrared energy absorption accounted for 3.32 × 10-20Joule. Indicates that the absorption of infrared radiation in certain material relating to the phenomenon of bergetarnya molecules or atoms and molecules absorb energy resulting in a change vibratory energy to be excited into a higher level.

Functional group	**Wave number (cm^{-1})**	**Frekuensi *v* (Hz)**	**Energi *E* (*Joule*)**
C=C	1645	$0{,}5\times10^{14}$	$3{,}32\times10^{-20}$

It showed that all the samples absorb infrared radiation are in the mid-infrared region. The resulting energy absorption due to the small wavelength in the infrared only causes the molecules to vibrate and does not transition the electron.

CONCLUSION

Based on the research results, obtained by the wave number range between 1550 cm-1 to 1650 cm-1. Identified functional groups is the functional group C = C, with alkenes and aromatics. Computed absorption band is at 1650 cm-1. The highest uptake of pesticides in vegetable samples show by string beans in the market with uptake of 1.90. For the functional group C = C absorption frequency of the resulting magnitude is 0.5 × 104 Hz, and the energy absorption of 3.32 × 10-20 Joule. This shows that the spectrum of the resulting sample belonging to the mid-infrared region that is normally used to determine the structure of organic compounds.

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