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OPTIMIZATION OF INGREDIENTS FOR THE PRODUCTION OF BREADFRUIT (ARTOCARPUS ALTILIS) CATSUP

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ABSTRACT

The main purpose of this study was to determine the optimum levels of salt, sugar and vinegar that will produce the desired sensory attributes and physico-chemical composition of breadfruit catsup in order to formulate a technoguide. The study employed the experimental research method known as Response Surface Method (RSM). Box Benken Design (BBD) in 3^3 fractional factorial design was used to determine the fifteen treatments of the study. Results disclosed that optimum formulation of breadfruit catsup greatly influenced its sensory qualities acceptability like color, flavor, consistency after taste and general acceptability. This makes the product more acceptable and comparable to commercial counterparts. High acceptability for breadfruit catsup can be deltoids sweet and sour taste and the color associated with it. The findings of the study concluded that the optimum formulation of breadfruit catsup is found technically and economically feasible.

KEYWORDS: optimization, ingredients, production, optimum levels and breadfruit catsup.

INTRODUCTION

The breadfruit has been regarded historically as a native tree extending from New Guinea through Indo-Malayan archipelago to Western Micronesia (Morton, 1987). A starchy staple of the Caribbean and Pacific Islands, breadfruit is fried, baked, boiled and sometimes mixed with coconut milk to a pudding. On the other hand, in Guam, a kind of biscuit is made by slicing the boiled fruit into a moderately thin section and drying slices under the sun or oven.This dried preparation which may last until the next fruiting season may be eaten as is toasted or grounded and in other several ways (Hughes, 1995).

Breadfruit is locally known as Rimas is a seedless fruit. According to Coronel (1983), it is called kulo or dalanguian in Visayan Region, pakak in Ibanag and Iloko, pa-a in the Mountain Province and ugub in Bikol. In the country, it is the most neglected fruits.

Breadfruit as potential raw material for catsup production had been proven and tested based on the preliminary study (Duallo, 2000). Although the developed breadfruit catsup formulation was found acceptable, however, formulation needs optimization to really determine the optimum level of major ingredients in order to produce better quality product.

Salt sugar and vinegar are the important ingredients for breadfruit catsup production, therefore it is necessary to optimize their levels for the production of quality catsup which is comparable if not better than its commercial counterparts. In most development works, hit and miss technique often practiced which means waste of time and costly experience. Optimization is more advantageous for it can predict the optimum levels of the necessary ingredients needed in a relatively short time and minimal expense. This study was therefore undertaken to determine the optimum levels of salt, sugar and that will produce the desired sensory attributes and physico-chemical composition of breadfruit catsup in order to formulate a technoguide.

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MATERIALS AND METHODS

The formulation of the product was based on researches' previous study; the Response Surface Methodology (RSM) was used in this experiment. The optimization in this study combined special experimental designs with Taylor First and Second Order Equations in a sequential testing procedure as cited by Henika (1972). A Box Behnken Design (BBD) was followed for response surface regression in 3^3 factorial designs to determine the influence of chosen variable of different levels of salt, sugar, and vinegar as independent variables. A total of fifteen treatments were formulated. Chosen levels were 15, 20, 25 grams for salt; 120, 160 and 200 grams of sugar; and 150, 200, and 250 ml of vinegar. These fifteen treatments were subjected to optimization study, which indeed activities leading to the choice of a best product formulation. Different formulations were compared and the most favorable option was retained while the other was discarded (Gordon and Dorkback, 1985). The optimization pattern in this study followed the fractional factorial experiment design for the three variables namely: salt, sugar, and unique at three levels.

RESULTS AND DISCUSSIONS

The tables show the results of the study. Outlined of the table are the optimum formulation of breadfruit catsup, the physico-chemical qualities of breadfruit catsup, consumer's acceptance are the cost of production.

Table 1: Optimum Formulation of Breadfruit

Salt	Sugar	Vinegar
16 to 24 gms	151 gms	214 ml

Among the parameters studied, the interaction of salt, vinegar and sugar played a significant effect on the visual sensory acceptability. With all ingredients held constant, the optimum levels of salt, vinegar and sugar in breadfruit catsup should contain 16 to 24 grams of salt, 151 grams of sugar and 214 ml of vinegar in a 1000 ml recipe.

Table 2: Physico-Chemical Qualities of Breadfruit Catsup Proximate Complex

pH AWM	TSS AWM	% Moisture	% Dry Matter	% Crude Protein	% Crude Fat	% Crude Fiber	% Ash
3.71	18.0	74.5	25.46	0.84	1.28	0.09	2.93

The physico-chemical qualities of breadfruit catsup were influence by the levels of the variables in the formulation. The pH of the product was affected by practically all the parameters studied. However, TSS (Total Soluble Solid) was more affected by salt, which includes both its linear and quadratic terms indicating that TSS values increased with salt after a certain point but decreases after that. The proximate analysis revealed that breadfruit catsup contained 74.5 percent moisture content, 25.46 percent dry matter, 0.84 crude protein, 1.28 percent crude fat, 0.09 percent crude fiber and 2.93 percent ash.

Table 3: Acceptability Level of Acceptance of Breadfruit Catsup by Consumers

Level of Acceptability	AWM	Verbal Description
Color	3.46	Pale orange
Flavor	6.31	Like slightly
Consistency	6.66	Like moderately
After taste acceptability	6.34	Like slightly
General acceptability	6.55	Like moderately

The sensory evaluation disclosed varied significant differences among the sensory attributes studied. For sensory acceptability evaluation only consistency and after taste resulted no significant difference among the regression parameters studied.

Table 4: Consumer's Testing of Breadfruit Catsup

	Like	Dislike	Total
Catsup without chicken	92	8	100
Catsup with chicken	99	1	100
	Yes	No	Total

Are you willing to use this catsup?	98	2	100
Are you willing to buy this if available in the market?	99	1	100

For consumer's testing, showed that breadfruit catsup was highly acceptable and they were very much willing to utilized breadfruit catsup in food preparation or cooking and were willing to patronize the product if available in the market.

Table 5: Cost and Return in Producing 400 gms Breadfruit Catsup

Items	Quantity (ml or g)	Prevailing Price (P)
A. Cost		
Breadfruit	400	1.00
Vinegar	200	2.25
Sugar	160	8.00
Onion fresh	18.1	5.00
Salt	20	0.25
Onion powder	15.2	5.00
Cinnamon	22	5.00
Garlic powder	3.7	5.00
Pepper labuyo	2.0	0.25
Food color	16 yellow with .44 red	1.00
Gas		2.00
Bottle	5 pcs.	0.25
Total Cost		35.00
B. Return	5 bottles of P 17.00/bottle	P 85.00
C. Net Income		50.00

Cost and return analysis was also determined by subtracting the total production cost for the gross income. It was observed that breadfruit catsup production is profitable and could be a good source of livelihood that could help augment family income.

CONCLUSION

The optimum formulation of breadfruit catsup greatly influenced its sensory quality acceptability. This makes the product more acceptable and comparable to its commercial counterparts. High acceptability for breadfruit catsup can be due to sweet and sour taste, color, as well as the flavor associated with it. Its high acceptance and diverse uses may greatly contribute to high demand of this product. Therefore, optimum formulation of breadfruit catsup is found to be economically profitable. Thus, may create a gainful employment for those who may wish to venture in the production of breadfruit catsup. It is technically and economically feasible.

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