

# OMICS Group



OMICS Group International through its Open Access Initiative is committed to make genuine and reliable contributions to the scientific community. OMICS Group hosts over **400** leading-edge peer reviewed Open Access Journals and organizes over **300** International Conferences annually all over the world. OMICS Publishing Group journals have over **3 million** readers and the fame and success of the same can be attributed to the strong editorial board which contains over **30000** eminent personalities that ensure a rapid, quality and quick review process. OMICS Group signed an agreement with more than **1000** International Societies to make healthcare information Open Access.

# OMICS Journals are welcoming Submissions

OMICS Group welcomes submissions that are original and technically so as to serve both the developing world and developed countries in the best possible way. OMICS Journals are poised in excellence by publishing high quality research. OMICS Group follows an Editorial Manager® System peer review process and boasts of a strong and active editorial board.

Editors and reviewers are experts in their field and provide anonymous, unbiased and detailed reviews of all submissions.

The journal gives the options of multiple language translations for all the articles and all archived articles are available in HTML, XML, PDF and audio formats. Also, all the published articles are archived in repositories and indexing services like DOAJ, CAS, Google Scholar, Scientific Commons, Index Copernicus, EBSCO, HINARI and GALE.

**For more details please visit our website:**

**<http://omicsonline.org/Submitmanuscript.php>**

# Utilization of Asian Moon Scallop (*Amusium pleuronectes*) Shell for Calcium Resource Formulation (In vivo) and Its Application on Fish-based Product



**Tri W. Agustini**

<sup>1</sup> Faculty of Fisheries and Marine Science, Diponegoro University,  
Semarang – Indonesia





# Introduction

**Asian Moon Scallop Production in Indonesian : 419 ton – 2.004 ton (DPPHP, 2008 and Statindex, 2009).**

**Study on Asian moon scallop:**

- 1. Distribution of Asian moon scallop along Java sea**
- 2. Diversification of Asian moon scallop-based product**
- 3. Shelf life of Asian moon scallop in different handling treatment**

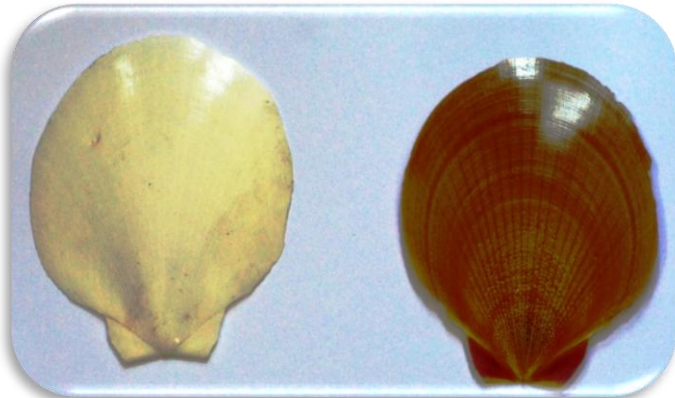
**Central Java – Brebes = > 41 ton (Widowati et al., 2008)**





# Introduction

Weight of Asian Moon Scallop : 250-670 gram  
Shell Waste : 53-65% (Trilaksani and Nurjanah, 2004)



Estimation of Shell Waste :

- $\pm 2,000$  tons  $\rightarrow$  Minimal 1,062.12 tons
- In Brebes  $\pm 21.73$  tons

95-99% Calcium Carbonat  
(Oregon Department of Human Service,  
1998 and Riverina, 2009)

Ash 83.6%, Calcium 17.23% and  
Phosphor 0.79%  
(Sarwono, 2009)

## PRELIMINARY STUDY :



**Ca-absorption : Control 1.28%, treatment 15 mg (decrease absorbtion 1.01%) and 18 mg (decrease absorbtion 1.04%) (High Calcium and low Phosphor = 17.23% : 0.79% (Agustini et al., 2009)**



**Calcium Phosphor ratio = 3 : 1, 2 : 1, 1 : 1 (Ca/P) (Khomsan, 2004 dan Sediaoetama, 1989)**

- Ca-Flour can be used in feeding trial → apply in food product
- In its application, addition of materials rich in phosphor (millet (*Setaria italica* sp.) and corn (*Zea mays* L.) is necessarily to be done
- Need to evaluate its effect in chemical and physical

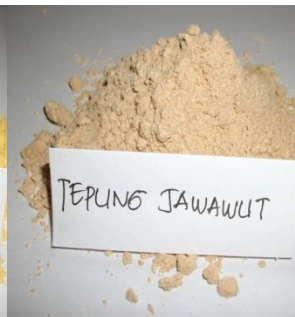
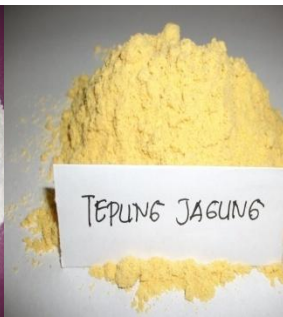
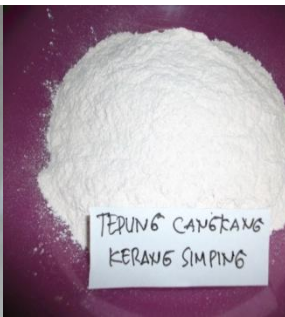
characteristic of the products resulted



# OBJECTIVES

## The objectives of this study :

- to observe the effect of feed formulation using scallop shell flour, corn and millet flours to Ca-absorption of blood serum in mice
- to assess nutritional, chemical, physical and sensory quality of formulated scallop shell flour on food products.



# METHODOLOGY

## Experimental in vivo

### 1. Preparation of Ca-Flour

- Mixture of asian moon scallop flour and corn flour
- Mixture of Asian moon Scallop flour and millet flour

### 2. Feeding trial to mice

Formulation Ca : P in feed + Ca-Flour) with ratio 1:1, 2:1 and 3:1 and evaluate for Ca-absorption during 0 h, 6 h, 3 days, 6 days and 10 days.

## Applying Ca : P Formulation Treatment in Food

1. **Formulation of Fish Based - Product Cookies** (Sarwono, 2009), extrudate (Hermanianto et al., 2000), Fish Nugget (Agustini et al., 2006)

### 2. Chemical Analysis

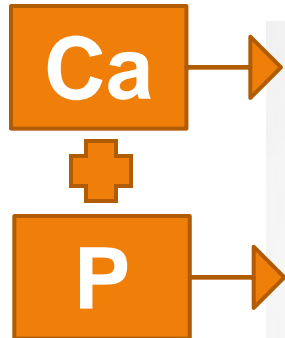
moisture, ash, fat, protein, carbohydrate, crude fibre, calcium, and phosphor

### 3. Physical Analysis

- Breaking Strength (Thomas et al., 1994) = cookies and extrudate)
- gel strength (SNI 2372.6:2009) .



# Calcium Formulation



1 : 1  
(Ca/P)

2 : 1 (Ca/P)

3 : 1 (Ca/P)

-Decreasing Growth  
-Losing appetite  
-Decreasing ash and deposit of mineral (Ye et

Gave significant effect in bone growing (Ye et al., 2006)

Have been used in Europe formulation standard but high phosphor consumption in food causing changing Ca/P ratio (Cherklewski, 2005)

Have not been studied

# Preparation of Asian moon scallop flour



Scallop Shell

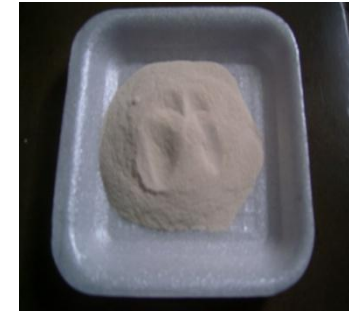
Boiling 80 °C, 30 minutes

Washing

Autoclaving (121 °C, 1 atm, 2 h)

Cutting 2-3 cm

Extraction by 2N HCl at 60 °C, 2 h



Scallop Shell flour

Grinding

Drying (100 °C, 1 h)

Washing

# Preparation of Ca-Flour

**Corn / Millet**

Milling

Sieving  
Mesh Size 80

Corn / Millet flour



**Scallop Shell flour**

Mixing

Formulation Ca : P  
using ratio of 3 : 1

**Ca-Flour**



**Table 1. Physical Characteristics and Nutrients Contents in Feeds (100 g)**

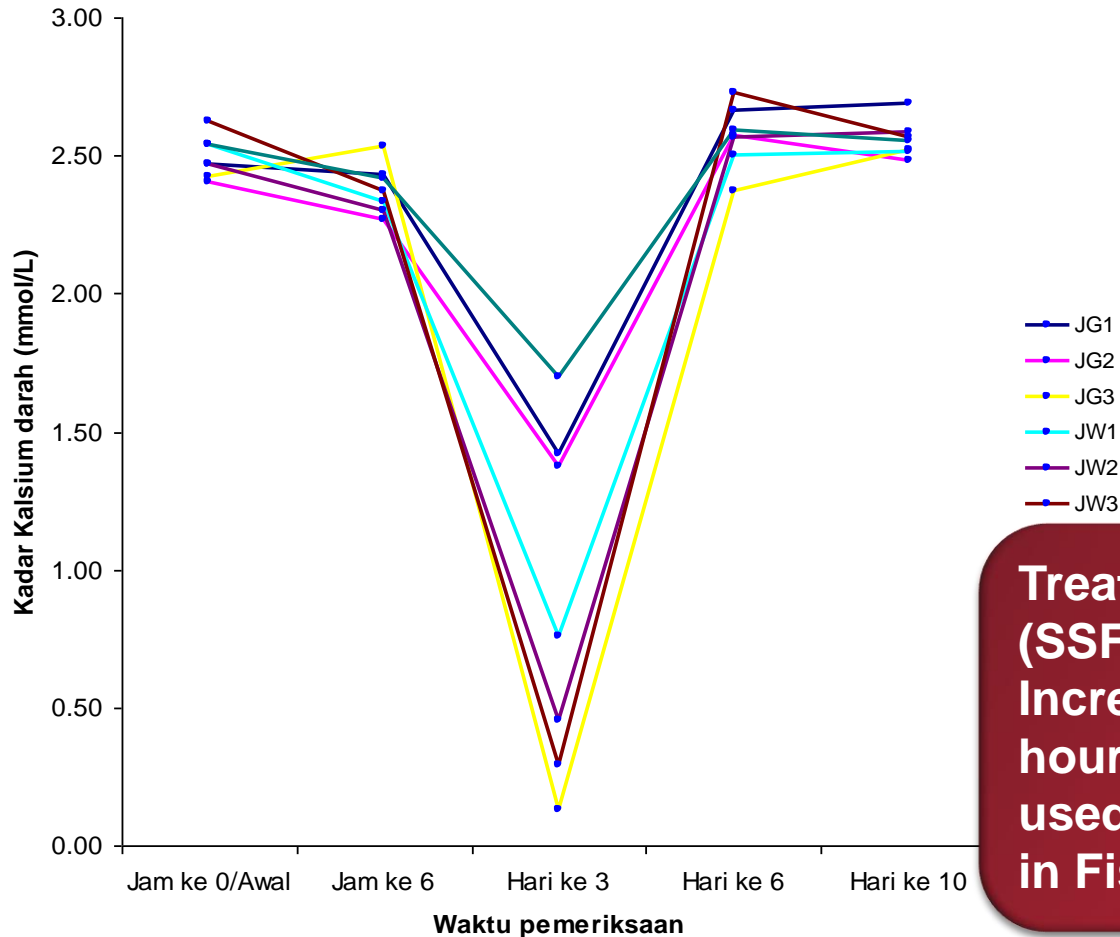
<b>Characteristics</b>	<b>Scallop shell flour</b>	<b>Corn flour</b>	<b>Millet flour</b>	<b>Standard Feed</b>
Physicals :				
Colour	White	Yellow	Brown	Greenish
Appearance	Powder	Powder	Powder	Brown Pellet
Nutrients :				
Protein (gr)	11.2	13.20	12.33	21.98
Fat (gr)	2.44	7.45	3.18	5.53
Carbohydrate (gr)	0,6	65.79	69.08	53.21
Fibre (gr)	0	9.6	10.05	7.31
Ash (gr)	83.56	2.27	4.71	7.48
Moisture (gr)	2.2	11.29	10.70	11.80
<b>Calcium (mg)</b>	<b>17230</b>	<b>1.98</b>	<b>6.41</b>	<b>423.97</b>
<b>Phosphorus (mg)</b>	<b>790</b>	<b>1043.77</b>	<b>622.6</b>	<b>770</b>
Phytic Acid(ppm)	-	2.69	1.95	-

**Table 2. Calcium Content in Blood Serum**

Parameter	Feed Formulation with Addition of						
	SSF and Corn flour 1 : 1	SSF and Corn flour 2 : 1	SSF and Corn flour 3 : 1	SSF and Millet flour 1 : 1	SSF and Millet flour 2 : 1	SSF and Millet flour 3 : 1	Control
Body Weight (g)							
0 day	140.17±3.12	137±6.4	160±2.37	149±4,6	142.67±5.0	159.5±6.4	123.3±2.6
3 days	151.67±10.2	145±9.87	161.5±12.1	161.5±16.8	172.08±9.7	162.7±7.8	126.2±4.7
6 days	153.3±13.5	150.5±17.7	165.3±14.1	166.8±17.2	183.2±14.2	166.8±7.2	131.7±6.8
10 days	158±13.77	155±25.64	175±15.09	179.3±23.0	193.75±14	171.8±7.7	146.3±9.8
Ca Serum (mmol/L)							
0 h	2.49±0.08	2.4±0.13	2.42±0.07	2.54±0.14	2.46±0.2	2.62±0.11	2.54±0.16
6 h	2.40±0.14	2.25±0.17	<b>2.53±0.11</b>	2.32±0.09	2.28±0.07	2.37±0.04	2.41±0.02
3 days	1.23±1.09	1.16±1.22	0.14±0.02	0.65±1.05	0.4±0.46	0.3±0.25	1.87±1.0
6 days	2.67±0.04	2.57±0.24	2.37±0.11	2.51±0.09	2.53±0.17	<b>2.67±0.16</b>	2.62±0.85
10 days	2.65±0.15	2.48±0.35	2.57±0.13	2.51±0.21	2.59±0.04	2.57±0.09	2.56±0.06

SSF= Scallop shell flour  
Mean±SD

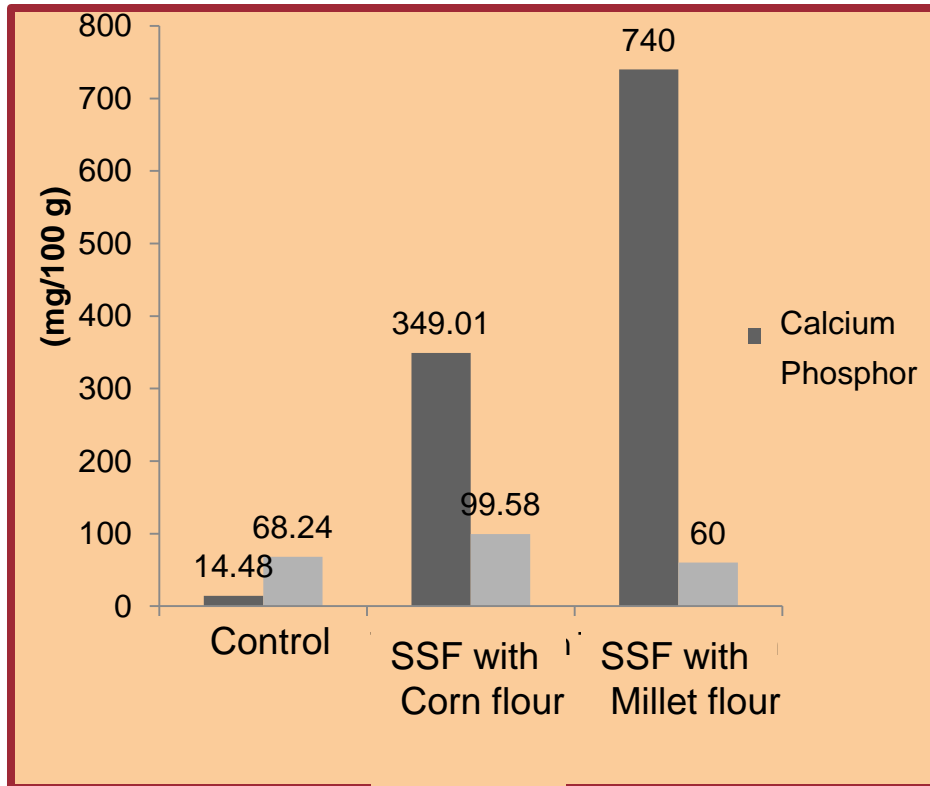
# Ca-absorption in Blood Serum of mice (Feeding Treatment )



**Treatment JG 3**  
(SSF : Corn flour ) Ca:P = 3 : 1  
Increase Blood Calcium Content in 6  
hours and 6 days. This ratio will be  
used in preparation Ca-fortification  
in Fish Based product

**Mice adaptation (Stress) in 3rd days**  
causing the decrease in Ca-  
absorption of blood serum

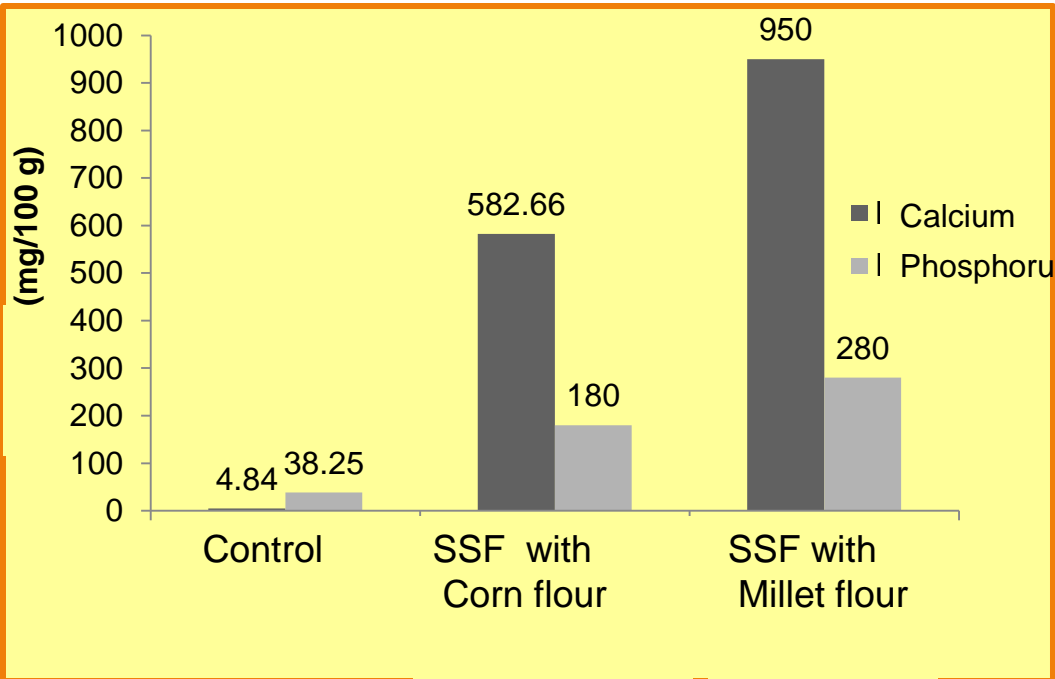
# cookies



- ▶ Commercial Cookies : 209 mg/ 100 gram (0.209%) (Sarwono, 2009)
- ▶ Fortification millet flour in cookies : 112-180 mg/100 gram (Khrisnan *et al.*, 2011)



# Extrudate



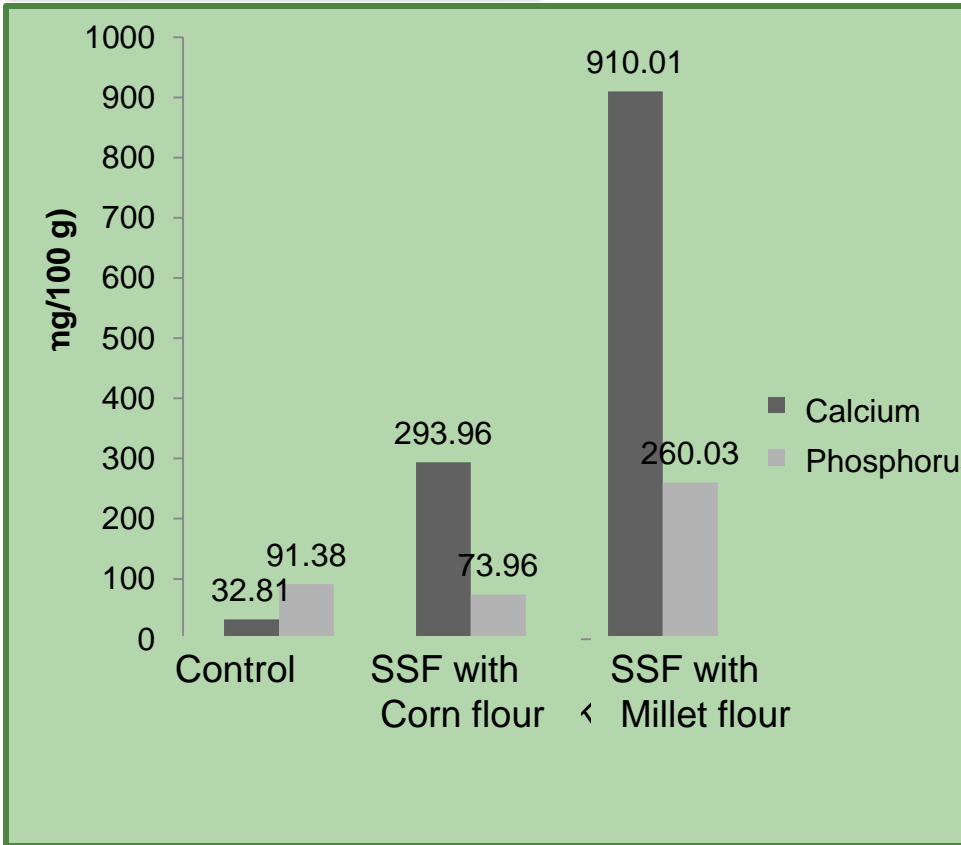
## Fortification with fish flour

15 mg/ 100 g (Oktavia, 2007)

- ▶ Amaranth Extrusion Ca : 133.2 mg/100 g and P:1295 mg/100 g (Ferreira and Areas, 2010)



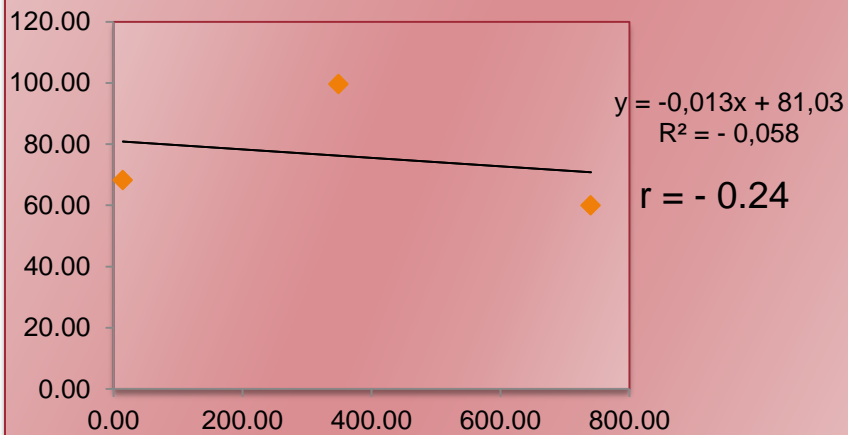
# Fish Nugget



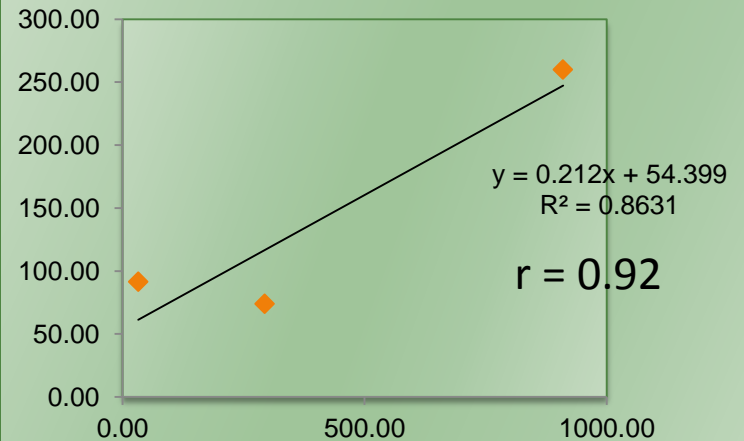


# Calcium and Phosphor Corellations

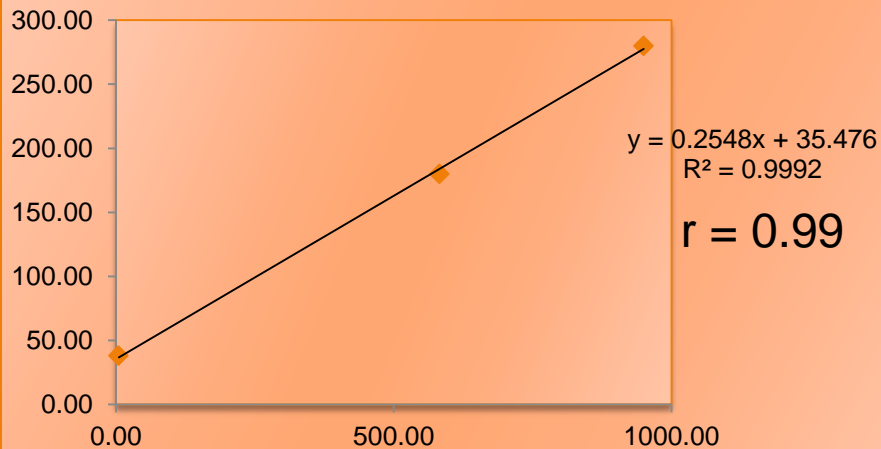
## Cookies



## Fish Nugget



## extrudate





# Chemical Analysis

## Cookies

Parameter	Control	Scallop shell flour with Corn flour	Scallop shell flour with Millet flour
Moisture(%)	7.56	2.81	7.62
Ash (%)	1.20	1.26	2.05
Protein (%)	8.31	4.34	7.88
Fat (%)	19.7	25.60	21.03
Carbohydrate(%)	51.2	58.16	49.05
Crude Fibre (%)	11.0	7.83	12.37

## extrudate

Parameter	Control	Scallop flour with Corn flour	Scallop flour with Millet flour
Moisture(%)	6.23	5.76	6.20
Ash (%)	1.81	2.46	3.38
Protein (%)	6.88	6.56	7.29
Fat (%)	29.80	34.43	32.91
Carbohydrate(%)	42.65	36.54	35.47
Crude Fibre (%)	12.73	14.25	14.75

## Fish Nugget

Parameter	Control	Scallop flour with Corn flour	Scallop flour with Millet flour
Moisture(%)	62.02	58.65	59.81
Ash (%)	2.07	4.978	5.92
Protein (%)	10.01	10.44	12.47
Fat (%)	7.04	7.59	10.30
Carbohydrate(%)	18.85	18.33	11.50
Crude Fibre (%)	1.54	3.87	2.33

# Physical Analysis

Fish-based Product	Control (KgF)	SSF with Corn flour(KgF)	SSF with Millet flour(KgF)
Cookies (breaking strength)	0.43±0.07	0.61±0.13	0.69±0.42
Extrudate (breaking strength)	3.12±1.54	8.81±0.67	5.32±3.11
Fish Nugget (gel strength)	14.48±4.8	14.00±4.67	27.77±9.26





# Ca : P Ratio in Products

Product	Control (0%)	SSF with Corn flour(KgF)	SSF with Millet flour(KgF)
Cookies	1 : 4.71	3.5 : 1	12.3 : 1
extrudate	1 : 7.9	3.2 : 1	3.39 : 1
Fish Nugget	1 : 2.78	3.9 : 1	3.4 : 1



# Conclusion



- ▶ **The best feed formulation using scallop shell flour, corn and millet flours to Ca-absorption of blood serum in mice was performed at ratio Ca:P of 3:1 with range of  $2.53 \pm 0.11$  –  $2.67 \pm 0.16$  mmol/L**
- ▶ **There is positive corelation between calcium value with breaking strength (cookies = 0.96 dan extrudates = 0.49) or gel strength (fish nuggets = 0.94)**

## ACKNOWLEDGEMENT

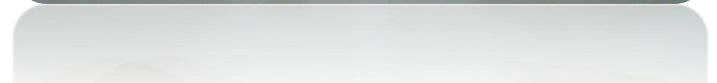
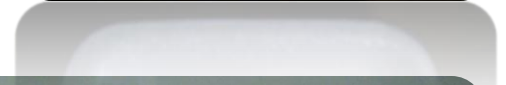
---

- ▶ Directorate General of Higher Education for research funding through National Strategy Grant in 2010
- ▶ Laboratory of Clinical Phatology, Medical Faculty Diponegoro University





**Thank You**





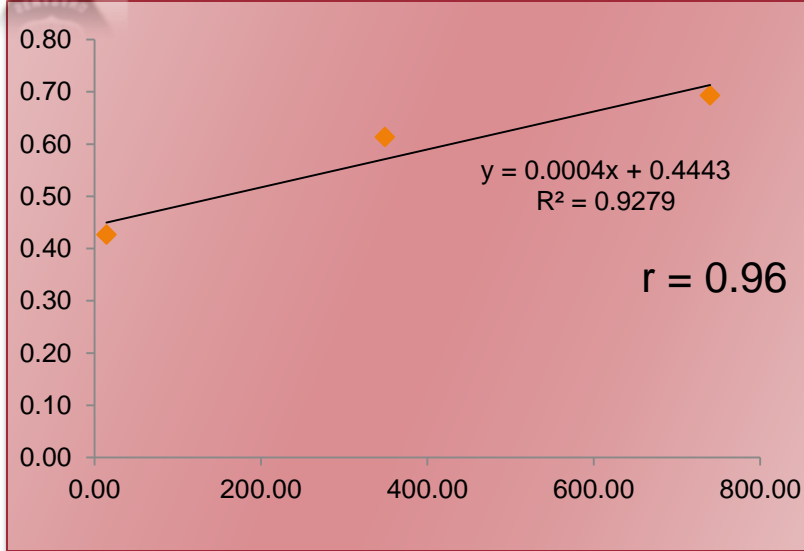
# References

- Agustini, T. W., Akhmad S. F., dan Ulfa A., 2006. *Modul Diversifikasi Produk Perikanan*. Program Studi Teknologi Hasil Perikanan, Universitas Diponegoro. 74 hlm.
- Agustini, T. W., 2008. *Peningkatan Mutu, Penanganan dan Pengolahan Kerang Simping di Kabupaten Brebes*. Laporan Hasil Penelitian, Universitas Diponegoro.
- Association of Official Agriculture Chemist (AOAC)., 1984. *Official Methods of Analysis on the Association of Official Agriculture Chemist*. Washington DC.
- Astuti, E. M., 2010. *Perbandingan Kandungan Asam Lemak pada Kerang Kipas-kipas (Amusium pleuronectes) dari Perairan Kendal dan Perairan Pemalang*. Pdf (Diakses tanggal 29 Desember 2010)
- Badan Standardisasi Nasional., 1992. SNI 01-2973-1992. *Mutu dan Cara Uji Biskuit*. Jakarta.
- \_\_\_\_\_, 2000. SNI 01-2886-2000. *Tentang Makanan Ringan Ekstrusi*. Jakarta.
- \_\_\_\_\_, 2002. SNI 01-6683-2002. *Nugget Ayam (Chicken Nugget)*. Jakarta.
- \_\_\_\_\_, 2009. SNI 2372.6:2009. *Tentang Cara Uji Fisika-Bagian 6: Penentuan Mutu Pasta Pada Poduk Perikanan*. Jakarta.
- Departemen Kesehatan Republik Indonesia. 2005. *Daftar Komposisi Bahan Makanan*. Bhratara Karya Aksara, Jakarta.
- Ditjen Pengolahan dan Pemasaran Hasil Perikanan. 2008. *Scallop Dalam Perdagangan: Warta Pasar Ikan Edisi Juli 2008 No. 59* (hal: 1). Departemen Kelautan dan Perikanan, Jakarta
- Fuadiyati, N., 1999. *Pola Konsumsi Makanan Jajanan dan Status Gizi Remaja di dalam dan Pinggiran Kota Semarang (Studi Kasus pada Siswa SMU Kesatrian 2 dan SMU 2 Ungaran)*. Fakultas Ilmu Gizi, Universitas Diponegoro. (Skripsi).
- Hermanianto, J., Syarief, R., dan Ernawati, E., 2000. *Analisis Sifat Fisiokimia Produk Ekstrusi Hasil Samping Penggilingan Padi (Menir dan Bekatul)*. Buletin Teknologi dan Industri Pangan. Vol 11 (1) hlm 5-10.
- Ibrahim, Y., 2003. *Studi Kelayakan Bisnis*. Rineka Cipta, Jakarta.
- Khomsan, A., 2004. *Pangan dan Gizi untuk Kesehatan*. PT. Raja Grafindo Persada, Jakarta. 210 hlm.
- Manson, R. D., and Lind, D. A., 1996. *Statistical Technuques in Business and Economic*. Teknik Statistik untuk Bisnis dan Ekonomi. Erlangga, Jakarta.
- Nasution, R., 2003. *Teknik Sampling*. Fakultas Kesehatan Masyarakat. Universitas Sumatera Utara.

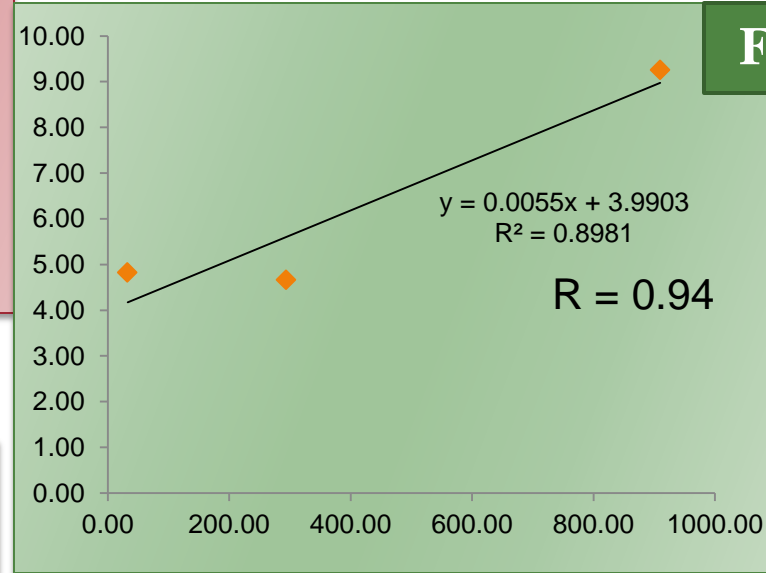
- Oemarjati, B. S. dan Wardhana, W., 1990. *Taksonomi Avertebrata: Pengantar Praktikum Laboratorium*. Jakarta: UI Press. 177 hlm.
- Oregon Departement of Human Service (ODHS), 1998. *Calcium Carbonat, lime, limewater*. Technical Buletin, Health Effect Informations. Pp 1-4.
- Perry and Larsen., 2004. *Amusium papyraceum (Gabb, 1873) Paper Scallop*. Guide to Shelf Invertebrates. Mexico.
- Purwadi, B., 2000. *Riset Pemasaran, Implementasi dalam Bauran Masyarakat*. Grasindo, Jakarta. 361 hlm.
- Riverina., 2009. *Calcium and Phosphorus Source*. Feed manufacturer.
- Sarwono, A., 2009. *Pemanfaatan Tepung Cangkang Kerang Simping (Amusium sp.) dalam Upaya Fortifikasi Kalsium pada Produk Kue Kering (Cookies)*. Fakultas Perikanan dan Ilmu Kelautan, Universitas Diponegoro. (Skripsi).
- Sediaoetama, A.D., 1989. *Ilmu Gizi untuk Mahasiswa dan Profesi*. Dian Rakyat, Jakarta. 252 hlm.
- Srigandono, B., 1989. *Rancangan Percobaan*. Universitas Diponegoro, Semarang.
- Steel, G.D. and Torrie, J.H., 1991. *Prinsip dan Prosedur Statistika Suatu Pendekatan Biometrik. Edisi II*. PT. Gramedia Pustaka Utama, Jakarta. 356 hlm. (Diterjemahkan oleh Bambang Sumantri).
- Susilowati, I., 2008. *Upaya Mempertemukan Aspirasi Produsen dan Konsumen dalam Rangka Komersialisasi Usaha Kerang di Brebes*. Laporan Hasil Penelitian, Universitas Diponegoro.
- Thomas, R., J. C. Oliveira., H. Akdogan and K. L. McCarthy., 1994. *Effect of Operating Conditions on Physical Characteristics on Extruded Rice Starch*. International Journal of Food Science and Technology 29: 503-514hm
- Trilaksani, W. dan Nurjanah., 2004. *Teknologi Pengolahan Kerang-kerangan*. Makalah Disampaikan pada Program Retooling TPSPD Kerjasama DIKTI-PKSPL. Bogor.
- Widowati, I., 2008. *Identifikasi Sumberdaya dan Peningkatan Kesadaran Masyarakat pada Kerang Simping sebagai Hasil Laut Unggulan Masa Depan*. Laporan Penelitian Universitas Diponegoro.
- Widowati, I., Jusup S., Indah S., Tri W. A., and Amin B. R., 2008. *Small-Scale Fisheries of the Asian Moon Scallop Amusium pleuronectes in the Brebes Coast, Central Java, Indonesia*. ICES CM 2008/ K:08.
- Yudiati, E., 2002. *Variasi dan Distribusi Komposisi Biokimia Pada Kerang Amusium sp.* Laporan Penelitian Dikrutin, Fakultas Perikanan dan Ilmu Kelautan, Universitas Diponegoro.
- Yuwono, T., Tri W. A. dan Jusup S., 2010. *Pemanfaatan Limbah Kerang simping (Amusium pleuronectes) Sebagai Bahan Pakan Itik Melalui Metode Silase*. Pascasarjana, Universitas Diponegoro.



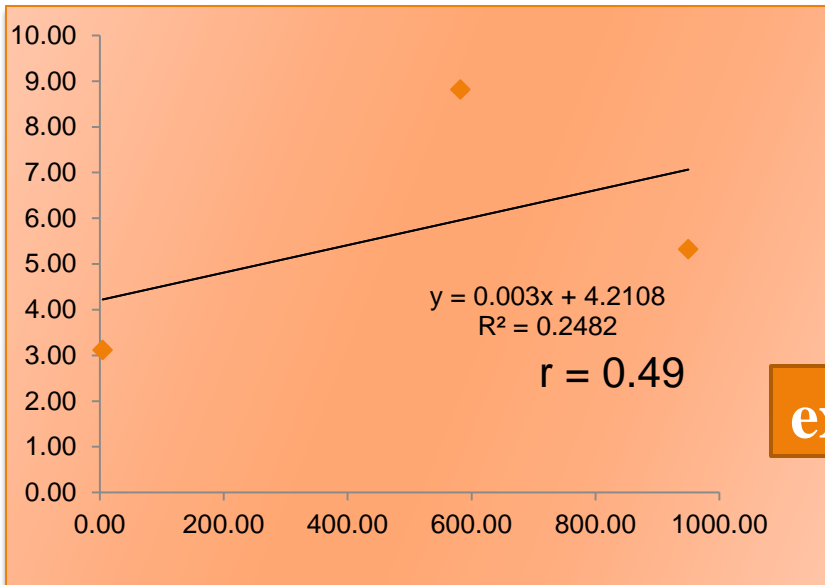
# Corellation between Calcium and Physical Characteristic of Product



**Cookies**



**Fish Nugget**



**extrudate**

---

# TAMBAHAN





# Statistical Analyzed

1. Normality test and homogeneity test (Srigandono, 1989).
2. ANOVA one's way (Srigandono, 1989)
3. Honestly Significant Difference (HSD)
4. Duncan's test for calcium in blood
5. Corelation test (Steel and Torrie, 1991) for calcium, phosphorus and physical characteristics in fish-based products.





# Statistical Analysis

## cookies

Test	CALCIUM	PHOSPORUS
ANOVA	Highly significant different	Highly significant different
HSD	Highly significant different	Significant different (Control Treatment with SSF+ Corn flour)

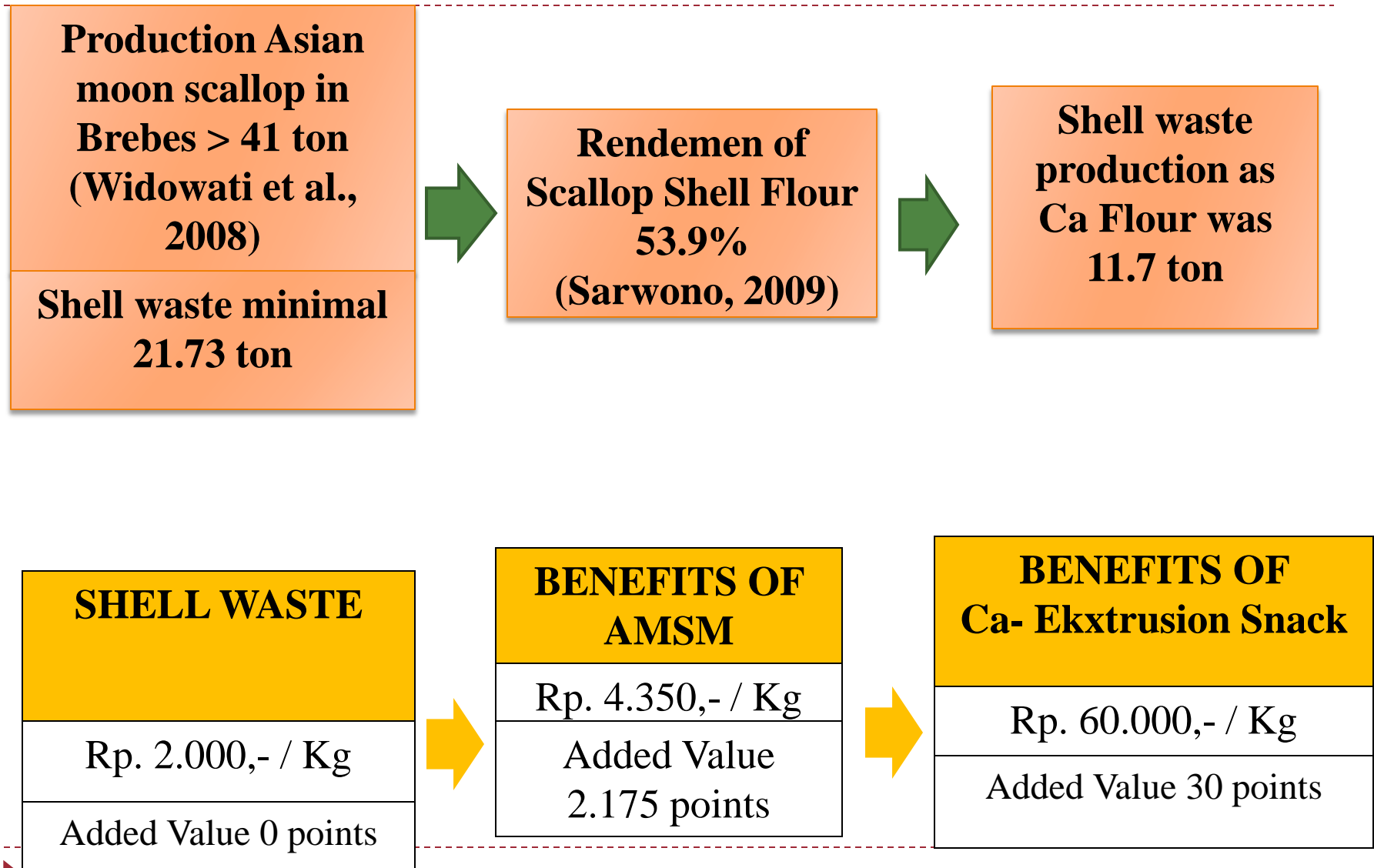
## extrudate

Test	CALSIUM	PHOSPHORUS
ANOVA	Highly significant different	Highly significant different
HSD	Highly significant different	Highly significant different

## Fish Nugget

Test	KALSIUM	PHOSPHORUS
ANOVA	Highly significant different	Highly significant different
HSD	Highly significant different	Highly significant different (SSF+ Corn flour with SSF+ Millet flour)

# Added value of Ca Flour from Asian Moon Scallop Shell



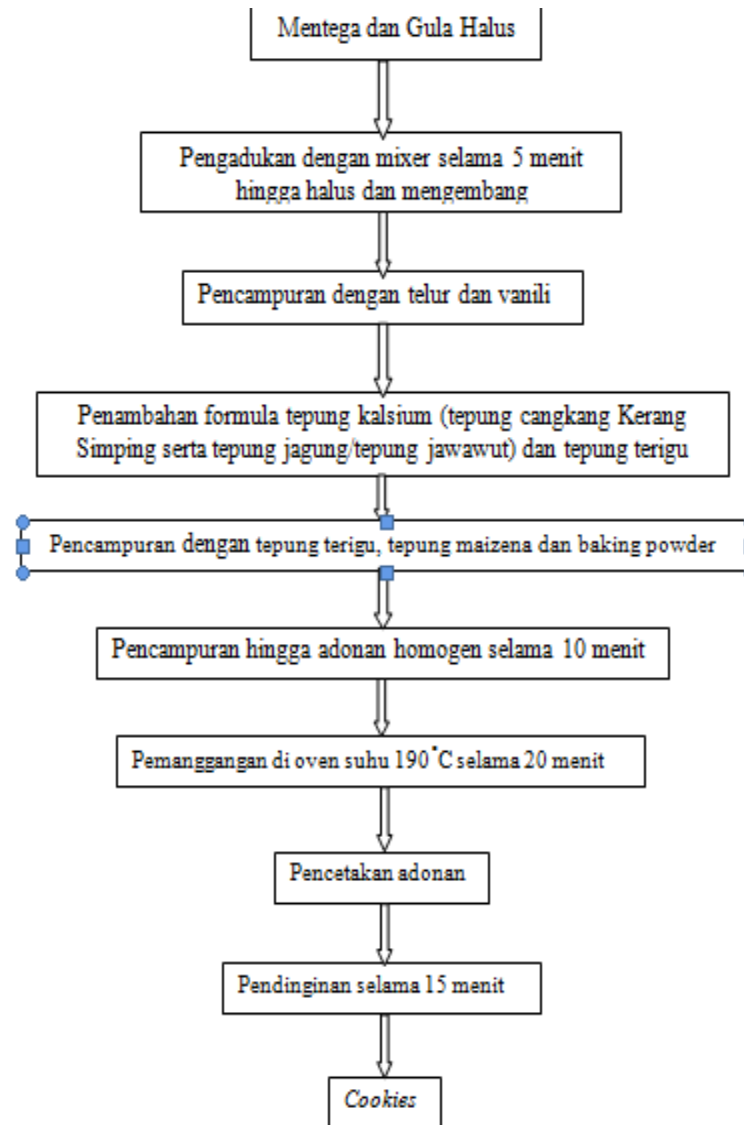
# Calcium Daily Consumption

Time	Daily Menu	Calcium Consumption (mg / 100 gram)	Consumption per serving (mg/ 100 g)	TOTAL
Morning	1. Milk 250 mL	143	357.5	
	2. Bread 200 g			
	3. Butter 0,5 g	10 15	20 7.5	
Day	1. Rice 200 g	5	10	
	2. Vegetables 100 g	220	220	
	3. Chicken 100 g	14	14	
Evening	1. Rice 200 g	5	10	
	2. Vegetables 100 g	220	220	
	3. Beef 100 g	11	11	
	Total		870 mg Ca	
	Ca- extrudate interlude 2 x 50 gram	291.33	582.66	1452.66 mg Ca
	Absorbtion Ca 30-75%	50% Ca		726.33 mg Ca

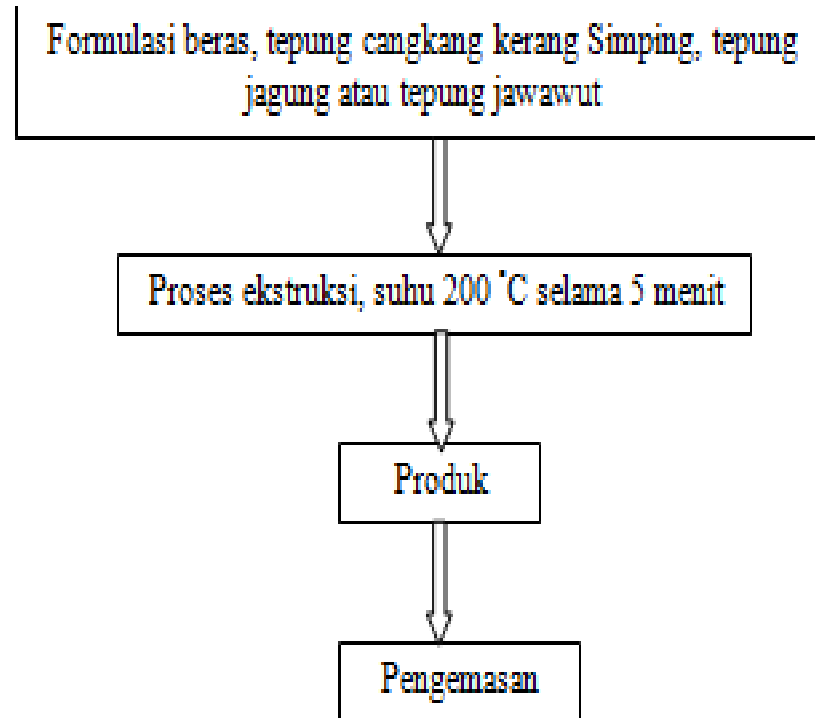




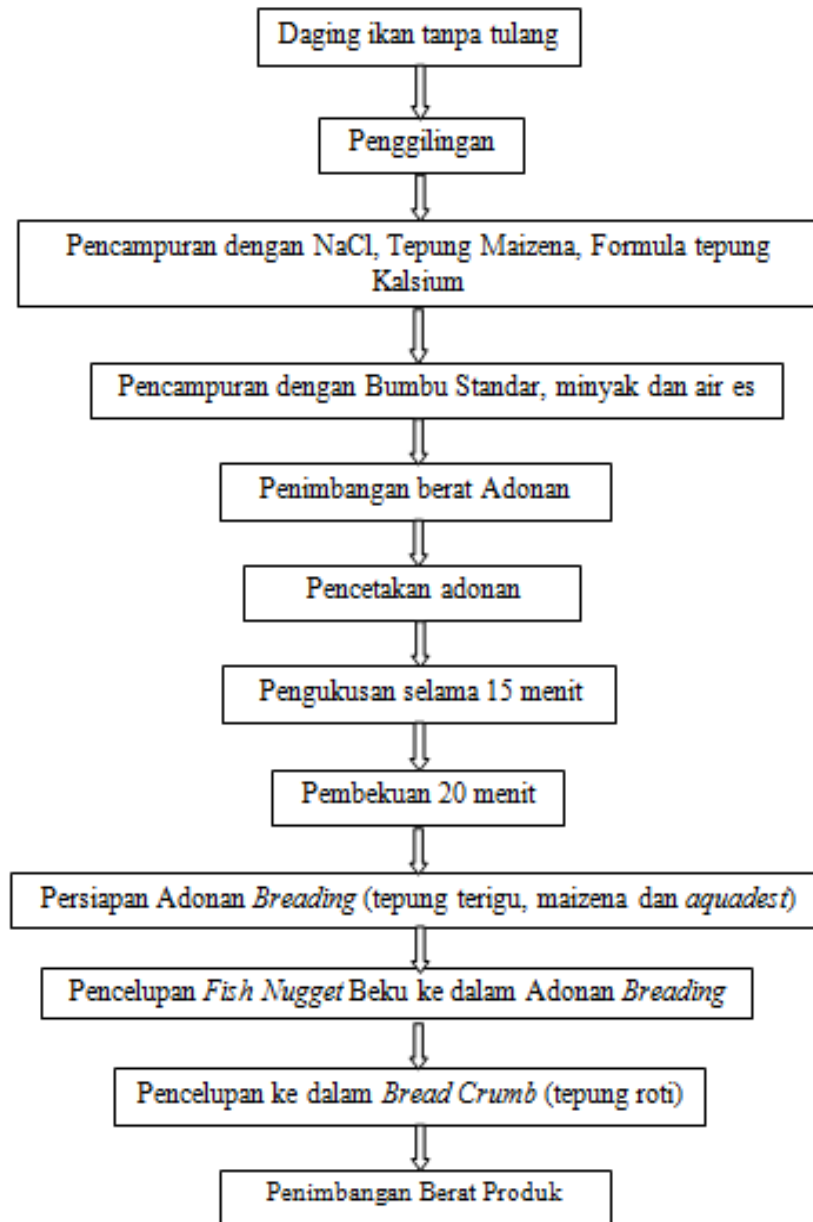
# Alur Proses Pembuatan Cookies (Sarwono, 2009)



# Alur Proses Pembuatan extrudate (Hermanianto et al., 2000)



# Alur Proses Pembuatan Fish nugget (Modifikasi Agustini *et al.*, 2006)



# Bahan dalam Pembuatan Cangkang Kerang Semping

---

Nama Bahan	Kegunaan
Cangkang kerang semping	Sebagai bahan baku tepung kalsium
HCl	Sebagai larutan pengekstrak kalsium cangkang
Aquadest	Sebagai larutan Pengental
Tepung jagung	Sebagai Bahan Pencampur formula tepung kalsium
Tepung Jawawut	Sebagai Bahan Pencampur formula tepung kalsium



# Bahan dalam pembuatan Fish Nugget

Nama Bahan	Berat	Produk 100 g (%)
Daging Ikan Giling	300 gram	46,13
Air es	150 mL	3,23
Garam	10,8 gram	1,38
Minyak	10,8 gram	1,66
Maizena	29,1 gram	2,45
Gula halus	3,6 gram	0,55
Bawang merah	4,8 gram	0,74
Bawang putih	1,2 gram	0,18
Lada	4,2 gram	0,09
Tepung terigu	21 gram	3,23
Tepung beras	1,5 gram	0,23
Baking powder	2,4 gram	0,37
Tepung Roti	120 gram	18,45
Formula tepung cangkang	X	X

**TOTAL BAHAN**

**= 650,4 gram + X**

# Bahan dalam Pembuatan Cookies

Nama Bahan	Berat	Produk 100 g (%)
Mentega	100	19,19
Gula halus	100	19,19
Vanili	0,2	0,04
Tepung terigu	200	38,37
Maizena	20	3,84
Baking powder	0,5	0,10
Telur	50	9,59
Kismis	50	9,59
Essens susu	0,5	0,09
Formula tepung cangkang	X	X

**TOTAL BAHAN**

**= 521,2 gram + X**



# Bahan dalam Pembuatan extrudate

---

Nama Bahan	Berat	Produk 100 g (%)
Beras	250 gram	40,32
Formula tepung cangkang	X	X
Minyak goreng	250 mL	40,32
Margarine	100 gram	16,13
Perisa Makanan	20 gram	3,23

**TOTAL BAHAN**

**= 620 gram + X**

---



# Cara Formulasi

## Formulasi Fish Nugget =

- ▶ Ca Bahan dasar + Ca Jawawut + Ca AMSM

$$96 + 1,74 + (100 - 96 - 1,74) = 96 \times 47,33 + 1,74 \times 6,41 + 2,26 \times 17.230$$

$$100 = 4543,68 + 11,1534 + 38939,8$$

$$\text{Ca} = 43.540,7 / 100$$

$$\text{Ca} = 435,40 \text{ mg}$$

- ▶ P Bahan dasar + P Jawawut + P AMSM

$$96 + 1,74 + (100 - 96 - 1,74) = 96 \times 121,39 + 1,74 \times 622,6 + 2,26 \times 790$$

$$100 = 11653,44 + 1083,324 + 1785,4$$

$$\text{P} = 14522,164 / 100$$

$$\text{P} = 145,22 \text{ mg}$$





# Formulasi Makanan Ringan Tanpa

Konsentrasi (%)	Bahan dasar	Tepung Cangkang	Jumlah	Rasio Ca/P
Total Komposisi	93	7	100	
Kalsium	44,46	1206,1	1250,56	7,44
Fosfor	112,89	55,3	168,19	1,0

Fish Nugget

Cookies

Konsentrasi (%)	Bahan dasar	Tepung Cangkang	Jumlah	Rasio Ca/P
Total Komposisi	98	2	100	
Kalsium	14,48	344,6	359,08	4,27
Fosfor	68,24	15,8	84,04	1,0

Konsentrasi (%)	Bahan dasar	Tepung Cangkang	Jumlah	Rasio Ca/P
Total Komposisi	99	0,77	99,77	
Kalsium	3,29	192,5	195,79	3,13
Fosfor	62,42	0,15	62,58	1,0

extrudate





# Formulasi Makanan Ringan dengan Penambahan Scallop flour dengan JG

Konsentrasi (%)	Bahan dasar	Tepung Jagung	Tepung Cangkang	Jumlah	Rasio Ca/P
Total Komposisi	93	4,15	2,85	100	
Kalsium	44,46	0,08	491,05	535,60	3,00
Fosfor	112,89	43,31	22,51	178,72	1,0

Fish Nugget

Cookies

Konsentrasi (%)	Bahan dasar	Tepung Jagung	Tepung Cangkang	Jumlah	Rasio Ca/P
Total Komposisi	98	0,59	1,41	100	
Kalsium	14,48	0,01	242,94	257,43	3,01
Fosfor	68,24	6,15	11,13	85,54	1,0

Konsentrasi (%)	Bahan dasar	Tepung Jagung	Tepung Cangkang	Jumlah	Rasio Ca/P
Total Komposisi	99	0,23	0,77	100	
Kalsium	3,29	0,004	192,5	195,80	3,01
Fosfor	62,42	2,40	0,15	64,98	1,0

extrudate





# Formulasi Makanan Ringan dengan Penambahan Scallop flour dengan JW

Konsentrasi (%)	Bahan dasar	Tepung Jawawut	Tepung Cangkang	Jumlah	Rasio Ca/P
<b>Total Komposisi</b>	96	1,74	2,26	100	
<b>Kalsium</b>	45,89	0,11	389,39	435,40	3,00
<b>Fosfor</b>	116,53	10,83	17,85	145,22	1,0

Fish Nugget

Konsentrasi (%)	Bahan dasar	Tepung Jawawut	Tepung Cangkang	Jumlah	Rasio Ca/P
<b>Total Komposisi</b>	98	0,64	1,36	100	
<b>Kalsium</b>	14,48	0,041	234,32	248,85	3,00
<b>Fosfor</b>	68,24	3,98	10,74	82,97	1,0

Cookies

Konsentrasi (%)	Bahan dasar	Tepung Jawawut	Tepung Cangkang	Jumlah	Rasio Ca/P
<b>Total Komposisi</b>	98	1,18	0,82	100	
<b>Kalsium</b>	3,26	0,07	205	208,33	3,01
<b>Fosfor</b>	61,79	7,34	0,16	69,30	1,0

extrudate

# Siklus Fosfor

Batuan fosfat



Erosi dan penambangan

Senyawa fosfor anorganik larut

Diserap tanaman

Fosfat organik pada tanaman

Sisa-sisa organisme mati

Dekomposer



Sisa-sisa organisme mati

Fosfat organik dan tulang hewan

Tanaman dimakan hewan

# Pembentukan tulang dan gigi

---



# Kebutuhan makanan ringan formulasi Scallop flour dengan JG

---

No	Golongan Umur (tahun)	Kebutuhan Ca (mg / hari)	biskuit /hari	extrudate /hari	Fish Nugget/hari
1	1-9	500	143 g atau 15-16 kp	85 g atau 2,8 bks	170 g atau 14 bh
2	10-15	700	200 g atau 22,22 kp	120 g atau 4 bks	238 g atau 19-20 bh
	16-19	600	171 g atau 19 kp	102 g atau 3,4 bks	204 g atau 17 bh
3	Pria				
	20-45	500	143 g atau 15-16 kp	85 g atau 2,8 bks	170 g atau 14 bh
	45-59	800	229 g atau 25 kp	137 g atau 4,5 bks	272 g atau 22 bh
	≥ 60	500	143 g atau 15-16 kp	85 g atau 2,8 bks	170 g atau 14 bh
	Wanita				
	20-45	500	143 g atau 15-16 kp	85 g atau 2,8 b bks	170 g atau 14 bh
	45-59	600	171 g atau 19 kp	102 g atau 3,4 bks	204 g atau 17 bh



# Kebutuhan makanan ringan formulasi Scallop flour dengan JW

---

No	Golongan Umur (tahun)	Kebutuhan Ca (mg / hari)	extrudate /hari	Fish Nugget/hari
1	1-9	500	52 g atau 1, 7bks	54,9 g atau 4,5 bh
2	10-15	700	73 g atau 2,4 bks	76,9 g atau 6,4 bh
	16-19	600	63 g atau 2 bks	65 g atau 5,42 bh
3	Pria			
	20-45	500	52 g atau 1, 7bks	54,9 g atau 4,5 bh
	45-59	800	84 g atau 2,8 bks	87,9 g atau 7,3 buah
	≥ 60	500	52 g atau 1, 7bks	54,9 g atau 4,5 bh
	Wanita			
	20-45	500	52 g atau 1, 7bks	54,9 g atau 4,5 bh
	45-59	600	63 g atau 2 bks	65 g atau 5,42 bh



---

Wahyuni, M. 2007. Kerupuk Tinggi Kalsium: Perbaikan Nilai Tambah Limbah Cangkang Kerang Hijau Melalui Aplikasi Teknologi Tepat Guna. <http://www.dkp.go.id>. diakses tanggal 3 April 2008.

Ca = 33,56

P = 0,12





# Biaya Produksi AMSM



No.	Jenis Biaya	Nilai (Rp)	Total (Rp)
1.	Bahan baku =		
	- Cangkang Kerang Simping 5 Kg x Rp. 2.000,- (2)	10.000 93.750	228.250
	- HCl 12,5 liter x Rp. 7.500,- (5)	12.500	
	- Aquadest 25 liter x Rp. 500,-	100.000	
	- Sewa Alat	2.000	
	- Penepungan	10.000	
	Biaya Transportasi		
	Total Biaya Produksi per Kg		45.650
	Keuntungan		4.350



# Biaya Produksi extrudate



No.	Jenis Biaya	Nilai (Rp)	Total (Rp)
1.	Bahan baku =		
	- Beras 3 Kg x Rp. 8000,-	24.000	83.203,9
	- Minyak 2 lt x Rp. 10.000,-	20.000	
	- Margarine 5 x Rp.3.000,-	15.000	
	- Bumbu Instant 4 x Rp. 2.975,-	11.900	
	- Tepung jagung Rp. 12.303,9	12.303,9	
	- Tepung cangkang Rp. 310,-	310	
	- Total		
2.	Biaya Kemasan		
	- Kemasan plastik Rp. 8.000,-	8.000	33.000
	- Cetak Sablon Rp. 25.000,-	25.000	
	- Total		
3.	Biaya sewa alat Rp. 200.000,-	200.000	200.000
4.	Biaya Transportasi	10.416,67	10.416,67
5.	Gaji Pegawai 2 org x Rp. 15.000,	30.000	30.000
6.	Biaya Pemeliharaan Rp. 2.739,73	2.739,73	2.739,73
	<b>TOTAL</b>		<b>359.670,3</b>
	<b>Total Biaya Produksi per Kg</b>		<b>59.945,05</b>
	<b>Dibulatkan</b>		<b>60.000</b>

# OMICS Group Open Access Membership

OMICS publishing Group Open Access Membership enables academic and research institutions, funders and corporations to actively encourage open access in scholarly communication and the dissemination of research published by their authors.

For more details and benefits, click on the link below:

<http://omicsonline.org/membership.php>

