Using Banana Flour to Replace Wheat Flour in Coffee Cookies

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About Mahidol University

• Mahidol is derived from the Pali also Sanskrit, mahi means land + tala means ground or level. Mahitala means the ground of the earth.

• Mahidol University located in Thailand was establish from Siriraj Hospital in 1888 by His Majesty King Chulalongkorn (Rama V).

• The oldest of institution learning is hospital's medical school and first medical degree was granting in 1893. But in 1943 changed becoming University of Medical Sciences. Then in 1969 Medical Sciences was renamed by H.M. King Bhumibol Adulyadej (son of Royal Father, H.R.H Prince Mahidol of Songkla) become Mahidol University until present
Institute of Nutrition (INMU)

• INMU (Institute of Nutrition) is one of the major that was established in 1977 as implementation body and a national planning of the Thai government

• This Institute was selected among other nutrition and nutrition-related institutions because of its dedication to medical sciences and health, technologies and advanced facilities, and high level of expertise that shown by faculty in food and nutrition

• INMU has fulfilled mission by conducting research laboratory levels, provide technical services in food and nutrition development, international training and provide national also education programs

• The purpose to achieve the highest possible quality of life for individuals and communities, Thai society, and for people that living in other countries within and outside the Southeast Asian Region
Vision of INMU

INMU strives to become a recognized world leader in food and nutrition by 2015 through innovative research, capacity building and the generation and transfer of advanced knowledge and technologies to effectively address critical food and nutrition challenges at individual, community, national and global levels.
Mission of INMU

INMU is committed to ensuring the optimal health and nutrition of all people by conducting timely basic and applied food and nutrition research into the ever-changing health, social and economic conditions that affect individuals, communities, nations and the world; by producing high caliber food and nutrition professionals who are committed to ethically conducting high quality multidisciplinary food and nutrition research studies that recognize, identify and tackle prominent food and nutrition problems; and by providing advanced academic, technical and administrative services for developing and transferring food and nutrition knowledge and technologies for the benefit of all people within and outside of the country through committed professionals, positive leadership and standards of excellence.
Introductions

• In fruits contain polyphenols that show antioxidant capacity and indigestible carbohydrate called dietary fiber (polysaccharides, lignin, oligosaccharides, and other substances).

• Advantages of dietary fiber: reduce high level of cholesterol, laxation, and reduce blood glucose that present in unripe fruits.

• One kind of dietary fiber fruit is Banana
Pisang Kepok/Musa sapientum L./Namwa

Banana is a climacteric fruit those located in the tropical and subtropical regions, and it represents a major state

- Unripe banana containing of large amounts of starch, cellulose, hemicellulose, and lignin in the pulp.
- Benefits for our health: reducing high level of cholesterol, constipation, diverticulitis, and even colon cancer
Objective

To develop coffee cookies by replacing wheat flour with banana flour at the level which is acceptable by consumers
Methods
Coffee Cookies Formula I

1. Evaporated milk and water are mixed then add instant coffee and mix until coffee is dissolved

2. Wheat flour (10.5-11% protein), milk powder, baking powder and baking soda are mixed and sifted

3. Butter and sugar are beaten using an electric mixer at medium speed until it turns to be cream (dry ingredient)
egg and vanilla extract are added and mixed (wet ingredient)

The dry ingredient and the milk-coffee mixture are added into the wet ingredient, and beaten at a slow speed

The cookie dough is placed into a cookie press and pressed on a greased tray

The dough is baked immediately at 175°C for 15-20 minutes in a baking oven
Following baking, cookies are cooked to room temperature (approximately 28°C) on a rack.

The cookies are kept in plastic bags.
Coffee Cookies Formula II

1. Coffee powder is dissolved in water

2. Wheat flour (10.5-11% protein) and baking soda are mixed and sifted

3. Butter and sugar are beaten using an electric mixer at medium speed until it turns to be cream

4. Egg is added and mixed
The dry ingredient and the coffee mixture are added into the wet ingredient, and beaten at a slow speed.

The cookie dough is placed into a cookie press and pressed on a greased tray.

The dough is baked immediately at 175°C for 15-20 minutes in a baking oven.

Following baking, cookies are cooked to room temperature (approximately 28°C) on a rack.
The cookies are kept in plastic bags
Coffee Cookies Formula III

1. Coffee powder is dissolved in water
2. Wheat flour combined (10.5-11% and 8-8.5% protein) and baking powder are mixed and sifted
3. Butter, shortening are beaten using an electric mixer at medium speed until the texture is soft
4. Sugar and salt are added and beaten until it turns to be cream (fluffy)
Whole egg, coffee mixture and coffee extract are added and mixed

The dry ingredient is added into the wet ingredient, and beaten at a slow speed

The cookie dough is placed into a cookies press and pressed on a greased tray

The dough is baked immediately at 175°C for 15-20 minutes in a baking oven
Following baking, cookies are cooked to room temperature (approximately 28°C) on a rack. The cookies are kept in plastic bags.
Coffee Cookies Banana Flour Formula

1. Coffee powder is dissolved in water
2. Wheat flour (8-8.5% protein), banana flour (50%, 60%, 70%, 80%, and 100%) and baking powder are mixed and sifted
3. Butter, shortening are beaten using an electric mixer at medium speed until the texture is soft
4. Sugar and salt are added and beaten until it turns to be fluffy (cream)
Whole egg, coffee mixture and coffee extract are added and mixed

The dry ingredient is added into the wet ingredient, and beaten at a slow speed

The cookie dough is placed into a cookies press and pressed on a greased tray

The dough is baked immediately at 175°C for 15-20 minutes in a baking oven
Following baking, cookies are cooked to room temperature (approximately 28°C) on a rack.

The cookies are kept in plastic bags.
Texture Analysis

Texture characteristics of all cookies formulas and the cookies during storage was evaluated by Texture Analyzer TA.XT plus (Stable Micro Systems Ltd., YL.UK)

Hardness of twenty cookies was evaluated by measuring the peak of breaking force (g) using a three-point band rig

Figure 1. Texture Analyzer
Color Analysis

All formulas of cookies and the cookies during storage were measured using a spectro-colorimeter model Color Flex EZ (Hunter Lab).

A tungsten halogen lamp was used as a light source.

The color values by a colorimeter were expressed as L*, a*, and b* values.
Sensory Evaluation – Ranking Test

Cookies of three formulas were prepared on the day before the evaluation, packed in polypropylene bags, and stored at room temperature (approximately 28°C).

Each formula was labeled with a three-digit random number and was randomly served to each panelist, at the same time.

Panelists were asked to rinse his/her mouth with water before testing the next sample.

The text was performed in air-conditioned testing booths under a daylight fluorescent.
Sensory Evaluation using ranking test according to overall preference order from one to three.
Sensory Evaluation Form for Coffee Cookies แบบประเมินทางประสาทสัมผัสผู้คัดเลือกคุณภาพคุปกรรมคุกแก่กิ่งกาแฟ

Objective: To select the most preference coffee cookies for the control formula
วัตถุประสงค์ เพื่อคัดเลือกสุดยอดที่สุดในการพัฒนาผลิตภัณฑ์

Date: January 31, 2017 วันที่ 31 มกราคม 2560
Gender (เพศ):  □ Female (หญิง)  □ Male (ชาย)
Age, year (อายุ, ปี):  □ 20-30  □ 40-50  □ 30-40  □ >50

Instructions: Please test samples from left to right, and rank the samples according to overall preference.
กรุณาทบทวนอย่างจากซ้ายไปขวา และเรียงลำดับตามความชอบในผลิตภัณฑ์โดยรวม โดยใส่หัวตัวอย่าง

Preference order (ลำดับความชอบ)    Sample code (รหัสตัวอย่าง)
1                                       
2                                       
3                                       

😊 Thank you 😊
Sample was labeled with a three-digit random number and at the same time was randomly served to each panelist.

Panelists rinsed his/her mouth with water before testing the next sample.

The test was performed on the table in air-conditioned testing booths under a daylight fluorescent lamp at Sensory Science Laboratory of INMU.
Sensory Evaluation Form for Coffee Cookies แบบประเมินทางประสาทสัมผัสผลิตภัณฑ์คุกกี้กาแฟ

Objective: To select the most preference coffee cookies for the control formula
วัตถุประสงค์ เพื่อคัดเลือกสูตรชาบั้นในการพัฒนาผลิตภัณฑ์

Date: January 31, 2017 วันที่ 31 มกราคม 2560
Gender (เพศ):  □ Female (หญิง)  □ Male (ชาย)
Age, year (อายุ, ปี):  □ 20-30  □ 40-50  □ 30-40  □ >50

Instructions: Please test samples from left to right, and rank the samples according to overall preference.
กรุณารีวิวตัวอย่างจากซ้ายไปขวา และเรียงลำดับความชอบในผลิตภัณฑ์โดยรวม โดยใส่รหัสตัวอย่าง

Preference order (ลำดับความชอบ)  Sample code (รหัสตัวอย่าง)
1                      
2                      

😊 Thank you 😊
Results and Discussions
### Ranking Test

Panelist information

- **N = 30**
- Gender: 80% Female, 20% Male
- Age: 20-30 Y 30%, 30-40 Y 16.67%, 40-50 Y 23.33%, >50 Y 30%

Numbers of panelist who select CCF1 = 11
Numbers of panelist who select CCF2 = 1
Numbers of panelist who select CCF3 = 15

### Table 1. Sensorial ranking score

<table>
<thead>
<tr>
<th>Sample</th>
<th>Sum of rank value</th>
<th>Mean of rank value</th>
<th>Ranking no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCF1</td>
<td>-9.35</td>
<td>-0.31&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3</td>
</tr>
<tr>
<td>CCF2</td>
<td>-0.85</td>
<td>-0.28&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2</td>
</tr>
<tr>
<td>CCF3</td>
<td>10.20</td>
<td>0.34&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 2. Breaking force and color value of the control cookies

<table>
<thead>
<tr>
<th>Sample</th>
<th>Weight. per piece (g)</th>
<th>Breaking force (g force/g weight)</th>
<th>Color value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L*</td>
</tr>
<tr>
<td>CCF1</td>
<td>5.72 ± 0.66&lt;sup&gt;b&lt;/sup&gt;</td>
<td>841 ± 182&lt;sup&gt;b&lt;/sup&gt;</td>
<td>40.67 ± 0.31&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>CCF2</td>
<td>5.96 ± 0.53&lt;sup&gt;b&lt;/sup&gt;</td>
<td>912 ± 197&lt;sup&gt;b&lt;/sup&gt;</td>
<td>48.49 ± 0.20&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>CCF3</td>
<td>4.75 ± 0.37&lt;sup&gt;a&lt;/sup&gt;</td>
<td>590 ± 118&lt;sup&gt;a&lt;/sup&gt;</td>
<td>54.13 ± 0.35&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Table 3. Breaking force and color value of the control formula 3 when changed wheat flour

<table>
<thead>
<tr>
<th>Sample</th>
<th>Weight per piece (g)</th>
<th>Breaking force (g force/g weight)</th>
<th>Color value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b*</td>
</tr>
<tr>
<td>CCF3</td>
<td>4.75 ± 0.37&lt;sup&gt;a&lt;/sup&gt;</td>
<td>590 ± 118&lt;sup&gt;b&lt;/sup&gt;</td>
<td>54.13 ± 0.35&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>CCF3N</td>
<td>9.92 ± 0.73&lt;sup&gt;b&lt;/sup&gt;</td>
<td>456 ± 106&lt;sup&gt;a&lt;/sup&gt;</td>
<td>53.10 ± 0.05&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sample</td>
<td>Weight. per piece (g)</td>
<td>Breaking force (g force/g weight)</td>
<td>Color value</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------</td>
<td>----------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>L*</td>
</tr>
<tr>
<td>CCBF50</td>
<td>5.12 ± 0.29&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>986 ± 97&lt;sup&gt;c&lt;/sup&gt;</td>
<td>44.71 ± 1.40&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>CCBF60</td>
<td>5.28 ± 0.44&lt;sup&gt;cd&lt;/sup&gt;</td>
<td>1125 ± 202&lt;sup&gt;d&lt;/sup&gt;</td>
<td>45.22 ± 0.66&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>CCBF70</td>
<td>4.80 ± 0.38&lt;sup&gt;a&lt;/sup&gt;</td>
<td>724 ± 141&lt;sup&gt;a&lt;/sup&gt;</td>
<td>41.91 ± 0.61&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>CCBF80</td>
<td>5.04 ± 0.19&lt;sup&gt;b&lt;/sup&gt;</td>
<td>766 ± 143&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>41.51 ± 0.16&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>CCBF100</td>
<td>5.41 ± 0.29&lt;sup&gt;d&lt;/sup&gt;</td>
<td>837 ± 157&lt;sup&gt;b&lt;/sup&gt;</td>
<td>39.55 ± 0.51&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Paired Preference Test

Panelist information
N = 30
Gender: Female 89.7%  Male 10.3%
Age:  20-30 Y 36.7%  30-40 Y 23.3%  40-50 Y 10.0%  >50 Y 30.0%
Numbers of panelist who select CCBF70 = 21
Numbers of panelist who select CCBF80 = 9
CONCLUSIONS

There are 3 cookies formula with wheat flour and people choose formula number 3 (CCBF3) by sensory evaluation ranking score. Wheat flour change with banana flour with 5 different concentration 50%, 60%, 70%, 80%, and 100%. People choose cookies with banana flour concentration 70% by sensory evaluation paired preference test. The quality evaluation consists of texture analysis and color measurement, the hardest are cookies with banana flour concentration 60% and the lowest is cookies with banana flour concentration 100%. The result of color measurement the highest lightness (*L) is cookies with banana flour concentration 60% and the lowest is 100%; highest redness (*a) is cookies with banana flour 100% and the lowest is 60%, and highest yellowness (*b) is cookies with banana flour 50% and the lowest is 100%.
REFERENCES


Bakery from wheat flour. Cookbook; Issue 1+2, UFM Food Centre.

Food and Dessert. Cookbook, Phra Nakhom Polytechnic School.


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Thank You