

SENSORY AND NUTRIENT COMPOSITION OF 'CHUTNEY' (SAUCE) PREPARED BY PAPAYA (*CARICA PAPAYA*), ORANGE (*CITRUS SINESIS*) AND CARROT (*DAUCUS CAROTA*)

UROOSHA AFZAL¹ AND VIRGINIA PAUL^{*2}

Department of Food Nutrition and Public Health, Ethelind College of Community Science, SHUATS, Prayagraj 211 007, U.P., India

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Abstract– A typical side dish or condiment in the Indian subcontinent is chutney, a traditional South Indian condiment. It is produced by blending components including coconut, ginger, cumin, coriander, green chilies, salt, water, oil, mustard seeds, dried red chilies, as afoetida, and curry leaves can all be used to optionally temper the chutney. Typically, chutney is served with breakfast and snack foods. This study was conducted to examine the effect of sensory properties of chutney by incorporating Papaya, Orange and Carrot in different proportions of experimental treatments and control that was prepared by Coconut. The products were evaluated for sensory characteristics and the result suggested that the treatment T₂ of chutney with the incorporation of coconut (20g), Papaya (10g), Carrot (35g), Orange (25g) was best. whereas the maximum incorporation of Carrot and Orange with 40g and 30g (T₃) resulted in decreased mean score of overall acceptability. The data obtained for Proximate Analysis, Mineral and Antioxidant content was done by using AOAC methods. Differences among the Sensory Score and nutrient content of the developed food product was done by using various Statistical Analysis methods like ANOVA, CD and 't' test. The nutritional composition of the best treatment (T₂) resulted to be higher than that of control (T₀). The nutritional composition of the best treatment (T₂) was also observed to be higher than that of control (T₀). Fruit and Vegetable Chutney had the moisture content of 78%, and ash content of 1.34 g per 100 g and protein content of 0.95g per 100g. Fat content was 0.22g per 100g, Fiber content was 2.60g per 100g, carbohydrate content as 16.25g per 100g and the energy content was 75.01 Kcal. Fruit and Vegetable Chutney also contained 54.3 mg of Calcium per 100g, 1.27mg of Iron per 100g and 10.88mg of Vitamin-C per 100 g. The cost of the dry ingredients for preparing Fruit and Vegetable Chutney per 100 g were Rs.22.42 for T₀, Rs.10.59 for T₁, Rs.11.09 for T₂ and Rs.11.59 for T₃. Thus it can be concluded that incorporation of Papaya, Orange and Carrot can be utilized for preparation of different food products which enhances the nutritional content and improves Sensory Acceptability

INTRODUCTION

The papaya is a fruit that is strong in antioxidants and contains vitamins A, C, and E. These vitamins are good for blood sugar regulation, digestion, and heart health. Iron, calcium, and potassium are some of the crucial minerals it contains. It has anticancer activities due to the presence of phytochemicals including lycopene and quercetin (Sheikh *et al.*, 2013). By lowering cholesterol levels, papaya leaf extract promotes liver function and has antiglycemic benefits. High levels of phenolic and flavonoid compounds present in papaya leaf extract

have been shown to be cytotoxic for squamous cell carcinoma cells (Nguyen *et al.*, 2016). It is a fruit that may be used in many different dishes, including salsa, smoothies, and salads.

Oranges, scientifically known as *Citrus sinensis*, are a hybrid between pomelo and mandarin (Xu Q *et al.*, 2013). They are rich in nutrients like vitamin C, fiber, and minerals such as potassium and iron. Oranges contain flavonoids and alkaloids like hesperidin and synephrine, which have positive health impacts. An orange daily encourages cardiovascular health. One medical study (Suryawanshi *et al.*, 2011) revealed that consuming

(¹Research Scholar, ²Professor)

one glass of orange juice per day significantly decreased the risk of stroke by 25%. Numerous more studies have supported the same advantages of frequent citrus consumption. Traditional Chinese medicine has used oranges to treat various ailments. Regular consumption of oranges supports cardiovascular health and may reduce the risk of stroke. Studies have shown the benefits of frequent orange consumption.

Carrots (*Daucus carota* subsp. *Sativus*) are root vegetables, available in various colors. They were initially cultivated for leaves and seeds and likely originated in Persia. The taproot is the most commonly consumed part (Massimo *et al.*, 2018). Carrots became popular for their high provitamin A content (Bartosz *et al.*, 2022). They are rich in antioxidants and nutrients, making them a cost-effective and nutritious addition to diets. Incorporating carrots and other fruits and vegetables can maximize health benefits.

These antioxidant rich fruit and vegetables like orange, carrot and papaya can be included in our daily life, in our breakfast, lunch and dinner meal in many forms like salad, juices, squash, jam etc. and the products been developed in this research is chutney.

The traditional techniques of preparation, such as chutneys, pickles, and chutney powders, were served as a side dish with rice, breakfast dishes like vada, idly, dosa, chapathi, upma, and samosa, as well as different snack foods, etc., which also stimulated appetite and yearning.

Consumers can be attracted to these lowcost processing technologies for serving the needs of offseason vegetables. In addition, consumers in cities have a limited amount of time each day to prepare vegetables and cater to the nutritional and sensory perception of vegetables. Vegetables that are convenient and simple to prepare are becoming more and more in demand. Therefore, the chutney was developed as easy to cook breakfast or a snack product which increases the feasibility for consumers.

MATERIALS AND METHOD

Procurement of raw materials: Raw materials which was required in product development like carrot, orange, papaya and all the other materials was purchased from local market of Naini, Prayagraj.

Development and standardization of value added

chutney: *Chutney* was developed by the incorporation of vegetable (carrot), fruit (papaya and orange). The basic recipe was served as control (T_0) and three treatments i.e., incorporation of carrot, papaya and orange on different level was referred as T_1 , T_2 and T_3 respectively. Each treatment was replicated three times to get an average standard value.

(T_0) (Control) The product was prepared from 90 g coconut, 10 g black gram split, (T_1). The product was prepared from 20 g coconut, 5g black split gram, 5g split chick peas, 30 g carrot, 10g papaya, 20g orange pulp, (T_2). The product was prepared from 20g coconut, 5 g black split gram, 5 g split chick peas, 35g carrot, 10g papaya, 25 g orange pulp, (T_3). The product was prepared from 20 g coconut, 5 g black split gram, 5 g split chick peas, 40 g carrot, 10g papaya, 30g orange pulp.

Fresh fruits and vegetable were collected (Orange, papaya and carrot). They were washed, peeled and cut. Carrot were then roasted till it changes color along with the other ingredients (Black gram split, chickpeas split, Garlic, Onion). Then it was cooled down. Then all the ingredients like coconut, orange pulp, papaya along with the roasted ingredients were grinded until preferred texture was obtained. At last it was tempered with curry leaves and mustard seeds.

Sensory evaluation of developed value-added food products: Sensory evaluation of the food products for their acceptability was done with the help of a score card based on the 9-point Hedonic Scale on the basis of attributes like Color and Appearance, Body and Texture, Taste and Flavor and Overall Acceptability. The mean scores for each product and each treatment were then calculated.

Nutritional analysis: Nutritional analysis was conducted following procedures to determine the nutritional composition of the developed food products, including moisture, ash, fibre by AOAC (2012), total carbohydrates (difference method), fat (Soxhlet method), protein (Lowery's method), calcium (titration method), iron (colorimetric method), and total energy (Kcal/100g) = (4 X Protein) % + (9 X fat) % + (4 X CHO) %.

Cost calculation: The cost of the prepared product was calculated by taking into account the cost of individual raw ingredients used in the preparation of food products as the prevailing market price.

Statistical analysis: The data was analyzed by using appropriate statistical analysis of variance (ANOVA)

and critical difference technique. A significant difference between the treatments was determined by using CD (Critical difference) test. "t" test was performed for comparing the difference in the nutritional content between control and best treatment of the value added food products (Gacula and Singh, 2008).

RESULTS AND DISCUSSION

Sensory evaluation of fruit and vegetable chutney:

The experimental chutney were sensory evaluated by a panel of five members on a 9 point hedonic scale and marking was done on the basis of six parameter Body and Texture, Colour and Appearance, Flavour and Taste and Overall Acceptability.

The mean sensory scores of the *fruit and vegetable chutney* in relation to color and appearance indicates that T₀ had the highest score 8.2 followed by T₂ (8.0), T₃ (7.6), T₁ (7.1) respectively. It is quite obvious that the treatment T₂ papaya 10 g, orange pulp 25 g, carrot 35 g, was liked very much, treatment T₃ and T₀ was liked moderately regarding the colour and appearance of *fruit and vegetable chutney*. The color of all the experimental treatments of the fruit and vegetable chutney was orange because oranges and carrots both contain carotenes, a type of photosynthetic pigment, which gives them their orange colour (USDA, 2019).

The statistical analysis carried out in relation to Color and Appearance the calculated value of 'F' (60.0) due to treatment is more than table of 'F' (4.75) on 3, 6 degree of freedom at 5 percent probability level, Hence the difference was significant. On comparing the average score for color and appearance against critical difference value (C.D.) the result was significant because the difference in

mean values of T₀T₁, T₀T₂, T₀T₃, T₁T₂, T₁T₃, T₂T₃ is greater than CD (0.34) therefore the difference was significant.

The mean sensory scores of the *fruit and vegetable chutney* in relation to body and texture indicates that T₀ had the highest score 8.5 followed by T₂ (8.3), T₃ (7.3), T₁ (7.2) respectively. It is quite obvious that the treatment T₂ papaya 10 g, orange pulp 25 g, carrot 35 g, was liked very much, treatment T₃ and T₀ was liked moderately regarding the body and texture of *fruit and vegetable chutney*. It was observed that all the experimental treatments of developed fruits and vegetable chutney showed fibrous and smooth texture because of the addition of coconut in different ratios. According to Hang *et al.*, 2020; Lu, C. *et al.*, 2020 coconut pericarp contains macro-ordered fibres contributing to its fibrous texture.

The statistical analysis carried out in relation to body and texture the calculated value of 'F' (41.9) due to treatment is more than table of 'F' (4.75) on 3, 6 degree of freedom at 5 percent probability level, Hence the difference was significant. On comparing the average score for body and texture against critical difference value (C.D.) the result was significant because the difference in mean values of T₀T₁, T₀T₂, T₀T₃, T₁T₂, T₁T₃, T₂T₃ is greater than CD (0.34) therefore the difference was significant.

The mean sensory scores of the *fruit and vegetable chutney* in relation to taste and flavor indicates that T₀ had the highest score 8.7 followed by T₂ (8.6), T₁ (7.8), T₃ (7.5) respectively. It is quite obvious that the treatment T₂ papaya 10g, orange pulp 25g, carrot 35g, was liked very much, treatment T₃ and T₀ was liked moderately regarding the taste and flavor of *fruit and vegetable chutney*. The treatments of chutney contains both carrot and coconut, so it has a tangy, sweet, smooth, creamy, and spicy flavor because carrot have a pleasantly sweet flavour from the

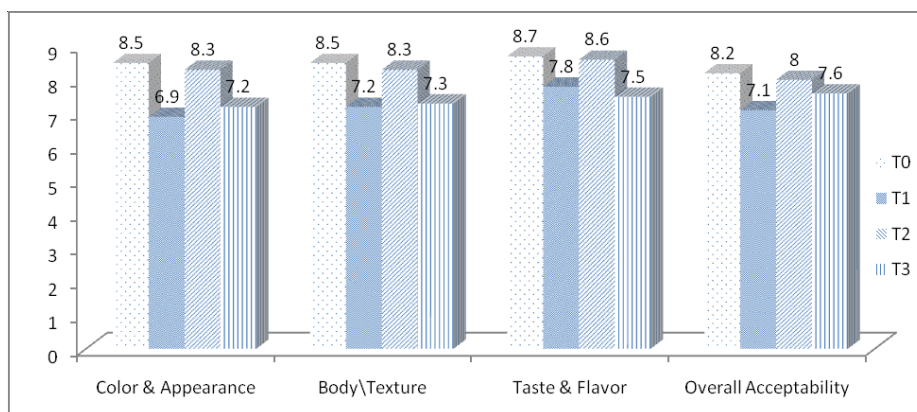


Fig. 1. Average sensory score for different attributes of *Fruit and Vegetable Chutney*.

presence of free sugars including glucose, fructose, and sucrose.

The statistical analysis carried out in relation to taste and flavor the calculated value of 'F' (30.0) due to treatment is more than table of 'F' (4.75) on 3, 6 degree of freedom at 5 percent probability level, Hence the difference was significant. On comparing the average score for taste and flavor against critical difference value (C.D.) the result was significant because the difference in mean values of T_0T_2 , T_0T_3 , T_1T_2 , T_1T_3 , T_2T_3 is greater than CD (0.34) therefore the difference was significant.

The mean sensory scores of the *fruit and vegetable chutney* in relation to overall acceptability indicates that T_0 had the highest score 8.2 followed by T_2 (8), T_3 (7.6), T_1 (7.1) respectively. It is quite obvious that the treatment T_2 papaya 10 g, orange pulp 25 g, carrot 35 g, was liked very much, treatment T_3 and T_0 was liked moderately regarding the overall acceptability of *fruit and vegetable chutney*. Orange adds a more tangy flavour to the chutney, and the combination of grated carrots and fresh coconut meat generated a distinct flavour profile that is both sweet and creamy and a bit nutty because of the presence of lactones which contributes to the aroma and flavor as well as an acidic character from the component eugenin (Lars Kjellenberg, 2007).

The statistical analysis carried out in relation to overall acceptability the calculated value of 'F' (30.1) due to treatment is more than Table of 'F' (4.75) on 3, 6 degree of freedom at 5 percent probability level, Hence the difference was significant. On comparing the average score for overall acceptability against critical difference value (C.D.) the result was

significant because the difference in mean values of T_0T_2 , T_0T_3 , T_1T_2 , T_1T_3 , T_2T_3 is greater than CD (0.46) therefore the difference was significant.

Nutrient Analysis of the developed Chutney

Carrots and oranges make up a significant portion of chutney, carrot provide a number of health advantages, including as anti-diabetic, cholesterol-lowering, cardiovascular disease reducing, antihypertensive, hepatoprotective, renoprotective, and wound healing effects (Dias *et al.*, 2014). A study revealed the many health advantages of quick chutney powders produced from spinach, basella, and carrots (Prasoon *et al.*, 2020). Oranges used to make chutney include a sizable amount of vitamin C and other beneficial substances like carotenoids and flavonoids that fight cancer and degenerative disorders. Additionally, they provide natural antioxidants, dietary fibre, and folate. The body's defences against infection are bolstered by diets high in vitamin C, which also helps to flush out dangerous free radicals. Hesperetin and naringenin, two phytochemicals found in sweet oranges that have anti-inflammatory, antioxidant, and immune-system-modulating properties (Momoh *et al.*, 2020).

Cost of the value added food product: The cost of the raw materials of "*fruit and vegetable chutney*" was Rs. 22.42 for T_0 , Rs. 10.59 for T_1 , Rs. 11.09 for T_2 and for T_3 is 11.59. It is therefore concluded that control has the highest cost and T_3 , T_2 and T_1 had the low cost in compared to the control because the control contained the more quantity of coconut than other treatment and it decrease the cost of the prepared product.

Table 1. Nutrient content in control and value added chutney.

Nutrients	T_0	T_2	(Difference) $T_0 - T_2$	t.cal.	t.tab	Result
Proximate Analysis						
Moisture (%)	76	78	2	3.67	2.447	S*
Ash (g)	2.26	1.34	0.94	6.22	2.447	S*
Protein(g)	1.32	0.95	0.37	26	2.447	S*
Fat (g)	0.15	0.22	0.07	8.57	2.447	S*
Fiber (g)	3.0	2.60	0.4	10.83	2.447	S*
Carbohydrate(g)	15.9	16.25	0.35	3.36	2.447	S*
Energy (kcal)	70.23	75.01	4.77	3.42	2.447	S*
Minerals						
Calcium (mg)	13	54.3	41.3	250.6	2.447	S*
Iron (mg)	1.0	1.27	0.27	12.65	2.447	S*
Vitamin						
Vitamin-C (mg)	0.12	10.88	10.76	429.7	2.447	S*

CONCLUSION

Thus it can be concluded that the chutney made with Fruits (Papaya and Orange) and Vegetable (Carrot) were having a greater health benefits and contain many nutrients. The study showed that the not so common used Fruits and vegetable combinations were given priority and also sensorially highly accepted well by the panel members. A combination of Fruit and Vegetable was best selected by panel members and it also possesses a wide range of nutrients.

Conflict of Interest- None

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