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Development and Acceptability of Creeping Cucumber (Melothria pendula) Gummy Candy

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Abstract: *This experimental-developmental study prepared gummy candy from creeping cucumber (Melothria pendula) and evaluated the sensory properties, acceptability, and nutritional composition of three fruit-puree formulations. A purposively selected group of 120 respondents (20 food technology experts and 100 university students) evaluated descriptive attributes and liking on a nine-point hedonic scale. Color was rated "like very much," while flavor, sweetness, texture, and overall appeal were generally rated "like moderately"; aroma received the lowest scores. The three formulations differed significantly in flavor ($F = 4.40$, $p = 0.01$), sweetness ($F = 6.31$, reported $p = 0.00$), texture ($F = 5.52$, reported $p = 0.00$), and composite appeal ($F = 7.43$, reported $p = 0.00$), but not color or aroma. Reported pairwise comparisons favored Formulation A over B for those four outcomes. Age and sex were not associated with significant acceptability differences for Formulation A. A 50-g serving of A contained 160 kcal, 29 g carbohydrate, 3.5 g fat, and 2 g protein. The product demonstrates initial sensory feasibility; aroma improvement, safety assessment, and shelf-life validation are recommended.*

Keywords: Melothria pendula; creeping cucumber; gummy candy; hedonic evaluation; food innovation

I. INTRODUCTION

Underutilized edible plants can broaden the range of ingredients available to food developers and provide opportunities for local value addition. Reviews of wild edible plants emphasize their diversity and possible role as sources of compounds and nutrients [1]. Creeping cucumber (Melothria pendula), sometimes called pipinong gubat, is a small-fruited vine that has been examined for conservation and ecogeographic diversity [2]. These findings support interest in the species but do not establish that products made from it have demonstrated health benefits.

Gummy candies are widely recognized for their texture and sweet flavor, making them suitable matrices for trials with fruit ingredients. Philippine research on indigenous fruits describes food-processing opportunities [3], while studies on chayote gummies [4], fortified gummy confections [5], and plant-based gummy jellies [6] show that formulation changes can affect taste, mouthfeel, and consumer response. Physical and sensory properties of gummies can also change during storage [7]. Cross-modal interactions among aroma, taste, and texture explain why improving one sensory attribute may alter perceptions of others [8].

Recent work on carob-based vegan gummies [9] and gummies using plant extracts [10] offers additional context for testing novel confectionery ingredients. However, favorable hedonic ratings cannot be treated as evidence of micronutrient retention, antioxidant activity, or nutritional superiority. The present study consequently focused on observable product characteristics, acceptability of three formulations, profile-group comparisons, and a proximate nutrient assessment of the selected formulation.

II. METHODOLOGY

Experimental preparation

The study followed an experimental-developmental approach at the Food Technology Innovation Center of Surigao del Norte State University in Surigao City, Philippines. Creeping cucumber fruits were washed, blended into puree, and

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combined with gelatin, sugar, water, and lemon juice. Gelatin was dissolved, a syrup was prepared, and the components were cooked together until uniform before molding, cooling, refrigeration, and storage in airtight containers. Three formulations contained 100 g, 150 g, and 200 g of fruit puree, with the other components adjusted to maintain product consistency. The source identifies Formulation A as the selected formula but does not give a complete treatment-by-treatment ingredient schedule in its summary.

Sensory assessment and statistics

A purposively selected group of 120 comprised 20 food technology experts and 100 university students. After orientation and informed consent, panelists examined blinded, three-digit-coded samples and provided descriptive characteristics (color, aroma, flavor, sweetness) and acceptance ratings (color, aroma, flavor, sweetness, texture, composite appeal) using a nine-point hedonic scale. Instrument review by experts, sanitation protocols, allergy awareness, and participant confidentiality were reported. Mean and standard deviation summarized sensory data; ANOVA and post hoc comparisons evaluated formulation effects at $\alpha = 0.05$, while respondent profile comparisons examined Formulation A. Nutrients were tested using laboratory methods including drying, ignition-gravimetry, Kjeldahl analysis, and fat extraction, as described in the source.

III. RESULTS AND DISCUSSION

Sensory description and acceptability

All three gummy samples were described as light green, having a mild cucumber aroma and moderate sweetness. Formulations A and C were described as having pleasant cucumber flavor; B was characterized as more balanced. Table I summarizes acceptability. Color produced the highest mean scores, whereas aroma was the least favored attribute: A and B were "like slightly," and the Formulation C aroma score was interpreted as "neither like nor dislike."

TABLE I: SENSORY ACCEPTABILITY OF CREEPING CUCUMBER GUMMIES (MEAN ± SD; NINE-POINT SCALE)

Attribute	A	B	C
Color	7.63 ± 1.41	7.53 ± 1.47	7.56 ± 1.43
Aroma	5.74 ± 2.34	5.63 ± 2.21	5.48 ± 2.26
Flavor	7.21 ± 1.81	6.77 ± 1.86	6.85 ± 1.96
Sweetness	7.26 ± 1.52	6.80 ± 1.77	6.97 ± 1.77
Texture	7.42 ± 1.56	6.96 ± 1.73	7.13 ± 1.66
Composite appeal	7.47 ± 1.40	6.95 ± 1.54	7.14 ± 1.54

Formulation A achieved the highest descriptive mean for every sensory attribute, including composite appeal (7.47). Nevertheless, the magnitude and significance of the differences varied by attribute. Sensory-method studies emphasize that aroma, sweetness, and texture interact in consumer liking [7], [8]; in the present formulation, aroma appears to be the primary weakness despite otherwise favorable scores.

Significance tests and pairwise results

TABLE II: REPORTED ANOVA OF ACCEPTABILITY ACROSS GUMMY FORMULATIONS

Attribute	F	p value	Decision (α = .05)
Color	0.48	0.62	Not significant
Aroma	1.84	0.16	Not significant
Flavor	4.40	0.01	Significant
Sweetness	6.31	0.00*	Significant
Texture	5.52	0.00*	Significant
Composite appeal	7.43	0.00*	Significant

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As shown in Table II, flavor, sweetness, texture, and composite appeal differed across formulations; color and aroma did not. Values printed as p = 0.00 in the thesis reflect rounding, not literal zero probability. The post hoc tests identified significant A-versus-B differences in flavor (mean difference = 0.442, p = 0.012), sweetness (0.458, p = 0.001), texture (0.458, p = 0.002), and composite appeal (0.517, reported p = 0.000). In contrast, comparisons between A and C and between B and C were nonsignificant for these outcomes ($p \geq 0.078$). These findings justify preferring A to B on several sensory dimensions but not claiming that A significantly exceeds C.

The source found no significant age-group or sex-group effects for Formulation A on any of the six sensory measures (reported age p = 0.34–0.94; sex p = 0.20–0.97). This does not demonstrate identical preferences across demographic groups in the wider population, because the purposive sample was predominantly young university students. Future panels should include additional age groups and independent consumer populations.

Nutritional profile

TABLE III: REPORTED NUTRITIONAL COMPOSITION OF FORMULATION A (PER 50-G SERVING)

Nutrient	Amount
Energy	160 kcal
Total fat	3.5 g
Carbohydrate	29 g
Protein	2 g

Formulation A supplied 160 kcal, 29 g carbohydrate, 3.5 g fat, and 2 g protein per 50-g serving (Table III). Carbohydrate was the predominant measured macronutrient, consistent with a sugar-containing confectionery. These figures do not by themselves establish that the gummy is low in sugar, a substantial source of vitamins, or nutritionally superior to conventional gummies; direct comparative and micronutrient analyses were not supplied. Storage studies of gummy products [7] further point to the importance of monitoring quality over time before wider distribution.

IV. CONCLUSION

Creeping cucumber (Melothria pendula) was incorporated into gummy candy with generally acceptable color, flavor, sweetness, texture, and overall liking, although aroma remained a notable limitation. Statistically significant formulation effects were detected for flavor, sweetness, texture, and composite appeal. Formulation A outperformed B in the reported pairwise tests, but was not shown to be significantly better than C. Its 50-g serving delivered 160 kcal and 29 g carbohydrate, confirming that it functions mainly as a confectionery product rather than a demonstrated nutrient supplement. Aroma reformulation, complete recipe standardization, microbial and shelf-life testing, and wider consumer trials are recommended before commercialization.

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