

# PHYSICOCHEMICAL COMPOSITION AND SENSORY PREFERENCE OF HOUSEWIVES ON DRAGON FRUIT KETCHUP

<sup>1</sup>Eufemio Barcelon  
Department of Food Technology,  
College of Education,  
University of Santo Tomas,  
España Manila, Philippines  
Email: [1fbarcelon@yahoo.com](mailto:1fbarcelon@yahoo.com)

<sup>2</sup>Meg Acurato, <sup>3</sup>Christine Fernando, <sup>4</sup>Karmina Mercado, <sup>5</sup>Vina Prades  
Department of Food Technology,  
College of Education,  
University of Santo Tomas,  
España Manila, Philippines  
Email: [4kmercs@yahoo.com](mailto:4kmercs@yahoo.com)

**ABSTRACT** This study determines the physicochemical composition and sensory preference of dragon fruit ketchup. The dragon fruit-based ketchup was formulated. The formulation containing 15, 20 and 25% dragon fruit in ketchup were subjected to preference ranking. The sum of preference rank indicated that ketchup containing 25% dragon fruit is most acceptable. The dragon fruit ketchup was compared to tomato ketchup that is available in the market. Housewives with age ranges from 18 to 59 years old were used as consumer sensory panellists. They were compared to non-housewives that are single adults' women (18- 59 years old). Further the physicochemical contents were determined. Results showed that the dragon fruit ketchup have a refractive index of 55.3°Brix, pH 3.66, titratable acidity of 0.19%, moisture content of 53.04%, water activity of 0.825 and viscosity of 37.90cp that is comparable to tomato ketchup. The dragon fruit ketchup proved to have comparable sensory acceptability to that of the tomato ketchup. Housewives and non-housewives consumer panellists have no significant difference ( $P < 0.05$ ) responses on the acceptability of dragon fruit ketchup.

**Keywords:** dragon fruit, ketchup, housewives, physicochemical composition, sensory preference

## 1. INTRODUCTION

Dragon fruit, "Pitaya" or "Pitahaya" is a vine, epiphytic cacti of the genus *Hylocereus* with three varieties including but not limited to: *Hylocereus undatus* (Red fruit coat with white flesh) which is the most common, followed by *Hylocereus costaricensis* or *Hylocereus polyrhizus* (Red fruit coat with red flesh) that grows bigger but is less sweet than the latter, and the less familiar variety is the *Hylocereus megalanthus* or *Selenicereus megalanthus* (Yellow fruit coat with white flesh) which is regarded to be the sweetest [13]. Nutritive and Functional, Dragon fruit can be used to produce industrialized products such as jam, jelly, preserve, ice cream, sherbet, syrup, yogurt, candy, pastry, fruit juice as well as wine[4]. In the production of ketchup, the *Hylocereus polyrhizus* variety was utilized following a modified formulation.

Ketchup is a descriptive term for a number of different products, which consist of various pulps, strained and seasoned fruit. Banana ketchup, indigenous to the Philippines suites a more specific palette of a sweet and spicy blend. The cheap and inherent abundance of

banana leads to the higher consumption of the Banana ketchup. While other variants of fruit ketchup rose from deficiency of raw materials, inadequate processing knowledge and the modernization of consumers demand for healthier substitutes.

The study was conducted to utilize the edible portion (peel and flesh) of the dragon fruit as ketchup wherein a sensory evaluation of semi trained panellists determined the final ketchup formulation using levels of dragon fruit at of 15, 20 and 25% in the formulation. Comparison test was applied to determine acceptability and marketability of the dragon fruit ketchup between commercial brand ketchup and dragon fruit ketchup through a semi-trained panel, while consumer test was used for housewives.

## 2. MATERIALS AND METHODS

### 2.1 Dragon Fruit Ketchup Preparation

Dragon fruits obtained from a local farm in Currimao, Ilocos Norte were used to produce the Dragon Fruit Ketchup, while dry and wet ingredients such as: sugar,

Iodized salt, celery salt, cayenne powder, mustard powder, ground black pepper, distilled vinegar and water were bought from a local supermarket in Manila; other ingredients included are modified starch and sodium benzoate were purchased from Spices and Food Mix House in Quezon City.

## 2.2 Methods

### 2.2.1 Preparation of Dragon Fruit Ketchup

A variation in dragon fruit ketchup was made through 15, 20, and 25% dragon fruit content from a mixture of homogenized dragon fruit peel and flesh. Measurements of spices and distilled vinegar remained constant whereas the distilled water varied with the dragon fruit content. Successively, all ingredients were mixed and cooked for twenty minutes within 75°- 80° Celsius; modified starch and water mixed with sodium benzoate, was added and cooked for additional two minutes. Samples were set aside to cool.

### 2.2.2. Physico-chemical Analysis

Refractive index of dragon fruit ketchup was measured using a refractometer (Atago Hand Refractometer) while the pH was measured using a pH meter (Jenway 350); Water activity was determined using water activity equipment (Novasina) whereas Titratable acidity in terms of acetic acid was determined by titrating the sample with 0.1 N NaOH. Lastly, moisture content was also determined using the method outlined in AOAC (2000).

### 2.2.3. Sensory Evaluation

Thirty non-housewives, ages 18 to 21 years old and thirty housewives, ages 25 to 50 years old were given two coded sample, one of which is the dragon fruit ketchup and the other were commercial tomato ketchup; the panellists were asked to rate the acceptability of dragon fruit ketchup based on its appearance, aroma, texture, flavor and acceptability using a 9-point hedonic scale (1=dislike extremely, 2=dislike very much, 3=dislike moderately, 4=dislike slightly 5=neither like or dislike, 6=like slightly, 7=like moderately, 8=like very much, 9=like extremely). Each sample was given to the panelist within 24 hours of production and coded with three digit numbers. Sensory data score was analyzed through Analysis of variance (Anova) whereas the mean scores were differentiated through Fisher's Least Significant Difference method.

## 3. RESULTS AND DISCUSSION

### 3.1 Physicochemical Properties of Dragon Fruit

The dragon fruit ketchup used for analysis had a refractive index of 55.3°brix while tomato ketchup had 24°Brix; this was due to a high sugar concentration in the formulation to offset the tartness (Table 1). Whereas, the pH of dragon fruit ketchup is at 3.66 (at 25°C) which is within the range of standard of 4.0 for tomato ketchup (Table 1). Titratable acidity, the volatile acidity of acetic acid computed was 0.19%. Moreover, the moisture content of the dragon fruit ketchup was 53.04% which was less than the 68% of Tomato ketchup; lower moisture content is ideal for the stability and quality of the product (Table 1). Whereas, the water activity is the total available amount of water within the product (Table 1); the dragon fruit ketchup had an Aw of 0.825 (at 23.67°C) which is below but within the average of 0.992 for Tomato ketchup. Lastly, the viscosity of the sample was 37.90cp and is within the standard viscosity of commercial brand ketchup of 50.00cp.

**Table 1. Physicochemical properties of ketchup**

Physiochemical Properties	Ketchup	
	Dragon Fruit	Tomato
Refractive Index (°Brix)	55.3	≤ 24 <sup>a</sup>
pH	3.66	≥ 4.0 <sup>a</sup>
Titrateable Acidity (%)	0.19	≤ 1.20 <sup>a</sup>
Moisture Content (%)	53.04	68 <sup>b</sup>
Water Activity	0.825	0.992 <sup>b</sup>
Viscosity (cp)	37.90	50.00 <sup>c</sup>

<sup>a</sup>DRAFT CARICOM REGIONAL, 2012 <sup>b</sup>J. Fernandez-Salguero, R. Gomez and M. A. Carmona, 1993 <sup>c</sup>OEC Fluid handling, 2014

### 3.2 Sensory Response

The dragon fruit ketchup contained 25% dragon fruit puree (peel and flesh) and was preferred overall with a preference rank sum of 45 (Table 2), it was chosen as the level of dragon fruit puree to be used for the formulation of dragon fruit ketchup.

**Table 2.** Preference ranking test on the level of dragon fruit puree in ketchup<sup>a</sup>

Dragon Fruit Content, %	Preference Rank Sums <sup>b</sup>
15	66a
20	69a
25	45b

<sup>a</sup>Any two rank sums not followed by the same letter are significantly different (P<0.05)

<sup>b</sup>A lower rank sum indicates higher preference

Significant differences ( $P < 0.05$ ) were observed for all sensory attributes between housewives and non-housewives (Table 3). Dragon fruit ketchup evaluated by housewives had lower score for appearance, flavor, and general acceptability than that of non-housewives while non-housewives had lower score for aroma and texture as compared to housewives. Since 9-point hedonic scale was used in determining the consumer acceptability, a mean score of 5 (neither like nor dislike) is the point of reference whether the product is acceptable or not. Based on the mean sensory scores obtained from housewives and non-housewives, dragon fruit ketchup is acceptable. All sensory attributes of the ketchup was observed by housewives and non-housewives panelists. General acceptability rating of housewives (7.47) has lower score than of the rating of non-housewives (7.80); this is may be due to the fact that the housewives had an uncontrolled environment than the non-housewives; one factor that was encountered was that the significant number of housewives works on nighttime though there were no assessed allergies or illness. On the other hand, the appearance, and texture (Table 3) has a higher rating from housewives, than of the non-housewives, it can be due to having near viscosity as the standard which has 50.00cp (Table 1), as for the appearance the housewives had a higher score, this can be attributed to consumer behavior when obtaining knowledge of a new product.

**Table 3.** Sensory acceptance of dragon fruit ketchup

Sensory Attributes	Housewives	Non-Housewives
Appearance <sup>ns</sup>	7.27 ± 1.44	7.57 ± 2.12
Aroma <sup>ns</sup>	7.57 ± 0.67	7.40 ± 1.49
Texture <sup>ns</sup>	7.57 ± 1.15	7.47 ± 2.05
Flavor <sup>ns</sup>	7.30 ± 1.67	7.57 ± 1.98
Acceptability <sup>ns</sup>	7.47 ± 0.95	7.80 ± 0.92

\*significantly different, <sup>ns</sup>not significantly different

#### 4. CONCLUSION

The study revealed that there are significant differences on the sensory attributes of Dragon fruit ketchup. Albeit the score for appearance, flavor, and general acceptability that the housewives evaluated were lower than that of non-housewives panelists, Dragon fruit ketchup is still acceptable overall. However, sensory evaluation as an independent information resource is not guaranteed which is why several physico-chemical analyses were performed to compare this new formulation to the world-wide known tomato ketchup. There are substantial differences that were also observed on the properties between Dragon fruit ketchup and tomato ketchup.

Nonetheless, the similarities of the ketchup were the factors why Dragon fruit was accepted by panelists. Further studies are needed for the improvement on the formulation of Dragon fruit ketchup.

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