

## Bioactive Components of Pandan's Fruits from Jayawijaya Mountains, Papua, Indonesia

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**Abstract:** Five Pandan species, namely *Pandanus julianettii*, *Pandanus iwen*, *Pandanus brosimos*, *Pandanus sp.1* (owadak) and *Pandanus sp.2* (woromo) from Jaya Wijaya Mountains, Papua have potential bioactive components. This study aimed to identify the bioactive components in Pandan's fleshy receptacle and seed from five Pandan species. Samples were obtained from fleshy receptacle and seed. Sample were mashed and dried for further proximate, minerals, and vitamins contents analysis. The study revealed that nutritive value compositions of food fiber per 100 grams in fleshy receptacle and seed of *Pandanus julianettii* were 23% and 12%; those of *Pandanus sp.1* (owadak) were 17.59% and 18.38%; those of *Pandanus sp.2* (woromo) were 30% and 23%; those of *Pandanus iwen* were 18% and 30%; those of *Pandanus brosimos* were 47.75 % and 17.40%. The nutritive value compositions of starch per 100 grams in pandan's fleshy receptacle and seed of *Pandanus julianettii* were 23 ppm and 0.24 ppm; those of *Pandanus sp.1* (owadak) were 26 ppm and 0.96 ppm; those of *Pandanus sp.2* (woromo) were 36 ppm and 18 ppm; those of *Pandanus iwen* were 21 ppm and 0.21 ppm; those of *Pandanus brosimos* were 35.88 ppm and 9.67 ppm. The nutritive value compositions of vitamin C per 100 grams in fleshy receptacle and seed of *Pandanus julianettii* were 8.10 mg and 6.40 mg; those of *Pandanus sp.1* (owadak) were 16.88 mg and 9.74 mg; those of *Pandanus sp.2* (woromo) were 20 mg and 1.72 mg; those of *Pandanus iwen* were 10 mg and 4 mg; those of *Pandanus brosimos* were 185.68 mg and 109.84 mg. The nutritive value compositions of vitamin E per 100 g in fleshy receptacle and seed of *Pandanus julianettii* were 0.19 mg and 0.46 mg; those of *Pandanus sp.1* (owadak) were 3.18 mg and 15 mg; those of *Pandanus sp.2* (woromo) were 6 mg and 0.07 mg; those of *Pandanus iwen* were 0.19 mg and 8 mg; those of *Pandanus brosimos* were 185.68 mg and 109.84 mg.

**Keywords:** Pandan, medicinal herbs, Papua biodiversity, conservation

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### I. Introduction

Mountain ecosystem in tropical countries is home of myriad biodiversity [1]. The middle mountain area of Jayawijaya is a rich region for Pandanaceae. The *Pandanus* genus is tropical fruits which are found 1750-3500 asl. There have been more than seven species of Pandan cultivated in forests. Pandans fruits have been used as an alternative carbohydrate source by local residents in the middle mountain area of Jayawijaya, including *P. julianettii*, *P. iwen*, *P. brosimos*, *Pandanus sp.1* (owadak), *Pandanus sp.2* (woromo), *P. antaresensis* and *P. conoideus*. The center areas of Pandans fruit production in the middle mountain area of Jayawijaya are Regencies of Puncak Jaya, Puncak Ilaga, Tolikara, Lanny Jaya, Puncak Trikora, Nduga, Wamena, Central Mamberamo, Yahukimo, Yalimo, Mts. Bintang and Papua New Guinea. The flowering season is between November-August. In Papua, Pandan's fleshy receptacle and seed are directly consumed in the form of fresh or dry fruits. Seeds have hard shell coat, resist up to two years, and are able to be dried [2] [3] [4] [5].

Scholars point out that *P. brosimos* and *P. julianettii* fruits have significant roles in people life in the mountainous area of Papua New Guinea (PNG) as food-stuff, traditional medicine, and ritual materials[2] [4]. Purwanto and Munawaroh (2010) confirmed that *P. julianettii*, *P. brosimos* and *P. iwen* were used as medicine materials among Dani tribe in Wamena [6]. Pandan fruit have economical value. They are traditionally treated as food source and medicine by people of East area in Indonesia and Papua New Guinea [3] [4] [7].

Fulfilling adequate food, both in quantity and quality, securely, well-distributed and affordable by all households are the main objective in economic development. Demands of food and medicine increase along with the population growth which promotes the acceleration of food production in order to achieve price stability and food availability. Thus, food security in local context is highly related to the government ability in order to keep the stability of local food availability [8] [9]. In such a case, Pandan fruits have a great potency in food security program. The significance of local food security as the vehicle to reinforce economic stability, health and politics, and food availability with affordable and promising price are main reasons to cultivate Pandan.

Fruits of Pandan plant are potential as food-stuffs and medicine. However, the information on nutrition and medical potency of its fruits has not yet revealed. The study aimed to identify the potency of fruit's nutritive

value on proximate, minerals, and vitamins in Pandan's fleshy receptacle and seed and provided the precise information to develop into food and medicine from five species of Pandans.

## II. Materials and methods

Mature Pandan's fleshy receptacle and seed fruits samples were collected from different sites. Samples of fruit were directly taken from the field under the criteria in which fruits were already ripe. Pandan fruits have two key components—fleshy receptacle and seed. Fruits were picked from trees and peeled from the skin. The fleshy receptacle and seed were separated and dried directly under the sun exposure for five weeks.

Endosperms were derived from seed by breaking the seed coat. White endosperm contains insoluble dietary fiber which has cellulose, hemicelluloses and lignin fibers. Meanwhile, the fleshy receptacle has various fruit color depending on the species of Pandan, i.e. is white, yellow, and orange. Pandans contains dietary fiber such as cellulose, hemicelluloses, pectin substance, and insoluble glycoprotein.

Dry fleshy receptacle and endosperm were mashed by wood pestle and mortar. The mashed result could be filtered by 80 mesh flour sieve, and packaged in plastics. Fleshy receptacle and endosperm from each Pandan plant were labeled for the content analysis of further bioactive materials.

Collecting samples was based on SNI (Indonesian National Standard) 19-0428-1989 for solid material. The water content was measured under standard methods of SNI 01-2891-1992 point 5.1; ash content was measured under standard methods of SNI 01-2891-1992 point 6.1; proteins were measured under standard methods of SNI 01-2891-1992 point 7.1; lipids were measured under standard methods of SNI 01-2891-1992 point 8.2, carbohydrates were measured under standard methods of SNI 01-2891-1992 point 9; calories (IK A2-06), saturated fat, trans fat, cholesterol were measured by Gases Chromatographic (GC). The fiber was evaluated under gravimetric methods of AOAC 985.29 (18th Ed., 2005). The total sugar was measured under SNI 01-2891-1992, point 4.1. Sodium (Na), Potassium (K) and Calcium (Ca) in fleshy receptacle and seed were evaluated by AAS based on the method of AOAC 985.35. Iron (Fe) was measured under standard methods of SNI 3751: 2009 point A.10 (AAS). Vitamin A, E, and Beta carotene in pandan's fleshy receptacle and seed were analyzed by High Performance Liquid Chromatography (HPLC). Vitamin C was analyzed by AOAC 967.21 (1993) methods.

The Butyric acid (C4:0), Caproic acid (C6:0), Capric acid (C8:0), Undecanoic acid (C11:0), Lauric acid (C12:0), Tridecanoic acid (C13:0), Myristic acid (C14:0), Myristoleic acid (C14:1), Pentadecanoic acid (15:0), Pentadecanoic acid (15:1). Palmitic acid (C16:0), Palmitoleic acid (C16:1), Heptadecanoic acid (17:0), Heptadecanoic acid (17:1), Stearic acid (C18:0), Stearic acid (C18:0), Oleic acid (C18:1) [trans-9], Oleic acid (C18:1) [cis-9], Linoleic acid(C18:2)[trans-9], Linoleic acid(C18:2)[cis-9], Arachidic acid (C20:0), Linolenic acid (C18:3)[cis-6], Eicosenoic acid (20:1), Linolenic acid (C18:3)[cis-9], Heneicosanoic acid (C20:2), Eicosadienoic acid (20:2), Behenic acid (C22:1), Eicosatrienoic acid (20:3)[cis-8], Eicosatrienoic acid (20:3)[cis-11], Arachidonic acid (C20:4), Erucic acid (C22:1), Tricosanoic acid (23:0), Docosadienoic acid (C22:2), Eicosapentaenoic acid (C20:5) and Docosahexaenoic acid (C22:6) in Pandan seed were measured by High Performance Liquid Chromatography (HPLC).

## III. Results and Discussions

### 1. Nutritive Value of fleshy receptacle and seed

Pandan is a plant with promising nutrition potency. The testing result of nutritive value composition in five species of Pandan could be observed from Table 1 as follows:

**Table 1.** Compositions of nutritive values in five species of Pandan fruit per 100 grams in seed

No	Parameters	Composition				
		<i>P. julianettii</i>	<i>P. iwen</i>	<i>P. sp1.</i> (owadak)	<i>P. sp.2</i> (woromo)	<i>P. brosimos</i>
1	Water content (%)	3.75	3.10	4.64	7.48	4.78
2	Ash content (%)	4.22	3.81	3.97	3.84	5.88
3	Protein (%)	18	15.08	10.41	15.40	16.06
4	Total fat (%)	47	50	33.08	48.46	48.41
5	Energy from fat kcal	420	450	300	440	485
6	Total Energy kcal	1020	1070	530	1040	1607
7	Carbohydrate (%)	28	27.61	47.90	25	20.06
8	Fat calories kcal/100 g	419.40	450	264.11	346.14	410.07
9	Saturated fatty acid (%)	18	3	1.65	1.5	1.74
10	Unsaturated fatty acid (%)	401.4	497	317.9	438.5	413.4
11	Trans fatty acid (ppm)	0	0	0	0	0
12	Cholesterol (%)	0	0	7	0	0
13	Dietary fiber (%)	12	30	18.38	23	17.40
14	Total sugar (%)	5	2	3.12	4	3.07
15	Betacaroten (ppm)	8.42	4.11	2.24	4.4	0.44

16	Starch (ppm)	0.24	0.21	0.96	18	9.67
17	Sodium (mg/100 g)	71.21	56.25	22.49	77.58	68.36
18	Potassium (mg /100 g)	300.22	255.2	123.05	246.60	117.84
19	Calcium (mg / 100 g)	97.20	51.44	2.46	72.44	92.95
20	Iron (mg / 100 g)	0.45	0.32	0.31	0.37	13.52
21	Vitamin A (IU/g)	0.02	0.02	864.84	0.02	0.76
22	Vitamin C (mg/100 g)	6.40	4	9.74	1.72	109.84
23	Vitamin E (mg/100 g)	0.46	8	15	0.07	17

The result of testing the composition of nutritive value in fleshy receptacle of five Pandan species could be studied in Table 2 as follows:

**Table 2.** Nutritive values in five species of Pandan fruit per 100 grams in fleshy receptacle

No	Parameters	Composition				
		<i>P. julianettii</i>	<i>P. iwen</i>	<i>P. sp.1.</i> (owadak)	<i>P. sp.2</i> (woromo)	<i>P. brosimos</i>
1	Water content (%)	10.93	12.68	5.98	10.20	11.21
2	Ash content (%)	3.41	3.88	3.88	4.82	4.26
3	Protein (%)	8.00	5.84	7.29	10	5.74
4	Total fat (%)	0.67	0.43	20.58	1	1.34
5	Total energy kcal	350	340	450	340	11,
6	Carbohydrate (%)	77	77.17	62.27	74	77.45
7	Fat calory kcal/100 g	6.03	3.87	185.22	8.46	3590.80
8	Saturated fatty acid (%)	0	0	12	0	1.63
9	Unsaturated fatty acid (%)	0.01	0	188.08	0.94	67.90
10	Trans fatty acid (ppm)	0	0	0	0	0
11	Cholesterol (%)	0	0	0	0	0
12	Dietary fiber (%)	23	18	17.59	30	47.75
13	Total sugar (%)	11	6	5.86	5	3.86
14	Betakaroten (ppm)	1.23	1.29	2.24	1.64	21.04
15	Starch (ppm)	23	21	26	36	35.88
16	Sodium (mg/100 g)	87.84	49.20	25.86	47.19	73.96
17	Potassium (mg /100 g)	248.80	311.89	118.95	295.19	343.67
18	Calcium (mg / 100 g)	148.55	127.00	18.31	284.90	351.41
19	Iron (mg / 100 g)	0.42	0.28	0.31	0.30	17.74
20	Vitamin A (IU/g)	0.02	0.02	279.21	0.02	0.87
21	Vitamin C (mg/100 g)	8.10	10	16.88	20	185.68
22	Vitamin E (mg/100 g)	0.19	0.19	3.18	6	2.97

## 2. Chemical Composition of Fatty Acid Group in Seeds

The testing result of fatty acid type group in *Pandanus julianettii*, *Pandanus sp.1* (owadak), *Pandanus sp.2* (woromo), and *Pandanus iwen* seeds was listed in Table 3 as follows:

**Table 3.** Group of fatty acid type in four kinds of Pandan (in percent)

No	Group of fatty acid type	<i>P. julianettii</i>	<i>P. sp.1.</i> (owadak)	<i>P. sp.2</i> (woromo)	<i>P. iwen</i>
1	Butyric acid (C4:0)	0.02	0.01	0.03	0.03
2	Caproic acid (C6:0)	0.29	0.06	0.16	0.24
3	Capric acid (C8:0)	0.34	0.20	0.19	0.30
4	Capric acid (C10:0)	0.07	0.06	0.06	0.07
5	Undecanoic acid (C11:0)	0.04	0.01	0.02	0.03
6	Lauric acid (C12:0)	0.02	0.11	0.07	0.01
7	Tridecanoic acid (C13:0)	0.01	0.02	0.01	0.01
8	Myristic acid (C14:0)	0.07	0.08	0.07	0.09
9	Myristoleic acid (C14:1)	0.00	0.00	0.00	0.00
10	Pentadecanoic acid (15:0)	0.07	0.12	0.10	0.05
11	Pentadecanoic acid (15:1)	0.00	0.00	0.00	0.01
12	Palmitic acid (C16:0)	28.66	9.21	19.91	23.22
13	Palmitoleic acid (C16:1)	0.01	0.16	0.06	0.01
14	Heptadecanoic acid (17:0)	0.08	0.06	0.07	0.08
15	Heptadecanoic acid (17:1)	0.01	0.04	0.02	0.02
16	Stearic acid (C18:0)	3.77	0.74	2.57	3.80
17	Oleic acid (C18:1) [trans-9]	1.84	0.02	0.00	0.77
18	Oleic acid (C18:1) [cis-9]	9.29	12.20	10.17	17.42
19	Linoleic acid(C18:2)[trans-9]	0.00	0.00	0.00	0.00
20	Linoleic acid(C18:2)[cis-9]	0.33	0.11	0.04	1.39
21	Arachidic acid (C20:0)	0.44	0.28	0.08	0.37
22	Linolenic acid (C18:3)[cis-6]	0.00	0.02	0.03	0.00

23	Eicosenoic acid (20:1)	0.02	0.17	0.23	0.01
24	Linolenic acid (C18:3)[cis-9]	0.02	0.00	0.00	0.16
25	Heicosanoic acid (C20:2)	0.52	1.01	1.29	0.38
26	Eicosadienoic acid (20:2)	0.70	0.20	0.22	0.52
27	Behenic acid (C22:1)	0.00	0.05	0.03	0.01
28	Eicosatrienoic acid (20:3)[cis-8]	0.14	0.09	0.05	0.13
29	Eicosatrienoic acid (20:3)[cis-11]	0.12	0.04	0.03	0.10
30	Arachidonic acid (C20:4)	0.00	0.00	0.00	0.00
31	Erucic acid (C22:1)	0.00	0.00	0.00	0.00
32	Tricosanoic acid (23:0)	0.03	0.03	0.03	0.02
33	Docosadienoic acid (C22:2)	0.00	0.07	0.02	0.00
34	Eicosapentaenoic acid (C20:5)	0.09	0.00	0.00	0.04
35	Docosahexaenoic acid (C22:6)	0.00	0.02	0.01	0.00

Based on the composition of nutritive values in Tables 1 and 2 above, the percent daily value (% DV) could be calculated. The calculation was based on the attachment Decree of Head of Supervisory Board of Drugs and Foods of Republic of Indonesia Number: HK. 00.05.52.6291. The calculation result was listed in Tables 4, 5, 6 and 7:

**Table 4.** Calculation of Percent DV in pulp and seed of *Pandanus julianettii*

Fleshy receptacle per 100 gram of <i>Pandanus julianettii</i>			
No	Parameters	Composition of nutritive values	% DV*
1	Total fat	0,5 g	1%
2	Saturated fat	0 g	0%
3	Trans fat	0 g	
4	Cholesterol	0 mg	0%
5	Protein	8 g	13%
6	Total carbohydrate	77 g	26%
7	Dietary fiber	23 g	92%
8	Sugar	11 g	
9	Sodium	90 g	4%
10	Potassium	250	5%
11	Vitamin A		0%
12	Vitamin C		10%
13	Vitamin E		0%
14	Calcium		20%
15	Iron		0%
Seed per 100 grams of <i>Pandanus julianettii</i>			
No	Parameters	Composition of nutritive values	% DV*
1	Total fat	47 g	75 %
2	Saturated fat	18 g	100 %
3	Trans fat	0 g	
4	Cholesterol	0 mg	0%
5	Protein	18 g	29%
6	Total carbohydrate	28 g	9%
7	Dietary fiber	25 g	99%
8	Sugar	5 g	
9	Sodium	70 g	3%
10	Potassium	300 g	6%
11	Vitamin A		0%
12	Vitamin C		8%
13	Vitamin E		4%
14	Calcium		10%
15	Iron		0%

\*Percent Daily Values based on 2000 calorie diet.

**Table 5.** Calculation of Percent DV in pulp and seed of *Pandanus iwen*

Fleshy receptacle per 100 grams of <i>Pandanus iwen</i>			
No	Parameters	Composition of nutritive values	% DV*
1	Total fat	0,5 g	1%
2	Saturated fat	0 g	0%
3	Trans fat	0 g	
4	Cholesterol	0 mg	0%
5	Protein	6 g	10%
6	Total carbohydrate	77 g	26%
7	Dietary fiber	18 g	71%
8	Sugar	6 g	
9	Sodium	50 mg	2%
10	Potassium	310 mg	7%
11	Vitamin A		0%
12	Vitamin C		10%

13	Vitamin E		0%
14	Calcium		15%
15	Iron		0%
Seed per 100 grams of <i>Pandanus iwen</i>			
No	Parameters	Composition of nutritive values	% DV*
1	Total fat	50 g	81%
2	Saturated fat	3 g	16%
3	Trans fat	0 g	
4	Cholesterol	0 mg	0%
5	Protein	15 g	25%
6	Total carbohydrate	28 g	9%
7	Dietary fiber	30 g	120%
8	Sugar	2 g	
9	Sodium	55 g	2%
10	Potassium	260 g	5%
11	Vitamin A		0%
12	Vitamin C		4%
13	Vitamin E		8%
14	Calcium		6%
15	Iron		0%

\*Percent Daily Values based on 2000 calorie diet.

**Table 6.** Calculation of Percent DV in pulp and seed of *Pandanus sp.2* (woromo)

Fleshy receptacle per 100 grams of <i>Pandanus sp.2</i> (woromo)			
No	Parameters	Composition of nutritive values	% DV*
1	Total fat	1 g	2%
2	Saturated fat	0 g	0%
3	Trans fat	0 g	
4	Cholesterol	0 mg	0%
5	Protein	10 g	16%
6	Total carbohydrate	74 g	25%
7	Dietary fiber	30 g	121%
8	Sugar	3g	
9	Sodium	50 mg	2%
10	Potassium	300 mg	6%
11	Vitamin A		0%
12	Vitamin C		20%
13	Vitamin E		6%
14	Calcium		35%
15	Iron		0%
Seed per 100 grams of <i>Pandanus sp.2</i> (woromo)			
No	Parameters	Composition of nutritive values	% DV*
1	Total fat	48 g	78%
2	Saturated fat	1,5 g	9%
3	Trans fat	0 g	
4	Cholesterol	0 mg	0%
5	Protein	15 g	26%
6	Total carbohydrate	25 g	8%
7	Dietary fiber	23 g	93%
8	Sugar	4 g	
9	Sodium	80 mg	3%
10	Potassium	250 mg	5%
11	Vitamin A		0%
12	Vitamin C		0%
13	Vitamin E		0%
14	Calcium		10%
15	Iron		0%

\*Percent Daily Values based on 2000 calorie diet.

**Table 7.** Calculation of Percent DV in fleshy receptacle and seed of *Pandanus sp.1* (owadak)

Fleshy receptacle per 100 grams			
No	Parameters	Composition of nutritive values	% DV*
1	Total fat	21 g	33%
2	Saturated fat	12 g	67%
3	Trans fat	0 g	
4	Cholesterol	2 mg	1%
5	Protein	7 g	12%
6	Total carbohydrate	62 g	21%
7	Dietary fiber	18 g	70%
8	Sugar	6 g	
9	Sodium	25 g	1%
10	Potassium	120 g	3%

11	Vitamin A	15%	
12	Vitamin C	20%	
13	Vitamin E	20%	
14	Calcium	2%	
15	Iron	0%	
Seed per 100 grams			
No	Parameters	Composition of nutritive values	% DV*
1	Total fat	33 g	53%
2	Saturated fat	25 g	137%
3	Trans fat	0 g	
4	Cholesterol	20 mg	7%
5	Protein	10 g	17%
6	Total carbohydrate	48 g	16%
7	Dietary fiber	18 g	74%
8	Sugar	3 g	
9	Sodium	20 mg	1%
10	Potassium	125 mg	3%
11	Vitamin A	45%	
12	Vitamin C	10%	
13	Vitamin E	15%	
14	Calcium	0%	
15	Iron	0%	

\*Percent Daily Values based on 2000 calorie diet.

Pandan fruits from the middle mountainous area of Jayawijaya Papua have relatively great fat potency for future development. The function of fat in human body is to produce and store energy, to construct/form body structure, to protect from losing the body heat, to control body temperature, to save protein in the body, to dissolve vitamins A, D, E, K in the body [10] [11]. Both unsaturated and saturated fatty acids are essential ones derived from vegetables necessarily required by human body [12] [13] [14] [15].

Pandan's fleshy receptacle and seed contains and has very good protein to develop into various functional food products. Functional food is food-stuff containing active components which are important in human health [11] [16]. In the body, proteins perform as enzyme substance to control movements, immunity and important transporter [16] [17] [18] [19] [20].

Carbohydrates in fleshy receptacle are potential to develop into an alternative food-stuff replacing wheat flour made from oat and rice. Pandan fruits contains complete bioactive components such as minerals and vitamins necessarily required to reduce diabetes and cardiovascular risks. Consuming high carbohydrate food with less vitamins and minerals leads to high risk of diabetes and cardiovascular [21].

The dietary fiber in Pandan fleshy receptacle and seed is potential to develop in food and medicine processing industries. Its soluble properties are able to lessen cholesterol level in blood plasma by binding bile acid to increase feces volume [22]. The dietary fiber which absorbs bile acid and is discarded with feces is the cholesterol becoming basic material to produce gastric acid. The cholesterol triggers coronary heart disease—one of the main causes in human death.

Starch from five species of Pandan is potential to develop into raw materials for producing bio-ethanol by fermentation method in the future. Through fermentation, ethanol is produced and it requires *Sacharomyces cerevisiae* yeast sugar with *Zymonas mobilis* bacteria which is able to accelerate ethanol fermentation [23]. Besides producing bio-ethanol, it produces raw materials for industries, pharmacies, drinks, cosmetics, and fuels. Developing bio-ethanol from Pandan as an alternative fuel is beneficial since it contribute to minimize global warming. Thus, Pandan forest will be developed as its native habitat without deforestation. This strategy will lead to the proper tropical forest conservation program in developing countries [1]. The highest production of Pandan fruits is obtained from forests instead of unproductive open lands.

Sodium is the main cation from extracellular liquid, osmotic concentration controlling, and body liquid volume. Its main function in the body as HCl formation is very significant for Fe absorption in stomach. Also, it helps irritability from muscular cells, buffer compound, or liquid restraint compound in the body. Losing Sodium from the body results in vomiting, diarrhea, and sweating [10]. Fruits from five types of Pandan have Sodium element necessary for the body.

Potassium element is very significant for body growth, muscle contraction, transmission of neural impulses, neural and muscular cells. Consuming Sodium bicarbonate for young athletes is significant as it can improve workout intensity and swimming between 50-200 meters for the distance composition [24]. In terminology, local residents of Papua hinterland consume Pandan fruits daily as their staple food so they have strong muscles which enable them to travel 100-200 kilometers for 10-15 hours on foot. Pandan fruits have high Sodium which are potential to be the food for athletes or other branches of sport.

Calcium functions in bone and tooth composition, blood coagulation, excitability of neural muscle, cellular fracture, transmissions of neural impulses, improving the function of cell membrane, activation of

enzyme reaction, and hormone release [10] [11]. The potency within five types of Pandan fruits has nutritive value of high Calcium developed into food and medicine.

Among five types of Pandan, Vitamin A is only found in fleshy receptacle and seed of *Pandanus* sp.1 (owadak). The fleshy receptacle of *Pandanus* sp.1 (owadak) is orange to pink in color and contains high carotene as the source of vitamin A. It needs to be naturally developed for acquiring body health particularly for eyes. As far, the important of vitamin consumption is poor understood by local people. The education of nutrition to substitute vitamin A as regular food input containing rich source of carotene is necessarily required [25].

Consuming fruits, vegetables, and leaves containing rich and high vitamin C will result in health improvement of heart, reduced diabetes, cataract, and cancer [26] [27]. The fruit storage for two weeks in 50°C room temperature does not cause the loss of vitamin C [28]. The fleshy receptacle and seed of five pandan species have vitamin C as an anti-oxidant which is crucial for future development. Vitamin E within the vegetable fatty acid has an important anti-oxidant to prevent bleeding in pregnant women and after childbirth [29]. It is detected in five types of Pandan and potential to be an anti-oxidant for future development.

#### IV. Conclusion

The study confirmed that compositions of fat nutrition value per 100 grams in *Pandanus julianettii*'s fleshy receptacle and seed were 0.67% and 47%; those in *Pandanus iwen* were 0.43% and 50%; those in *Pandanus* sp.1. (owadak) were 20.58% and 33.08%; those in *Pandanus* sp.2 (woromo) were 1% and 48.67%; those in *Pandanus brosimos* were 1.34% and 48.41%. Compositions of protein nutrition value per 100 grams in *Pandanus julianettii*'s fleshy receptacle and seed were 8% and 18%; those in *Pandanus* sp.1 (owadak) were 7.29% and 10.41%; those in *Pandanus* sp.2 (woromo) were 10% and 15.40%; those in *Pandanus iwen* were 5.84% and 15.08%; those in *Pandanus brosimos* were 5.47% and 16.06%. Compositions of carbohydrate nutrition value per 100 grams in *Pandanus julianettii*'s pulp and seed were 77% and 28%; those in *Pandanus* sp.1 (owadak) were 62.27% and 47.90%; those in *Pandanus* sp.2 (woromo) were 74% and 25%; those in *Pandanus iwen* were 77.17%; and 27.61%; those in *Pandanus brosimos* were 77.45% and 20.06%.

Compositions of Sodium nutrition value per 100 grams in *Pandanus julianettii*'s fleshy receptacle and seed were 87.84 mg and 71.21 mg; those in *Pandanus* sp.1. (owadak) were 25.86 mg and 22.49 mg; those in *Pandanus* sp.2. (woromo) were 47.19 mg and 77.58 mg; those in *Pandanus iwen* were 49.20 mg and 56.25 mg; those in *Pandanus brosimos* were 73.96 mg and 63.70 mg. Compositions of Calcium nutrition value in *Pandanus julianettii*'s pulp and seed were 148.55 mg and 97.20 mg; those in *Pandanus* sp.1. (owadak) were 18.31 mg and 2.46 mg; those in *Pandanus* sp.2. (woromo) were 284.90 mg dan 72.44 mg; those in *Pandanus iwen* were 127.00 mg and 51.44 mg; those in *Pandanus brosimos* were 351.41 mg and 92.95 mg. Compositions of vitamin A nutrition value per 100 grams in *Pandanus julianettii*'s fleshy receptacle and seed were 0.02 IU/g and 0.02 IU/g; those in *Pandanus* sp.1 (owadak) were 279.21 IU/g and 864.84 IU/g; those in *Pandanus* sp.2. (woromo) were 0.30 IU/g and 0.02 IU/g; those in *Pandanus iwen* were 0.02 IU/g and 0.02 IU/g; those in *Pandanus brosimos* were 0.87 IU/g and 0.76 IU/g.

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