

DR. KURNIA HD



LAMPIRAN B19

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# International Seminar on Food & Agricultural Sciences

17 February 2010 Bukittinggi, Indonesia

*"Improving the quality of life  
through food and agricultural sciences"*

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# PROCEEDING

## INTERNATIONAL SEMINAR ON FOOD AND AGRICULTURAL SCIENCES-ISFAS2010

16-17 FEBRUARY 2010

HILL HOTEL AND CONVENTION, BUKITTINGGI-INDONESIA

### Improving the quality of life through food and agricultural sciences

***Jointly organized by:***

Faculty of Agricultural Technology,  
Universitas Andalas, Padang-Indonesia.

and

School of Chemical Sciences and Food Technology  
Faculty of Science and Technology,  
Universiti Kebangsaan Malaysia.

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## Content

v	Preface	31
vi	Welcoming address by Chairman	
vii	Kata Pembuka dari Dekan Fakultas Teknologi Pertanian	32
vii	Kata-kata Aluan Pengerusi Pusat Pengajian Sains Kimia & Teknologi Makanan, Fakulti Sains Teknologi-UKM	33
ix	Kata-kata aluan Dekan FST-Universiti Kebangsaan Malaysia	
x	Kata-kata Aluan NAIB CANSELOR Universiti Kebangsaan Malaysia	36
xi	Opening Remarks by the Rector of the Universitas of Andalas	

### Content

#### Plenary

Page	Name	TITLE	
1	Aminah Abdullah	CURRENT RESEARCH ACTIVITIES IN FOOD SCIENCE AND NUTRITION AT UNIVERSITI KEBANGSAAN MALAYSIA	47
3	Anwar Kasim.	REORIENTATION OF RESEARCH AND UTILIZATION OF GAMBIER (UNCARIA GAMBIER ROXB.)	51
9	Musa Ahmad	CHEMICAL SENSORS AND BIOSENSORS FOR FOOD QUALITY MONITORING	
10	Mamot Bin Said	PROTEINS AS FUNCTIONAL INGREDIENTS IN FOODS AND COSMETICS	56
15	Santosa	DASAR - DASAR SIMULASI SISTEM BIO-SCIENCE	57
<b>Sustainable agriculture</b>			
18	Azri Kusuma Dewi, and Mugiono	GRAIN QUALITY IMPROVEMENT ON CISANTANA RICE VARIETY THROUGH INDUCE MUTATION TECHNIQUE	62
21	Yuliasti and Harry Is Mulyana	PROTEIN CONTENT IN HIGH PROTEIN SOYBEAN MUTANTS IN INDONESIA	
25	Rusnam, , M.S.M. Amin, T.S. Lee, Azmi Idris, N.Abdullah Al Mamun.	RUNOFF QUALITY INDEX (RQI) FOR AGRICULTURAL AREA UNDER TROPICAL CONDITION.	66
28	Hermansah , Wulansari, and Toshiyuki Wakatsuki	NUTRIENT MANAGEMENT BY FARMERS TOWARD CHARACTERISTICS OF SOIL AND RICE PRODUCTION IN WEST SUMATRA, INDONESIA	70
30	Ali Jamil	IMPROVEMENT OF SOIL FERTILITY AND CROP PRODUCTION THROUGH THE	74

- 130 Arif Hidayat, Endah Rahayu L, Aunur Rofiq M, Arie Pramitadevi THE FUZZY LOGIC FOR QUALITY ASSESSMENT OF FRESH FISH AS THE RAW MATERIALS OF THE FROZEN FISH INDUSTRY
- 134 Refilda Suhaili, Diana and Indrawati THE USE OF LIQUID SMOKE AS AN ALTERNATIVE TO CHANGE TRADITIONAL SMOKING PROCESS ON BILIH FISH (MYSTACOLEUSEUS PADANGENSIS) THAT LIVE IN SINGKARAK LAKE
- 137 Shanti Fitriani and Evi Sribudiani THE FORMULATION OF SAGO NOODLE WITH MODIFIED CASSAVA FLOUR (MOCAL) COMBINATION
- 142 I. Epriliati, B. R. D'Arcy, and M. J. Gidley THE HUMAN IN VIVO CHEWING STUDY OF FRESH AND DRIED TOMATO, PAPAYA AND MANGO
- 147 Aunur R. Mulyarto, Isti Purwaningsih, & Ninik Tri Aggraini PROFILING SMALL AND MEDIUM FOOD INDUSTRY: A DATA MINING APPROACH
- 151 Wike A. P. Dania, Ir. Endah R. Lestari, Aunur R. Mulyarto, INVENTORY CONTROL OF RAW MATERIAL "KEBAB TURKI" USING QUANTITY REVIEW SYSTEM MODEL (CASE STUDY AT PT. BABA RAFI INDONESIA)
- 156 Kurnia Harlina Dewi, Lukman Hidayat, Devi Silsia, Laili Susanti dan Gita Nanda *Big* ✓ STUDY ON THE USE OF STABILIZER AND EMULSIFIER TO THE PHYSICAL AND CHEMICAL PROPERTIES OF ICE CREAM BASED ON AGRICULTURAL PRODUCTS
- 161 Fauzan Azima ANTI-PLATELET AGGREGATION AND ANTIOXIDANT POTENCY OF CASSIA VERA BARK EXTRACT (CINNAMOMUM BURMANI)
- 162 Tutu Angraini, Takuya Toda, Akihiro Tai, Tomio Itani, Tomoyuki Yoshino ANTIOXIDATIVE PROPERTIES OF BLACK TEA SYRUP
- 165 Kesuma Sayuti and Norio Muto INHIBITION OF  $\alpha$ -GLUCOSIDASE BY MULBERRY EXTRACT POWDER AND MULBERRY INSTANT
- 169 Fetriyuna, Rina Yenrina, Anwar Kasim. BIOAVAILABILITY OF PROTEIN AND CALCIUM ON INSTANT NOODLE WITH ANCHOVY FISH POWDER MIXED.
- 174 Fahroji, Achmad Saiful Alim and Ali Jamil. STUDY ON PROCESSING OF COMPOSITE FLOUR (TARO-MUNGBEAN SPROUT) FOR MAKING BISCUIT IN RIAU
- 179 T. Dwi Wibawa Budianta. Susana Ristiarini. PENENTUAN MASA KADALUARSA TEH HITAM DAN TEH WANGI DALAM KEMASAN KERTAS MENGGUNAKAN METODE GAB (GUGGENHEIM ANDERSON DE BOER).
- 183 Tensiska OPTIMIZATION AND CHARACTERIZATION ENCAPSULATED ANTHOCYANIN PIGMENT FROM RED RASPBERRY (RUBUS IDAEUS (LINN.))

232	Norlia Jainal and Ayub Mohd Yatim I	DEVELOPMENT OF FRUIT LEATHER FROM PINK GUAVA
235	Ayub M.Y & Norazmir M.N.	PINK GUAVA (PSIDIUM GUAJAVA) PUREE INTAKE IMPROVED LIPID PROFILE OF HIGH FAT DIET (HFD) INDUCED-OBESE RATS
238	Sri Melia	THE EFFECT OF DEPPING TIME AND STORAGE EGG IN GELATIN TO PROTEIN, WATER, HAUGH UNIT, FOAMING VALUE DAN BACTERIAL COLONY FORMING
243	Deni Novia and Sri Melia	THE EFFECT TIME OF SMOKING PROCESS AND STORAGE OF SMOKING SALTING EGG WITH MATERIAL COCO FIBER FOR WATER, PH, BACTERIAL COLONY FORMING AND FORMALDEHIDE
250	Nofiarli, Fitriana Nasution, and Kuswandi	EFFECT OF STORAGE PERIOD AND METHOD ON QUALITY AND QUANTITY OF BREADFRUIT FLOUR
253	Kurnia Harlina Dewi, Lukman Hidayat, Devi Silsia, Laili Susanti dan Gita Nanda	STUDY ON THE USE OF STABILIZER AND EMULSIFIER TO THE ORGANOLEPTIC PROPERTIES OF ICE CREAM BASED ON AGRICULTURAL PRODUCTS
258	Azhar Abdul Halim, and Farahdilla Abu Bakar	KESAN KEHADIRAN BAHAN PERISA MAKANAN BERASID DAN SERBUK KUNYIT TERHADAP KELARUTAN ALUMINIUM DALAM LARUTAN AKUAS
259	Kesuma Sayuti and Diana Sylvi	THE INFLUENCE OF COMPARISON LEVEL YELLOW SWEET POTATO (IPOMEA BATATAS L.) AND MUNG BEAN (VIGNA RADIATA L. WILEZCK) AGAINST FLAKES THE RESULTING CHARACTERISTICS".
267	Indri Juliyarsi, Sri Melia and Ade Sukma	THE EFFECT OF ADDED CARBOXYMETHYL CELLULOSE AND GLYCEROL FOR WATER, PH, DENSITY, SOLUBILITY TIME AT THE FORMATION OF EDIBLE FILM WHEY MILK BY USING WHEY AS THE BASIC INGREDIENT
269	Rina Yentrina, Fauzan Azima, Malse Anggia	EFFECT OF MAIZENA FLOUR TO MENGKUDU VELVA QUALITY (MORINDA CITRIFOLIA. L.)"
264	Rina Yentrina	NUTRITION VALUE OF ABON PROTEIN EVALUATION BY IN VIVO METHOD
268	Aisman, Zuraida Zuki and Serly Yulanda	NUTRITION VALUE DIVERTIFICATION FROM TRADITIONAL FOOD THROUGH MATERIAL MODIFICATION
271	Neswati, Aisman dan Andi Heriza .	INFLUENCE OF LONG DELAY PROCESSING THICK SUGARCANE JUICE TO CHARACTERISTICS OF BROWN SUGAR POWDER OF SUGAR CANE
275	Azfrianty1, Anwar Kasim2, Rini.B2.	STUDI PEMBUATAN SIRUP CASSIA VERA DARI BUBUK FLAVOR CASSIA VERA.

B19

## STUDY ON THE USE OF STABILIZER AND EMULSIFIER TO THE PHYSICAL AND CHEMICAL PROPERTIES OF ICE CREAM BASED ON AGRICULTURAL PRODUCTS

Kurnia Harlina Dewi, Lukman Hidayat, Devi Silsia, Laili Susanti dan Gita Nanda

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### ABSTRACT

Pumpkin (*Curcubita moschata*) and banana (*Musa sp*) is a cellulose source of agricultural product. Ice cream is kinds of semi-solid food are made by freezing. The softness of the texture is strongly influenced by the role of stabilizer (CMC) and emulsifiers (milk cream). Development of the ice cream industry requires raw materials based on cheap agriculture product; easily available, therefore necessary looked into raw material modification. Pumpkin and banana can be a CMC replacement option as stabilizer and soya bean milk is full cream substitute materials as emulsifiers. The purpose of this research is to determine the effect of raw material modification to the quality of ice cream produced in the views of the physical and chemical properties. This study uses completely randomized design of factorial based on factor perceived namely types of fruit difference (banana and pumpkin) and milk type difference (skimmed milk and soy milk) by four treatment combination and one control. The results of physical measurements show that the highest overrun was ice cream with banana-skimmed milk treatment, while the longest time for melting ice cream was pumpkin-soy milk. Results of the analysis on ice cream chemical composition show that the fat and protein level of ice cream sample is in the quality standard was prescribed

Key word: pumpkin, banana, ice cream

### INTRODUCTION

Ice cream usually made for dessert. This dish is popular and favorite, especially among children. Ice cream is also good for children growth because it is made from milk which is rich of protein and energy [1] (Chan, 2008). According to Watt and Annabel 1963 in Wibowo [2], ice cream contains of 4.0% protein, 12.0% fat and 20.6% of carbohydrate. The high fat content of ice cream causes a lot of people are reluctant to consume ice cream, especially in the present, where many products developed low-fat food. Therefore, other materials needed with low-fat content as a mixture ingredient in the manufacture of ice cream.

Ice cream industry will continue to grow as we get ice cream consumers in Indonesia. According to Hidayat [3] in the last five years, the growth rate of ice-cream market in Indonesia at least 20% every year. According to Hadiwerdoyo [4], ice cream consumption

in Sumatra 100% increased in the year of 2000. Therefore, it is natural if the ice cream business competition getting tighter because of the new business continues to appear. However, as in the food business in general, the ice cream business opportunities are providing a very promising because the ice cream is very popular in all levels of Indonesian society from children to adults. Moreover, ice cream business is easy, anyone can run and without the need for many employees [5] (Anon, 2003). In addition, the government of the Indonesian state in the equator strongly support the development of ice-cream business (Anon, 2009a). Therefore, the research conducted to determine the influence of raw material modification to the quality of ice cream

Ice cream has a lot of variations. Some consumers like ice cream with a distinctive character and taste different from the others. At this time many ice cream makers add other ingredients such as chocolate chips, nuts, and fresh fruits, either mixed or just sprinkled on top. In addition to taste, these materials can also improve the performance of ice cream, thereby increasing consumer interest [1] (Chan, 2008). In general, each type of ice cream with high solids content can be used in the composition of ice cream. In this study, ice cream was made using a banana (*Musa paradisiaca* L.) and pumpkin (*Curcubita moschata*), because the fruit are widely available, have a favorite flavor and are relatively inexpensive. These fruits serve as a substitute for fat solids in skim milk. In addition, these fruits can also serve as stabilizers. According to Fardiaz and Setiawan (2008), stabilizers are used in order to obtain the texture of ice cream that is to keep water in the ice cream not too cold and reduce the large amount of ice. Stabilizer which is often used in the manufacture of ice cream and frozen dessert is the CMC (Carboxymethyl Cellulose), gelatin, alginates, karagenan, guar gum, and pectin. According to Glickman and Setianawati et al [8], the use of CMC as a stabilizer in ice cream products will provide better texture and stability used in conjunction with one or more other stabilizer materials

Factors that influence the ice cream texture are the amount of homogenization, stabilization and the amount of fat content. According to Saleh [9], rough texture of ice cream is the damage caused by the ice crystals during stabilization and homogenization, and also during storage

...by letting a long wait before it is inserted into ... According to Saroso [10], the function of ... is as body that forms the texture. Whereas ... same as content of cream within ice ... which is between 8% to 16%. However, the price ... on the market are relatively expensive, so ... other ingredients instead of skim. This ... examined the production of ice cream using ... as a substitute for skim milk

... is a nutritious drink, mainly because of the ... content. But public attention is still lacking, ... the price of soy milk is cheaper than milk ... products [11] (Anonymous, 2009<sup>b</sup>). According ... [12] (2007), soy milk has several advantages, ... it not contain lactose, the protein does not ... allergies, low in fat, cholesterol free, highly ... relatively simple manufacturing technology, ... costs are relatively inexpensive, and can be ... into ice cream, yogurt, mayonnaise, ... . Meanwhile, according to [13] Anonymous ... the composition of the soy milk is similar to ... milk. Quality of protein in soy milk is similar to ... milk protein quality. Soy milk is an attractive ... for the people who can not stand to milk ...

... This study aims to determine the effect the use ... banana and soy milk as a raw material of ... to the physical quality (overrun and melting ... the level of consumer preference and chemical ... (fat and protein content) of ice cream

#### METHODOLOGY

##### Instrument

... The instrument used in this study are cutting ... , Ohaus analytical balances of 210 gram ... , gas stoves, tools diminutive size ... (Kenwood), Kenwood ice cream maker of 1.5-liter ... mixer (Philips), plastic containers, ... , ovens, pipettes drops, measuring ... flask, Soxhlet, filter paper, kjeldahl ... Erlenmeyer and 650 ml desiccators and ... (refrigerator and freezer).

##### Materials

... Materials used in this study were banana, ... , soy milk, skim milk powder, full cream milk ... , eggs, gelatin, water, aquadestillate, ... , 50% NaOH, 0.1 N HCL, and diethyl ...

##### Observation Parameters

... Variables were observed in this study consisted ... quality of ice cream (overrun, melting ... the chemical properties of ice cream (fat and ... content) and Organoleptic properties (color, ... , mouthfeel and general appearance)

##### Design of Experiment

... Study design used was Completely Randomize ... (RAN) factorial with two different factors. The ... is the difference in the fruit as a filling ... with two types of fruit. The second factor is ... in milk as an ingredient emulsifiers with

two types of milk from which the four combinations of treatment and control (without the addition of pumpkin, banana and use skim milk

#### Research Stages:

##### Making of Ice cream

Ice cream making process based on Elisabeth et al.[14] (2007) research conduct. Pumpkin and bananas are washed, peeled and steamed, then ground using a blender or food processor separately. Egg yolk in shake until fluffy; add dry ingredients which have been dissolved in water. Followed by pasteurization at 80-85°C temperature for 25 seconds and cooled. The admixture was ready incorporated into ECM, (Ice Cream Maker), then stored in a refrigerator at 4°C temperature for 4 hours to the aging process. Homogenization was repeated for 15 minutes with the ECM and the mixture stored in the freezer until half frozen at a temperature -5°C until 8°C and agitation for 15 minutes. The admixture was ready packed in the container and save it back into the freezer at a temperature of -25°C to -30°C

##### Physical Quality Testing of Ice Cream

At this stage, the physical properties of the factors that affect the quality of ice cream were analyzed, that is overrun and melting rate. Developing of the ice cream volume was expressed as overrun and calculated based on the volume difference of product to the first admixture volume at the same mass, or based on mass differences of products to the first admixture mass at the same volume [2]. Initial admixture inserted into graduated cylinder at a certain volume and mass. Afterwards, ice cream inserted into a graduated cylinder at the same volume then measured the mass. The melting rate was expressed in minutes, as the resistance of ice cream against melting when served at the room temperature. Overrun percentage can be calculated by following formula.

$$\text{Overrun} = \frac{M1 - M2}{M2} \times 100\%$$

where : M1 = mass of initial admixture  
M2 = mass of ice cream

##### Chemical Quality Testing of Ice Cream

Chemical properties analysis was conducted on fat and protein content which affects the quality of ice cream

##### Fat Content Test (AOAC, 1995)

Water free sample extracted using ether solvent inside soxhlet extraction apparatus for 6 hours. Extraction result was left in the open air and then dried in an oven at a temperature of 100° C for 30 minutes and cooled inside desiccators until constant weight

$$\text{Fat content (\%)} = \frac{B_2}{B_1} \times 100\%$$

Note : B<sub>1</sub> = Weight of initial sample (gram)  
B<sub>2</sub> = Weight of fat (gram)

#### Protein Level (Kjedahl Method/AOAC, 1995)

Samples that have been refined as much as 0.1 grams inserted into a 30 ml Kjeldahl flask, added 2.5 ml of concentrated sulfuric acid, 1 gram of catalyst and boiling stones, respectively. Boiled for 1 to 1.5 hours until the liquid becomes clear. The flask cooled, transferred to the distillation equipment and add 15 ml of 50% NaOH solution, then rinsed with distilled water. Erlenmeyer containing 25 ml of 0.02 N hydrochloric acid placed under the condenser, previously added 2 to 3 drops of nitrogen indicator. End of condenser tube immersed within a chloride solution. Distilled was conducted until 25 ml of distillate within Erlenmeyer. Distillate titrated with 0.02 N NaOH until the green color changes to purple. Blank determination was done in the same way

$$\text{Crude Protein (\%)} = \frac{(Y-Z) \times 1.4 \times 5.25}{W} \times 100\%$$

Note: Y = ml NaOH titre for blank  
B = ml NaOH titre for sample  
N = normality of NaOH  
W = weight of sample (gram)

#### Data Analysis

Test results data of the physical properties analyzed using analysis of variant (ANOVAs). If there were significantly, the Tukey test performed as subsequent test using 95% of confidence interval ( $\alpha = 0.05$ ) [15, 16, 17] (Djarwanto, 2001; Yitnosumarto, 1993; Zar, 1984)

### RESULT AND DISCUSSION

#### Physical properties of Ice Cream: The influences of Raw Materials against Ice Cream Overrun

Overrun is defined as the development of the ice cream volume toward the initial admixture due to air trapped in ice cream (Arbuckle, 1986 in Wibowo, 1992). The result data of overrun average value shown in Figure 1.

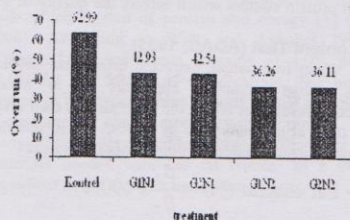


Figure 1. Effect of raw material on ice cream overrun

Figure 1 shows that the use of different types of fruit and milk as raw material of ice cream production may affect ice cream overrun value. The use of different types of fruit and milk as raw material may affect the overrun value lower. The overrun ice cream value from the highest to the lowest was the ice cream overrun of the control treatment, G<sub>1</sub>N<sub>1</sub>, G<sub>2</sub>N<sub>1</sub>, G<sub>1</sub>N<sub>2</sub>, and G<sub>2</sub>N<sub>2</sub>, respectively. The highest overrun value produced by the G<sub>1</sub>N<sub>1</sub> treatment product for 42.93%, but when compared to controls (62.99%), the overrun is still under control, whereas the lowest overrun produced by the G<sub>2</sub>N<sub>2</sub> treatment products in the amount of 36.11%. According to Padaga et al. (2005), ice cream which has high-quality has overrun of 70-80%, whereas 25-30% for home industry. Based on this fact, the overrun in this study was still in the ice-cream quality standard. Overrun variation analysis shown in Table 3.

Table 3. Table of Anova

Source of Variance	Degree of freedom	Sum of square	Central square	F <sub>count</sub>	F <sub>table</sub>
Treatment	3	128,27	42,99	10,74	5
Error	8	0,30	0,04		
Total	11	128,57			

Analysis of variants (ANOVA) results showed that the use of combinations of fruits and type of milk give a significantly between treatments in the significance level of 5% toward the ice cream overrun produced, which F<sub>count</sub> value greater than the value of F<sub>table</sub> (F<sub>count</sub> > F<sub>table</sub>).

Results of further tests by the Tukey method showed that the ice cream overrun by using G<sub>1</sub>N<sub>1</sub> treatment was not significantly to G<sub>2</sub>N<sub>1</sub> treatment, but highly significant to treatment using G<sub>1</sub>N<sub>2</sub> and G<sub>2</sub>N<sub>2</sub>. The discrepancies of the overrun values by using different types of milk presumably because milk has a deposition that will further increase the thickness of the ice cream admixture. This is also in accordance with Suprayitno et al. (2001) [12], that an increase in ICM (Ice Cream Mix) viscosity will increasingly restrict the mobility of water molecules because the space between particles in the ICM becomes increasingly narrow. Narrowness of the space between the particles causes the less of the air coming into the ICM during the agitation so overrun resulting value lower.

#### The influence of raw materials against Melting rate of Ice Cream

Good quality of ice cream characterized by be resistant to melting. Melting quality assessed by how in the mouth, i.e. whether the product can easily melt and give the impression of gliding easily in the mouth or stiff and difficult to melt. Melting power is identical with the time required to completely melting at room temperature. (Setianawati et al., 2002). The data averaging values calculated of melting rate can be seen in Figure 2

#### Protein Level (Kjedahl Method/AOAC, 1995)

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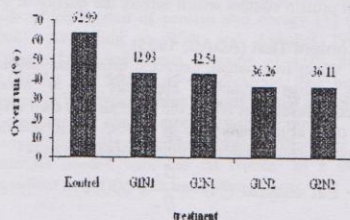


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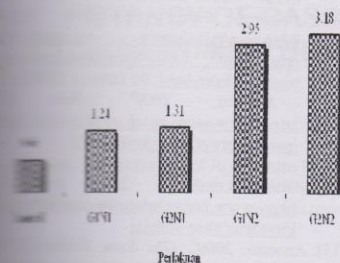


Figure 2. Material effect on the ice cream melting rate

Figure 2 shows that the use of different types of raw material as raw material affects the melting rate of ice cream. Melting time of ice cream will be longer by using different types of fruit and milk as raw material. Melting rate of ice cream, from the highest to the lowest, was the sample of ice cream with control treatment,  $G_1N_1$ ,  $G_1N_2$  and  $G_2N_2$ , respectively. The highest melting rate produced by the product with treatment  $G_2N_1$ , namely 0.66. The lowest melting rate produced by the product with  $G_2N_3$  treatment, in the amount of 3.18. The overrun analysis is shown in table 4.

Table 4. Anova Table

Source	Degree of Freedom	Number of Squares	Central Squares	F <sub>count</sub>	F <sub>table</sub> (5%)
Treatment	4	10,70	3,57	19,817	4,07
Error	16	1,44	0,18		
Total	20	12,14			

Results of variants (ANOVA) showed that the combinations of fruits and milk type was significantly between treatments in the 5% level of confidence of the ice cream melting rate that is  $F_{count} > F_{table}$  value greater than the value of  $F_{table}$  ( $F_{count} > F_{table}$ ). Tukey tests performed as a post-hoc test to see the significantly between treatments.

Post-hoc test results of Tukey method showed that the melting rate on  $G_2N_1$  treatment was significantly to  $G_1N_2$  samples, but significantly to  $G_1N_1$  samples.  $G_1N_2$  ice cream made of  $G_1N_1$  was significantly to  $G_1N_2$  samples. This shows that the combination of ice cream by using different fruits, but the same milk type, does not provide a significant effect to the melting rate of ice cream sample. The combination of ice cream with different kinds of fruits significantly to the melting rate of each ice cream sample. When compared to the melting rate of ice cream for 1.25 minutes, the rate of the ice cream in this study was not much different. According to [1], the rate of melting ice cream is related to the ice cream texture. Ice cream with

rough texture would melts easily because of low of viscosity and melting resistance.

#### Chemical Properties of Ice Cream Influence of Raw Material against Ice Cream Fatty contents

Fat test conducted on the most preferred panelist sample which is ice cream made of skimmed milk and pumpkin. With the percentage of skim milk and pumpkin of 7.5%: 2.5% shows contained fat amounted to 9.966%. The results of this test were under the SII quality standard, where the allowed fat content at least 8%. Whereas Padaga and Beads [18] categorize the ice cream with fat content of 10-12% in the standard category. This decrease in fat levels presumably because the use of pumpkins in the ice cream. Pumpkin has a relatively low fat content in the amount of  $\pm 0.30\%$ .

#### Influence of Raw material against protein contents of Ice Cream

Protein test conducted on the most preferred panelist sample which is ice cream made of skimmed milk and pumpkin. The test results on the protein content of ice cream by using skim milk and pumpkin (7.5%: 2.5%) showed levels of protein are contained by 4.3311 grams and according to the SII (Indonesian Industrial Standard) No. 1617 of 1985 in [18] there is no quality standard for protein content of ice cream. But according to Buckle et al. (1985), the average composition of ice cream for the protein content amounted to 4.6 grams. Meanwhile, when compared to fat content in the 4 grams of diamond ice cream, then the protein content of ice cream samples in this study was still higher. High content of fat in ice cream sample suspected because of pumpkin has a protein content of  $\pm 1.10\%$  whereas skim milk of  $\pm 3.5\%$ .

#### CONCLUSIONS

Based on research observations, the influence of modifications to the quality of ice cream can be concluded as follows:

1. Ice cream which has the highest overrun was made from bananas-skim milk.
2. banana-skim milk ice cream was melts the fastest, whereas melting power of pumpkin-soy ice cream ( $G_2N_2$ ) was the longest.
3. Chemical composition of ice cream shows that the levels of fat and protein content of ice cream samples still in the quality standard.

To do further research on consumer acceptance of ice cream, technique/method of making ice cream and shape of the final product consumer preferred.

#### REFERENCES

- [1] Chan, L.A. 2008. *Membuat Es Krim*. Agromedia Pustaka. Jakarta
- [2] Wibowo, Tinawaty. 1992. *Pengaruh Jenis dan Konsentrasi Bahan Penstabil Terhadap Mutu Velve Fruit Jambu Biji*. Institut Pertanian Bogor. Bogor



# International Seminar on Food & Agricultural Sciences - 2010



Bukittinggi, Indonesia. February 17-18, 2010

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Date : 14 January 2010

To: Kurnia Harlina Dewi, Lukman Hidayat, Devi Silsia, Laili Susanti, dan Gita Nanda. Department of Agroindustrial Technology Faculty of Agriculture. University of Bengkulu.

*Dear Participants,*

**Acceptance to present a paper for the seminar**

Thank you very much for submitting a paper entitled:

**STUDY OF USING STABILIZER AND EMULSIFIER ON PHYSICAL AND CHEMICAL PROPERTIES OF ICE CREAM BASED ON AGRICULTURAL PRODUCTS**

for International Seminar on Food and Agricultural Sciences 2010 (ISFAS 2010), joint seminar between Agricultural Faculty of Andalas University and Faculty of Science and Technology, Universiti Kebangsaan Malaysia. The seminar will be held on **February 17, 2010** at Convention Hall of The Hill Hotel, Bukittinggi. More information about the seminar can be accessed at [www.isfas2010.co.cc](http://www.isfas2010.co.cc).

We are pleased to inform you that the committee has decided that your proposed title has been **accepted** for the seminar and we officially invite you to present your paper to the seminar. Thank you very much and we are looking forward to seeing you at **ISFAS2010**.

Your sincerely,  
Dean of Agricultural Faculty of  
Andalas University

Chairman of ISFAS2010

**Prof. Dr. Isril Berd**

**Prof. Dr. Anwar Kasim**



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This is to certify that

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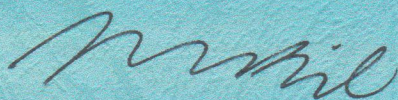
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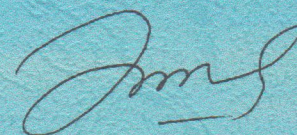
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