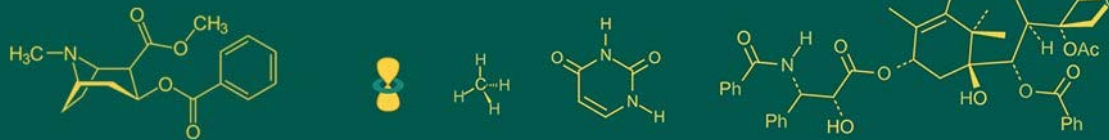


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
 ISSN Online: 2617-4707
 IJABR 2024; 8(10): 180-184
www.biochemjournal.com
 Received: 19-07-2024
 Accepted: 22-08-2024

Girhepunje CJ

M.Tech Scholar, Department of Food Chemistry and Nutrition, CFT, VNMKV, Parbhani, Maharashtra, India

Gadhe KS

Head, Department of Food Chemistry and Nutrition, CFT, VNMKV, Parbhani, Maharashtra, India

Bhosle PB

M.Tech Scholar, Department of Food Process Technology, CFT, VNMKV, Parbhani, Maharashtra, India

Ghatge PU

Assistant Professor, Department of Chemistry and Nutrition, CFT, VNMKV, Parbhani, Maharashtra, India

Corresponding Author:**Girhepunje CJ**

M.Tech Scholar, Department of Food Chemistry and Nutrition, CFT, VNMKV, Parbhani, Maharashtra, India

Standardization of instant soup mix powder using horse gram malt, quinoa malt, and Roselle (Leaves and Calyces)

Girhepunje CJ, Gadhe KS, Bhosle PB and Ghatge PU

DOI: <https://doi.org/10.33545/26174693.2024.v8.i10c.2437>

Abstract

This study focuses on the standardization of an instant soup mix powder utilizing Horse Gram (*Macrotyloma uniflorum*) malt, Quinoa (*Chenopodium quinoa* Willd) malt, and Roselle (*Hibiscus sabdariffa*) leaves and calyces powder. The formulation combines Horse Gram malt (rich in protein and minerals) and Quinoa malt (gluten-free pseudocereal with essential amino acids) with Roselle (excellent source of antioxidants and vitamins). The developed instant soup mix powder aims to address malnutrition, providing a convenient and healthy breakfast alternative. Malting enhances the bioavailability and nutritional quality of the ingredients. Sensory evaluation revealed that the optimized formulation (T₃) was well-accepted, with a high acceptance score. Techno-economic analysis ensured the product's affordability and viability. This research promotes underutilized food legumes and pseudocereals, offering a sustainable solution for health-conscious consumers seeking wholesome, easy-to-prepare meals.

Keywords: Horse Gram malt, instant soup mix powder, quinoa malt, Roselle leaves and calyces powder

Introduction

Instant soups can serve as a nutritious and convenient breakfast alternative, providing a balanced mix of essential nutrients to support overall health and wellbeing (Mathangi *et al.*, 2017) [1]. A soup improves the gastrointestinal response and appetite by giving nourishment quickly and stimulating appetite, so soups are given as a starter. A soup is suggested for admitting in human foods as they help to improve the weight loss and reduce energy consumption (Cecil *et al.*, 1999) [2]. Soup also accelerates saliva production and stomach peristalsis, increases satiety in humans (Clegg *et al.*, 2013) [3]. Instant soups are one type of dried foods and prepared by mixing spices, flavours, salts, corn starch and flavor enhancers. Instant soup mix obtains its own recognition among all dried foods as they are easy to prepare and accessible in various packet sizes. Formulation of soup can be made by adding ingredients such as pulses, vegetables and cereals for the purpose of balancing the nutrients in the soup. Instant soup mix can satisfy the amount of nutrients and energy needed by the human body, so it can be used as a breakfast substitute (Gandhi *et al.*, 2018; Joshi *et al.*, 2020) [7, 8]. Instant soup mix can be a great source of nutrition for the many millions of hungry people across the world. It is available in a variety of packages, which lowers the cost of transportation and food preparation takes a very short amount of time.

Horse gram (*Macrotyloma uniflorum*), a legume traditionally used in Ayurvedic cuisine, possesses exceptional medicinal qualities and high nutritional value, with 20% protein content. Despite its potential, horse gram remains an underutilized food source due to its unpleasant taste and limited consumption by farming communities and low-income groups. Recent interest in functional foods has revived attention to horse gram's health-promoting effects, including its role in weight management, jaundice treatment, and cardiovascular health. This study aims to explore the nutritional, medicinal, and industrial applications of horse gram, highlighting its potential as a valuable resource for protein products, starch extraction, and disease prevention (Sadawarte *et al.*, 2018) [13].

Quinoa (*Chenopodium quinoa* Willd.), a protein-rich crop domesticated in the Andes over 7,000 years ago, is a revered plant in South American cultures.

Belonging to the Chenopodiaceae family, quinoa boasts an exceptional balance of essential amino acids, earning its status as a holy plant. With a history dating back to 5000 BC, quinoa has been a staple in the region, particularly in Peru, Bolivia, Ecuador, Argentina, and Chile, where it is cherished for its nutritional and culinary value. This study delves into the significance of quinoa, exploring its unique characteristics, cultural importance, and potential benefits (Maradini *et al.*, 2017)^[10].

Roselle (*Hibiscus sabdariffa*) leaves are the sepals of the hibiscus plant (*Hibiscus sabdariffa*). The hibiscus plant is a blooming shrub that is indigenous to tropical regions of Africa and Asia and is a member of the Malvaceae family. Roselle leaves are commonly used in traditional medicine and culinary practices in many countries. Roselle leaves have a tart, tangy taste and are often compared to cranberries in terms of flavor. They are a rich source of antioxidants, flavonoids, and phenolic compounds, which are believed to contribute to their potential health benefits. They also contain a range of nutrients, including vitamin C, iron, and calcium. Additionally, Roselle leaves are low in calories and high in dietary fiber, making them a nutritious addition to any diet (Edo *et al.*, 2023)^[5].

Roselle calyces are used as a digestive and purgative agent and a folk remedy for abscesses, billows, cancer, hypertension etc. In western Nigeria, roselle calyx are used in cooking vegetable soup. It is usually prepared by steeping it with wood ash overnight or parboiled with wood ash and washed thoroughly prior to its use for the preparation of soup. (Duke, 1985)^[4].

Materials and Methods

Materials

The present investigation was carried out in Department of Food Chemistry and Nutrition and Department of Food Process Technology, College of Food Technology, V.N.M.K.V., Parbhani during year 2023-24.

The good quality of Horse gram (*Macrotyloma Uniflorum*), Quinoa (*Chenopodium quinoa* Willd.), Roselle (*Hibiscus sabdariffa*) leaves and calyces, corn starch, onion, garlic, spice mix curcumin, salt, sugar, carrot and sweet corn were procured from Parbhani local market.

Chemicals and glasswares

Chemicals and glasswares used during research study were available in the Department of Food Chemistry and Nutrition, College of Food Technology V.N.M.K.V., Parbhani.

Methods

Preparation of horse gram malt flour

Horse gram seeds are first cleaned to remove dirt, dust, chaff, and other debris, and then soaked in water for 12 hours at a 1:5 ratio. After soaking, the seeds are germinated for 24 hours at room temperature to activate enzymes. The germinated seeds are then dried in a cabinet dryer at 55 °C for 4-5 hours, followed by kilning and steam cooking to stop further germination. The cooked seeds are dried again in a cabinet dryer at 55 °C for 1 hour before being milled horse

gram malt flour. The resulting powder is a nutritious and easily digestible ingredient for various applications (Gaikwad *et al.*, 2022)^[6].

Preparation of quinoa malt flour

Quinoa seeds are first cleaned to remove dust and filth, and then soaked in water at a 1:5 ratio for 8 hr at room temperature. The water is changed every 8 hours to promote even germination. After soaking, the quinoa seeds are drained and spread in a sprout maker lined with muslin cloth for germination. The germinated quinoa seeds (sprouts) are then kiln-dried at 65-70 °C in a cabinet dryer to stop further growth. Finally, the dried sprouts are ground into a fine powder, resulting in quinoa malt flour (Wanole *et al.*, 2022)^[16].

Preparation of roselle leaves powder

Fresh roselle leaves sorted and destalked. These destalked leaves were washed with potable water. Washed leaves were steam blanched at 90 °C for 3 min to avoid over leaching of nutrients and cooled immediately. Blanched leaves were dried in cabinet dryer at 55 °C for 3 hr and grinded to fine powder then packed in air-tight container.

Preparation of roselle leaves powder

Roselle calyces were collected and washed in potable water. These washed calyces were steam blanched at 90 °C for 3 minutes and dried at 55 °C for 5-6 hr in cabinet dryer. These dried calyces were milled to fine powder and packed in air-tight container.

Preparation of instant soup mix powder

For the preparation of the instant soup mix, all the ingredients were combined in accordance with the recommended ratio (Table 1). The preparation of instant soup mix powder was prepared by mixing of all powder ingredients such as horse gram malt flour, quinoa malt flour, roselle leaves powder and roselle calyces powder. In this mixture of dry powder such as onion, garlic and sufficient of spices mix 5.8 g (which includes black pepper, coriander, cumin, red chilies, cinnamon) and other minor dry ingredients such as carrot and sweet corn were mixed properly. The raw materials like onion and garlic were washed under running water for removal of dust, dirt and other foreign material, and processed into powder form by using standard methods of Srivastava (2010)^[15], Pawar (2019)^[12], and Sangwan (2010)^[14], respectively.

The incorporation of corn starch in the instant soup mix powder formulation was scientifically justified due to its optimal rheological properties, gelatinization, water absorption, and emulsification capabilities. Corn starch ensured a smooth, stable texture and optimal mouthfeel. Gradual reduction of corn starch (T₀-T₄) and introduction of Horse gram malt flour, Quinoa malt flour, Roselle leaves powder, and Roselle enhanced nutritional profile and functional properties, balancing viscosity and texture. This strategic formulation yielded a scientifically sound, nutritionally enhanced instant soup mix powder meeting consumer expectations.

Table 1: Formulation of instant soup mix powder

Ingredients	Formulation				
	T ₀	T ₁	T ₂	T ₃	T ₄
Corn starch	70	50	40	30	20
Horse gram malt flour	0	10	15	20	25
Quinoa malt flour	0	5	7.5	10	12.5
Roselle leaves powder	0	2.5	5	7.5	10
Roselle calyces powder	0	2.5	2.5	2.5	2.5
Onion Powder	5	5	5	5	5
Garlic powder	3	3	3	3	3
Spice mix	5.8	5.8	5.8	5.8	5.8
Curcumin	0.2	0.2	0.2	0.2	0.2
Carrot	2.5	2.5	2.5	2.5	2.5
Sweet corn	2.5	2.5	2.5	2.5	2.5
Iodised Salt	8	8	8	8	8
Sugar	3	3	3	3	3

T₀ (Control)-70 g Corn starch + 0 g HGMF+0 g QMF+0 g RLP +0 g RCP

T₁-50 g Corn starch + 10 g HGMF + 5 g QMF+2.5 g RLP +2.5 g RCP

T₂-40 g Corn starch + 15 g HGMF+7.5 g QMF +2.5 g RLP +5 g RCP

T₃-30 g Corn starch + 20 g HGMF + 10 g QMF +2.5 g RLP +7.5 g RCP

T₄-20 g Corn starch + 25 g HGMF + 12.5 g QMF +2.5 g RLP+10 g RCP

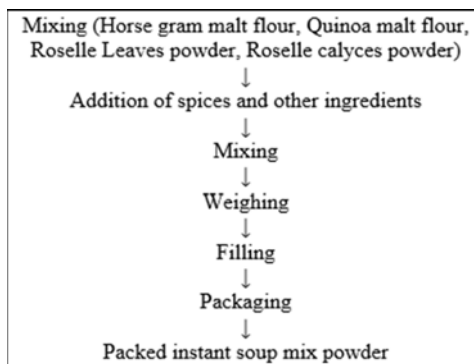
HGMF- Horse Gram Malt Flour

QMF-Quinoa Malt Flour

RLP-Roselle Leaves Powder

RCP-Roselle Calyces Powder

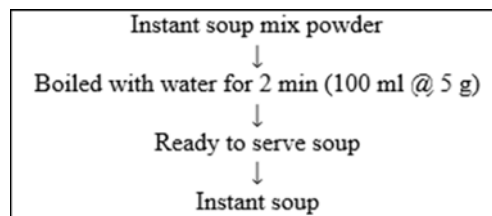
The control sample (T₀) was prepared by using only corn starch while other samples prepared by using different proportion of horse gram malt flour, quinoa malt flour, roselle leaves powder and roselle calyces powder. Other ingredients except corn starch, horse gram malt flour, quinoa malt flour, roselle leaves powder and roselle calyces powder were kept constant in all variants. Different trials were taken by changing the ratio of horse gram malt flour to corn starch was varied to 5:1, 8:3, 3:2 and 4:5 while different amounts of quinoa malt (5 g, 7.5 g, 10 g, and 12.5 g), and roselle calyces powder (2.5 g, 5 g, 7.5 g, 10 g) used as a variable in the instant soup mix powder formulation, primarily to adjust color intensity and sourness levels while roselle leaves powder (constant as a 2.5 g) maintained at a constant level to ensure a consistent, herbal taste profile. This balanced approach allows flexibility in color and sourness while stabilizing the overall flavor profile. This blended mixture was filled in HDPE pouches and sealed and stored properly in clean and dry place.



Flow sheet 1: Preparation of instant soup mix powder

Preparation of instant soup

Preliminary trials were carried out for reconstitution of formulated instant soup mix. Initially-5 g of soup powder was taken mixed with hot water, further 5 g of instant soup mix powder was taken mixed separately with 75 ml, 100 ml and 125 ml of water and boil for 2-3 minutes to obtain flavour. Instant soup mix powder in 100 ml water observed visually that thick in consistency, at 125 ml thin in consistency. Reconstitution of instant soup mix powder in 100 ml water observed by panelist and decided as good consistency when compared to other proportions. Finally, panelists decided that 100 ml of water suitable for reconstitution of 5 g instant soup mix powder. Amal *et al.*, (2014) [1] method was applied to prepare all experimental samples with minor modifications. Number of trials were taken to standardize the method of preparation of instant soup using different formulations. Finally, one standardized method was used to prepare instant soup. In this method, first soup powder is mixed in 100 ml of boiling water and served hot.



Flow sheet 2: Preparation of instant soup

Organoleptic evaluation

The organoleptic evaluation of millet milk curd prepared by plant-based milk was performed by 9-point hedonic rating scale, by the semi-trained panel members.

Statistical analysis

The results of various physical and chemical measurements of grain quality were analysed. The Analysis of variance was calculated using the standard ANOVA procedure. The analysis of variance revealed significance at a *p*<0.05 level. The standard error (SE) and critical difference (CD) at the 5% level were mentioned where required.

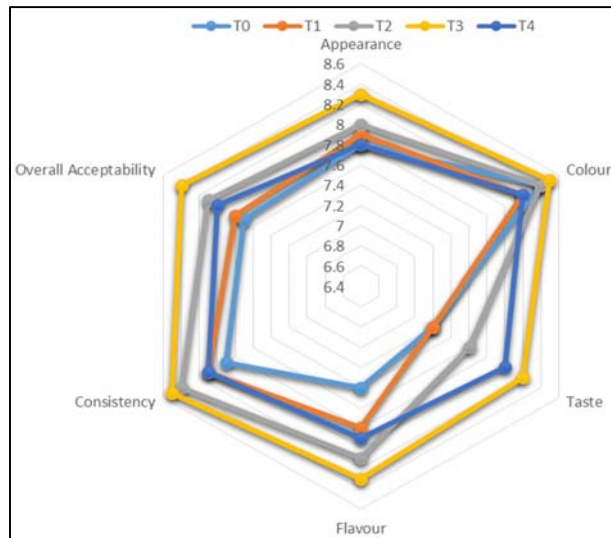
Results and Discussion

Sensory evaluation of instant soup

The sensory evaluation of various soup samples was conducted by trained panel members utilizing the 9-point hedonic scale. The sensory scores were based on the appearance, color, taste, flavor, consistency, and overall acceptability of the prepared instant soup samples, which were then compared to the control sample (T₀) and samples T₁, T₂, T₃ and T₄. The table below presents the mean sensory scores of the soup samples, with the organoleptic attributes assessed using a 9-point hedonic scale ranging from 9 (like extremely) to 1 (dislike extremely). Sample T₃ was acceptable, as it received the highest scores across all sensory attributes, indicating a high level of overall acceptability. Specifically, it achieved scores of 8.3 for appearance, 8.5 for color, 8.2 for taste, 8.3 for flavor, 8.5 for consistency, and 8.4 for overall acceptability.

Table 2: Sensory evaluation of different samples of soup

Sample	Appearance	Colour	Taste	Flavour	Consistency	Overall Acceptability
T ₀	7.8	8.4	7.2	7.4	7.9	7.7
T ₁	7.9	8.2	7.2	7.8	8.1	7.8
T ₂	8.0	8.4	7.6	8.1	8.4	8.1
T ₃	8.3	8.5	8.2	8.3	8.5	8.4
T ₄	7.8	8.2	8.0	7.9	8.1	8.0
SE±	0.051	0.066	0.072	0.122	0.095	0.083
CD @ 5%	0.156	0.204	0.220	0.372	0.291	0.254

**Fig 1:** Sensory evaluation of different samples of soup

These results suggest that Sample T₃ was well-received by the trained panel members, who evaluated its sensory characteristics favorably, making it an acceptable option. The result were found similar to results expressed Kokani *et al.*, 2019^[9].

Techno-economical feasibility for instant soup mix powder

The instant soup mix powder was a techno-economically feasible blend of ingredients, with a total weight of 100 g. The base ingredients, corn starch (30 g), horse gram malt flour (20 g), and quinoa malt flour (10 g), provided a cost-effective foundation. The addition of roselle leaves powder (2.5 g) and roselle calyces powder (7.5 g) enhanced nutritional value, while onion powder (5 g), garlic powder (3 g), Spice mix (5.8 g), boosted flavour and curcumin powder (0.2 g) added a hint of warmth and nutraceutical properties. carrot (2.5 g), and sweet corn kernel (2.5 g) added texture and flavor, while salt (8 g) and sugar (3 g) balanced the taste. This optimal blend of ingredients ensured a high-quality instant soup mix powder at a minimal cost, making it a techno-economically feasible option that was successfully produced and marketed.

The production of instant soup mix powder had involved a total raw material cost of Rs 25.76. After adding a 20% processing cost, the total cost had escalated to Rs 5.152, bringing the overall production cost to Rs 30.91 per 100 g. When scaled up to larger quantities, the production cost of instant soup mix powder had amounted to Rs 309.1 per kilogram (1,000 g) and Rs 3091 per 10 kilograms (10,000 g). This breakdown had provided a comprehensive understanding of the costs involved in producing instant

soup mix powder, from raw materials to final product, in various quantities, during the previous production cycle.

Conclusion

This study developed a nutrient-dense instant soup mix powder using Horse Gram malt flour, Quinoa malt flour, Roselle leaves powder, and Roselle calyces powder. The optimized formulation (T₃) demonstrated superior sensory and nutritional properties, making it an ideal breakfast substitute. Horse Gram and Quinoa provided high protein content, while Roselle leaves and calyces contributed antioxidants and phytochemicals. The techno-economic analysis revealed a production cost of Rs Rs 30.91 per 100 Gram, ensuring affordability and viability.

References

1. Amal MH, Abdel-Haleem A, Omran. Preparation of dried vegetarian soup supplemented with some legumes. *Food Nutr Sci.* 2014;5:2274-2285.
2. Cecil JE, Francis J, Read NW. Comparison of the effects of a high-fat and high-carbohydrate soup delivered orally and intragastrically on gastric emptying, appetite, and eating behaviour. *Physiol Behav.* 1999;67(2):299-306.
3. Clegg ME, Ranawana V, Shafat A, Henry CJ. Soups increase satiety through delayed gastric emptying yet increased glycaemic response. *Eur J Clin Nutr.* 2013;67(1):8-11.
4. Duke Y. Handbook of medicinal herbs. 13th ed. University Press. Living Stone Group Ltd., Edinburgh; c1985, p. 228-229.
5. Edo GI, Samuel PO, Jikah AN, Oloni GO, Ifejika MN, Oghenueke O, *et al.* Proximate composition and health benefits of Roselle leaf (*Hibiscus sabdariffa*): insight on food and health benefits. *Food Chem Adv.* 2023;3:100437.
6. Gaikwad SS, Ghatge PU, Anerao KK, Deshpande HW. Optimization of malting process of horse gram and its effect on biochemical, anti-nutritional factors and utilization in nutri-drink mix. *Biol Forum Int J.* 2022;14(4a):505-510.
7. Gandhi N, Singh B, Sharma S, Kapoor S. Extrusion process optimization of corn starch to develop instant vegetable soup mix. *Int J Curr Microbiol Appl Sci.* 2018;7(2):2886-2910.
8. Joshi N, Bains K, Kaur H. Evaluation of antioxidant activity of developed instant soup mixes using vegetable leaf powders from unconventional greens. *Int J Curr Microbiol Appl Sci.* 2020;9(1):2319-7706.
9. Kokani RC, Mokashi PS, Shelar YP. Studies on development and standardization of moringa leaves instant soup mix powder incorporated with garden cress seeds. *Int J Res Rev.* 2019;6(10):242-246.

10. Maradini-Filho AM, Pirozi MR, Borges JTDS, Pinheiro Sant'Ana HM, Chaves JBP, Coimbra JSJR. Quinoa: nutritional, functional, and antinutritional aspects. *Crit Rev Food Sci Nutr.* 2017;57(8):1618-1630.
11. Mathangi S, Geethanjali S, Visalachi V. Development and formulation of instant soup mix from sprouted horse gram and radish leaves. *Int J Home Sci.* 2017;3(1):346-349.
12. Pawar SH. Formulation and evaluation of garlic powder loaded floating matrix tablet. *Int J Pharm Pharm Sci.* 2019;11(3):17-21.
13. Sadawarte S, Pawar V, Sawate A, Thorat P, Surendar J. Effect of germination on proximate and phytochemical content of horse gram and green gram malt. *Int J Chem Stud.* 2018;6(3):1840-1844.
14. Sangwan A, Kawatra A, Sehgal S. Nutritional evaluation of onion powder dried using different drying methods. *J Dairying Foods Home Sci.* 2010;29(2):151-153.
15. Srivastava S. Quality characteristics and antioxidant activity of tomato powder and incorporated food products. Thesis, Ph.D. G.B. Pant University of Agriculture and Technology, Pantnagar, India; c2010.
16. Wanole PD. Studies on effect of malting characteristics on quality of quinoa seeds [dissertation]. Vasant Naik Marathwada Krishi Vidyapeeth, Parbhani; c2023.