Tomato Pomace Soup Blend: "A Fusion with Nutrient-Rich Moringa Leaves Powder"

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Abstract- Soup is a versatile food that can be enjoyed as an appetizer or for comfort during cold weather or illness. Instant soup options are convenient and quick to make, consisting of dehydrated vegetables, herbs, and spices. These powders have a long shelf life and are popular for their ease of use. Tomato pomace, a by-product of tomato processing, is edible and nutrient-rich but spoils quickly, posing disposal challenges. Dried tomato pomace contains various nutrients, including lycopene and β-carotene. Moringa, also known as drumstick leaves, is a highly versatile plant in the food industry due to its various uses and benefits. The energy content of the soup mix powder ranges from 280.47 to 407.11. When 5g of Moringa leaf powder was added, the energy content increased. The carbohydrates content also increased, with variation 2 having the highest content (70.04), followed by variation 1 (61.87) and basic (55.57). The protein content follows a similar pattern, with variation 2 having the highest content (20.13), followed by variation 1 (14.2) and basic (9.94). The ash content is highest in variation 2 (5.83) and lowest in basic (1.91). The fat content is highest in variation 2 (8.86), followed by variation 1 (5.92) and basic (4.27).

Keywords: Tomato pomace, quality analysis, sensory evaluation, Soup mix powder.

INTRODUCTION

Soup is a traditional food that serves various purposes. It can be enjoyed as an appetizer, providing a delightful start to a meal. Additionally, soup is often sought after during cold weather or when feeling under the weather, as it has a comforting and warming effect on the body. These convenient options, such as canned, dehydrated, and frozen soups, offer a time-saving alternative to the lengthy process of making soup from scratch. Many individuals opt for instant soup mix powder, as it provides a convenient and quick way to create a warm and flavourful soup. These mixtures usually consist of a combination of dehydrated vegetables, herbs, spices and sometimes a base like bouillon or broth powder. By simply adding hot water, a delicious and satisfying bowl of soup can be ready in no time (Rahimah *et al.*, 2012).

Soup is typically made by mixing together various ingredients, including vegetables, leafy greens and liquid such as water. There are typically two main types of soups, which are thick soups and clear soups. However, it is worth noting that in today's fast-paced society, commercially prepared instant soups have become more prevalent, largely replacing the traditional homemade soups (Niththiya *et al.,* 2014).

Dried soup powders have an advantage of protection from enzymatic and oxidative spoilage and flavour stability at room temperature over long periods of time (6– 12 months). In addition, they are ready for reconstitution in a short time for working families, hotels, hospitals, restaurants and institutional use as well as to military rations. Moreover, they exert light weight for shipping and availability at all time of year (Rekha *et al.,* 2010).

Tomato, scientifically known as (Solanum lycopersicum L.,) is a fruit vegetable thatis believed to have originated in Tropical America. This crop is highly processed and used to make various products such as juice, paste, ketchup and powders (Bathla *et al.,* 2019).

When tomatoes are processed, about 2-5% of the tomato pomace is generated (Zuorro*et al.,* 2011). This by-product, which is edible, can be used for food purposes and is a valuable source of nutrients, due to its high water and nutrient content, tomato pomace spoils quickly and poses disposal and pollution challenges (Rehal *et al.,* 2021). Researchers have approximated that the global production of tomato pomace ranges between 5.4 and 9.0million tons each year (Paengkoum *et al.,* 2022). The dried tomato pomace (DTP) has moisture, crude protein, crude fiber (CF), ether extract (EE), ash, calcium and phosphorus (Jafari *et al*.,2006). Various studies have also examined the potential of tomato peel as a source of

lycopene, a significant antioxidant and β-carotene (Kalogeropoulos *et al.,* 2012).

Moringa (Moringa oleifera), is a member of the Moringaceae family, popularly known as drumstick leaves or sahjna, is often called "mother's best friend" because it is aplant that is highly versatile in the food industry and related fields due to its abundance of nutrients and bioactive substances (Lakshmipriya *et al.,2016)*. Moringa oleifera stands out as an exceptional example, as it encompasses all the essential nutrients, enzymes, omega oils, minerals, antioxidants and phyto-chemical compounds required for optimal health (Gilani *et al.,* 1994). Consuming moringa as part of a balanced diet, can help scavenge free radicals and potentially have immune suppressive effects (Oyeyinka *et al.,* 2018).

(Zea mays L.) commonly known as corn or maize, belongs to the Poaceae family. Corn is the primary source of starch production derived from plants (Waterschoot *et al.,* 2015). By incorporating corn starch into soup mix formulations, the viscosity of the mixture can be high, allowing it to hold larger quantities of solids and increase nutrient density.

Furthermore, the extruded flour or starch only needs to be reconstituted in warm water before consumption making it suitable for the preparation of powdered instant soup mixes (Onyango*et al.,*2004).

Coriander (C. sativum L.) is referred to as "kusthumbari" or "dhanayaka". For several years, mankind has been captivated by the enticing aromas and flavours associated with coriander. This fascination can be attributed to the existence of a delightful aromatic scent and an abundance of essential oil, specifically linalool, which can be found in the stem,leaves and fruits of the coriander plant (Taneva *et al.,* 2016). It is a rich source of various nutrients such as protein, fat, carbohydrates, calcium, phosphorous, sodium, zinc, carotene, thiamine, riboflavin, niacin, tryptophan, vitamin B6, folate, vitamin A, vitamin D, vitamin B- 12, vitamin C and vitamin E (Nimish *et al.,* 2011).

Onion (Allium cepa) is a member of the family Amaryllidaceae and one of the most widely cultivated species of the genus Allium Onions possess natural oils that contribute to the delightful flavor and taste of various dishes. Additionally, they serve as an excellent source of essential nutrients such as a carotene, vitamin C, calcium and iron. Notably, onions also have medicinal properties that play a crucial role in safeguarding against heart diseases (Augusti, 1990).

Objectives:

1. To make an innovative nutritious product.
2. To determine the nutritional value by chemical analysis.
3. To determine the consumer acceptability by sensory evaluation.

MATERIALS AND METHODS

Raw materials:

Tomato pomace (Solanum lycopersicum) was obtained from the Food Industry, moringa leaf powder (Moringa Oleifera), corn starch (Zea mays L), Coriander leaf powder (C. sativum L.),Onion powder (Allium cepa), ginger and garlic powder were procured from the local market of Guntur.

Tomato Pomace Soup Blend preparation:

Fresh tomato pomace, which consists of the peel and seeds, was obtained from a nearby tomato paste factory in Guntur. It was then processed, sifted and stored at a low temperature. The remaining ingredients for the soup were purchased from the local market. The instant soup mix was prepared using different ratios of ingredients. High-quality Moringa leaves were carefully selected and cleaned, removing any damaged or deteriorated parts, and only the good quality leaves and stems were chosen for drying. The soup mixes with all treatments were prepared by weighing all the ingredients according to table 1 followed by mixing them well. For conducting the sensory analysis, each treatment was takenand 1000ml water was measured.

Procurement ingredients

↓

Weighing

↓

Adding 1000ml water

↓

Mixing to avoid lumps formation

↓

Boiling the soup till gelatinization occurs

↓

Drying (85ºC to 95 °C)

Figure:1 Flowchart of Tomato Pomace Soup Blend process

S.NO	Ingredients	Basic	Variation-1	Veriation-2
1.	Tomato pomace (gm)	10	20	30
2.	Corn starch(gm)	30	30	30
3.	Moringa powder(gm)	0	5	15
4.	Coriander powder(gm)	20	20	20
5.	Onion powder(gm)	10	10	10
6.	Chilli powder(gm)	10	10	10
7.	Water(ml)	1000	1000	1000

Table 1: Variations with details of ingredients to prepare Tomato Pomace Soup Blend: A Fusion with Nutrient-Rich Moringa Leaves Powder"

Sensory evaluation:

The sensory characteristics of the instant soup mix were assessed using a 9-point scale to rate its appearance, smell, taste, texture and overall likability. The samples were made into soup by boiling them in water and a panel of 10 experienced individuals participated in the evaluation. In the sensory analysis, Variation-1 received the highest scores in colour, flavour, taste, consistency, appearance and overall acceptability.

Quantitative Analysis:

The inclusion of Moringa oleifera leaves in various instant soup mix formulations hadan impact on the proximate composition. The tables provide the findings for different biochemical parameters. When it comes to carbohydrate content, variation 2 instant soup mix (control) had the highest percentage at (70.04) percent. The control formulation was statistically superior to the other formulations in terms of carbohydrate content. The information provided in Table 2 clearly shows that the protein content in different instantsoup mix formulations ranged from 16.4 to 15.2 percent. It is important to note that all of the formulations had significantly different protein contents from each other.

Estimation of nutritional parameters:

The chemical parameters analysed includes proximate composition such as ash, energy, protein, carbohydrates, and fat.

The ash content of the sample was obtained by dry ashing the samples completelyover a flame. The ash content of dried tomato pomace was found to be 1.91 to 5.83g per 100gon a dry weight basis, as shown in (Table 2). This result is consistent with the findings of (Topkaya et al.,2017). This was expressed as g/100 g of the sample (AOAC, 1980). Energy was computed as follows for all the samples. Energy [kcal] = [protein [g] x 4] + [carbohydrate [g] x 4] + [fat [g] x 9]. The protein content of the dried samples was estimated as percent total nitrogen by micro kjeldhal method. Protein percent was calculated by multiplying the percent nitrogen by the factor 6.25. Protein(g) = Titre value × normality of HCl × 0.014 × 6.25 weight of sample(g) × 100. Carbohydrate content was calculated by difference method. Carbohydrate [g/100 g] = 100 – [protein [g] + fat [g] + fiber [g] + ash [g]+ moisture [g]]. Fat content of the sample was estimated as crude ether extract using moisturefree samples. The solvent was removed by evaporation and the residue of fat was weighed.

Statistical analysis

All the data were presented in the form of mean ±SD. To test the significant difference between the organoleptic scores of the product Holm Sidak method was applied.

RESULTS AND DISCUSSION

The results of ANOVA mean analysis presented in a bar graph. The bar graph explainsthe total average of nutritional content of Soup mix powder in 100gms. The purpose of the investigations was to examine whether or not Moringa oleifera leaves could be used in combination with other ingredients to create an instant soup mix. The findings from the investigation have been presented in the form of tables and figures. Values are mean ± SD[n=3].

Basic: Standard soup mix powder.

Variation-1: Tomato pomace soup with the incorporation of 5gms of moringa leaf powder.

Variation-2: Tomato pomace soup with the incorporation of 15gms of moringa leaf powder.

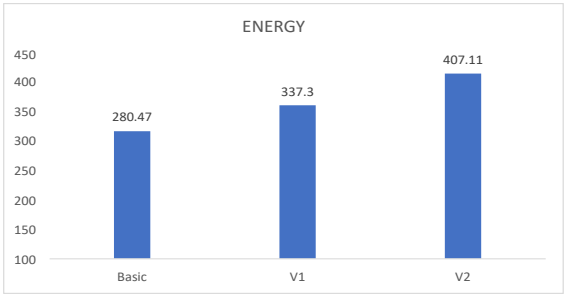

Figure 2: Nutrition-related claims in Soup mix powder (Energy)

The energy content of the soup mix powder is 280.47±0.02, 337.3±0.2 and 407.11±0.2 respectively (Figure-2). 5g of Moringa leaf powder whereas higher was observed in instant soup mixes from basic to variation 2 rapid increasing in energy.

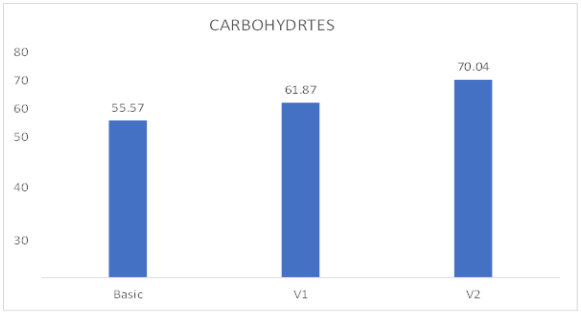

Figure 3: Nutrition-related claims in Soup mix powder (Carbohydrates content)

There is an increase in the carbohydrates content the variation 2 shows the highest content (70.04) followed by variation 1 (61.87) and basic (55.57). The values of basic is 55.57 ± 0.02, variation 1 61.8± 0.15 and variation 2 is 70.04±0.2.

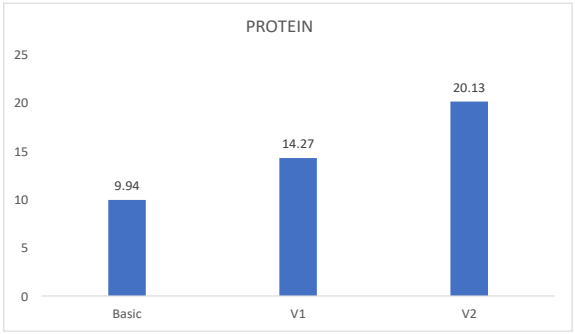

Figure 4: Nutrition-related claims in Soup mix powder (Protein)

The protein content in the sample of soup mix powder in basic, variation 1 and variation 2 are 9.94 ±0.02, 14.2 ±0.15 and 20.13 ±0 respectively. Protein value shows that variation 2(20.13) has the high protein content followed by variation 1(14.2) and basic (9.94).

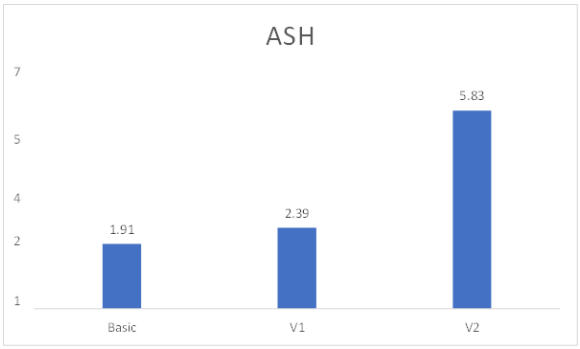

Figure 5: Nutrition-related claims in Soup mix powder (Ash content)

The ash content of the soup mix powder is presented in the Fig.4. The ash content of the sample, variation 2 is recorded as high as 5.83 whereas 1.91 is the least ash content observein basic.

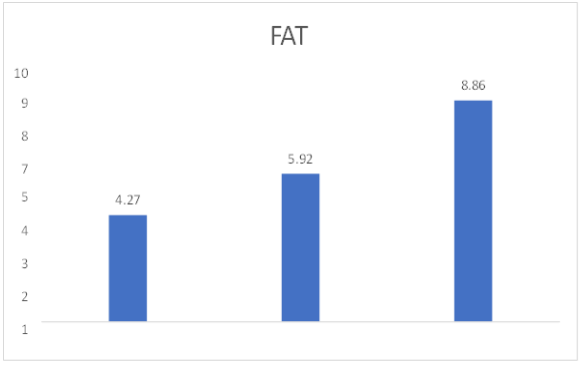

Figure 6: Nutrition-related claims in Soup mix powder (Fat content)

The fat content of the basic one is 4.27 ±0.02, variation1 is 5.92±0.1 and variation 2 is8.86±0.2. Here we observed that variation 2 has highest fat content with other two variations.

Proximate Composition (g/100gm)	Basic	Variation 1	Variation 2
Energy content(gm)	280.4±0.02	337.3±0.2	407.11±0.2
Carbohydrate content(gm)	55.57±0.02	61.8±0.15	70.04±0.2
Protein content(gm)	9.94±0.02	14.2±0.15	20.13±0.2
Fat content(gm)	4.27±0.02	5.92±0.1	8.86±0.2
Ash content(gm)	1.91±0.1	2.39±0.2	5.83±0.2

Table 2: Nutrients and nutritional value of Soup mix powder per (100g)

Sensory Analysis:

The results from the sensory evaluation of the instant soup mix powder, which had different quantities of spice powders and moringa infused into them, are presented in table-3. The scores obtained from this assessment provide insight into judges and semi trained persons perceived the soup powder. Based on their ratings, it can be concluded that the judges generally expressed a liking for the soup powder ranging from "liked very much" to "liked moderately".

Sensory parameter	Basic	Variation-1	Variation-2
Colour	7.4±0.52	8.0±0.66	7.2±0.44
Texture	7.3±0.72	8.1±0.83	7.7±0.66
Taste	7.3±0.5	8.2±0.8	7.5±0.72
Flavour	7.3±0.5	8.0±0.70	7.3±0.5
Consistancy	7.1±0.60	8.2±0.66	7.5±1.01
Overall acceptability	7.2±0.44	8.3±0.86	7.7±0.66

Table 3: Sensory evaluation of Soup mix powder

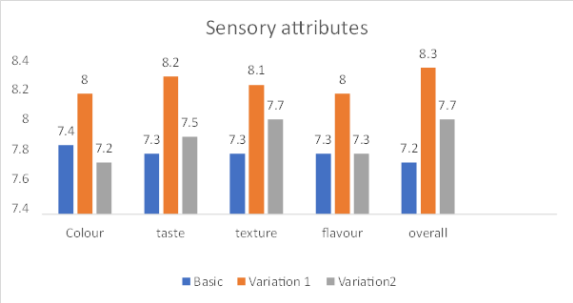

Figure 7: Sensory attributes for Soup mix powder

After analyzing the sensory scores provided in both Table- and Figure-, it becomes clear that V1 achieved the highest scores cross various categories. In terms of colour, it received a score of 8.0±0.66, while for taste it received a score of 8.2±0.8. Its texture was rated at 8.1±0.83, its flavour at 8.0±0.07, its consistancy at 8.2±0.66, and its overall acceptability at 8.3±0.86. These scores were significantly higher compared to the othertreatments.

CONCLUSION

A highly satisfactory instant soup mix can be achieved by incorporating moringa leaf powder in tomato pomace soup blend, which has demonstrated excellent acceptability. Based on the study's findings, it can be concluded that “Tomato Pomace Soup Blend; A fusion with nutrient rich Moringa leaves powder” show promise for the development of soup mixes and enhancing their nutritional value by adding Moringa leaf. Out of the three combinations tested, variation 1 was found to have the best taste and preference score. Additionally, the cost of production was deemed acceptable. The newly developed soup mix is more convenient than traditional options, making it more appealing to younger consumers. Furthermore, this innovative product has great potential for commercial success. To summarize, this soup offers sufficient quantities of carbohydrates, fats, proteins, energy, ash thereby rendering it a viable choice for individuals seeking a nutritious for breakfast option.

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