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Formulation of a mayonnaise-type dressing with the addition of a majagua flower extract (*Talipariti elatum Sw*)

Abstract

In this work, a mayonnaise-type dressing was formulated with the addition of a majagua flower extract (*Talipariti elatum* Sw.) using a mixture design for which the percentages of extract, oil and water were taken into account. The antioxidant capacity of the extract to be used was also determined by the DPPH(2,2-diphenyl-1-picrylhydrazyl) method and some quality indices related to the plant material. An analysis of the sensory profile was carried out on the elaborated product, taking into account the attributes indicated in the literature. The extract presented a high antioxidant capacity. From the organoleptic point of view, it presented an amber red color and a strong presence of bitter and astringent principles. In addition, the CIELAB method for color determination could be used effectively. The formulation with the best acceptance was 10 % extract, 62.7 % oil and 2 % water, for a rating of 'Like' obtained from a linear model from which the components Extract and Oil turned out to be those of greater influence on the response variable. From the analysis of the sensory profile, it can be seen that the descriptor "stickiness" was the worst evaluated followed by "color" mainly due to the formulation used and the color of the extract.

Keywords: majagua flower, extract, seasoning, acceptability, antioxidant capacity

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Introduction

Currently there is a growing concern in the population for their quality of life and within this, nutrition is recognized as an important factor to promote and maintain good health throughout life. In this sense, foods are recognized whose composition, in addition to satisfying the supply of nutrients, contributes to the improvement of the organism or to strengthening its defense systems against stressful processes such as disease or aging.

Various international institutions have developed their own definition of functional food, and there are still controversies about what is and what is not a functional food. The Institute of Medicine and the National Academy of Sciences of the United States define functional foods by limiting them to those in which the concentration of one or more ingredients has been modified to improve their contribution to a healthy diet.[1]

Plant extracts have been used since ancient times for the treatment of various diseases. Plants are an inexhaustible source of bioactive chemicals, many of them with important technological applications.[2] The Majagua, Majó, Majagua azul or Blue Majoe is a plant native to Jamaica and Cuba. It is reported that it grows in elevated and humid areas. Its scientific name is *Talipariti elatum* Sw. and it belongs to the *Malvaceae* family (ornamental trees).[3] The flowers of the plant are an important source of bioactive compounds, such as organic acids, phytosterols and phenols, some of them with antioxidant properties. Phenolic content in flowers consists mainly of flavonoids such as gossypitrin, glycosylated derivatives of quercetin, gossypetin-3'-O-glucoside, the presence of compounds such as β-sitosterol, γ-sitosterol, red anthocyanin, phenolic acids such as propionic acid, pentatonic acid, hydroxypropionic acid, hydroxyacetic acid, 2-hydroxypropionic acid, and hexanoic acid.[4]

The pharmacological activity reported for the plant is varied, attributing to it aperitif, emollient, sudorific and laxative properties, and it also points out that with a bunch of flowers and half a bottle of water a decoction is prepared that is taken divided into several cups a day, being very useful. for acute diseases of the digestive organs.[5]

The in vitro relaxing effect of the flowers of *Talipariti elatum* Sw. was studied by Acevedo in 1975; In addition, in Cuba the Majagua flowers are used to make a syrup (FlorMaj) with expectorant activity. Two additional pharmacological effects have been tested with FlorMaj syrup: antihistamine and bronchodilator activity; resulting positive for the first.[6,7]

The antioxidant activity of polyphenolic flavonoids against free radicals (RL) generated during lipid peroxidation (POL), whether enzymatic or non-enzymatic, has been evaluated. Several flavonoids have inhibited this process, according to studies based on the measurement of the production of malonyldialdehyde (MDA) through the assay of substances reactive with thiobarbituric acid. In this aspect, gossypitrin showed a mean inhibitory concentration (IC50) equal to 8.11 µM using the hepatotoxin carbon tetrachloride in vivo. This allowed gossypitrin to be included in the category of good antioxidant agents to which those flavonoids with IC50 values < 45 µM respond.[8] In a preliminary study of the antioxidant activity of gossypitrin by evaluating the inhibition of microsomal lipid peroxidation (POL) induced by autooxidation of rat brain phospholipids, it was found that the flavonoid produced about 80% of inhibition of phospholipid oxidation in the rat brain.[8] Taking into account the existing scientific evidence, the following work aims to formulate a mayonnaise-type dressing with functional potentialities using an extract of majagua flower (*Talipariti elatum* Sw.).

Material and methods

Collection and processing of plant material

The majagua (*Talipariti elatum* Sw.) flowers used were manually collected, selecting those that generally presented the same characteristics of vegetative state, size, color and absence of spots, cracks and visible morphological alterations from fungi and parasites.

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To facilitate water loss, the petals were separated from each other and from the pistil in each flower. Drying was carried out in an oven with forced air circulation at a temperature of 40ºC for 5 days.[9,10] With the help of a blade mill, the plant material was crushed and passed through a sieve (0.5 mm). Its quality was verified through routine evaluations: residual humidity (azeotropic method), total ash, ash soluble in water and ash insoluble in 10% hydrochloric acid, according to the Branch Standard of the Ministry of Public Health.[11,12]

Preparation and evaluation of the extract

To prepare the extract, the Soxhlet method was used, using an ethanol: water mixture in a 1:1 ratio, taking into account the performance reported for this extraction.[9,13] The working temperature was of 78 °C, using 6 cartridges (16.5 cm long and 2.6 cm in diameter) with a content of 40 g each and exhausting them with 500 ml for a period of 12 h, for a total of 3 l of extract, then it was concentrated in a rotary evaporator until one liter of extract was obtained.

Total solids, color (spectrophotometric method according to the recommendations of the International Commission on Illumination CIE, 1971), phenol concentration[14] and antioxidant capacity (DPPH method Brand-Willams W et al.,[15] modified by Kim et al.,[16] were determined for this majagua flower extract.

Dressing formulation

The base homemade mayonnaise shown in Table 1 was prepared, following the regulations established in the country,[17,18] for the main ingredients (egg, oil, vinegar and salt). A mixture design was then carried out in the STATGRAPHICS Centurion XVI.I. software; having as components of the mixture a: percentage of oil (A, in the range of 48 to 62.7), percentage of extract (B, in the range of 10 to 26.7) and percentage of water (C, in the range of 0 to 8) and defining the variable "global acceptance of the product" as a response variable. The 10 formulations shown in table 2 were finally elaborated.

Table 1 Formulation of the dressing

Ingredientes	% (m/m)
Oil	74.7
Egg (yolk)	14.8
Vinegar	7.1
Salt	1.48
Sugar	1.92

Table 2 Formulations of the mayonnaise type dressing

Formulations	A (% oil)	B (% extract)	C (% water)
1	48	26.7	0
2	62.7	12	0
3	62.7	10	2
4	56.7	10	8
5	48	18.7	8
6	55.35	19.35	0
7	48	22.7	4
8	62.7	11	1
9	59.7	10	5
10	52.35	14.35	8

General acceptance was evaluated by means of a liking level test with 85 semi-trained judges, between 19 and 45 years of age, using a 7-point hedonic scale (7= "I like it very much", 6= "I like it", 5= "I like it slightly", 4= "I neither like nor dislike it", 3= "I dislike it slightly", 2= "I dislike it" and 1= "I dislike it a lot").

Preparation of dressing and sensory profile

For the formulation of the dressing, eggs marketed in the retail network, refined commercial soybean oil brand "Cocinero", commercial vinegar "Deleite" (4.5 % acidity), refined sugar (98°Brix), iodized salt and natural mineral water "Ciego Montero".

The sensory profile was prepared by 7 evaluators trained in this type of food product using the controlled association method. Appearance (color, brightness, surface and homogeneity), odor (odour typicity and intensity), flavor (total flavor, acidity and acid-sweet-salty balance) and texture (stickiness, spreadability, firmness and plasticity) were taken into account (Table 2).

Results

Table 3 shows the evaluations carried out on the plant material and the majagua flower extract.

Table 3 Indices of plant material and majagua flower extract

	Parameter	Mean (Standard deviation)
Vegetal material	Humidity (%)	8.60 (0.033)
	Ashes (%)	5.96 (0.028)
	Water soluble ash (%)	2.28 (0.020)
	Acid Soluble Ash (%)	0.45 (0.034)
Extract	Total solids (%)	2.86 (0.043)
	Phenols (mg/ml)	2.31 (0.130)
	L *	89,017
	to *	-5,417
	b *	44.34
	C	44.67

The extract appeared as a translucent amber colored liquid according to the chromatic coordinates.

Figure 1 shows the percentages of inhibition of the DPPH+ radical obtained for the different concentrations of the evaluated extract.The acceptance of the 10 formulations, according to the scores given by the semi-trained judges, is shown in Table 4. Taking into account the results of the Acceptance variable, the program used for the design of the formulations indicates that the equation that best explains this behavior is the following:

$$Acceptance=6.1059\times A+4.99096\times B+5.64201\times C$$

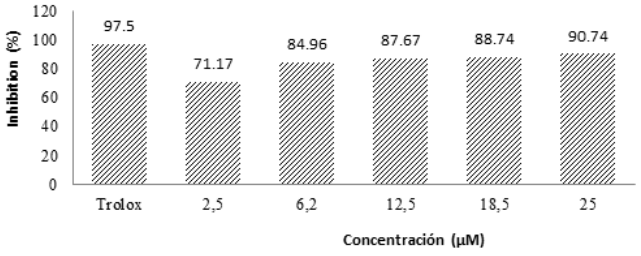

Figure 1 DPPH+ radical scavenger capacity of the extract compared to the positive control group (Trolox 20 µM).

Where A is the percentage of oil, B is the percentage of extract and C is the percentage of water.

Similarly, the statistical program yielded the following proportion of components A, B and C as the one that would guarantee maximizing the acceptance of the mayonnaise-type dressing: 62.7% oil, 10% extract and 2% water. This result predicts that under the conditions in which the experiment was carried out, a level of acceptance of "likes" would be obtained. Figure 2 shows the results of the surveys

applied to the 7 judges who carried out the descriptive profile of the mayonnaise-type dressing.

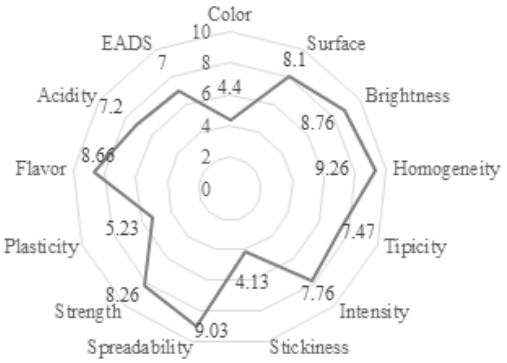

Figure 2 Sensorial description.

Table 4 Acceptance of each formulation

Formulations	A (% oil)	B (% extract)	C (% water)	Answer (Acceptance)
1	48	26.7	0	5.0286
2	62.7	12	0	6.0286
3	62.7	10	2	5.9714
4	56.7	10	8	5.8286
5	48	18.7	8	5.0857
6	55.35	19.35	0	5.2857
7	48	22.7	4	5.3147
8	62.7	11	1	6.0857
9	59.7	10	5	60,000
10	52.35	14.35	8	5.7714

Discussion

In the study of the physical-chemical quality indicators determined for the plant material of *Taliparitielatum* Sw., the residual moisture content was within the required range (between 8 and 14 %),[19] corroborating the results obtained by Gutierrez et al.,[9] and very similar (8.5 %) to that obtained by Gonzalez et al.,[20] demonstrating the efficiency of the drying process, since values lower than 8 % could imply a too drastic drying and therefore cause modifications in some of the metabolites, interfering in the extraction process. On the contrary, high humidity contents compromise the stability of the plant material, which would be subject to attacks by fungi or other microorganisms capable of altering its composition.

The Pharmacopoeias propose a total ash index of up to 5 %.[21,22] In the present study, the value of 5.96 % is slightly higher than the required limit; this could be attributed to the place of collection, the characteristics of the soil and the availability of nutrients absorbed by the plant, which can vary to favor one or another metabolic process, and although in this case it was lower than 5.01 % reported by Gutiérrez et al.,[9] The amount of ashes soluble in water and those insoluble in 10 % hydrochloric acid are also parameters that help evaluate the purity of plant material. When analyzing the results, it was possible to show that in both determinations the values were small and are within the established limits (around 2 % for medicinal plants).[21,22]

The total solids content was below that reported by Quiala[23] and very far from that offered by Milanés (1999).[13] The difference in the results could be conditioned by the influence of factors such as the ecosystem where the plant grows or harvesting time, as well as its phenological state, which favor variations in the content of metabolites and therefore in the content of total solids.

Studies carried out by González et al.,[20] where the content of compounds extracted by different methods is analyzed by HPLC, showed that the use of percolation turns out to be superior to extraction with Soxhlet and inferior to ultrasonic bath. The content of total phenols in the extract (2.31 mg/ml) was lower than those reported in the literature, 6.90 mg/ml by Quiala[23] and Gutierres et al.,[9] where values in the order of 3.58 mg/ml were obtained. The results could be related to the factors previously exposed for total solids. The smell of the same as reflected in the literature was characteristic, behavior similar to that reported by others authors.[13,23] Regarding the existence of bitter and astringent principles, a strong presence was found.

The percentages of inhibition of the DPPH+ radical obtained for the different concentrations of the evaluated extract indicate a high antioxidant capacity, since only at a concentration of 2.5 µg/ml was it capable of inhibiting 71.17 % of the radical, values that place it as a powerful antioxidant according to Ramos et al.[24]

From the model equation it can be seen that component A (oil), individually and seen as a pure mixture, is the one that generates the largest values of the response (Acceptance), followed by component C (water) and in third place component B (extract).

From the analysis of the sensory profile, it can be seen that the Stickiness descriptor was the worst evaluated, followed by Color. In the case of stickiness, it may be due to the fact that the formulation contains 2 % water, in addition to 10 % of the aqueous extract, which replaces part of the oil and obviously this negatively influences the texture of the product because the oiliness of the oil is it changes in part for more fluid products. In the case of color, it is worth mentioning the use in the formulation of egg yolk, which gives a yellowish color to the product, in addition to the extract that, when concentrated in a rotary evaporator, acquires an intense amber red coloration which also has a negative effect on this descriptor. Homogeneity is the best scored, which shows a correct elaboration of the dressing and the good aggregation capacity between the components used. In addition, among the observations of the judges, there was the presence of bubbles, which is due to the foaming capacity of the saponins of the extract; these retain part of the air incorporated into the product during beating and emulsion formation. One of the judges also detected an atypical but unidentifiable odor in the product, surely provided by the extract, which has its characteristic odor, which some vaguely associate with tomato sauce.

Conclusion

The extract presented a high antioxidant capacity. From the organoleptic point of view, it presented an amber red color and a strong presence of bitter and astringent principles. The formulation with the best acceptance was 10 % extract, 62.7 % oil and 2 % water, for a rating of 'Like' obtained from a linear model from which the components Extract and Oil turned out to be those of greater influence on the response variable. From the analysis of the sensory profile, it can be seen that the descriptor "stickiness" was the worst evaluated followed by "color" mainly due to the formulation used and the color of the extract.

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None.

Conflicts of interest

The authors do not declare conflict of interest.

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