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Effect of Processing Methods on Some Anti Nutrients Composition of Premature and Mature Fruits of Piliostigma Thonningii from Guinea Savanna Zone of Nigeria

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ABSTRACT

Effect of sun drying, soaking, boiling and fermentation processes on the level of some anti nutrients present in the seeds and pulp of premature and mature fruits of pilio stigma thonningii were studied. Comparing with other treatments, fermentation had the least (reduction) of trypsin-inhibitor in the seeds regardless of its duration. Boiling and fermentation significantly ($p<0.05$) reduced cyanide by (41.6- 47.9%), phytate by (65.7 - 74.3%), saponin by (33.1 - 45.2%) and oxalate by (33.7 - 84%). However, the combined effect of boiling and fermentation processes has the potential of removing most anti nutrients from the seeds and the pulp of the fruits of Piliostigma thonningii to a minimal level. Reduction to safe level of the anti nutrients is essential to improve the nutritional quality of the seeds and the pulp of the fruits of Piliostigma thonningii and for effective utilization of its full potentials as a novel food for animals and human.

Keywords: *Processing, antinutrients, seeds, pulp. Piliostigma thonningii, guinea savanna*.

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1. INTRODUCTION

Most carbohydrate based foods such as cassava, maize, yam, cocoyam and rice provide appropriate calories but are highly deficient in other nutrients particularly proteins and are usually supplemented with beans (Egbakum and Ehiezue, 1999; Achi, 1999). Plant foods such as cereals and legumes have consistently been listed as the major potential sources of dietary protein for feeding the world of tomorrow and research efforts are being directed to this area t o identify and evaluate unexploited sources, (Egbe and Akinyele, 1990; Rajaram and janardhanan, 1991). Piliostigma thonningii which is commonly called Thonning'piliostigma (others also called it Carmel's foot or Monkey's bread) is one of the lesser known legumes which is still wild and has not been utilized to alleviate the problem of protein malnutrition common in developing nations o f the world such as Nigeria. It contains about 20.25% crude protein which is high enough to be used as complementary food in carbohydrate based diets (Singh and Krihorian, 1982). However, the anti nutrients composition

commonly found in legumes stand as a limiting factor in the utilization of Piliostigma thonningii. Among these anti nutrients are trypsin inhibitors which inhibit the proteolytic activity of the digested enzyme trypsin and can lead to reduced availability of a mind acids and reduced growth (Liener and Kakade, 1980). Phytate content of legumes has been known to lower the bio-availability of mineral (Evadman 1979) and inhibits the activity of several enzymes (Singh and Krihorian, 1982). Saponin when present in large quantities food legumes impart bitter taste to the plant foods and also induced haemolysis (Oaken full, 1981). Mores, tannin inhibit the activities of some enzymes like trypsin, amylase and lipase (Griffith, 1979) resulting from the formation of complexes with protein. Thus, the reduction to safe level of the anti nutrients content is essential to improve the nutritional quality of the fruits of P. thonningii and for effective utilization its full potentials as animals and human food and therapy. Information regarding the effect of processing methods on some anti nutrient factors in the fruits of P. thonningii is sparsely or not widely available in literature. Thus, this study is therefore imperative as it investigate the effect of various processing methods on anti nutrients content of P. thonningii.

2. MATERIALS AND METHODS

2.1 Plant Collection

Premature and mature fruits of Piliostigma thonningii were harvested from all over Makurdi and Kwando Local Government, Benue State, Nigeria. The fruits were collected and packed in two jute sacks categorizing the two groups, the premature and mature fruits.

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2.2 Processing Procedures

The pods were sundried for two weeks and they were opened to release the seeds by the use of local pestle and mortar. Some of the seeds of mature fruits were decupled, separating the seed nuts from the seed coats by simple soaking of the seeds in excess water for 48 hours. The three portions of the mature seeds (ie seed nuts, coats and whole) together with the rest of the whole seeds of premature fruits were subjected to other different processing methods (ie boiling and fermentation), while other portions of each category were analyzed raw.

3. CHEMICAL ANALYSIS

The standard method described by AOAC (1995); was used for the determination of trypsin inhibitor, saponin and phytic acid .
Oxalate was determined by the method of Munro & Bassir (1969). While total cyanide was estimated according to the procedure of Balogoplan (1998).

4. STATISTICAL ANALYSIS

Data was statistical analyzed and all data collected in this study were subjected to analysis of variance (ANOVA) a s described by (Welkowtz 1979) and values where expressed as mean standard deviation. The treatment means of various portions of the processed fruit s and seeds were compared using Duncan's multiple Range test. Values at $p<0.05$ were considered significant.

5. RESULTS AND DISCUSSION

Table 1 presents the result of the effect of boiling and fermentation on the anti nutrients contents of mature seeds of Piliostigma thonningii. Boiling and fermentation and some of the traditional processing methods have reduction effect on all anti nutrients content considered. The result from the study showed that, boiling and fermentation of the seeds for a couple of days and hours decreased the amount of anti nutrients content in all samples from their raw state. Boiling and fermentation processes have remarkable reduction effect on cyanide by 4 1.6 - 47.9%, saponin by 33.1 - 45.2%, oxalate by 33.7 - 84%, phytate by 65.7 - 74.3% and trypsin - inhibitor by 17.2-42.5%. Generally, there were significant decrease ($p<0.05$) in the anti nutrients content of all the samples (i.e the various portions of the seeds) with respect to boiling and fermentation processes. This is because, the combined effect of cooking and fermentation processes have the potential of removing most ant nutrients from the seed legumes to a minimal level, (Kraus, 1983). Purse glove (1991) reported that, the precaution of soaking and cooking in libr al amount of water with changing of water many times during processing will further leach out the liberated cyanide from the seeds. More so, the amount o f phytic acid in cooked and fermented portion of the seeds were considered to be in trace amount as compared to those reported by Ega, et al., (1994) for fermented Tamaridus seed nuts (14.24 mg/ 100g), Parkia seed nut fermented (21.52mg/ 100g), Sesamum seeds (59.65mg/ l00g), sweet cassava peel tissue e (16mg/ 100g) and Taro cocoyam peel tissue (9.14 mg/ 100g). This trace and reduction in amount of phytic acid from raw to cooked fermentated state o f the seeds could be due to the presence of the enzyme called phytase which may be produced by fermenting microorganisms that have been reported to r educe phytic acid in most fermented seed legumes (Sunder and Markakis, 1977). This also gives a clear indication that the seeds of Piliostigma thonningii if properly cooked and fermented could be consumed without any adverse effect from phytic acid. The much more signify cant ($p<0.05$) amounts of ant nutrients content in the raw whole seeds might have been due to the three major components (ie the coat, nut, and embryo), and the presence of these anti nutrients content in all the components gave their cumulative highest amount in the whole seeds.

Table 2 presents the results of the anti nutrients content in pre-mature and mature whole seeds (ie raw, cooked and fermented). The whole seeds at premature stage have recorded significant ($p<0.05$) higher amount of anti nutrients contents in raw, cooked and fermented state as compared to the mature whole seed at the same states. The levels of anti nutrients contents in both mature and premature whole seeds decreased significantly ($p<0.05$) from their raw to cooked and fermented states. More so, the anti nutrients content of the pulp of premature and mature fruits are presented in table 3. The pulp of premature fruits recorded significant higher amount of saponin, and oxalate than the pulp of mature fruits. And both pulp showed absence of cyanide, phytate and triypsin-inhibitor. Hence there was no significant difference among the mean treatments at 5% level of probability. Conclusively, results from this study on the anti nutrients content have given an impression that, the seeds of Piliostigma thonningii should not be consumed in the raw state, as the amounts of these anti nutrients in most samples obtained during the study were always in decreased mounts when cooked and fermented. Thus, Kraus (1983), Makkav and Becker (2000) on this plight also reported that, the combined effect of sun drying, soaking, cooking an d fermentation processes have potential of removing most of these anti nutrients from the seed legumes to a minimal level that may have less or no adverse e effects on human and animals.

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Table 1: Anti-nutritients Content of processed Matured Seeds of Piliostigma Thonningii From Benue State of Nigeria

	Anti - nutrients Content (PPM)				
SEED SAMPLE	**Cyanide**	**Saponin**	**Oxalate**	**Phytate**	**Trypsin Inhibitor**
Raw whole seed	14.33[b] ± 0.42	25.00[a]±0.10	10.00[a]±0.50	2.63[b]±0.15	114.33[a]±0.58
Rawseednut	16.70 [a]± 0.27	16.87[b]±0.35	8.97[C]±0.I5	3.50[a]±0.10	96.88[e]±0.15
Raw seed coat	0.47 4 0.06	15.10[f]±0.10	0.00g±0.00	0.00[f]±0.00	58.43^*0.06
Cooked whole seed	11.70[b] db 0.27	13.70[b]±0.27	6.63[d] ±0.06	0.77[e]±0.06	65.70° ±0.61
Cooked seed nut	8.70[e]±0.10	1.6.73[d] ± 0.06	9.03[b] ± 0.06	1,20[d] ± 0.01	45.67[e]±0.58
Cooked seed coat	0.00* ± 0.00	0.85® ±0.01	0.00§±0.00	0.00*'± 0.00	12.63S±0.06
Cooked fermented whole seed	10.47^ ± 0.06	16.73^*0.06	1.60[c]±0.06	1.60[c] ± 0.01	94.70[b]±0.27
Coked fermented seed nut	9.75^ ±0.05	10.00[e]±0.00	2.03[e] ±0.01	0.90[e]±0.01	430.13^± 0.06
Coked fermented seed coat	0.00* ±0.00	1.53*±0.06	1.63*±0.06	0.00*'±0.00	0.00[b]±0.00

Note:
Means of three determinations ± SD
Means With the same superscripts within a column are not significantly different at 5% level of probability Means in parentheses indicate percentage loss

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Table 2: Anti-nutrition's Content of processed Premature and Mature Seeds of Piliostigma Thonningii From Benue State of Nigeria

		Anti – nutrients Content (PPM)				
SEED SAMPLE		**Cyanide**	**Saponin**	**Oxalate**	**Phytate**	**Trypsin Inhibitor**
	Mat.	14.33±0.42	25.00±0.010	0.00±0.50	2.63±0.50	144.33±0.58
Raw whole seed						
	Imm.	21.03±0.06	26.50±0.10	15.67±0.06	6.09±0.06	61.03±0.08
	Mat	11.70±0.27	13.70±0.27	6.63±0.06	1.60±0.01	94.70±0.27
Seed						
	Imm.	18.00±0.12	17.07±0.12	8.53±0.06	5.27±0.12	65.57±0.12
	Mat	10.47±0.06	16.730.06	1.60±0.06	0.77±0.06	65.70±0.06
Cooked fermented						
Whole seeds	Imm.	4.03±0.06	12.07±0.06	0.15±0.01	2.00±0.00	14.00±0.00

Note:
Means of three determinations + SD
Mat = Mature seeds
Imm = premmature seeds

Table 3: Anti-nutrition's Content of processed Premature and Mature Pulp Seeds of Piliostigma Thonningii From Benue State of Nigeria

	Anti – nutrients Content of the Pulp (PPM)				
Pulp	**Cyanide**	**Saponin**	**Oxalate**	**Phytate**	**Trypsin Inhibitor**
Premature	0.000	1.50±0.006	1.61±0.006	0.000	0.000
Mature	0.000	1.47±0.027	1.58±0.020	0.000	0.000

Note:
Means of three determinations ± SD
Means with the same superscripts within a column are not significantly different at 5% level of probability.

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