BIBLIOGRAPHY

PE, MARITES O. JUNE 2011. Evaluation of Pork Patties Processed with Different Levels of Ampalaya (*Momordica charantia*) Extract. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted at the Meat Laboratory Room of the Department of Animal Science under the College of Agriculture, Benguet State University. This was conducted to determine the acceptability of pork patties processed with different levels of ampalaya extract in terms of appearance, tenderness, juiciness, flavor, and the overall acceptability of the product; to determine the cost of producing meat patties processed with different levels of ampalaya extract; and to determine the composition of pork patties processed with different levels of ampalaya extract.

The results of the study revealed that adding ampalaya fruit extract in processing pork patties at the level of 100-200 ml/kg did not significantly affect the appearance, juiciness, flavor and the overall acceptability of the product. However, in terms of tenderness, the inclusion of ampalaya fruit extract at the level of 200 ml/kg meat made the pork patties less tender. Both the patties with no ampalaya fruit extract and those with ampalaya fruit extract added at the level of 100 ml/kg meat were more or less similar in tenderness.

The results also revealed that the inclusion of ampalaya fruit extract in processing pork patties at the level of 100-200 ml/kg meat have caused an increase (Php 2.00-4.00) in the total cost of production. Furthermore, in terms of food composition, it resulted to an increase in the energy content of the product but caused a reduction in the protein content ranging from 0.98-1.72%.

Based on the results of the study, ampalaya extract maybe added when making pork patties for its medicinal value but at the level of 100 ml/kg meat so that the tenderness of the product will not be reduced, the increase in total cost will not be high, and the reduction in the protein content will only be slight. However, it is also recommended that further studies should be conducted to include the micro nutrient contents of the processed product to confirm its medicinal value and the nutrient composition analysis should be replicated to have more conclusive results.

INTRODUCTION

Meat processing is not merely producing a product just to have something to sell, but the taste and preference of the consumers should be considered. Consumers today are getting more conscious of their health so they are very selective on the quality and nutritional value of the products they buy and eat. Researchers have responded by adding herbs or healthful flavorings to meat during processing such as basil leaves, lemon grass extract, and corn syrup and are still continously doing researches to satisfy the meat product consumers.

One of the common herbal plants is the ampalaya. Ampalaya, botanically known as *Momordica charantia,* is a tropical and subtropical vine of the family Cucurbitaceae. It is widely grown in the Philippines for its edible fruit and it is also called bitter melon or bitter gourd. As the English name suggests, the melon has a bitter taste due to the presence of momordicin, and is believed to be among the most bitter of all vegetables. Ampalaya is a climbing vine that grows up to five meters, with tendrils up to twenty centimeters long. Amplaya leaves are heart-shaped, five to ten centimeters across, cut into five to seven lobes. Each ampalaya plant bears separate yellow male and female flowers. It bears fleshy green fruit, oblong shaped with pointed ends, ribbed and wrinkled, bursting when mature to release seeds. Ampalaya seeds are flat with ruminated margins (hubpages. com, 2011).

Ampalaya leaves and fruits are excellent sources of Vitamin B, iron, calcium, and phosphorus. It is also rich in beta carotene. Ampalaya is used as herbal treatment for diabetes, coughs, skin diseases, hemorrhoids, stomach problems and as purgative. Scientific studies have also been conducted on ampalaya as a possible cure for cancer and

HIV. It has been found to be helpful in treating malaria and is known, like most bitter foods, to stimulate digestion and relieve constipation. Its leaves are also used as medicine for wounds, for coughs, to combat sterility in women, as a paraticide and antipyretic. Pounded ampalaya seeds or leaves are used to treat burns, scalds and wounds (www. medicalhealthguide.com, 2011).

Because of the above benefits, the researcher has been motivated to determine the acceptability of pork patties processed with ampalaya extract. Result of this study would serve as a reference material to students, food processors, other researchers in their future researches, and other people who are interested to venture on meat processing. It will also probably help encourage the ampalaya growers to increase their production as this will be used not only as vegetable but also in meat processing.

Generally, the objective of this study was to determine the acceptability of pork patties processed with different levels of ampalaya extract. Specifically, this study aimed to determine the acceptability of pork patties processed with ampalaya extract in terms of appearance, tenderness, juiciness, flavor , and the overall acceptability of the product; to determine the cost of producing pork patties processed with ampalaya extract; and to determine the composition of pork patties processed with ampalaya extract.

This study was conducted at the Meat Laboratory Room of the Department of Animal Science under the College of Agriculture, Benguet State University, La Trinidad, Benguet in May 2011.

REVIEW OF LITERATURE

Bitter gourd, scientifically known as *Momordica charantia*, is one of the most popular vegetables in Southeast Asia. It is a member of the cucurbit family along with cucumber, squash, watermelon, and muskmelon. Native to China or India, the fast-growing vine is grown throughout Asia and is becoming popular worldwide. Depending on location, bitter gourd is also known as bitter melon, karella, or balsam pear. The immature fruits and tender vine tips are used in a variety of culinary preparations (Entre Pinoys Atbp, 2008). This vegetable is, predictably, very bitter in flavour and it grows easily and the climbing vine is often seen in kitchen gardens (Hutton, 1998).

According to Doijode (2001), bitter gourd is an important vegetable crop in Southeast Asia. It is mainly cultivated for its bitter unripe fruits. It is also known as alligator pear, balsam pear, bitter cucumber, bitter melon, ku gua, and foo gwa. Immature fruits are cooked as a vegetable. Its leaves and fruits are used in medicine. It is valued for its high calcium, phosphorus, iron, and its vitamin C contents. Dipping the fruits in salt water reduces the bitterness.

Medicinal Uses

Since ancient times, plants and herbal preparations have been used as medicine. Researches carried out in the last few decades had certified several claims on the use of several plants as traditional medicine. Popularity of *Momordica charantia* (MC) in various systems of traditional medicine for several ailments (diabetis, abortifacient, anthelmintic, contraceptive, dysmenorrhea, eczema, emmenagogue, malaria, galactagogue, gout, jaundice, abdominal pain, kidney (stone), laxative, leprosy,

leucorrhea, piles, pneumonia, psoriasis, purgative, rheumatism, fever and scabies) focused the investigator's attention on this plant. Over 100 studies using modern techniques have authenticated its use in diabetes and its complications (nephropathy, cataract, insulin resistance), as antibacterial as well as antiviral agent (including HIV infection), as anthelmintic and abortifacient. Traditionally, it has also been used in treating peptic ulcers. Interestingly, recent experimental studies have exhibited its potential against *Helicobacter pylori*. Most importantly, the studies have shown its efficacy in various cancers such as lymphoid leukemia, lymphoma, choriocarcinoma, melanoma, breast cancer, skin tumor, prostatic cancer, squamous carcinoma of tongue and larynx, human bladder carcinomas and Hodgkin's disease (Elsevier, 2004).

Romualdez (2004) cited that while ampalaya has long been an Asian traditional medicine, medicinal value has been concentrated on its use against diabetes. An Indian study proved that ampalaya increases sensitivity to insulin. In 2007, the Philippine Health Department mentioned that ampalaya can lower blood-sugar levels. Both these countries produce ampalaya capsules and export them to many countries, including the United States.

Culinary Uses

In the Philippines, where it is known as ampalaya, bitter melon is used in many dishes. It may be stir-fried with ground beef and oyster sauce, or with eggs and diced tomato. A very popular dish from the Ilocos region in the north of Luzon island is pinakbet, which consists mainly of bitter melons, eggplant, okra, string beans, tomatoes, lima beans, and other various regional vegetables alltogether stewed with a little bagoong- based stock. The young shoots and leaves of the bitter melon may also be eaten as greens; these are

locally called “dahon ng ampalaya”. The seeds can also be eaten, and give off a sweet taste, but have been known to cause vomiting and stomach upset (hubpages. com, 2011).

Apart from Filipinos, ampalaya is used in many other Asian cuisines. In China, it is used for stir-fried dishes, soups and in tea. In Indonesia, it is stir-fried with coconut milk. In Vietnam, they have bitter melon soup. In India and Nepal, it is curried or stuffed with spices before frying in oil. In Pakistan, ampalaya is fried with onions and Okinawans eat a lot of it, which supposedly accounts for their longer life spans (Romualdez, 2004).

Below are nutrient values of fresh and raw bitter gourd per 100 grams according to Mangajji, 2010.

Principle	Nutrient value	Percentage of RDA
Energy	17 Kcal	<1
Carbohydrates	3.70 g	3%
Protein	1.00 g	2%
Total fat	0.17 g	0.5%
Cholesterol	0 mg	0%
Dietary fibre	2.80 g	7%
Vitamins		
Folates	72 mcg	18%
Niacin	0.400 mg	2.5%
Pantothenic acid	0.212 mg	4%
Pyridoxine	0.043 mg	3%
Riboflavin	[illegible]	3%
Thiamine		3.5%

Vitamin A	471 IU	16%
Vitamin C	84 mg	140%
Electrolytes		
Sodium	5 mg	<1%
Potassium	296 mg	6%
Minerals		
Calcium	19 mg	2%
Copper	0.034 mg	4%
Iron	0.43 mg	5%
Magnesium	17 mg	4%
Manganese	0.089 mg	4%
Zinc	0.80 mg	7%
Phyto-nutrients		
Carotene-*B*	190 mcg--	
Carotene-a	185 mcg--	
Lutein-zeaxanthin	170 mcg--	

MATERIALS AND METHODS

Materials

The materials used in the study were nine kilograms of ground lean pork and ground pork fat; fresh ampalaya fruit extract; spices and seasoning ingredients which included salt, pepper, onions, garlic, eggs, flour, milk powder, hamburger seasoning, and cooking oil. The other materials that were used include cooking stoves, kitchen knives, frying pan, mixing bowl, measuring spoons and cups, chopping board, plates, weighing scale and juicer (Figure 1).

Methodology

Preparation of meat material and ampalaya extract. Fresh meat and fat were purchased and washed. Lean meat and fat at the ratio of 70:30, respectively, were grinded after which these were mixed together in a large bowl. On the other hand, good and quality raw ampalaya fruits were selected (Figure 2). These were washed with water and then soaked in salt water for about two minutes to lessen its bitterness after which the ampalaya juice (Figure 3) was extracted using a juicer.

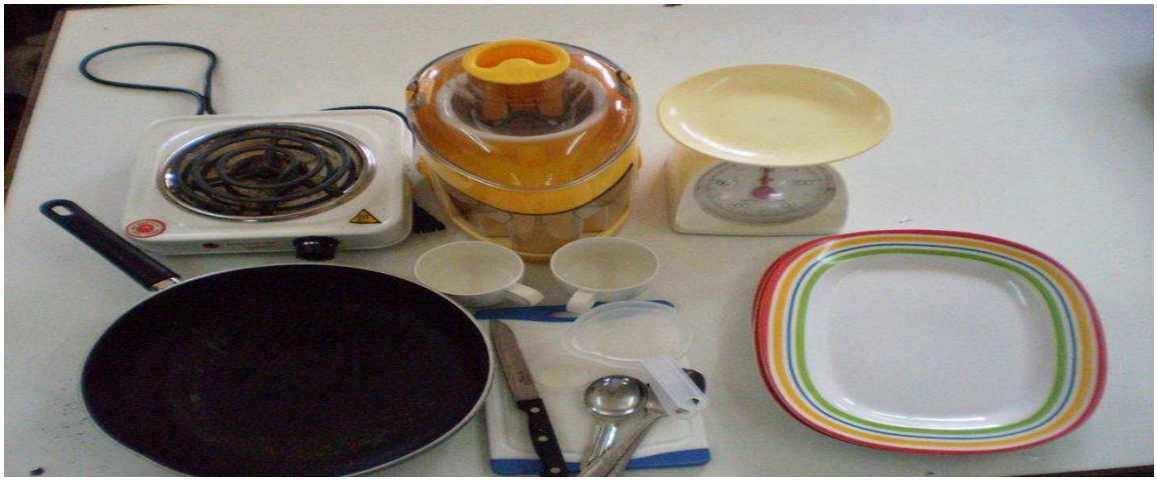

Figure 1. Materials used in the study

Figure 2. Bitter gourd or ampalaya fruits

Figure 3. Ampalaya fruit extract

Experimental treatments. There were three treatments in the study replicated three times. One kilogram of ground meat (700 g lean pork + 300 g pork fat) was used for each replication. The treatments were the following:

T_0 - 0 ml ampalaya fruit extract

T_1 - 100 ml ampalaya fruit extract

T_2 - 200 ml ampalaya fruit extract

Making of patties. The patties in all the three treatments were produced using the same procedure and proportions of ingredients. The only difference was on the level of ampalaya extract added depending on the treatment where these patties belong. The procedure followed was as follows. In a mixing bowl, the meat materials (700g ground lean pork and 300g ground pork fat) were mixed thoroughly. Likewise in a separate bowl, the different seasonings including table salt (Table 1) were mixed together after which the resulting mixture was added into the meat material together with the chilled water and the required level of ampalaya extract and these were mixed thoroughly again. Finally, the resulting mixture as shown in Figure 4, was refrigerated for two hours to make the

Table 1. Ingredients Used for Every Kilogram of Meat

MEAT MATERIALS	CURING MIX	SEASONINGS
700g pork lean, ground	1 tbsp salt, refined	1/2 tbsp black pepper, ground
300g pork fat, ground	1/2 tbsp water, chilled	1 tbsp garlic, chopped finely
		1/2 cup onion, chopped finely
		1 tbsp hamburger seasoning
		2 tbsp milk powder
		1/2 cup flour
		2 pcs. medium fresh egg

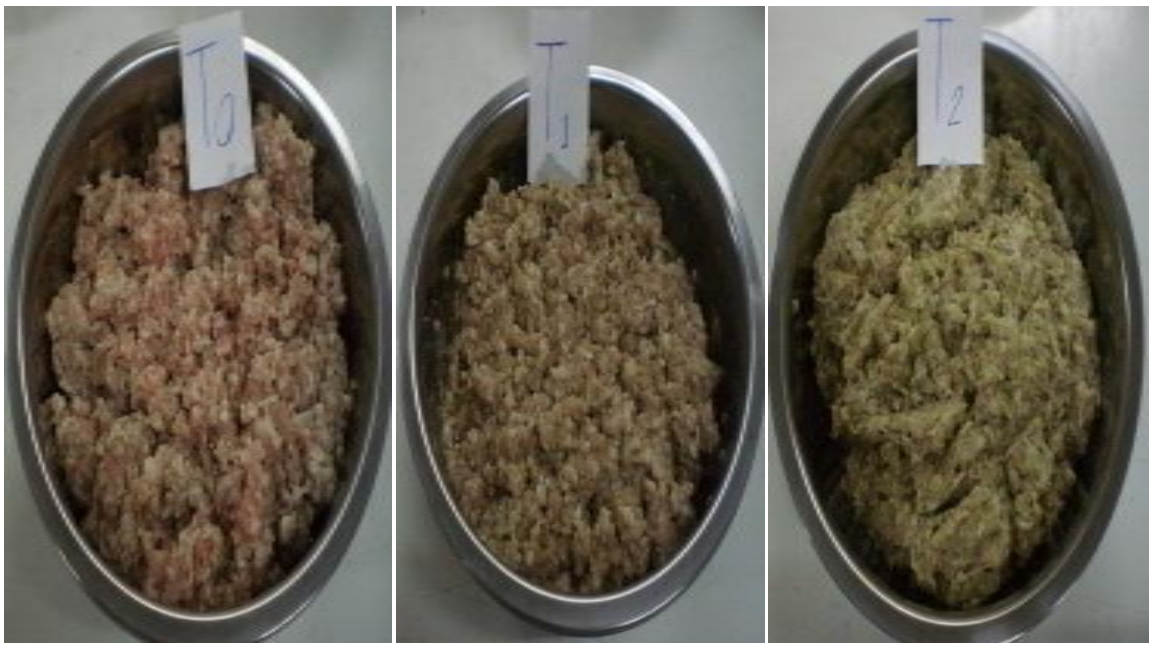

Figure 4. Meat mixture by treatment ready for molding

mixture firm. After refrigeration, the mixture was molded using a hamburger molder to produce the patties, each patty weighing more or less fifty grams (Figure 5). The patties produced are then ready for cooking and for the laboratory analysis.

Organoleptic test. From the different treatments, samples of the patties were obtained and pan-fried separately by treatments (Figure 6). When cooked, these were sliced into bite sizes (Figure 7), placed in containers with codes and were subjected to the panel of tasters for evaluation. Each member of the panel of evaluators was given a score sheet for him to put his ratings. The panel of tasters were composed of five teachers, five students, five dieticians, five food servers, and five housewives making a total of twenty five. Organoleptic test was done three times to compose the three replicates per treatment.

Composition of pork patties. From the different treatments, sample from each was obtained and labelled accordingly. All the samples were then brought to the Department of Science and Technology (DOST) – CAR, La Trinidad, Benguet for the analysis of pork patties composition.

Figure 5. Molded pork patties by treatment

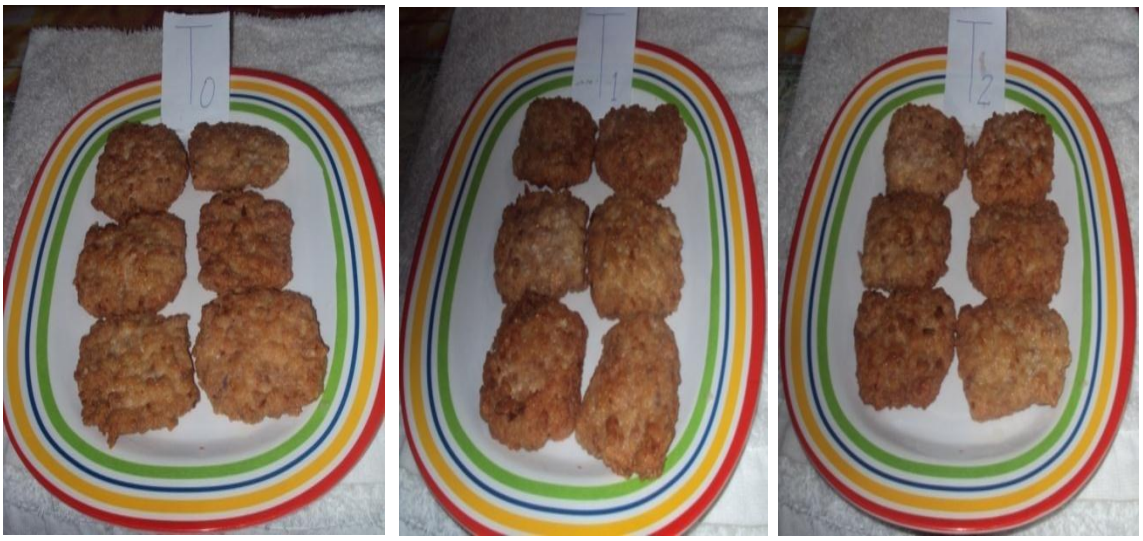

Figure 6. Deep-fried pork patties by treatment

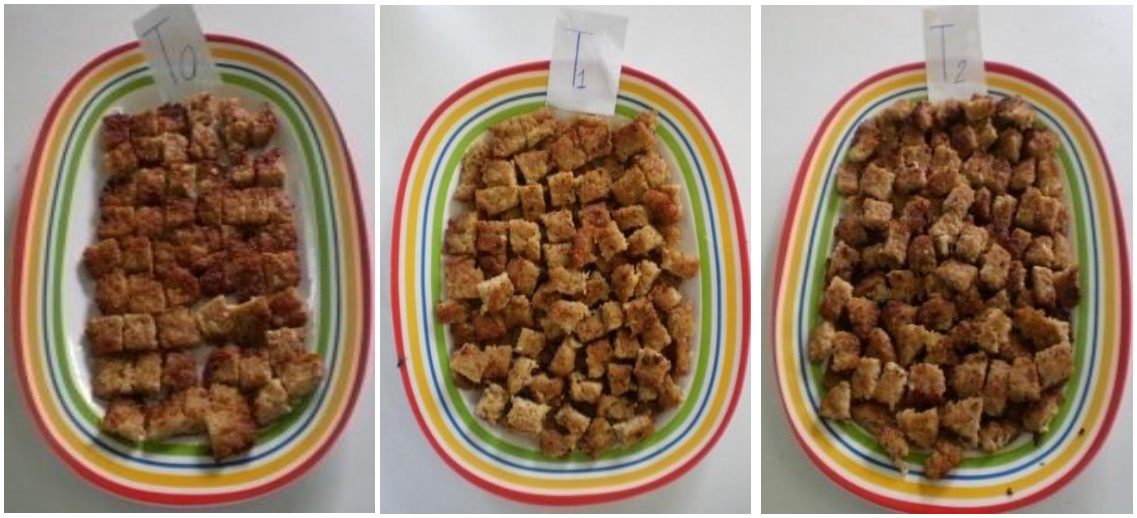

Figure 7. Bite-sized pork patties by treatment

Data Gathered

1. Appearance of the product. Each sample was evaluated using the scale: (1) Very pleasing, (2) Pleasing, (3) Dull.

2. Tenderness of the product. Each sample was evaluated using the scale: (1) Very tender, (2) Moderately tender, (3) Tough.

3. Juiciness of the product. Each sample was evaluated using the scale: (1) Very juicy, (2) Moderately juicy, (3) Not juicy.

4. Flavor of the product. Each sample was evaluated using the scale: (1) Desirable, (2) Moderately desirable, (3) Undesirable.

5. Acceptability of the product. Each sample was evaluated using the scale: (1) Like very much, (2) Like moderately, (3) Dislike.

6. Total cost of production (TCP). This was computed by adding all the cost of meat and non-meat ingredients used to produce the patties per treatment.

7. Composition of pork patties. These were determined at the DOST - CAR, La Trinidad, Benguet in terms of ash, carbohydrate/energy, crude fat, crude protein, and moisture contents of the patties.

Data Analysis

The data gathered were recorded, tabulated and analyzed for differences using the analysis of variance for Completely Randomized Design (CRD). The Duncan's Multiple Range Test (DRMT) was used to determine significant differences between treatment means.

RESULTS AND DISCUSSION

Appearance

Table 2 presents the evaluation of the appearance of the patties in the different treatments. Differences between means are observable, however, such differences were still considered small to cause significant effects as revealed by the statistical analysis. This result implies that the patties produced in all the treatments were more or less similar in appearance. It is also implied that the addition of ampalaya extract did not greatly alter the appearance of the patties. For the verbal rating, it follows that the appearance of the patties in all the treatments were all rated as moderately pleasing.

Tenderness

Table 3 shows the tenderness of the pork patties produced in the different treatments. No significant difference has been observed between means of the patties processed with no ampalaya extract and the patties produced with 100 ml ampalaya extract as revealed by the statistical analysis. However, both of the above, were found to be more tender than the patties processed with 200 ml ampalaya. The result implies that

Table 2. Ratings for the appearance of pork patties in the different treatments

TREATMENT	MEAN *	VERBAL RATING
0 ml ampalaya extract	1.9919[a]	Moderately pleasing
100 ml ampalaya extract	2.0820[a]	Moderately pleasing
200 ml ampalaya extract	1.7905[a]	Moderately pleasing

*Means with the same letter are not significantly different at 5% DMRT

Table 3. Ratings for the tenderness of pork patties in the different treatments

TREATMENT	MEAN*	VERBAL RATING
0 ml ampalaya extract	1.7905[b]	Moderately tender
100 ml ampalaya extract	1.8353[b]	Moderately tender
200 ml ampalaya extract	2.2833[a]	Moderately tender

*Means with the same letter are not significantly different at 5% DMRT

the ampalaya extract, when added in the making of patties at the level of 100 ml/kg meat, did not reduce the tenderness of the patties, but it made the meat patties less tender when the level was increased to 200 ml/kg meat.

Juiciness

The ratings for juiciness of the patties in the different treatments are presented in Table 4. It is presented that there were no significant differences between treatment means as revealed by the statistical analysis. The result implies that the juiciness of the patties were more or less similar. It is also implied that the addition of ampalaya extract at the level of 100 ml-200 ml per kilogram meat into the patties produced did not alter the juiciness of such patties. In verbal rating, all the patties in the different treatments were all rated as moderately juicy.

Flavor

Table 5 presents the flavor of the patties in the different treatments as rated by the members of the taste panel. No significant differences were observed as revealed by the statistical analysis implying that the patties in all the treatments had more or less the same flavor. It is also implied that the addition of 100 or even 200 ml of ampalaya extract into

Table 4. Ratings for the juiciness of pork patties in the different treatments

TREATMENT	MEAN*	VERBAL RATING
0 ml ampalaya extract	1.8886[a]	Moderately juicy
100 ml ampalaya extract	1.8752[a]	Moderately juicy
200 ml ampalaya extract	1.9285[a]	Moderately juicy

*Means with the same letter are not significantly different at 5% DMRT

Table 5. Ratings for the flavor of pork patties in the different treatments

TREATMENT	MEAN*	VERBAL RATING
0 ml ampalaya extract	1.9285[a]	Moderately desirable
100 ml ampalaya extract	1.7059[a]	Moderately desirable
200 ml ampalaya extract	1.7552[a]	Moderately desirable

*Means with the same letter are not significantly different at 5% DMRT

the patties did not alter the flavor of such patties. The patties in the different treatments were all verbally rated as moderately desirable.

Acceptability

Table 6 shows the acceptability of the patties as rated by members of the taste panel. Statistical analysis revealed no significant differences between treatment means and all received a verbal rating of liked moderately. The result implies that 100 to 200 ml of ampalaya extract may be added to every kilogram of pork processed to produce patties and still acceptable to consumers.

Table 6. Ratings for the acceptability of pork patties in the different treatments

TREATMENT	MEAN*	VERBAL RATING
0 ml ampalaya extract	1.7367[a]	Like moderately
100 ml ampalaya extract	1.7686[a]	Like moderately
200 ml ampalaya extract	1.9285[a]	Like moderately

*Means with the same letter are not significantly different at 5% DMRT

Composition of Pork Patties

Table 7 presents the composition of the pork patties in the different treatments as analyzed at the DOST-CAR, La Trinidad, Benguet. It is presented that the pork patties with ampalaya fruit extract added at the level of 100 – 200 ml/kg meat had higher energy and crude fat contents compared to the pork patties with no ampalaya extract. However, because the ampalaya fruit extract is not a good protein source, reductions were observed in the crude protein contents from 15.11% observed from the patties with no ampalaya fruit extract to 14.13 (difference of 0.98%) observed from the patties with ampalaya fruit extract added at the rate of 100 ml/kg meat and 13.19% (a difference of 1.72%) observed from the patties with ampalaya fruit extract added at the level of 200 ml/kg meat. The results imply that the inclusion of ampalaya fruit extract in making pork patties should be done not because of its protein content but because of its medicinal value. According to Elsevier (2004), over 100 studies using modern techniques have authenticated the use of ampalaya in diabetes, its use as antibacterial as well as antiviral agent and as an anthelmintic. He also cited that recent studies have shown the efficacy of ampalaya in various cancers like lymphoid leukemia, lymphoma, choriocarcenoma,

Table 7. Composition of pork patties produced in the different treatments*

NUTRIENT CONTENT	PORK PATTY W/ 0 ML AMPALAYA EXTRACT	PORK PATTY W/ 100 ML AMPALAYA EXTRACT	PORK PATTY W/ 200 ML AMPALAYA EXTRACT
Ash, % w/w	1.93	1.56	1.52
Carbohydrate , % w/w	5.84	5.47	0.51
Crude fat, % w/w	8.26	16.81	18.73
Crude protein, % w/w	15.11	14.13	13.39
Moisture, % w/w	68.86	62.03	65.86
Energy, kcal	158.00	230.00	224.00

*As analyzed at the DOST-CAR, La Trinidad, Benguet

prostatic cancer, squamous carcinoma of tongue and larynx, human bladder carcinomas, and Hodgekin's disease. Similarly, Romualdez (2004) cited that an Indian study proved that ampalaya increases sensitivity to insulin and in 2007, the Philippine Health Department mentioned that ampalaya can lower blood sugar levels.

Total Cost of Production

Table 8 presents the cost of producing the patties in the different treatments. As presented, higher expenses were revealed from the pork patties processed with ampalaya extract compared to those with no ampalaya extract. This was because of the additional expense brought about by the cost of ampalaya extract. The inclusion of ampalaya fruit extract may have increased the total cost of producing the patties but anyway, many of the consumers of today would still buy processed product even at a higher price in exchange for the improved quality of the product and for as long as the increase in price is not too much.

Table 8. Total cost of producing pork patties for every kilogram of meat by treatment

INGREDIENTS	PATTY W/ 0 ML AMPALAYA EXTRACT (Php)	PATTY W/ 100 ML AMPALAYA EXTRACT (Php)	PATTY W/ 200 ML AMPALAYA EXTRACT (Php)
Pork lean and pork fat, ground	180.00	180.00	180.00
Onion, finely chopped	5.00	5.00	5.00
Garlic, chopped finely	3.00	3.00	3.00
Hamburger seasoning	3.00	3.00	3.00
Medium fresh eggs	10.00	10.00	10.00
Black pepper	0.20	0.20	0.20
Milk powder	1.50	1.50	1.50
Cooking oil	5.00	5.00	5.00
Ampalaya		2.00	4.00
Table salt	0.20	0.20	0.20
Total Cost of Production (Php)	206.90	208.90	210.90

SUMMARY, CONCLUSION, AND RECOMMENDATION

Summary

This study was conducted at the Meat Processing Laboratory of the Department of Animal Science under the College of Agriculture, Benguet State University, La Trinidad, Benguet. The study was conducted to determine the acceptability of pork patties processed with different levels of ampalaya fruit extract in terms of appearance, juiciness, tenderness, flavor, and the overall acceptability of the product; to determine the cost of producing meat patties processed with different levels of ampalaya fruit extract; and to determine the composition of pork patties processed with different levels of ampalaya fruit extract.

A total of 9 kilograms of pork was used in the study. This was equally divided into three to compose the three treatments and each treatment had three replications with one kilogram per replication.

All the patties in the three treatments were processed following the same procedure and the same levels of meat and non-meat materials. The only difference was in the level of ampalaya extract added during the processing of patties. No ampalaya extract was added in the patties produced in the control group (T^0); 100 ml of ampalaya extract was added for every kilogram of meat used to produce the patties in treatment 1 and 200 ml of ampalaya extract was added for every kilogram of meat used to produce the patties in treatment 2.

Results of the study revealed that except for tenderness, where a significant difference was observed, no significant differences between treatment means were observed in terms of appearance, juiciness, flavor, and the overall acceptability of the patties as evaluated by the panel of tasters. The non-significant results reveal that the patties produced in all the treatments, with or without ampalaya extract were more or less

similar in appearance, juiciness, and flavor. All the patties in all the treatments were all liked moderately by the panel of tasters. However, in terms of tenderness, the patties with ampalaya extract added at the level of 200 ml/kg meat, were found to be less tender compared to the patties with no ampalaya extract and even those with ampalaya extract added at the level of 100 ml/kg meat.

In terms of food composition, though this was not subjected to statistical analysis, the laboratory test revealed that the patties with ampalaya extract had higher energy and crude fat contents than the patties with no ampalaya extract. However, slight reductions in the crude protein and ash contents were observed from the patties with ampalaya extract compared to those patties with no ampalaya extract.

Finally, in terms of total cost of production, the patties with ampalaya extract incurred higher total costs because of the additional expense on the ampalaya extract compared to the patties with no ampalaya extract.

Conclusion

Based on the results of the study, it is therefore concluded that ampalaya fruit extract can be used as one of the ingredients in processing pork patties at the rate of 100 ml/kg meat without greatly affecting the appearance, tenderness, juiciness, flavor and the overall acceptability of the pork patties. It could also be concluded that though the addition of ampalaya extract caused an increase in the crude fat content and/or energy content as a whole, this result is inconclusive as no replications have been made on the nutrient composition analysis.

Recommendation

Based on the results of the study, ampalaya extract maybe added when making pork

patties but at the level of 100 ml/kg meat so that the tenderness of the product will not be reduced, the increase in total cost will not be high, and the reduction in the protein content will only be slight. However, it is also recommended that further studies should be conducted to include the micro nutrient contents of the processed product to confirm its medicinal value and the nutrient composition analysis should be replicated to have more conclusive results.

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