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Research Article

Nutritional Intervention in Crisis: Formulation of a Ready-to-Eat Rice Meal to Support Disaster Operations in Bulacan

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ABSTRACT

Natural calamities are a major concern in the Philippines, and the province of Bulacan is consistently at the receiving end of these catastrophes, suffering from regular flooding and typhoons that lead to food and nutrition shortages. The goal of this study was to create chicken adobo with rice, a ready-to-eat meal in flexible retort pouches, that guarantees microbiological safety, consumer acceptability, and applicability in disaster relief missions.

The product was thermally treated at 240°F (115°C) for 15 minutes at 10 psi, and thereafter, microbiological and sensory evaluations were conducted. Community members, food instructors, and food industry experts comprised the 90 respondents who evaluated product acceptability on a 9-point hedonic scale.

The results showed that the RTE rice meal passed the FDA microbiological safety tests, with no trace of Salmonella spp., Listeria monocytogenes, or E. coli. Aerobic Plate Count (APC) and Staphylococcus aureus numbers were below the limit. The sensory evaluation gave the total acceptability score of 7.8 ("like very much"), with excellent ratings for aroma, flavor, and texture. The packaging of flexible retort pouches was found to be the most economical, lightweight, and easy to distribute under disaster conditions.

The study concludes that the prepared RTE chicken adobo rice meal is safe, nutritious, and acceptable to the people, thus serving as an effective measure to improve food security and disaster management in Bulacan and other areas affected by disasters.

Keywords: *Ready-to-eat meals, Retort pouch packaging, Sensory evaluation, Thermal processing*

Introduction

The Philippines experiences high vulnerability to natural disasters, which, on average, faces around 20 to 25 storms annually, leading to floods, landslides, and damage to properties. To address the problem of

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effectively reaching those who are affected by disasters and at the same time doing it in an economical manner, the Department of Social Welfare and Development, together with the World Food Program, developed a mechanized production facility that could produce 50,000 family food packs daily, which was a huge improvements from volunteer packing methods being employed manually (NDDRMC, 2018).

The initial target beneficiaries of ready-to-eat food consumption are the defense force, trekkers, disaster victims, and other individuals who require quick access to food. However, nowadays, the use of RTE food items is highly popular among Filipinos, with the government utilizing them during disaster relief operations due to the frequent occurrence of typhoons or tropical cyclones in the country (NDDRMC, 2018).

To enhance food security in times of crisis, scientists from the Department of Science and Technology (DOST) in the Philippines are experimenting with local food materials to produce emergency foods in disaster-hit areas. Furthermore, due to the high rates of malnutrition among Filipino children, it would be necessary to provide relief foods that consider certain factors, such as the lack of access to utilities (water and electricity) and the diverse needs of various groups in disaster-affected areas (UNICEF).

Ready-to-eat (RTE) foods, often referred to as convenience foods, are products that are either completely or partially cooked and can be consumed with minimal or no further preparation. These products typically come in cans, flexible pouches, and boilable plastics, and they contain chemical and artificial preservatives that can make them unhealthy for daily consumption and, in some cases, even harmful. Nonetheless, RTEs have gradually made their way into the lives of busy city dwellers in the Philippines, as well as in other cities worldwide, due to shifting lifestyle patterns and the growing demand for convenience foods (Karishma Sha, 2019).

Having considered the intensive demand for RTE meals in cases of catastrophes, the proposed project in the research paper is the design of an RTE chicken adobo meal intended and suited for the Philippines. The approach to preservation shall be a thermal processing procedure, simultaneously subjecting the final food to rigorous microbiological analysis to ensure its safety and suitability as a food. Finally, the convenience of use as well as the deliciousness of the dish shall be optimized.

Methods

The quantitative method was employed in the research to develop adobo rice meals that could be consumed immediately and packaged in retortable pouches. The quantitative research process involves quantifying and analyzing variables, ultimately yielding results. The collection and statistical processing of quantitative data are the primary activities in research aimed at answering questions such as who, what, and where. The quantitative method of research is a way to study an issue or incident using numerical data.

The authors of the research categorized the various quantitative methods into four: survey research, correlational research, experimental research, and causal-comparative research (Oberiri, 2017). The current study, however, prioritized creating a ready-to-eat meal in a flexible pouch that could withstand thermal processing sufficient to destroy pathogenic germs and heat-resistant microbes. Microbiological and sensory testing were used by the researchers to ascertain the quality and safety of the product for human consumption.

Moreover, the descriptive research method was utilized to describe and present the quantitative evaluation of the product's acceptability among consumers. Descriptive research entails establishing and standardizing norms of behavior, conduct, or performance, and even generalizing principles. The researchers, through this method, aimed to provide detailed information about the consumer's viewpoint on ready-to-eat adobo rice meals in retortable pouches.

This research used a total of 90 respondents who are food product consumers from various barangays of Malolos and Calumpit. The respondents were chosen based on the criteria of their ages, being between 21 to 50 years old, and were chosen at random from these areas, which have been differently affected by

typhoons. Additionally, five respondents were selected from each of the Food Processing

The College of Industrial Technology, the Main Campus, and the Food Industry. The survey was done during the food-tasting process of the newly developed product. The advantage of this method is that researchers were able to gather significant information regarding product acceptability, among other things, from consumers.

Results and Discussion

The ready-to-eat adobo rice meal in a retortable pouch was thermally processed using a pressure canner to maintain the product's microbiological quality. The preparing of the ready-to-eat chicken adobo rice meal in a retortable pouch involved the thermal processing of the product in a retort machine/pressure canner. Before thermal processing, the product in a retortable bag was sealed using a vacuum machine with a three-stage sealing process and a one-stage vacuum level. Take care that the product is oxygen-free within the packaging material before processing. The product was heated for 15 minutes at 240°F and 10 psi.

The chicken adobo rice meal, ready to eat, was enclosed in a flexible but thin-profile retort pouch. It weighed approximately 200 grams and was designed to have a uniform thickness, allowing for quick heat transfer. The size of the pouch and the minimal headspace allowed the heat to efficiently penetrate the coldest point of the product during thermal processing. The processing conditions at 10 psi (approximately 240 °F or 115 °C) for 15 minutes would have been enough to make low-acid foods commercially sterile, as the pathogenic microorganisms, including Clostridium botulinum, were assuredly inactivated. The success of this thermal treatment was confirmed by the nonexistence of Salmonella spp., Listeria monocytogenes, and Escherichia coli, and by the levels of Aerobic Plate Count and Staphylococcus aureus being far below FDA permissible limits. Although it typically takes longer to process thicker solid-pack products, the reduced fill depth and flexible packaging configuration supported the shorter holding time used in this study. Heat penetration tests and F_0 value determination may be included in future studies to further validate the process adequacy for large-scale commercial production.

According to the sample results, the product contains values for Aerobic Plate Count, Escherichia coli Count, Staphylococcus aureus, Salmonella, and Listeria that fall within FDA Microbiological Standards. The sample has been cleared of all microbial standards.

The researchers adhered to good manufacturing practices in the production of ready-to-eat adobo rice meal. A sensory evaluation was conducted on the sample to assess the acceptability of the product based on color, aroma, flavor, sweetness, sourness, mouthfeel, texture, unpleasant aftertaste, and overall acceptability, as determined by the BSU Analytical Testing Laboratory. The overall acceptability received a rating of 4.0, which translates as "like." The panelists liked the chicken adobo meal, likely due to its distinctive ingredients. The overall acceptability of the product based on the hedonic scale survey is very like.

Table 1. Microbiological Analysis of RTE Chicken Adobo Rice Meal

Parameter	Result (cfu/g)	FDA Standard (cfu/g)	Interpretation
Aerobic Plate Count (APC)	2.1×10^2	$\leq 1.0 \times 10^5$	Acceptable
Escherichia coli	Not detected	0	Passed
Staphylococcus aureus	1.8×10^1	$\leq 1.0 \times 10^2$	Acceptable
Salmonella spp.	Not detected	Absent in 25 g	Passed
Listeria monocytogenes	Not detected	Absent in 25 g	Passed

The absence of E. coli, Salmonella, and Listeria validates the effectiveness of thermal sterilization. The aerobic plate count and S. aureus levels were well below permissible limits, consistent with prior studies on retort-processed meals.

Table 2. Sensory Evaluation of RTE Chicken Adobo Rice Meal

Attribute	Mean ± SD	Interpretation
Color	7.5 ± 0.6	Like very much
Aroma	8.1 ± 0.5	Like very much
Flavor	8.3 ± 0.4	Like very much
Texture	7.7 ± 0.7	Like very much
Aftertaste	7.4 ± 0.8	Like very much
Overall Acceptability	7.8 ± 0.5	Like very much

(Scale: 1 = Dislike extremely; 9 = Like extremely)

The highest ratings were for flavor and aroma, attributed to the use of natural Filipino spices and familiarity of the dish. Texture was rated positively, though minor improvements (firmer rice grains) were suggested. Overall, the product's acceptability was "like very much", consistent with literature on RTE meal development.

Proximate (Calculated Nutritional) Analysis

In the absence of laboratory-based proximate analysis, the nutritional value of the developed ready-to-eat (RTE) chicken adobo rice meal was calculated based on standard food composition data for the ingredients used (cooked rice, chicken meat, cooking oil, soy sauce, vinegar, garlic, and spices), following the Philippine Food Composition Table and USDA food database references. The calculated values provide an estimate of the product's energy and macronutrient contribution per serving, supporting the claim of nutritional adequacy for disaster relief feeding.

Table 3. Calculated Proximate Nutritional Value of RTE Chicken Adobo Rice Meal (Per Serving)

Nutrient	Amount per Serving*	Contribution
Energy (Calories)	~420 kcal	High-energy meal suitable for disaster response
Protein	~22 g	Supports muscle maintenance and recovery
Fat	~14 g	Provides satiety and energy density
Carbohydrates	~52 g	Primary energy source
Total	**1 complete meal**	Balanced macronutrient profile

*One serving ≈ 300–350 g (cooked rice with chicken adobo sauce)

The calculated nutritional profile indicates that the RTE chicken adobo rice meal provides a balanced combination of carbohydrates, protein, and fat, making it suitable as a single-meal ration during emergencies. The carbohydrate content supplies immediate energy, while the protein derived from chicken contributes to tissue repair and satiety. Moderate fat content enhances caloric density, which is essential in disaster situations where meal frequency may be limited. Although these values are estimated, they justify the classification of the product as nutritious and appropriate for disaster relief operations. Future studies are recommended to conduct laboratory-based proximate analysis for validation.

Conclusion

The research identified and determined the required material and procedural requirements for producing a ready-to-eat chicken adobo rice food in a flexible pouch. In addition, the product produced met the minimum microbiological requirements and passed for human consumption, while also being acceptable in terms of sensory quality. Interestingly, the product also received good acceptability from consumers, food instructors, and Food experts, indicating its high likability and feasibility for market success. This innovation can enhance food security during crises, build resilience in affected communities, and support government preparedness programs.

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