Choose your Patty: The Sensory Characterization and Consumer Acceptance of Burger Patties with Oyster Mushroom (*Pleurotus ostreatus*) Enrichment

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Abstract – This experimental study aimed to determine the acceptable proportion of burger patty enriched with 25 g (Proportion A), 50 g (Proportion B) and 75 g (Proportion C) of oyster mushroom in terms of appearance, aroma, taste and texture. The level of acceptability as to appearance, aroma, taste and texture were also evaluated. The sensory characteristics were evaluated by 30 selected evaluators using a sensory evaluation sheet based in Five-point hedonic scale.

Frequency count and percentage were used as statistical tools to determine the sensory characteristics of burger patty enriched with oyster mushroom. While, arithmetic mean was used to determine the level of acceptability of burger patty.

Findings revealed that Proportion A has a very much pleasant oyster mushroom taste. On the other hand, Proportion B had a very much pleasant oyster mushroom smell and very much compact and fine texture. Lastly, Proportion C had a golden brown appearance and very much pleasant oyster mushroom smell.

Keywords – Burger Patty, Consumer Acceptance, Sensory Characteristics, Oyster mushroom

INTRODUCTION

One of the marketing researches on foods served at campus dining facilities was conducted at a northern California university. The results of this research indicated that a significant number of campus consumers considered the local concession’s beef burger as “not tasty” and “unhealthy” and were interested in having more vegetarian and lower fat options[1]. It was found out further that a 250 calorie deficit per day can lead to a half a pound a week weight loss, offering lower-fat burger patty alternatives is a viable way to meet this consumer demand, as well as to promote health on campus through leaner protein sources.

Red meat is high in saturated fat content. Saturated fat hardens arteries, elevates blood pressure and increases risk of cardiovascular disease.

Nutritional authorities have persistently recommended a reduction in the consumption of foods which have a high content in saturated fatty acids (SFAs), such as red meats. In general, fat in meat derived from ruminant animals is composed of approximately 45–55% of saturated fatty acids (SFAs), 45–50% monounsaturated fatty acids (MUFAs), and relatively minor amounts of polyunsaturated fatty acids (PUFAs) [2], with a PUFA/SFA ratio for beef about 0.1 [3]. On the other hand, health agencies recommended diet high in fruits and vegetables, whole grains, legumes, low-fat dairy products, lean meats, and fish [4]. Although nutritional parameters are important factor in consumer’s judgment of food quality [5], consumers show unwillingness to change their dietary habits. Thus, this suggests that there is a considerable potential market for frequently consumed foods, such as meats, that have been reformulated to incorporate these recommended dietary changes. As one of the common foods in our diet, meats are an especially suitable vehicle for adding healthier lipids, and this has not escaped the industry, which has marketed a wide variety of healthier lipid-enriched, meat-based foods worldwide [6].

Today, Filipino people who are young at age and young at heart love to eat burger patty. There are numerous fast food chains that offer this kind of food. This is rated with affordable price yet it can be satisfying to the starving stomach of costumers.

Americans believes that home-cooked dishes are healthier than to those that are made in fast food chains whose ingredients come from preserved and ready to cooked ingredients.

Acknowledging the fact that meat such as pork and beef are becoming more expensive, fast food chains ought to purchase cold cut products for burger patty. A readily made food is filled with preservatives that may pose great danger to health.

Previous studies indicate consumers do not always detect differences between healthy and unhealthy foods [7]. Nevertheless, directly pertaining to burger patties, another study concluded that the “juiciness” of low-fat beef patties, rated by six trained panelists, increased with the addition of soluble fiber [8]. Hence, with the right amount of soluble fiber...
and fat, a burger patty can be both healthier and well liked. Other research has also shown that treatments with vegetarian protein substitutes are equally well accepted by adult consumers [9].

On the other hand, malnutrition is a problem in developing third world countries. Mushrooms with their flavor, texture, nutritional value and high productivity per unit area have been identified as an excellent food source to alleviate malnutrition in developing countries [10]. Among the reasons for the quick acceptance of mushroom is its nutritive content. Mushrooms are eaten as meat substitutes and flavoring. Edible mushrooms are low in fat and calories, rich in vitamins B and C, it contain more protein than any other food of plant origin and are also a good source of mineral nutrients[11].

Polypores are group of fungi that from fungi bodies with pores or tubes. It is typically found in open deciduous forest during the summer and early autumn months. Mostly seen in dead trees trunk and sometimes may grow on soil.

To alleviate hunger and malnutrition in a world of rising food prices, cultivation of mushrooms is a very reliable and profitable option [12].

In this study, three modified type of burger patty for a healthier alternative was created. The objective of this study was to examine whether any of the three alternatives could be substituted for the original without any decrease in consumer acceptence and/or the quality of sensory properties. We tested the sensory quality of these four types of burgers as perceived by both untrained student consumers and trained panellists using two sensory evaluation methods; hedonic testing and quantitative descriptive analysis (QDA).

OBJECTIVES OF THE STUDY

The objective of this study is to determine the acceptability of Oyster Mushroom-Beef Burger Patty.

Specifically, this study would like to seek answers to the following questions:

1. What are the sensory characteristics of burger patty enriched with 25 g, 50 g and 75 g of oyster mushroom in terms of appearance, aroma, taste, and texture?
2. What is the level of acceptability of burger patty enriched with 25 g, 50 g and 75 g of oyster mushroom in terms of appearance, aroma, taste and texture?

MATERIALS AND METHODS

Research Design

This study made use of experimental research design. In experimental research design, the researchers manipulate and control one independent variable for the variation to the manipulation of the dependent variable. According to Morton and Williams (2009) [13], Experimental Design refers to a blueprint of a procedure that enables researchers to test their hypothesis by reaching valid conclusions about relationships between dependent and independent variables. It refers to the conceptual framework, within which the experiment is conducted.

Evaluators of the Study

There were thirty (30) randomly selected evaluators for sensory characteristics. Fifteen (15) of whom were Technology and Livelihood Education major students that were considered as semi experts and fifteen (15) were Home Economics teachers that were considered as experts. The evaluators were from Iloilo Science and Technology University, Iloilo City, Philippines.

Source of Data

The responses of the evaluators were the sources of data in this study. The evaluators rated the sensory characteristics in terms of appearance, aroma, taste, texture and general acceptability of Oyster mushroom and Beef in making burger patty.

Experimental Layout

In order to arrive at a reliable and meaningful result the Complete Randomized Block Design (CDBR) in evaluating the products was utilized. In this study, each sample was evaluated in the three replications to avoid biases during the evaluation.

Below is the experimental lay-out of the Study.
Figure 1. Experimental lay-out of the Study

Legend:
A- 25 g Oyster Mushroom and 75 g Beef Burger Patty
B- 50 g Oyster Mushroom and 50 g Beef Burger Patty
C- 75 g Oyster Mushroom and 25 g Beef Burger Patty
D- 0 g Oyster Mushroom and 100 g Beef Burger Patty

Data Gathering Instruments
The sensory characteristics of the Oyster Mushroom-Beef Burger Patty were evaluated using 5 points Hedonic Scale rating test score sheet. Every proportion was evaluated with (5) like very much; (4) like much; (3) like moderately; (2) dislike moderately; (1) dislike very much.

Table 1. Arbitrary scale for the evaluation of Oyster-Mushroom-Beef Burger Patty.

| Scale | Verbal Interpretation           | Range of Score |
|-------|--------------------------------|----------------|
| 5     | Liked Very Much                | 4.21-5.00      |
| 4     | Like Much                      | 3.41-4.21      |
| 3     | Like Moderately                | 2.61-3.40      |
| 2     | Disliked Moderately            | 1.81-2.60      |
| 1     | Disliked Very Much             | 1.00-1.81      |

Data Gathering Procedures
The experiment were divided into three (3) phases: Phase 1- The preparation of materials, Phase 2- Making of Oyster Mushroom-Beef Burger Patty and Phase 3- Evaluation of Product

Phase 1: Preparation of Materials.
The materials used in conducting the study were the Oyster Mushroom, Bread Crumbs, Egg, and Ground Beef. These ingredients were necessary to attain variations of Appearance, Aroma, Taste, and Texture. The tools and utensils used in the preparation of the recipe are mixing bowl, spatula, measuring cups and spoons, knives, ladle, chopping board, and frying pan.

The Gas Range will be used for cooking the Burger Patty.

Phase 2: Making of Oyster Mushroom-Beef Burger Patty

Cleaning and washing of all the ingredients needed for the preparation of Oyster Mushroom-Beef Patty.

Blanching of Oyster Mushroom.

Slicing and cutting of ingredients into a proportion size.

Mixing and combining all the ingredients.

Cooking and testing of the recipe.
Figure 2: Process Flow in making Oyster Mushroom-Beef Burger Patty

Table 2: Ingredients of Oyster Mushroom-Beef Burger Patty in Different Enrichments.

| Ingredients         | Proportion |
|---------------------|------------|
|                     | A         | B       | C           | D           |
| Oyster Mushroom     | 25 g      | 50 g    | 75 g        | 0 g         |
| Ground Beef         | 75 g      | 50 g    | 25 g        | 0 g         |
| Eggs                | 5 pcs.    | 5 pcs.  | 5 pcs.      | 5 pcs.      |
| Bread Crumbs        | 1 cup     | 1 cup   | 1 cup       | 1 cup       |
| Worcestershire sauce| 1 T       | 1 T     | 1 T         | 1 T         |
| Onions              | 1 T       | 1 T     | 1 T         | 1 T         |
| Garlic              | 1 T       | 1 T     | 1 T         | 1 T         |
| Spring Onions       | 1 T       | 1 T     | 1 T         | 1 T         |

Procedures:
1. Prepare all the ingredients.
2. Mix all the ingredients in a mixing bowl. Mix well to combine all the ingredients thoroughly.
3. Place the patties into a tray-lined with greaseproof paper. Cover with plastic wrap and place in the fridge at least 30 minutes or overnight.
4. Prepare a non-stick pan and put a little oil over a medium heat of fire.
5. Fry the patties for four minutes and then turn upside down.
6. When it is already cooked, it will ready to be served with burger bans and vegetables.

Phase 3: Evaluation of the Product
Before the evaluation of the product, the evaluators were given an instruction on how to evaluate the finished product. The evaluation criteria were enumerated and explained. As to the appearance the evaluators were instructed to see the general appearance of the product through its color. As to aroma the evaluators are required to find out if the Oyster Mushroom-Beef Burger Patty product is apparent as to the taste. As to the texture the evaluator were instructed to rate the product if it is fine or smooth, which is the acceptable parameter.

Data Processing Technique
After the evaluation of the Oyster-Mushroom-Beef Burger Patty, the score sheets were gathered. The responses were tallied and summarized. The data were analysed to determine the level of acceptability of Oyster Mushroom-Beef Burger Patty as to its sensory qualities. The mean was used to determine if what proportion is accepted. One-way ANOVA was used to determine the significant differences further.

RESULTS AND DISCUSSION
The acceptable proportion of Oyster Mushroom-Beef Burger Patty in terms of appearance, aroma, taste, texture and general acceptability was determined according to the results of evaluation.

Table 3 presents the characteristics Burger Patty Enriched with Oyster Mushroom as to appearance.

Table 3. Sensory Characteristic of Burger Patty enriched with Oyster mushroom as to Appearance.

| Parameters     | Proportion |
|----------------|------------|
|                | A | B | C   | D  |
| Appearance     | f %| f %| f %| f %|
| Dark Brown     | 7 | 23| 9  | 30 | 7 | 23| 10 | 33 |
| Golden Brown   | 14| 47| 6  | 20 | 20| 67| 12 | 40 |
| Brown          | 8 | 27| 11 | 37 | 3 | 10| 5  | 17 |
The result showed that the appearance of burger patty with 25 g of oyster mushroom (Proportion A=47%), 50 g of oyster mushroom (Proportion B=20%), 75 g of oyster mushroom (Proportion C=67%) and 0 g of oyster mushroom (Proportion D=40%) were described as “golden brown”.

Among the experimental proportions, Proportion C (75 g of oyster mushroom) was evaluated by the majority of the evaluators (67%) as golden brown appearance. This implies that the burger patty with 75 g oyster mushroom has a golden brown appearance. However, Proportion A and B were almost comparable with Proportion D (control). This means that the burger patty with 25 g, 50 g and 0 g of oyster mushroom were comparable to each other.

It further implied that the Oyster Mushroom-Beef Burger Patty has a golden brown color which appealing to the eyes of the evaluators.

According to Shewfelt (2000), color and appearance attract the consumer to a product and can help in impulse purchases. At the point of purchase the consumer uses appearance factors to provide an indication of freshness and flavor quality. External appearance of a whole fruit is used as an indicator of ripeness, although it can be a misleading one [14]. Consumers have a preferred color for a specific item [15].

Table 4 presents the characteristics Burger Patty Enriched with Oyster Mushroom as to aroma.

Table 4. Sensory Characteristic of Burger Patty enriched with Oyster mushroom as to Aroma.

| Parameters                                      | Proportion A | Proportion B | Proportion C | Proportion D |
|------------------------------------------------|--------------|--------------|--------------|--------------|
| Aroma                                          | f | %  | f | %  | f | %  | f | %  | f | %  | f | %  |
| Extremely pleasant oyster mushroom smell.      | 8 | 27 | 9 | 30 | 12 | 40 | 11 | 37 |     |     |     |     |
| Very much pleasant oyster mushroom smell.      | 16 | 53 | 14 | 47 | 14 | 47 | 13 | 43 |     |     |     |     |
| Moderately pleasant oyster mushroom smell.     | 4 | 13 | 4 | 13 | 3 | 10 | 5 | 17 |     |     |     |     |
| Very much unpleasant oyster mushroom smell.    | 2 | 7  | 3 | 10 | 1 | 3  | 1 | 3  |     |     |     |     |
| Extremely unpleasant oyster mushroom smell.    | 0 | 0  | 0 | 0  | 0 | 0  | 0 | 0  |     |     |     |     |
| Total                                          | 30 | 100| 30 | 100| 30 | 100| 30 | 100|     |     |     |     |

The result showed that the aroma of burger patty with 25 g of oyster mushroom (Proportion A=53%), 50 and 75 g of oyster mushroom (Proportions B and C=47%) and 0 g of oyster mushroom (Proportion D=43%) were described as “Very much pleasant oyster mushroom smell.”

Among the experimental proportions, Proportion A (25 g of oyster mushroom) was evaluated by the majority of the evaluators (53%) as Very much pleasant oyster mushroom smell.

This implies that the burger patty with 25 g oyster mushroom has a Very much pleasant oyster mushroom aroma. However, Proportions B and C were almost comparable with Proportion D (control). This means that the burger patty with 50 g and 75 g of oyster mushroom were comparable to control.

Development of more intense aroma has been achieved by feeding precursors into the atmosphere of strawberry tissue cultures and fruit [16]. Aroma variations in foods often affect other food properties as well due to physicochemical interactions, such as the food’s viscosity [17].
Table 5 presents the characteristics Burger Patty Enriched with Oyster Mushroom as to taste.

Table 5. Sensory Characteristic of Burger Patty enriched with Oyster mushroom as to Taste.

| Parameters                          | Proportion A | Proportion B | Proportion C | Proportion D |
|-------------------------------------|--------------|--------------|--------------|--------------|
| Taste                               | f %          | f %          | f %          | f %          |
| Extremely pleasant oyster mushroom taste. | 7 23        | 10 33        | 7 23         | 11 37        |
| Very much pleasant oyster mushroom taste. | 15 50       | 12 40        | 12 40        | 15 50        |
| Moderately pleasant oyster mushroom taste. | 8 27        | 8 27         | 11 37        | 4 13         |
| Very much unpleasant oyster mushroom taste. | 0 0          | 0 0          | 0 0          | 0 0          |
| Extremely unpleasant oyster mushroom taste. | 0 0        | 0 0          | 0 0          | 0 0          |
| Total                               | 30 100       | 30 100       | 30 100       | 30 100       |

The result showed that the taste of burger patty with 25 g of oyster mushroom (Proportion A=50%), 50 g of oyster mushroom (Proportion B=40%), 75 g of oyster mushroom (Proportion C=40%) and 0 g of oyster mushroom (Proportion D=50%) were described as “Very much pleasant oyster mushroom taste”.

Among the experimental proportions, Proportions A (25 g of oyster mushroom) was evaluated by the majority of the evaluators (50%) as very much pleasant oyster mushroom taste. This implies that the burger patty with 25 g oyster mushroom has a very much pleasant oyster mushroom taste and comparable with Proportion D (control). However, Proportion B and C were comparable with each other.

Taste has been described as being comprised of five primary components—sweet, salty, sour, bitter, and umami. It is possible to measure these basic taste components instrumentally. Sweetness can be approximated by HPLC determination of individual sugars, or more rapidly but less accurately by a refractometer or hydrometer that measures total soluble solids [18]. Indicator papers exist for rapid determination of glucose in some commodities, such as potatoes [19].

Table 6 presents the characteristics Burger Patty Enriched with Oyster Mushroom as to texture.

Table 6 presents the characteristics Burger Patty Enriched with Oyster Mushroom as to Texture.

| Parameters                          | Proportion A | Proportion B | Proportion C | Proportion D |
|-------------------------------------|--------------|--------------|--------------|--------------|
| Texture                             | f %          | f %          | f %          | f %          |
| Extremely compact and fine texture. | 12 40        | 9 30         | 8 27         | 18 60        |
| Very much compact and fine texture. | 14 47        | 17 57        | 16 53        | 9 30         |
| Moderately compact and fine texture. | 3 10         | 35 10        | 4 13         | 3 10         |
| Very much compact and has a coarse texture. | 1 3         | 1 3          | 2 7          | 0 0          |
| Extremely compact and has a coarse texture. | 0 0         | 0 0          | 0 0          | 0 0          |
| Total                               | 30 100       | 30 100       | 30 100       | 30 100       |

The result showed that the texture of burger patty with 25 g of oyster mushroom (Proportion A=47%), 50 g of oyster mushroom (Proportion B=57%) and 75 g of oyster mushroom (Proportion C=53%) and 0 g of oyster mushroom (Proportion D=30%) were described as “Very much compact and fine texture.”

Among the experimental proportions, Proportion B (50 g of oyster mushroom) was evaluated by the majority of the evaluators (57%) as Very much compact and fine texture. This implies that the burger patty with 50 g oyster mushroom has a Very much compact and fine texture. However, Proportions A and C were almost comparable with Proportion D (control). This means that the burger patty with 25 g and 75 g of oyster mushroom were comparable to control.
Textural parameters of fruits and vegetables are perceived with the sense of touch, either when the product is picked up by hand or placed in the mouth and chewed.

The textural properties of a food are the “group of physical characteristics that arise from the structural elements of the food, are sensed by the feeling of touch, are related to the deformation, disintegration and flow of the food under a force, and are measured objectively by functions of mass, time, and distance.” Furthermore, the terms texture, rheology, consistency, and viscosity are often used interchangeably, despite the fact that they describe properties that are somewhat different. In practice the term texture is used primarily with reference to solid or semi-solid foods; however, most fruits and vegetables are viscoelastic, implying that they exhibit combined properties of ideal liquids, which demonstrate only viscosity (flow), and ideal solids, which exhibit only elasticity (deformation)[20].

CONCLUSION AND RECOMMENDATION

Conclusions
Based on the findings the following conclusions were made:
1. Burger patty enriched with oyster mushroom was generally acceptable as snacks and viand.
2. Evaluators rated as Proportion A as liked very much burger patty since it has a very much pleasant oyster mushroom taste and general acceptability, Proportion B had a very much pleasant oyster mushroom smell and a very much compact and fine texture and Proportion C had a very much pleasant oyster mushroom smell and has a golden brown color.
3. It was concluded that burger patty enriched with oyster mushroom were noted to have no significant differences in terms of appearance, aroma, taste, texture and general acceptability.

Recommendations
Based on the findings and conclusions the following were recommended:
1. Since burger patty with oyster mushroom in different proportion were all acceptable, it is recommended that Home Economics teachers should disseminate the information to the public through lecture demonstration, livelihood training and food exhibits as part of their advocacy to answer the call of DepEd’s campaign to prepare healthy food snack for school children.
2. Since Proportions A, B, and C were liked very much, it is recommended that the HE teachers, lunch counter teachers and housewives should prepare and sell burger using burger patty with oyster mushroom and other desired recipes using this main ingredient or a substitute in making snack items of school children and for the family.
3. Students and pupils are encouraged to eat burger patty with oyster mushroom because of the nutrients that they may get from the said food rather than consuming junk foods.
4. Entrepreneurs are also encouraged to use the indigenous ingredients to produce a new set of product that would hit in the market niche.
5. Farmers should cultivate more of oyster mushroom as they would be the source of additional income.
6. A follow up study be conducted to further investigate the usefulness of oyster mushroom.
7. More researches along this line be conducted using variables and be tested of its proximate nutritive value to promote healthy living.

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