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Moringa oleifera, Basella Rubra Linn, *Corchorus olitorius* Vegetable Jellies: Potentials for Product Development and Commercialization

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ABSTRACT

Naturally-made products are now available in the local and international markets. Green leafy vegetables are very rich in phytonutrients that could be utilized in producing value-added products like vegetable jellies. The study considered green leafy vegetables: *Malunggay (Moringa oleifera), Kulitis* (*Amaranthus spinosus L.*), *Camote tops* (*Ipomoea batatas), Alugbati (Basella Rubra* Linn*),Saluyot* (*Corchorus olitorius*) for the development of vegetable jellies. It specifically determined the sensory acceptability of vegetable jellies in terms of their appearance, aroma, color, texture, consistency, and general acceptability using the single factor experiment in a Completely Randomized Design considering five treatments evaluated by 80 evaluators using score cards for sensory evaluation. The appearance, aroma, texture, consistency and general acceptability of Malunggay jelly was "Liked Very Much" while Saluyot jelly was "Liked Extremely" in terms of color. There were significant differences among the vegetable jellies in the sensory qualities and general acceptability of Malunggay jelly and Saluyot jelly in terms of color. The five vegetable jellies were acceptable. Malunggay jelly had the highest acceptability that was high in ash, crude protein, crude fat, carbohydrates and energy content. Saluyot jelly was high in moisture content, and Alugbati jelly was high in sodium content. *Malunggay (Horseradish*

tree), Alugbati (Malabar nightshade), and *Saluyot* (Jute leaves) vegetables have potentials for product development as vegetable jellies.

Keywords **-** Science and clinical laboratory, vegetable jelly, nutrition, CRD, experimental design, Capiz, Philippines

INTRODUCTION

People in the world are faced with economic problems especially on the scarcity of food due to the rapid increase of population. In the Philippines, many Filipinos suffer from malnutrition due to the amount and kind of food they eat and the lack of knowledge about proper nutrition. Some even go to bed with an empty stomach. However, if people are just observant enough and resourceful on what they can see in their community, this problem may be minimized.

The country is rich in natural resources. A lot of vegetables grow freely or are cultivated in fertile land. These vegetables contain edible parts such as leaves, stalks, roots, tubers and flowers that may be eaten raw, cooked or sometimes added to meat, fish, shellfish and poultry products. Vegetables are mostly water (approximately 80%) and usually contain vitamins, minerals, carbohydrates, protein and fats. They can help a person look and feel great, the healthiest foods one can eat and with disease-fighting phytochemicals that make them excellent food cures (Bauer, 2010).

Malunggay, Kulitis, Camote Tops, Alugbati, and *Saluyot* are vegetables rich in Vitamins, Minerals, and Amino acids that are needed for optimum health. *Malunggay* (Horseradish Tree) is considered an "all-natural multi-vitamin and can give four times the vitamin A one can get from carrots, seven times the vitamin C from oranges, twice the protein and four times the calcium from milk, three times the iron from spinach, and three times the potassium from bananas. *Kulitis* (Amaranth), known as "Powerhouse of Nutrients" contains protein, carbohydrates, potassium, phosphorus, vitamin A, vitamin B1 (Thiamine), vitamin C, folate, calcium and iron (National Agricultural and Fishery Council, 2003). *Camote tops* (sweet potato leaves) are excellent source of anti-oxidative compounds mainly, polyphenolic that protects the human body from oxidative stress associated with many diseases, including cancer and cardiovascular diseases (Fernando, 2012). *Alugbati* (Malabar nightshade) is an excellent source of calcium, iron, vitamin A, vitamin C and vitamin B which contain saponins that act as phytochemicals and fights cancer and other diseases. *Saluyot* (Jute leaves)

is rich in calcium, iron, protein, vitamin A, C and E, thiamin, riboflavin, niacin, folate and dietary fibers and beta carotene (Maghirang, Guevara, & Rodolfo, 2008).

Considering the richness of nutrients present in these leafy vegetables and the vastness of vacant land areas that could be utilized in producing these products, the researcher thought of developing jellies from these vegetables. The study looked at the usefulness of these vegetables in making jellies for sandwich spread/fillings which would become a value-adding product that is nutritious and preservatives-free. Besides, these vegetables are abundantly and locally thriving in the community. Hence, the study was conceived.

OBJECTIVES OF THE STUDY

The study aimed to find out the acceptability of vegetable jellies from green leafy vegetables: *Malunggay, Kulitis, Camote tops, Alugbati,* and *Saluyot.* Specifically, it sought to: 1) determine which of the vegetables is the most acceptable in terms of appearance, aroma, color, texture, consistency, and general acceptability; 2) find out which of the vegetable jellies is extremely liked in terms of the sensory qualities tested; 3) find out if there are significant differences in the vegetable jellies in terms of appearance, aroma, color, texture, consistency, and general acceptability; and 4) determine the nutrient content of the most accepted vegetable jellies.

METHODOLOGY

The study used single (1) factor experiment in a Completely Randomized Design (CRD) in which each of the vegetable jellies was cooked for one (1) hour and evaluated through consumer testing method using incidental/accidental sampling. The experiment was carried out by using five (5) different green leafy vegetables, namely, *Malunggay, Kulitis, Camote Tops, Alugbati,* and *Saluyot.*

The study used score card for sensory evaluation (Hedonic scale) as a research instrument. It looked into the sensory qualities such as appearance, aroma, color, texture, consistency, and general acceptability of Malunggay, Kulitis, Camote Tops, Alugbati, and Saluyot jellies. The score card for sensory evaluation used the 9- point Hedonic scale rating standard wherein the respondents were made to rate each vegetable jelly according to the nine (9) responses. These categories were used to determine the qualitative description of the resulting figures of the study.

The evaluation of the vegetable jellies was done through an accidental sampling of 80 prospect consumers composed mainly of students, employees, faculty and food vendors from Capiz State University, Roxas City Main Campus. Evaluators were oriented on the mechanics of evaluating the jellies prior to actual testing and evaluation.

Vegetable jellies were evaluated in terms of five sensory qualities: appearance, aroma, color, texture, consistency, and general acceptability which were scored using the nine (9) point Hedonic scale. The data of the study were processed using the Statistical Package for Social Sciences (SPSS) software.

The Arithmetic mean and Analysis of Variance (ANOVA) were the statistical tools used in analyzing and interpreting the data. Mean or the Expected Average Value was used to determine the sensory qualities and the general acceptability of Malunggay, Kulitis, Camote Tops, Alugbati and Saluyot jellies. ANOVA or F-test was used to determine the significant difference in the appearance, aroma, color, texture, consistency and general acceptability of the vegetable jellies. The Tukey HSD Post Hoc tests were used to pin-point where the significant difference lies for range or interval data.

Out of the 5 products, 3 best jellies based on the consumer testing were submitted to the Department of Science and Technology in Iloilo and Cebu City for proximate and sodium analyses.

RESULTS AND DISCUSSION

Results showed that in terms of appearance, Malunggay jelly got the highest mean (7.93). Saluyot jelly (7.90) and Alugbati jelly (7.59) were qualitatively described as "Liked Very Much." As to aroma, Malunggay, Alugbati, and Saluyot jellies were "Liked Very Much." In terms of color, Saluyot jelly had the highest mean (8.16), closely followed by Malunggay jelly (8.14) which was "Liked Extremely." In texture, the four vegetable jellies were "Liked Very Much" except for Camote tops jelly which was "Liked Moderately." In terms of consistency, Malunggay jelly also got the highest mean (7.80) and was "Liked Very Much". Meanwhile, Kulitis jelly got the lowest mean (7.20) which was qualitatively described as "Liked Moderately" by the evaluators. In terms of general acceptability, out of the five kinds of vegetables, three were "Liked Very Much". However, Kulitis and Camote tops jellies were only "Liked Moderately" by the evaluators. Various experiments have also been conducted with evaluated the acceptability of fruits and vegetables. Vegetables were acceptable for use as ingredients in various

purposes (Institute of Food Technologists (2014); Barcelon, et al. (2014); Junio & Bisco (2013).

Results implied that the evaluators had different judgment on the sensory qualities tested. Data further showed that the color of Saluyot and Malunggay jellies were "Liked Extremely". The five vegetable jellies were "Liked Very Much" by the evaluators.

Table 1. Sensory qualities of the vegetable jellies

	Malunggay Jelly		Kulitis Jelly		Camote Tops Jelly		Alugbati Jelly		Saluyot Jelly	
Sensory Qualities	Mean	QD	Mean	QD	Mean	QD	Mean	QD	Mean	QD
Appearance	7.93	LVM	7.30	LVM	7.31	LVM	7.59	LVM	7.90	LVM
Aroma	7.89	LVM	6.79	LM	6.53	LM	7.70	LVM	7.58	LVM
Color	8.14	LE	7.06	LM	7.11	LM	7.49	LVM	8.16	LE
Texture	7.99	LVM	7.31	LVM	7.13	LM	7.85	LVM	7.64	LVM
Consistency	7.80	LVM	7.20	LM	7.35	LVM	7.63	LVM	7.31	LVM
General Acceptability	8.09	LVM	7.20	LM	7.04	LM	8.00	LVM	7.82	LVM
Overall Mean	7.97	LVM	7.14	LM	7.07	LM	7.71	LVM	7.74	LVM

Legend: QD = Qualitative Description; LVM = Liked Very Much;
LE = Liked Extremely LM = Liked Moderately

There were significant differences in the vegetable jellies in terms of appearance, aroma, texture, consistency, and general acceptability in favor of Malunggay jelly, while in terms of color it was in favor of Saluyot jelly. The study of Awoyinka, Abegunde and Adewusi (1995) supports the findings of the study, wherein they posited that vegetables were highly acceptable among consumers when used as ingredients in food.

Figure 1. The finished jelly products

Based on the reports obtained from Department of Science and Technology (DOST) Iloilo and Cebu City on the nutrient analysis of the most accepted vegetable jellies, the results revealed that Malunggay jelly was high in ash (0.32g), crude protein (0.23g), crude fat (0.19g), carbohydrates (84.72g) and energy (342 kcal/mg) content. Saluyot jelly was greater in moisture content (17.75g) and low in sodium (20.1mg/kg), while Alugbati jelly obtained the highest sodium content of (48.5mg/kg).

The experimental design employed in this study implicates the desired outcomes. Through the method employed, the study has produced developmental products which are qualitatively and economically accepted by the consumers and possible investors. However, the discussions of the procedures were limited since the product is under application for Intellectual Property Rights of the University.

CONCLUSIONS

The positive response of the respondents indicates that there is a potential for vegetable jelly to be accepted in the general market. Furthermore, the availability of the products, their affordability in the market and the ease of their preparation are plus factors that could add up to the interest of the consumers. With the vegetable's appealing aroma, color, texture and consistency, there is a possibility for further enhancement on the recipe of these vegetable jellies.

TRANSLATIONAL RESEARCH

This study can give information about the indigenous plant species abundantly thriving in the locality and in the country. Malunggay, Kulitis, Camote Tops, Alugbati and Saluyot which are potent sources of essential nutrients that the body needs.

Results of this study could be translated into brochures, and pamphlets after the approval of Intellectual Property Rights Office of the University. The Department of Agriculture could utilize the information gained from this research in encouraging farmers to plant more of these vegetables which could be used in the production of nutritious jellies which also serves as their additional source of income. It would also support the Department of Agriculture's program of propagating vegetables as a revenue generating industry with Malunggay, Kulitis, Camote Tops, Alugbati and Saluyot for vegetable jellies.

LITERATURE CITED

Awoyinka, A. F., Abegunde, V. O., & Adewusi, S. R. (1995). Nutrient content of young cassava leaves and assessment of their acceptance as a green vegetable in Nigeria. *Plant Foods for Human Nutrition*, *47*(1), 21-28.

Barcelon, E. G., Chua, J. N., Encinas, J. B., Montemayor, J. E., Nagalinngam, M. G., Ocampo, A. E., & Ong, R. M. G. (2014). Online Consumer Preference and Sensory Acceptability of Vegetable-Added Pasta Noodles. *Food and Public Health*, *4*(6), 301-305.

Basella (vine spinach) nutrition facts. Retrieved from: http://www.nutrition-and-you.com/basella.html September 18, 2014.

Bauer, J. (10th. November 2010) Vegetables: How Foods Affects Health. Retrieved August 20, 2014 from http://www.joy bauer.com/ food- articles/ vegetables. aspx.

Fernando, M. (2012, November 10). Find Out the Natural Health Benefits ofTalbos ng Kamote[Web log post]. Retrieved September 5, 2014, from http://gustokohealthyka.blogspot.com/2012/11/find-out-natural-health-benefits-of.html.

Foundation for Resource Linkage and Development Inc.

Junio, I.C. and L.P. Bisco (2013). Formulation and standardization of seaweeds flakes. e-International Scientific Research Journal, 5(1), pp. 183-194.

Maghirang, R G., Guevara, ML D., Rodulfo G S., (2008).Alugbati Production Guide. Information Bulliten no. 269/2008. Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, ISO 9001-2000 & Department of Science and Technology.

Maghirang, R G., Guevara, ML D., Rodulfo G S., (2008).Malunggay Production Guide. Information Bulliten no. 292/2010. Department of Trade and Industry & Philippine Council for Agriculture, Forestry and Natural Resources Research and Development , ISO 9001-2008.

Maghirang, R G., Guevara, ML D., Rodulfo G S., (2010). Saluyot Production Guide. Information Bulliten No. 273/2010. Department of Trade and Industry, Philippine Council for Agriculture, Forestry and Natural Resources Research, ISO 9001-2008 and Development & Department of Science and Technology.

Malunggay. Retrieved from: http://www.medical healthguide.com /articles/ malunggay.htm on June 6, 2014.

National Agricultural and Fishery Council (NAFC) (2003). Indigenous Vegetables. Malate, Manila. Department of Agriculture-Bureau of Plant Industry.

Saluyot. Retrieved http://www.medicalhealthguide.com/articles/saluyot.htm on September 10, 2014.