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Development and Acceptability of Sea Grapes (Caulerpa racemosa) Kropek

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Abstract: *This experimental-developmental study formulated sea-grape (Caulerpa racemosa) kropek and examined descriptive attributes, consumer acceptability, statistical differences, and nutritional composition. Three formulations with different nominal sea-grape proportions were assessed by 120 purposively selected evaluators (20 food technology experts and 100 students). Products showed green to light-green colors, fresh sea-grass aroma and flavor, and moderate-to-balanced saltiness. Composite appeal means were 6.98, 7.26, and 7.18 for Formulations A, B, and C, respectively, corresponding to "like moderately." Six across-formulation ANOVA tests showed no statistically significant differences (p = 0.06–0.71). For Formulation C, the tabulated subgroup analysis identified a sex difference in color acceptability (F = 4.69, p = 0.03) but no age effects. Per 25-g serving, the selected product contained 120 kcal, 17 g carbohydrate, 5 g fat, and 0 g protein. Formulation C was selected on the basis of lower sea-grape requirement rather than superior sensory performance. The findings demonstrate initial feasibility of the snack but call for formulation refinement and validated shelf-life, safety, and market testing.*

Keywords: Caulerpa racemosa; sea grapes; kropek; sensory acceptability; marine-based snack

I. INTRODUCTION

Sea grapes (Caulerpa racemosa), locally eaten as lato or ar-arosep, represent an opportunity for value-added marine-based foods in coastal communities. The nutritional and functional properties of C. racemosa have been discussed in studies on Indo-Pacific seaweeds [1] and reports of its proximate composition [2], [3]. However, nutrient composition in raw sea grapes cannot be assumed to persist at equivalent levels in a starch-based snack after thermal processing.

Kropek is a familiar crisp snack traditionally made from starchy ingredients and sometimes seafood. Incorporation of sea-grape powder could introduce characteristic color, marine aroma, and flavor, but may also influence crispness and saltiness. Prior development work on sea-grape-enriched noodles [4] and seaweed crackers [5] illustrates the need to evaluate both product characteristics and consumer liking. Sensory science recommends systematic testing of appearance, odor, flavor, texture, and overall acceptability because these dimensions contribute differently to food preference [6].

Product studies on sea-grape cookies [7] and basic processing literature [8] also provide a rationale for careful formulation, drying, and frying procedures. Wider assessments of fisheries and marine food systems [9], [10] situate the work in the context of resource utilization; they do not prove that the resulting kropek is nutritionally superior or commercially viable. Against this background, the study developed three sea-grape kropek variants, compared their sensory qualities and acceptability, examined respondent-group differences, and analyzed nutrients in the selected product.

II. METHODOLOGY

Formulation and processing

An experimental-developmental design with descriptive and sensory components was implemented at the Food Technology Innovation Center of Surigao del Norte State University, Surigao City, Philippines. Sea grapes were

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washed, dehydrated, and ground into powder. The powder was combined with cassava starch, rice flour, lemon juice, sugar, baking powder, white pepper, garlic powder, and water; dough was molded, steamed, cooled, dehydrated, and deep-fried. Three formulations varied the nominal sea-grape component (100%, 50%, and 25%) while other ingredients were described as constant. The manuscript does not specify complete formulation-specific masses, so the percentages should be treated as treatment descriptions rather than complete reproducible recipes.

Panel, measures, and analysis

A purposively chosen evaluation group of 120 included 20 food technology experts and 100 students. Participants gave descriptive ratings for color, aroma, flavor, and dominant (salty) flavor, then scored acceptability for color, aroma, flavor, saltiness, texture, and composite appeal using a validated nine-point hedonic evaluation form. Expert critique and a group discussion supported refinement. The source reports informed consent and food-handling precautions. Means and standard deviations summarized scores; ANOVA at $\alpha = 0.05$ compared treatments and respondent groups. The selected Formulation C underwent laboratory proximate testing through DOST–Caraga.

III. RESULTS AND DISCUSSION

Descriptive properties and acceptability

Formulations A and C were described as green, whereas B was light green. All three were characterized by a fresh sea-grass aroma and a rich sea-grass flavor. Saltiness was moderately salty for A and B and "just right" for C. For hedonic ratings, all six evaluated attributes for every formulation were interpreted by the source as "like moderately." Table I reproduces the main mean and standard-deviation results in consolidated form.

TABLE I: SENSORY ACCEPTABILITY OF SEA-GRAPE KROPEK (MEAN ± SD; NINE-POINT SCALE)

Attribute	A	B	C
Color	6.84 ± 1.68	6.83 ± 1.60	6.95 ± 1.61
Aroma	6.88 ± 1.57	6.90 ± 1.65	7.12 ± 1.45
Flavor	6.80 ± 1.76	7.01 ± 1.71	6.88 ± 1.93
Saltiness	6.54 ± 1.93	6.89 ± 1.71	6.98 ± 1.70
Texture	6.82 ± 1.75	7.18 ± 1.85	7.04 ± 1.74
Composite appeal	6.98 ± 1.62	7.26 ± 1.54	7.18 ± 1.62

Formulation B achieved the highest descriptive composite appeal (7.26), followed by C (7.18) and A (6.98). Formulation C was most favored for color, aroma, and saltiness, while B received the highest flavor and texture means. The resulting profile suggests that improving crispness and flavor balance may be more fruitful than maximizing the sea-grape proportion. This interpretation accords with the need for multidimensional hedonic evaluation described in sensory-method literature [6].

Formulation and subgroup comparisons

TABLE II: REPORTED ANOVA FOR SEA-GRAPE KROPEK SENSORY ACCEPTABILITY

Attribute	F	p value	Decision (α = .05)
Color	0.35	0.71	Not significant
Aroma	1.58	0.21	Not significant
Flavor	0.65	0.52	Not significant
Saltiness	3.51	0.06	Not significant
Texture	2.07	0.13	Not significant
Composite appeal	1.83	0.16	Not significant

Table II shows no significant difference among formulations on any sensory outcome (all $p > 0.05$). Saltiness approached but did not cross the selected threshold ($p = 0.06$). Formulation C was selected for follow-up laboratory testing because it used a lower amount of sea grapes while remaining comparably acceptable, rather than because it was the highest-rated formulation overall.

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The source subgroup table reports no significant age differences in any Formulation C acceptability measure (p = 0.50–0.91). For sex, a statistically significant difference was reported for color (F = 4.69, p = 0.03); aroma, flavor, saltiness, texture, and composite appeal had p = 0.06–0.15 and were not significant. The text accompanying a separate table refers to saltiness by sex, but the primary inferential table identifies color; the raw analysis should be checked before submission. Because the sample consists largely of university students, the findings should not be generalized to the wider consumer market.

Nutritional characteristics and implications

TABLE III: REPORTED NUTRIENTS IN FORMULATION C PER 25-G SERVING

Nutrient	Amount
Energy	120 kcal
Total fat	5 g
Carbohydrate	17 g
Protein	0 g

The finished kropek contained 120 kcal, 17 g carbohydrate, 5 g fat, and 0 g protein per 25-g serving (Table III). Despite its sea-grape ingredient, the tested snack was not a source of measurable protein. Its energy is supplied mainly by carbohydrate and fat, which is consistent with a starch-based deep-fried snack. The thesis provides a general comparison to prawn kropek, but those benchmark figures are not tied to a verified laboratory sample, so comparative nutritional superiority cannot be claimed. Additional measurements of sodium, minerals, water activity, and microbial quality, as well as packaging and shelf-life tests, would help establish safe positioning and commercial feasibility.

IV. CONCLUSION

Sea-grape (Caulerpa racemosa) kropek was successfully prepared and achieved moderately favorable ratings for all six sensory attributes. No statistically significant formulation effects were detected, although Formulation B had the highest descriptive composite appeal. Formulation C was retained as a potentially economical option requiring less raw sea-grape material. In the primary subgroup results, color acceptability differed by sex (p = 0.03), while no age differences were significant. A 25-g serving contained 120 kcal, 17 g carbohydrate, 5 g fat, and no reported protein. Future research should standardize recipes, reconcile subgroup tables, improve crispness and flavor, test shelf stability and food safety, and assess market responses beyond the student panel.

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