BIBLIOGRAPHY

RIVERA, ALDRIN L. APRIL 2012. Effect Of Time Of Dry Curing With Salt On The Microbiological And Sensory Properties Of Hot-Smoked Pork From Native Pigs. Benguet State University. La Trinidad, Benguet.

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ABSTRACT

The study was conducted at the Tangere project laboratory of Benguet State University in Bektey, Puguis, LaTrinidad Benguet to evaluate the general acceptability and quality attributes of hot-smoked pork from native pigs as affected by curing time in terms of color, aroma, taste, and texture. It also aimed to determine the presence of pathogenic bacteria in the processed products called "etag".

Twenty seven respondents with good sensory capability were selected to evaluate the prepared smoked meat. Five panelist are faculty members and a consumer panelist consisting of ten students from the College of Home Economics and Technology and twelve students of the university. Cooked samples from all the treatments were rated by the respondents as "like very much" in terms of color, aroma, and texture. Verbal description for taste and acceptability for smoked pork cured for 10 days was "like moderately" and "like very much" for smoked pork cured for 6 and 8 days. All samples were negative for *eschirichia coli, staphylococcus aureus and salmonella*. Total coliform count (TCC) and fecal coliform (FC) was not detected in the product samples. The return on investment was calculated as 9.40 for T1, 4.32 for T2, and 2.35 or T3.

INTRODUCTION

Meat is considered an important part of a well-balanced diet. It has been used as food even before historians started to record events. Filipinos always consider the pork as a major source of protein in their diet. Not only is meat a very concentrated source of protein but also it has a biological value because its composition matches closely that of our proteins. It contains all the amino acids essential for human health. Meat is also an important source of vitamins particularly vitamin B12 (cyanocobalamin), B6 (pyridoxine), niacin and riboflavin. It is a major source of minerals such as selenium, iron, zinc, and phosphorus.

Even with the advancement of technology and availability of modern equipment for preserving meat, the etag making is still practiced in the cordilleras. This is not only attributed to "etag's" economic value but also to its significance and importance in the culture of Cordilleras (Fiaraochan, 2006).

To date etag is added to boiled meat during canao, wedding, harvest time and thanksgiving meals. It is also often mixed with legumes and boiled roasted chicken locally known as 'pinikpikan' for regular meals. "Etag" gives a distinct exotic creamy taste and texture to the soup of fresh meat (Ciano, 2010).

Prehistoric men were hunters. They catch animals for food but cannot consume all the meat. Therefore, they resorted to various procedures to prevent the spoilage of the meat. They started the so called meat preservation. The first type of processed product was sundried meat. Salting and smoking were also ancient practices (PCARRD, 1991).

The practice of curing meat was widespread among historical civilization, as a safeguard against wasting of food and the possibility of spoilage. Table salts, which consist

primarily of sodium chloride, is the most important ingredient for curing food and is used in relatively large quantities. Curing/Salting is used extensively in our country for fish and meat. When salt applied in meat water content is drawn out by osmosis. Most bacteria stop growing in salt concentration of about 1.5 percent and at 2.1 percent, molds and yeast are unable to grow (Pearson and Dutson, 1986).

Hot smoking exposes the food to smoke and heat in controlled environment. Smoking is not only means of preserving but also a means of enhancing the flavor and coagulating the proteins. Smoking also lowers the moisture content and furnishes some protection against bacteria and oxidation (Ranken, 2000). Hot smoking occurs within a range, 165ºF (74ºC) to 185ºF (85ºC) and it will speed up the drying, Lower temperature (110ºF to 135ºF) with a dense fog of smoke will intensify the smoky flavor. Smoking hotter than 185ºF (85ºC), the food will shrink buckle or even split. Smoking at high temperature also reduces yield, as both moisture and fat are "cooked" away (Hui, 2001).

The study aimed to evaluate the general acceptability and quality attributes of hot smoked pork from native pig as affected by curing time. Specifically, the objectives of the study wre to determine the presence of the pathogenic bacteria in the hot-smoked meat products; to evaluate the sensory properties of the meat products in terms of color, odor taste and texture ; and to make a cost and return analysis of hot smoking native pork.

The study was conducted at the Animal Genetic Resources (TANGERE) Project Laboratory of Benguet State University in Bektey, Puguis, La Trinidad, Benguet from October 20, 2011 to November 1, 2011.

REVIEW OF LITERATURE

The tradition of meat processing for increasing shelf-life in asia, especially in china, is much older than in Europe (Heinz and Hautzinger 2007). Salting and smoking are two of the ancient practices made to preserve meat even before the birth of Christ. For many centuries that art of preservation was at a standstill or has develop slowly and that purely empirical fermentation, drying, smoking, salting and curing with salt were the principal methods (Groiler, 2002).

Meat processing is not merely producing of products just to have something to sell, but one has to consider the taste and preference of the consumer. Today's consumers are very selective on the quality of the product they buy, which include nutrient value or composition, flavor as well as the aroma and free from chemicals. Because of this, strong competition between processed meat producers is being observed.

Ibbara (1983) mentioned that preservation has been the only tool to prevent the deteriorating changes in food and the development of effective measure of prevention to be one of the major fields of scientific and industrial endeavor.

Preservation by salt is achieved by its effectiveness in lowering water activity. However, lowering the water activity to a level necessary for effective preservation requires a salt content of the finished product of approximately 9-10%. This is considerably higher than the 2-3% commonly found in commercial cured meat products.

While some of the microorganisms are inhibited by these latter salt concentrations, the water activity is usually higher enough to support the growth of molds, yeast and hilophilic (salt loving bacteria). These salt today in commercial processed meat and other methods of preservation are necessary in order to prolong their shelf life.

Salt is a white crystalline compound chemically known as sodium chloride (NaCl). In the Philippines, it is commonly classified based on the sodium chloride content, into crude, industrial, and refined salt. Crude salt contains 92 percent sodium chloride; industrial more than 95 percent, refined at least 99 percent. Crude is for table consumption; industrial for industry, and refined for processing of products. Salt is one of the essential components of our human body. Without it survival is impossible and salt deficiency may seriously imperil one's health (PCARRD, 1991).

Ranken (2000) stated that preservation by curing with salt is very ancient; it was used by the Egyptians in 200BC in its original meaning "Curing" meant saving or preserving. Food-curing process therefore includes preservation such as drying, salting, and smoking.

Although there are number of methods of curing meat, they are all modification or combination of two fundamental procedure; (1) Dry curing, and (2) pickle curing. In dry curing, the curing ingredient usually salt,sugar, and nitrite and/or nitrate are added to meat without additional water. In this method, the curing ingredients draw enough moisture from the meat to form brine, which serves to transport the ingredient into the meat by diffusion. In pickle curing, the ingredients are dissolve in water, which forms brine that acts in the same general number as that formed by the natural meat juices and the curing ingredients (Desrosier, 1970). The length of curing is usually seven days per inch of thickness in a clean storage with temperature at 32°F to 40°F (Ray, 2000).

The length of curing depends on several factors: (1) Size of the meat – the larger the meat the more time required for the solution to fully penetrate the meat; (2) Temperature – higher temperature faster curing; (3) Moisture content of the meat; (4) Salt

concentration – higher salt concentration, faster curing; (5) Amount of fat – more fat in meat, slower curing, fatty tissue; (6) Acid or Alkaline level of the meat (pH) – Lower pH, faster curing (Marianski et al., 2007).

Fraizier (1997) explained that preservation action salt it ionizes to yield chlorine, which is harmful to organisms, and it reduces the solubility of oxygen in solution and deprives aerobic organisms of this needed oxygen. In further denatures protein which microbial enzymes are composed and thus interferes with this function.

According to Liggayo (2009) stated that the higher the level of salt applied to the meat, the longer the shelf life. However, if the level of salt is too much, the finished product of "etag";produced will be too salty. Which it is not good when cooked. But anyhow, based on their practice, the level of salt used is ¼ - ½ kilo for every kilogram of meat.

Salt has been known to improve palatability and acceptability of food. Addition of salt is known to improve the flavor and acceptability of many types of food particularly meat, poultry, fish, vegetables and other fruits. Salt inhibits objectionable putrefaction and dangerous microorganisms and those which it does not inhibit are more or less unobjectionable. The effect is mainly due to salt concentration in the water in the product. (Elley, 1994 and Quin et al., 2002).

The effect of smoking and salting is relatively simple to define. Both methods have bactereostatic effect by reducing the available water and creating environment hostile bacteria. The drying effect of smoke and the smoke components, creosote, acetic acid and pyroligneous acids inhibits bacteria and retard fat oxidation. Color and flavor changes that occur are very acceptable (Desrosier, 1970).

Smoke is generated through the thermal destruction of the wood components such as lignin and cellulose. The thermal destruction sets free more than 1000 desirable or undesirable firm, liquid or gaseous components of wood. The useful components contribute to the development of the following desirable effects on processed meat products (Benton, 1997).

Smoking is usually accomplished in three stages. During the first phase or drying stage, the smokehouse is heated to 125°F. All dampers are opened to allow all excess moisture to escape and there is no smoking during this eight hour period, during the next eight hour stage the dampers are partially closed and the temperature on the smokehouse is increased to 135°F and the smoke is generated. The smoke is continued throughout the third stage with all dampers closed, and the temperature on the house raised to 180°F. Hold this temperature until the product temperature reaches 142°F (Ray 2000).

There are two principal smoking techniques: cold and hot smoking. Hot smoking is carried out at temperature of 74°C to 85°C. The thermal destruction of the wood used for the smoking is normally not sufficient to produce this temperature in the smoking chamber. Hence, the additional heat has to be applied in the smoking chamber (Heinz and Hautzinger, 2007). The relatively high temperature in hot smoking assures a rapid color and flavor development. The treatment period is kept relatively short to avoid excessive impact of the smoke (too strong smoke color and flavor). Smoking maybe from 4-12 hours, defending on the conditions and the product required. The internal temperature of the meat may rise to around 95°C during hot smoking. This should reduce as rapidly as possible afterwards (Ranken, 2000).

In the Philippines, one ancient and indigenous technology of meat preservation that still exist is being practiced in the cordilleras, this is the etag making. Etag, an ethnic product of the cordillerans is a preserved meat using salt then dried either by sun drying or smoking. Etag is also called by some locals as ‘inasinan’ and ‘kinuday’ while foreigners dubbed it as igorot ham and igorot smoke meat (Didican, 1995).

Health has been of increasing importance for consumer choice for the last 50 or so, and today analysis of consumer quality perception many times indicated that health and sensory considerations have about equal weight. Health related qualities are quite different from sensory qualities, though, in that they are tor the consumer invisible. While consumers have learned that there is a link between and health, they do not expect the consumption of a particular product on a particular occasion to have health implication that they can experience. Many health effects of foods are rather abstract nature; Like the risk of the particular diseases being reduced by a certain percentage, and thus do not lead to consequences that are readily accessible to experience.

A wide variety of diseases can be caused by eating food contaminated with pathogenic microorganisms on their products. These diseases can be caused as food poisonimos (Elley, 1994). Among these pathogenic bacteria are salmonella, staphylococcus and E. coli.

Salmonella is a genus of rod shaped, gram negative, non-spore forming, and predominantly motile enterobacteria. They cause illnesses in humans and many animals, such as typhoid fever, parathyphoid fever and the food borne illnesses salmonellosis (Carter and J. Darla, 2004)

Staphylococcus spp. are gram positive that tend to be arrange in irregular clusters or “bunches of grapes” formation. Staphylococcal food poisoning is caused by eating food contaminated with staphylococcus aureus. Staphylococcus aureus is able to concentrations. These characteristics enable staphylococcus aureus to grow in a wide variety of foods and conditions. Although when food is cooked, salmonella can be eliminated tor 0.2 to 2 minutes in 65°C temperature.

The pathogenic effects of staphylococcus are mainly caused by toxins. In staphylococcus food intoxication, the major toxin is caused an enterotoxin. The staphylococcus enterotoxin causes quick onset of food poisoning which can lead to cramps and severe vomiting that can mimic sea sickness (Pelczar et al., 1986)

Eschirichia coli is a gram negative rods and its pathogenesis is enterotoxin in the ST and LT, or both produced in the intestine and its clinical sign is traveler’s diarrhea with sudden onset of diarrhea, abdominal cramps and vomiting. The duration of illness will last 1 to 7 days (Quinn et al, 2002).

MATERIALS AND METHODS

Materials

The matertials used in this study include fresh meat obtained from the warm carcass of native pig which is about one-year old, rack salt, stainless pans, meat knives, measuring cup, record book, chopping boards, weighing scale, earthen jars, and alnus wood, leaves and twigs.

Methodology

Preparation of meat. A total of 12 kilos of pork was obtained from the warm carcass of a native pig. Meat pieces were cut into 1-inch thick strips composed of skin, fat and lean. The meat strips were washed and drained, after draining the meat strips were placed in stainless pans for curing.

Curing/Salting**.** For every kilo of meat, 180 grams of rack salt (NaCl) dried by vacuum were rubbed on both sides of the meat (Figure 1). Any undisolved salts were scrapped off to prevent the appearance of the very objectional white crusts on the surface of the meat. Then, the meat strips were placed in a clean stainless container at room temperature (Figure 2).

Figure 1. Meat was cured by dry curing

Figure 2. Meat was kept for curing

The duration of curing served as experimental treatments replicated four times. One kilogram of pork was considered as replicate. The duration of curing were as follows,

T_1 = 6 days of curing (Figure 3)

T_2 = 8 days of curing (Figure 4)

T_3 = 10 days of curing (Figure 5)

After the curing period the meat strips in each treatments were placed in the smoke chamber for smoking (Figure 6).

Figure 6. Smoke chamber

Hot smoking. The smoker was prepared by placing alnus leaves and twigs over the burning alnus wood inside the fire fit. Air intake was adjusted to regulate the fire and burning of wood. A temperature of 74ºC to 85ºC was maintained in the smoke chamber with a dimension of 31.5 inches wide, 27.5 inches high, and 3.5 inches long. Meat strips were stringed by making a small cut with a narrow bladed knife, then inserting a cord into the cuts. The meat strips were suspended above the safety baffle in the smoker (Figure7). Meat strips were not be allowed to come in contact with one another in the smoke chamber to enable uniform penetration of smoke and even color development.

Figure 3. Meat cured for 6 days

Figure 4. Meat cured for 8 days

Figure 5. Meat cured for 10 days

Figure 7. Cured meat hanging inside the smoke chamber

Sensory evaluation. Cooked by boiling in plain water. The smoked cooked samples were leveled and presented to a team of trained panelists composed of five faculty members, and a consumer panelist consisting of ten students from College of Home Economics and twelve students of the university (Figure 8). Only people with good sensory capability were chosen as panelist in order to find out difference in color, odor, taste, and texture. Testing room was provided with adequate light and seating arrangement was used for the sensory evaluation. Each panelist was given relevant instructions and a score sheet with 9 point hedonic-scale rating which was adopted from (Heinz and Hautzinger, 2007).

Figure 8. Panels tasting "etag"

Microbial Analysis. Samples of the meat products were wrapped in aluminum foil and placed in plastic bags. The samples were labeled accordingly and brought to the Regional Standards and Testing Laboratory of the Department of Science and Technology - (CAR) in La Trinidad, Benguet for microbial analysis. Each sample weighing approximately 250 grams, was tested for the presence of pathogenic bacteria such as eschirichia coli, salmonella spp., and staphylococcus aureus.

The following procedure were followed for microbial analysis;

Total coliform count. Presumotive test. Most Probable Number (MPN) of coliform organisms present in 100g of sample, lauryl sulfate broth, 48 hours incubation at 35ºC.

Total coliform count. Confirmed test. Most Probable Number (MPN) of coliform organisms present in 100g of sample, brilliant green bile broth, 48 hours incubation at 35ºC.

Fecal coliform. Most Probable Number (MPN) of coliform organism present in 100g of sample, escherichia coli medium, 24 hours incubation at 45ºC

Eschirichia coli confirmation. Streaked in EMB 48 hours incubation at 35ºC.

Indole production. Tryptone Broth, 24hours incubation at 35ºC addition with 0.5ml of Kovac's reagent.

Methyl red test. MR-VP Tube, 24 hours incubation at 35ºC addition with 5 drops of methyl red solution.

Citrate utilization test. Streak and Stab inoculation, Simmons citrate agar slants, 24-48 hours of incubation at 35ºC.

Yeast and mold count. Colonies per gram in 100g sample, spread plate method, Malt Extract Agar, 3-5 days incubation at 25ºC.

Staphylococus aureus enumeartion. Colony Forming Unit (CFU) in 100ml sample, spread plate method, Baird-Parker Agar, 48 hours incubation at 35ºC.

Salmonella detection. Lactose Broth (LB), 24 hours incubation at 35ºC; Tetrathionate Broth Base, 24 hours incubation at 35ºC. Streaked atBismuth Sulfite (BS) Agar, Xylose lysine Deoxycholate (XLD) Agar and Hekteon Enteric (HE) Agar incubate for 24 hours at 35ºC.

Good hygienic practices. The following good hygienic practices as recommended by the Department of Health (DOH, 2004) for meat processing and handling of smoked products was observed to prevent or minimize microbial contamination:

1. Maintaining adequate personal cleanliness.
2. Wearing adequate garments, and hand gloves.
3. Washing hands before starting work and repeatedly during work.
4. No rings, bracelets, and wrist watches shall be worn during work.
5. Cleaning and disinfection of tools, knives, chopping boards, utensils, and other materials for meat handling.

6. Taking any other necessary precautions to protect against contamination of meat and finished product.

In addition, basic hygienic requirements for slaughtering were strictly observed.

Data Gathered

1. Color of the product. The panel evaluated each samples as (1) Like extremely (2) Like very much (3) Like moderately (4) like slightly (5) Neither like nor dislike (6) Dislike slightly (7) dislike moderately (8) Dislike very much (9) dislike extremely.

2. Taste of the product. The panel evaluated each samples as (1) Like extremely (2) Like very much (3) Like moderately (4) like slightly (5) Neither like nor dislike (6) Dislike slightly (7) dislike moderately (8) Dislike very much (9) dislike extremely.

3. Texture of the product. The panel evaluated each sample as (1) Like extremely (2) Like very much (3) Like moderately (4) like slightly (5) Neither like nor dislike (6) Dislike slightly (7) dislike moderately (8) Dislike very much (9) dislike extremely

4. Aroma of the product**.** The panel evaluated each samples as (1) Like extremely (2) Like very much (3) Like moderately (4) like slightly (5) Neither like nor dislike (6) Dislike slightly (7) dislike moderately (8) Dislike very much (9) dislike extremely.

5. Acceptability of the product. The panel evaluated each sample as (1) Like extremely (2) Like very much (3) Like moderately (4) like slightly (5) Neither like nor

dislike (6) Dislike slightly (7) dislike moderately (8) Dislike very much (9) dislike extremely

6. Microbial count. The number of microorganisms such as coliform, *E.* ctedoli and Staphylococcus A. was counted.

Data Computed

1. Total cost of production (TCP). This was computed by adding the cost of meat and the ingredients used per treatments.

2. Total sales. This was computed by adding the sales of the processed products.

3. Net Income (NI). This was computed by subtracting the TCP from the total sales of the process and unprocessed products.

4. Return on Investment (ROI). This was computed by dividing the NI by the TCP and multiplied by 100.

5. Grand mean. This was computed by multiplying numerical rating to the number of respondents and dividing it to the total number of respondents.

RESULT AND DISCUSSION

Color Rating of Hot-smoked Pork

Evaluation of the color of hot smoked pork as affected by curing time. Table 1 shows the mean rating of the treatments. The mean color rating, for color of smoked pork cured for 6 days was (2.74) and (2.67) both for smoked pork cured for 8 and 10 days. All the rating has the same verbal description "like very much". The color of smoked products does not affect on the preference of the respondents because according to them the color is likely the same on the color of hot smoked product that they are buying in the market or in their province as shown by the verbal description which is "like very much". In the data collected (Appendix Table 1) 26 panels "liked" the treatments 2 and 24 for the treatment 1 and 3, 2 panels "disliked" the smoked pork cured for 6 and 8 days. Color also depends on the wood used. For example acasia is a very hot burning wood and it does not create color. Alnus produce yellow to maroon color.

Aroma Rating of Hot-smoked Pork

The mean aroma rating of hot smoked pork as affected by curing time is presented Table 2. The mean numerical rating for aroma of smoked cured for 6 days got

Table 1. Mean color rating of hot smoked pork

TREATMENTS	MEAN RATING	VERBAL DESCRIPTION
6 days of curing	2.74	Like very much
8 days of curing	2.67	Like very much
10 days of curing	2.67	Like very much

n = 27

the highest (2.70) fallowed by smoked pork cured for 10 days (2.63) and smoked pork cured for 8 days has the lowest mean of (2.56). The data also shows that the verbal description of the three treatments is "like very much", therefore the treatments have more or less the same aroma (odor). Warris(2000) cited that, there components of flavor; taste and aroma or smell in raw meat has little flavor. Only on heating during cooking do the characteristics flavors associated with meat develop. The volatility of the aromas is related to the temperature of the food.

Taste Rating of Hot-smoked Pork

Table 3 shows the taste of hot smoked pork as affected by duration of curing the table also reveals that verbal description for each of the mean.

The result of the mean rating for taste of smoked pork cured for 6 days was (2.88), smoked pork cured for 8days has (2.75) and (2.56) on smoked pork cured or 10 days. However, panelist rated smoked pork cured for 6 and 8 days as "like very much" and 10 days as "like moderately". The smoked pork cured for 6 and 8 days got the verbal rating as "like very much" because tasters prefer in terms of taste but treatment 3 got satisfactory result which is "like moderately". Because they added also that the tastes depend on the meat portion being used because fatty meats have more taste.

Table 2. Mean aroma rating of hot smoked pork

TREATMENTS	MEAN RATING	VERBAL DESCRIPTION
6 days of curing	2.70	Like very much
8 days of curing	2.56	Like very much
10 days of curing	2.63	Like very much

n = 27

Table 3. Mean Taste rating of hot smoked pork

TREATMENTS	MEAN RATING	VERBAL DESCRIPTION
6 days of curing	2.88	Like very much
8 days of curing	2.75	Like very much
10 days of curing	2.56	Like very much

n = 27

Texture Rating of Hot-smoked Pork

Table 4 shows the mean of the texture rating of the hot smoked pork as affected by the duration of curing time. It also reveals the verbal description for each of the mean.

The mean numerical rating for texture of smoked pork cured for 6 days was (2.85), smoked pork cured for 8 days has (2.59) and (2.56) on smoked pork cured for 10 days. The smoked pork was all rated by evaluators with "like very much" this shows that the treatments have the same texture when cooked. Some of the respondents say's that the smoked pork they are buying in their own province is most likely the same texture. According to (Mc Williams, 2008), the texture is visual or tactile surface characteristics and appearance and the textural qualities of a food have a relationship to the appearance of a product.

Table 4. Mean texture rating of hot smoked pork

TREATMENTS	MEAN RATING	VERBAL DESCRIPTION
6 days of curing	2.85	Like very much
8 days of curing	2.59	Like very much
10 days of curing	2.56	Like very much

n = 27

Acceptability Rating of Hot-smoked pork

Table 5 shows that the acceptability of the different treatment and the table also reveals the verbal description or each of the mean. The mean acceptability rating obtained from 27 panelist for color of smoke pork cured for 6 days was (2.63), smoke pork cured for 8 days has (2.56) and (2.48) for smoked pork cured for 10 days. The panelist rated the smoked pork cured for 6 and 8 days as "like very much" and "like moderately" for smoked pork cured for 10 days Smoke pork cured for 10 days differ from the verbal description because 25 panelists like the texture and the 6 and 8 days got a higher number of panels which is 26 who like the texture.The overall acceptability of the treatments show the smoked pork cured for 6 days is much preferred with regards to their texture, color, taste and aroma.

Microbial Analysis

Table 6 shows the total coliform count (TCL Fecal Coliform), salmonella aureus and E. coli of the hot smoked pork. It shows that the presence of microorganisms on the hot smoked pork were in the standard limit set for food by the Bureau of Food in Drugs which is <3.0 MPN/g

Table 5. Mean acceptability rating of hot smoked pork

TREATMENTS	MEAN RATING	VERBAL DESCRIPTION
6 days of curing	2.63	Like very much
8 days of curing	2.56	Like very much
10 days of curing	2.48	Like very much

n = 27

Table 6. Mean number and microorganisms present on the hot smoked pork

TREATMENTS	TCC <3.0 MPN/g	FC <3.0 MPN/g	E.coli	S. aureus 100 CFU/g	Salmonella
6 days of curing	3.0	3.0	negative	0	0
8 days of curing	3.0	3.0	negative	0	0
10 days of curing	3.0	3.0	negative	0	0

Coliform bacteria may not cause diseases, but can be an indicator of pathogenic organisms that can cause diseases such as intestinal infections, dysentery hepatitis, typoid fever, cholera and other illnesses. However, these illnesses are not limited to disease causing organism in drinking water, other factors are not associated with drinking water maybe the cause, (DOH 2004)

Microorganisms with regards to meat hygiene include parasites, moulds, bacteria, and viruses. These groups of bacteria, plays the most important role and depending on the slaughter hygiene, these bacteria find their way to the carcass or contaminate the meat during slaughterhouse operations (Heinz and Hautzinger, 2007). The temperature range for growth and toxin production of staphylococcus aureus is about 4 to 46 °C. Some toxigenic coccus are very salt tolerant, and also tolerate nitrites fairly well and therefore can grow in curing solutions and on curing and cured meat.

Cost and Return Analysis

Table 7 shows details of the sales, expenses, net income and return on investment of the treatments. All the treatments have the same expenses which is 1219.36 per treatment. The processed products produced in a 12 kilogram pork meat were 9.635

kilogram of smoked meat after the duration of curing and smoke for 2 days. The commercial smoke meat had computed price of Php400.00 per kilogram. The return on investment reveals that the smoked pork cured for 6 days of curing had the highest ROI of 9.40 while the 8 days has 4.32 and 10 days which is 2.35. This implies that the 6 days of curing can generate the highest income and return on investment.

Table 7. Cost and Return Analysis

TREATMENTS	SALES	TCP	NET INCOME	ROI %
6 days of curing	1,334	1,219.36	114.64	9.40
8 days of curing	1,272	1,219.36	52.64	4.32
10 days of curing	1,248	1,219.36	28.64	2.35

A total of 9.635 kilograms of smoked pork was produced as follows

For T_1 = 3.335 kilogram

T_2 = 3.180 kilogram

T_3 = 3.120 kilogram

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted at the Tangere project laboratory of Benguet State University in Bektey Puguis, La Trinidad Benguet from October 20 to November 1, 2011.

Following the completely randomized design (CRD), the twelve kilogram of pork from a native pig was equally allotted into three treatments, each treatments has four replication, with one kilogram of pork per replication. For every kilogram of pork, 180 grams of salt was used for curing. The meat was cured for several days depending on the duration of curing on each treatment. For treatment 1, 6 days of curing; treatment 2, 8 days of curing; and treatment 3, 10 days of curing. The cured meat was exposed to hot smoking for 2 days, 8 hours of smoking per day.

The study was conducted to evaluate the acceptability of the finish product as affected by curing time; to determine the sensory properties in terms of taste, aroma, texture and color; and to determine the production cost and return on investment of the finish product. It also aimed to determine the presence of pathogenic bacteria such as *salmonella spp.,Staphylococcus aureus and Escherichia coli.* Twenty-seven panelist composed of 5 faculty members and consumer panelist consisting of 10 students from college of home economics and 12 students from the university were invited to evaluate the product samples.

There were numerically differences on the mean rating in terms of texture, color, aroma, taste and also in the acceptability of the product. Although for verbal description, there are differences in terms of taste and acceptability of the processed

product. The panelists give like very much and like moderately to the product which signify a positive result for the commercialization of etag.

The return on investment of etag, smoked pork cured for 6 days was highest at 9.40, followed by 8 days od curing with 4.32. On the other hand smoked pork cured for 10 days got the lowest ROI at 2.35. This was expected because the larger amount of moisture draws out on the meat when it is subjected to longer curing time.

Laboratory test detected the presence of total coliform count (TCC) and fecal coliform (FC), but it is within the standard limit set for food. Staphylococcus aureus, salmonella, and Escherichia coli are not detected in all the treatments.

Conclusion

Based on the results of the study, the taste, texture, aroma and color of the smoked pork were not significantly affected by the duration of curing time. The 6 days of curing was consistently as like very much and it was constant to have the highest mean. The acceptability rating, 6 days of curing were like very much by the respondents. The presence of total coliform count (TCC) and fecal coliform (FC) are within standard limit set mfor food and E. coli is negative. Salmonella and staphylococcus was not detected because of good and proper hygienic practices of handling smoked meat. 6 days of curing has the highest return on investment due to the lesser curing time.

Recommendation

Since the duration of curing time does not have significant effect on taste texture, aroma, and color. 6 days of curing was recommended. For higher acceptability the smoked pork meat may be cured for 6 days. Proper sanitation and hygiene are also necessary to prevent contamination with microorganisms.

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