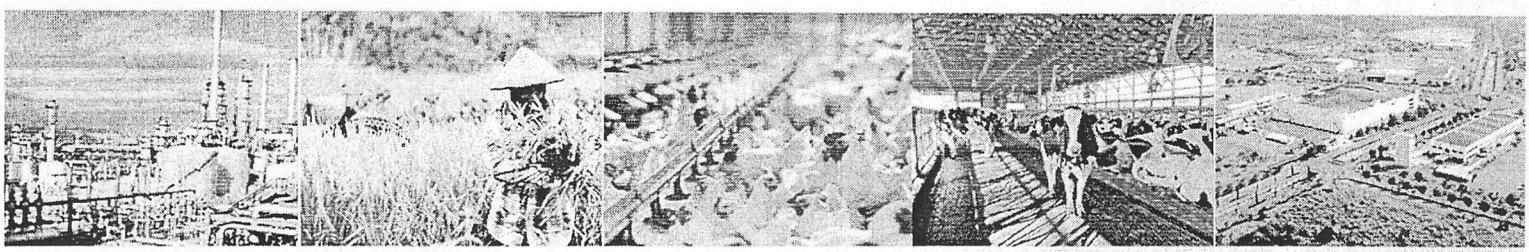
PROCEEDINGS

2015 3rd International Conference on Adaptive and Intelligent Agroindustry (ICAIA)

ICAIA 2015



August 3rd - 4th, 2015
IPB International Convention Center
Bogor, Indonesia

ISBN : 978-1-4673-7404-0
IEEE Catalog Number : CFP15C67-CDR

IEEE INDONESIA SECTION

IEEE
INDONESIA SECTION

Proceedings of

2015 3rd International Conference on Adaptive and Intelligent Agroindustry (ICAIA)

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Published by :

Department of Agroindustrial Technology

Bogor Agricultural University

Bogor, Indonesia

Welcome Message from The General Chairs of ICAIA 2015

On behalf of the organizing committee, it is our pleasure to welcome you to International Conference on Adaptive and Intelligent Agroindustry, Bogor, Indonesia. This is the 3rd conference on the topic that is held by the Department of Agroindustrial Technology, Bogor Agricultural University, Indonesia.

The conference is expected to provide excellent opportunity to meet experts, to exchange information, and to strengthen the collaboration among researchers, engineers, and scholars from academia, government, and industry. In addition, the conference committee invited five renowned keynote speakers, i.e. Prof Irawadi from Bogor Agricultural University; Prof Kenneth De Jong from George Mason University, USA; Dr Yandra Arkeman from Bogor Agricultural University; and Dr Guillermo Baigorria from University of Nebraska-Lincoln, USA.

The conference committee also invited Prof Noel Lindsay from University of Adelaide, Australia; Kiyotada Hayashi from National Agricultural Research Center-Tsukuba, Japan; Prof Margareth Gfrerer from Islamic State University of Jakarta, Indonesia; Dr Barry Elsey from University of Adelaide, Australia; Dr Gajendran Kandasamy from Melbourne University, Autralia; and Imperial College London-British, Prof Allan O'Connor from University of Adelaide, Australia; Dr Wisnu Ananta Kusuma from Bogor Agricultural University ,Indonesia; and Dr Frank Neumann from University of Adelaide, Australia, as invited speakers.

This conference was organized by Department of Agroindustrial Technology, Bogor Agricultural University and Asosiasi Agroindustri Indonesia, and technically sponsored by IEEE Indonesia Section. Furthermore, it was supported by Departement of Computer Science, Bogor Agricultural University; Surfactant amd Bionegergy Research Center; PT Bogor Life Science and Technology; Indonesian Ministry of Industry; PT Pachira Distrinusa; and PT Kelola Mina Laut.

I would like to take this opportunity to express my deep appreciation to the conference's committee members for their hard work and contribution throughout this conference. I would like to thank authors, reviewers, speakers, and session chairs for their support to participate in the Conference. Lastly, I would like to welcome you to join ICAIA 2015 and wish you all an enjoyable stay in Bogor.

Sincerely,
Dr Yandra Arkeman
General Chairs, ICAIA 2015

WELCOMING ADDRESS

Prof. Dr. Ir. Nastiti Siswi Indrasti
Head of Agroindustrial Technology Department
Faculty of Agricultural Engineering and Technology
Bogor Agricultural University

on

3rdInternational Conference on Adaptive and Intelligence Agroindustry (3rd ICAIA)

Bogor, August, 3 – 4, 2015

Assalamu'alaikum Warohmatullahi Wabarokatuh
In the name of Allah, the beneficent and the merciful,

Distinguish Guest, Ladies and Gentlemen
Let me first thank you all for accepting the invitation to participate in this 3rd International Conference on Adaptive and Intelligence Agroindustry (ICAIA). In particular I would like to thank Rector of IPB (Institut Pertanian Bogor/Bogor Agricultural University) Prof. Herry Suhardiyanto for supporting this event as part of the series academic event in celebrating the 52nd Anniversary of Bogor Agricultural University.

We are certainly proud to have been able to assemble this event in IPB, Bogor. The range of participants and audience at this conference is precisely something I would like to stress. Participants who followed the event more than 150 people, coming from various countries including the USA, Australia, Japan, Vietnam, Philippine, Germany and Indonesia. The main goal of the conference is to provide an effective forum for distinguished speakers, academicians, professional and practitioners coming from universities, research institutions, government agencies and industries to share or exchange their ideas, experience and recent progress in Adaptive and Intelligent Agroindustry.

The 2015 3rd International Conference on Adaptive and Intelligent Agro-industry (ICAIA) is the third forum for the presentation of new advances and research results on various topics in all aspects of innovative agro-industry that highlights the development and improvement for today and tomorrow's global need for food, energy, water and medicine. The aim of the conference is to stimulate interaction and cohesiveness among researchers in the vast areas of innovative agro-industry. Innovative Agro-industry has the ability to adapt intelligently to future global challenges, i.e. food, energy, water, and medical. Global challenges needs a new breed of Agroindustry which could produce innovative products to fulfill the needs through advanced processing technology, production systems and business strategy supported by cutting-edge information and communication technology.

The topic for this event is "Empowering Innovative Agroindustry for Natural Resources, Bioenergy and Food Sovereignty". The topics clustered into four main parts:
Track 1 : Innovative Agroindustrial and Business System Engineering

Track 2 : Frontier Approaches in Process and Bioprocess Engineering
Track 3 : Frontier Approaches in Industrial Environmental Engineering
Track 4 : Intelligent Information and Communication Technology for Adaptive Agroindustry of the Future

This event also hosts four (4) workshops: (1) Strategies for Agroindustry Development (2) LCA for Agroindustry (3) Innovation and Technopreneurship for Agroindustry and (4) Agroindustry Informatics.

Distinguish Guest, Ladies and Gentlement,
Agroindustry transforms agricultural commodities into high value-added products. Agroindustry is industry that process agricultural products to increase their value added significantly by using technology and by considering environmental aspect and sustainability. However, with changing global demand and technology advancement, innovative agroindustry is needed in order to be competitive as well as sustainable. The challenge of future agroindustry is not merely efficiency and productivity anymore, but also the challenge to appropriately apply frontier technology as well as meeting future global demands.

Agroindustry needs to deal with the application of advance technologies and cope future global issues. Current global issues which arise and expected to exist in the future are food sovereignty, renewable energy, sustainable water management and pharmacy. The ability of agro-industry to respond the future global issues and the undoubtedly substantial increase in demand in future decades will be highly dependent on the increased application of existing technologies as well as the exploitation of new and innovative technologies.

The emergence of high technology could be applied in the agro-industry are: nanotechnology, biotechnology, bioinformatics, food processing, food packaging-waste, state-of-the-art computation and many others. The aforementioned high-technology along with computation technology could greatly advance agro-industry from a traditional system into a smart-intelligent and innovative technology. Therefore, in the new millennia, adaptive-intelligent and innovative agro-industry will contribute to solutions to global problems and brings agriculture into perfection.

Hope this conference will also discuss this issue in more detail as it is an important matter for all of us. We should no more think just how to produce high value product but it is also necessarily important how to keep our live in good quality by understanding following old saying... "You do not live at once. You only die once and live every day".

I do not to take up any more of your time with these opening remarks. Let me simply thank you once again for sharing your thoughts with us. Here's wishing every success for the conference. May Allah bless all of us.

Thank you for your kind attention,
Wassalamu'alaikum Warohmatullahi Wabarokatuh

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AGENDA

Time	Activities
Monday, August 3rd 2015	
08.00 - 09.00	Registration
09.00 - 10.00	Opening Ceremony • Welcoming Address: Prof. Nastiti Siswi Indrasti (Head of DAT, Fateta, IPB) • Welcoming Speech Head of Bogor Regency • Conference Opening: Prof. Herry Suhardiyanto (Rector of IPB) • Opening Speech and Conference Opening : Minister of Industry Indonesia * • Launching Expose International program DAT
10.00 – 10.05	*Photo Session*
10.05 - 10.15	*Coffee break*
10.15 - 10.45 10. 45 - 11.30 11.30 – 12.00 12.00 – 12.30	Keynote Speech : 1. Prof Irawadi (Bogor Agricultural University, Indonesia) 2. Prof. Kenneth De Jong (George Mason University, USA) 3. Dr. Yandra Arkeman (Bogor Agricultural University, Indonesia) 4. Dr. Guillermo Baigorria (University of Nebraska, Lincoln, USA)
12.30 – 13.30	Lunch break
13.30 – 13.50 13.50 – 14.10 14.10 – 14.30 14.30 – 14.50 14.50 – 15.10 15.10 – 15.45	Plenary Session 1 : Prof. Noel Lindsay (University of Adelaide, Australia) Dr. Kiyotada Hayashi (National Agricultural Research Center, Tsukuba, Japan) Prof. Margareth Gfrerer (Islamic State University of Jakarta, Indonesia) Dr. Barry Elsey (University of Adelaide, Australia) Ir. M. Novi Saputra (Marketing Director KML Food Group) *Discussion*
15.30 – 15.45	*Coffee break*
15.45 – 18.00	Parallel session A, B and C
18.00 – 21.00	Welcome Dinner

Time	Activities
Tuesday, August 4rd 2015	
08.30 – 09.00	Registration
09.00 – 09.20	Plenary Session 2 : Dr. Gajendran Kandasamy (PhD in Physic, Melbourne University ; PhD in Innovation Imperial Collage, London)
09.20 – 09.40	Prof. Allan O'Connor (University of Adelaide, Australia)
09.40 – 10.00	Dr. Eng. Wisnu Ananta Kusuma, ST, MT (Bogor Agricultural University, Indonesia)
10.00 – 10.20	Dr. Frank Neumann (University of Adelaide, Australia)
10.20 – 10.45	*Discussion*
10.45 – 13.00	Parallel Session A, B and C
13.00 – 14.00	Lunch break
14.00 – 15.30	Parallel Workshop • Strategies for Agroindustry Development • LCA for Agroindustry • Innovation and Technopreneurship for Agroindustry • Agroindustrial Informatics
15.30 – 15.45	Coffee Break
15.45 – 16.15	Closing remark

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Identification of Media and Indicator Liquid as A Recorder Smart Label

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Abstract

In this research, identification of liquid as color indicator and media i.e. paper as diffusion media, has been studied. This study used several types of paper as diffusion media (buffalo paper, HVS 80 gr, photo paper, concord, drawing paper and cardboard duplex). It also used high viscosity liquid (cooking oil, oil A and oil B) as the indicator liquid. The research was begun by paper and liquid characterizations including gramature, density, mass density and viscosity. Indicator liquid as much as 20 mL was poured into chamber and the edge of paper was immersed into the liquid. The chambers were stored at 50°C for cooking oil, while 30.15°C and 5°C for other oil. Length of liquid diffused in the paper was measured in cm. Measurement was done at at 24, 48, 72 and 96 h. A graphic of paper length (L) vs time (t) was plotted and diffuse rate constant (k) as well as activation energy (Ea) was determined. Best media of indicator liquid and paper was selected based on their high value of Ea. Result showed that cooking oil, oil A and oil B showed slow diffusion rate. These materials were able to detect up to 4 days of shelf life of such product during storage. Based on activation energy, the most suitable indicator for recorder smart label was oil A. The best materials for this label development sequentially from low-to-high activation energy were buffalo paper, cardboard, drawing paper, concord, HVS 80 g and photo paper.

Keyword: liquid indicator, diffusion, shelf life recorder

1. Introduction

Shelf life is an important for determining the quality and safety of food product. Generally, refrigerator is an alternative storage in effort to extending product shelf life. People store either fresh or processed food in refrigerator without tagging the record of its shelf life. Therefore, when the product is again consumed, there do not know how long the food have been already stored into the refrigerator. A smart label of Time Indicators (TI) can be attached into food packed and it will record the product shelf life based on its storage time.

Shelf life is the period between when the product begins to be packed with quality products that are still eligible to be consumed. Information about the shelf life of the product is very important to be included as closely linked to the quality and safety of food products. A recorder smart label is a label tagging that can record the shelf life of the product and inform it to consumer. The principles is such colored liquid as ink diffuse into the paper as media along the period of storage.

This research identified medium and correspond indicators for label producing. Paper and cardboard was chosen as the material for the impregnation medium. Diffusion rate is influenced by the viscosity, where the higher the viscosity of the fluid thus it will result on higher flow rate [1]. Basically the label will be applied to the recording of the shelf life of the products stored in the refrigerator, so that the liquid will be selected based on the lowest possible power absorbing to facilitate application of labels.

Recorder smart labels will be produced using the principle of diffusion of liquid, wherein the liquid indicator will be allowed to diffuse in the paper during the period of storage by utilizing long-impregnation as registrar duration of product storage in a refrigerator at days 1, 2, 3, 4 and so on. The label will record the time of storage products based on the power of liquid permeation (diffusion). The longer the storage process, the longer it will also impregnating liquid on the media. Therefore, it is necessary to further study related types of indicator liquid and

ISBN : 978-1-4673-7404-0

the medium used as impregnation medium in order to produce smart labels that can record the shelf life of the product.

2. Theory

Sorption of ink/liquid indicator in such media (paper) is controlled by the rate of expansion and follows a first-order kinetic equation [2,3]:

$$-\partial L/\partial t = k(L_t - L_0) \quad (1)$$

where L is the length of the media; k is a first-order rate constant; L_t and L_0 represent the length of paper at time of equilibrium, t and time 0 respectively.

Integration of equation (1) with the boundary condition $L_0 = 0$ at $t = 0$ results in:

$$kt = \ln [L_t/(L_t - L_0)] \quad (2)$$

Thus the rate constant, k, is estimated from the slope of a plot of $\ln (L_t - L_0)$ versus time, t.

The rate constant is strongly temperature dependant. In most cases, the relationship between the logarithm of the rate constant and the reciprocal of the absolute temperature over a certain range of temperatures is linear and is quantitatively described by the Arrhenius equation [2,3]:

$$k = A \times e^{-Ea/RT} \quad (3)$$

where A is the frequency factor; E_a is the activation energy; R is the ideal gas constant and T is the absolute temperature. Thus, the activation energy, E_a, and the frequency factor, A, can be estimated from the slope and intercept of a plot of ln k versus 1/T respectively (equation 4).

$$\ln k = -E_a/RT + \ln A \quad (4)$$

3. Material and Method

3.1. Material

The material used in this study were five types of paper and one type of cardboard i.e buffalo, HVS 80 g, photo paper, concord, and drawing paper.a s medium of sorption. It is also use high viscosity liquid of as indicator i.e. cooking oil, oil A and oil B. The equipments were scissors, pen, ruler, fridge, jar, measuring cup, thickness gauge, tube Ostwald, pycnometer, water bath, analytical balance, spatula, incubators, room thermometer and pipette.

3.2. Method

3.2.1. Media and liquid characterization

The media of sorption of paper and the liquid were measured of its characteristic including gramature and mass density (for paper) as well as density and viscosity for liquid.

3.2.2. Sorption of liquid into media

Paper or cardboard was cut in a rectangle with a size of 20 cm × 1.5 cm, then dipped into a jar containing liquid dye which has been given previously. Paper was marked at the edges for easy measurement of observation at hours-0. Furthermore, the sample was stored at room temperature for 96 hours to conduct a long recording of liquid sorption at hour of 24, 48, 72 and 96. The length of sorption liquid in the paper L were recorded.

The experiment were done in three different of temperature i.e room temperature, 5°C at refrigerator and 50°C at incubation. The rate constant and activation energy and then were obtained as equation (2) and (3).

3.3. Results and Discussion

3.3.1. Media and liquid characterization

(i) Gramature

Gramature is the mass of a sheet of paper divided by the unit area of paper in square meters, measured under standard conditions [4]. This value of each paper or cardboard that was used in this research can be seen in Figure 1. It can be seen that the value of paper gramature of buffalo,

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HVS 80 g, photos paper, concord, drawings paper and cardboard were 152 222 g / m2, 85.556 g / m2, 235.556 g / m2, 231.111 g/m2, 151.111 g/m2, and 1055.556 g/m2 respectively.

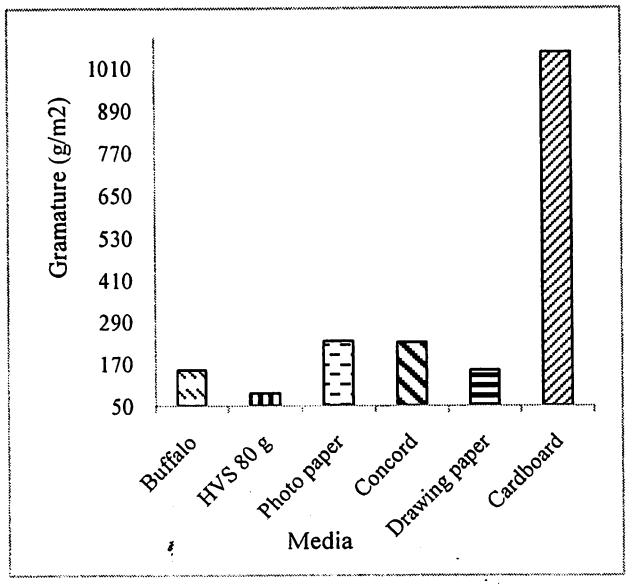

Figure 1. Gramature of paper

(ii) Mass density

Mass density is the mass of the paper sheet in kilograms divided by the unit volume in cubic meters or it is calculated from the value of gramature divided the thickness of paper, measured under standard conditions [4]. Based on the calculation of this value, the result was displayed in Figure 2.

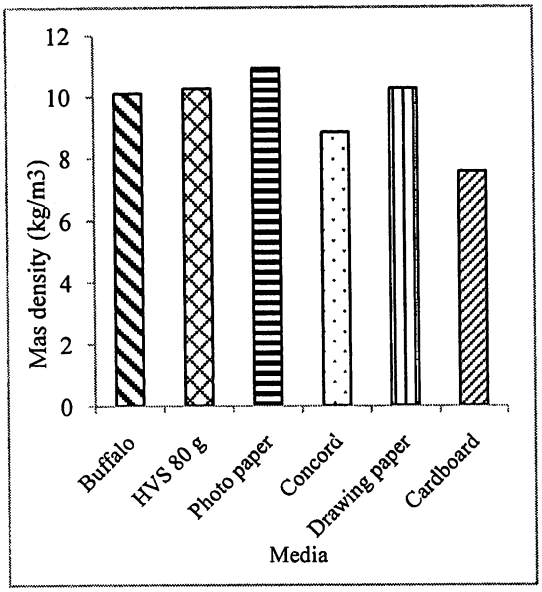

Figure 2. Mass density of paper

(iii) Density

Density is the result of mass per unit of volume of substance. Density changes due to temperature change. This value of density of the liquid tended to decreasing as a result of temperature rising (Figure 3). At a temperature of 25°C for cooking oil, oil A and oil B had the density of 0.910 g/mL, 0818 g/mL and 0804 g/mL. At a temperature of 40°C density values of cooking oil, oil A and oil B were 0907 g/mL, 0817 g/mL and 0803 g/mL, while the value of the density at 50°C for cooking oil, oil A and oil B were 0906 g/mL, 0.810 g/mL, 0802 g / mL.

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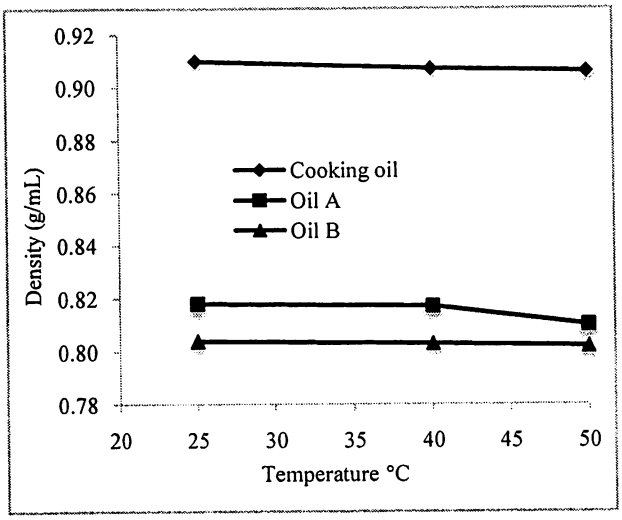

Figure 3. Density of liquid

(iv) Viscosity

Viscosity is a quantity expressing the magnitude of internal friction, as measured by the force per unit area resisting a flow in which parallel layers unit distance apart have unit speed relative to one another. The slower flow means the viscosity is high, and vice versa the faster flow means the lower the viscosity [5]. The oil viscosity used in this experiment was as follow (Table 1).

Tabel 1 The viscosity of solvent

Solvent	Viscosity at 40°C (cSt)
Cooking oil	23.365
Oil A	56.491
Oil B	51.835

3.3.2. Absorption rate constant and activation energy

Rate constant k and was obtained from the slope plot length impregnation paper versus time. Otherwise, the activation energy between each medium and the solvent can be known from the value of the plot slope of length impregnation performed at different temperature conditions. The temperature used for testing were room temperature (30.15°C) and refrigerator temperatures (5°C). The value of k and Ea is shown in Table 2.

Tabel 2 Rate rate contant and activation energy liquid in media of paper

Jenis Zat Cair	Jenis Kertas	Absorpsion constant k (cm/jam)			Activation energy Ea (J/mol)
		5°C	30.15°C	50°C	
Cooking oil	Buffalo		0.0573	0.0178	-132002.936
	HVS 80 g		0.1133	0.0161	-172106.323
	Photo paper		0.0840	0.0171	-147669.839
	Concord		0.1560	0.0164	-115929.788
	Drawing paperr		0.1079	0.0159	-182986.608
	Cardboard		0.1330	0.0167	-159795.352
Oil A	Buffalo	0.0250	0.0680		-1961.938
	HVS 80 g	0.0223	0.0730		1578.496
	Photo paper	0.0229	0.0517		1881.541
	Concord	0.0230	0.1035		1416.872
	Drawing paperr	0.0227	0.0579		1318.351
	Cardboard	0.0220	0.0766		1116.986
Oil B	Buffalo	0.0240	0.0678		-468.236
	HVS 80 g	0.0259	0.0783		-1776.536
	Photo paper	0.0255	0.0479		-1457.777
	Concord	0.0232	0.1098		1060.284
	Drawing paperr	0.0227	0.0566		1279.275
	Cardboard	0.0248	0.0788		-913.542

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Cooking oil in all types of medium showed a negative slope value, however, oil A, slope on the graph broadly positive value except on paper buffalo, while the indicator of oil B, value of its slope varies.

4. Conclusion

Paper gramature in order from the lowest to the highest was HVS 80g, buffalo, drawing paper, concord, photo paper and cardboard. While the mass density was cardboard, concord, buffalo, drawing paper, HVS 80 g and photos paper. Temperature was greatly affects the absorbing of liquid into the medium. Low temperature caused low absorption. Based on the value of activation energy, the most suitable type of indicator, namely oil A with the highest activation energy values than other solvent.. Cooking oil and oil B has a negative activation energy

5. Acknowledgment

The authors would like to say great gratitude to the Directorate General for Higher Education for the funding of this research.

6. References

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