

Development and Quality Analysis of Protein Enriched Instant Soup Mix

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Abstract

The aim of the study was to develop protein enriched instant fish soup mix and analysis of the quality of various conditions. The study used a mechanical dryer for maintaining a constant air flow and temperature at its drying and dehydration stage. Powder was made after drying. An appropriate composition was used as an indicator. Various compositions like 75%, 65%, 55% and 45% fish powder were used as formulation 0, formulation 1, formulation 2, and formulation 3 respectively. Then these were reconstituted by boiled water for soup mix preparation. The result indicated that mixer 2 was the best composition. The finding suggested that 55% fish powder mix is the best composition for protein enriched instant soup mix. It will help to produce the instant soup mix and an alternative source of various costly animal and plant protein as a value-added material.

Keywords

Instant Soup, Fish Powder, Value Addition, Vegetable Powder, Fish Soup

1. Introduction

Soup is a liquid which is prepared from vegetables, fish or meat using with water, juice or stock and some thickening agents and fall under heterogenous category of food. Usually there are two kinds of soups like thick soup and clear soup. Thick soups are prepared by mixing powder of cereal or pulse flour, cream and eggs [1]. On the other hand, clear soups are made from clear extracts of plant

parts and animal which are edible. Instant soup is almost ready to eat and take less time to cook [2]. It has an important role for maintain nutrition of the people by covering a wide range of dried foods [3]. There is a big demand of dry soup mixes in the global market [4]. Generally commercial production of instant soup largely depends on the physiochemical and rheological properties at the time of preparation [5]. Actually, rheological characters deal with the deformation and flow of matter. As a result, rheological parameters are important to understand the behavior of the food structure during processing [6] [7]. Instant dry fish soup has a large stored life. There are millions of people who suffered from malnutrition in the world. Instant soup mix can be a great source of nutrition of them [7] [8]. The deficiency of the protein can be minimized by supplying instant fish soup since it can provide a mentionable amount of protein to the diet [9]. Now fish is using an important element for making many types of instant food by value addition [10]. Instant fish soup can be a great source of protein in fast food [11]. There are so many studies have already done on instant soup but a few studies on instant fish soup. The study is intended to fill the gap by exploring the finding related to instant fish soup mix. The aim of the study was to explore a formula of better instant fish soup mix, the impact of fish powder on the content and specification of soup mix as a complete instant food.

2. Review of Related Literature

Instant food is very popular in modern society. Soup is one of the top instant foods which people like so much with other fast food item. It is actually a part of modern daily life. Soup is very much convenient to eat. It is now fulfilling the consumer's social requirements [10]. Upadhyay *et al.* [12] conducted a research work on instant herbal mix soup from various vegetable like potato, carrot, tomatoes, garlic and others and found that leguminous elements increases sensory significantly with increasing nutritional advantages.

Usually there are two types of soups are available viz. clear and thick soups. Chandramouli *et al.* [13] conducted a study on soup powder preparation and nutritional status analysis. They used various ingredients like *Moringa oleifera*, *Centellaasiatica*, and *Solanum trilobatum* for their study. Basically, they used the dried leaves of these species and found that corn flour was a good thickening agent and sensory was increased due to coriander and pepper powder [14]. There are various types of soups are available in the market. Some soups are prepared from vegetables elements and some are from animal and fish elements. Instant soup helps to fulfill people's nutrient requirement quickly by taking less time [15]. Sudarsan *et al.* [9] reported that instant soup is almost free from pathogenic attack and it can preserve its quality until one month after preparation at normal condition. They used horse gram, onion and garlic powder, radish leaves, pepper and salt for their study and found that all the ingredients are good for making instant soup which can provide more nutritional supply than other soup [8]. The old aged people are increasing day by day. Instant soup mix may

be a better nutritional supplement for them for meeting their dietary requirements. Satusap *et al.* [16] mentioned that instant soup which made from dried vegetables were good for older people. The food product which is available in the market may not be suitable for older people in terms of cost, low nutrition and physical characteristics [14]. So, instant soup is best for them.

Formulation food products are increasing day by day to meet the requirements of the consumers [15]. The formulation on value added products are now the main target of the consumers. Because it can supply the nutritional value as well as delicious test to consumers. Monteiro *et al.* [17] conducted a study on the instant soup which was made from Tilapia (*Oreochromis niloticus*) and concluded that instant Tilapia soup can be used in food industry on additive material on making new food item. Udari *et al.* [18] conducted a research on omega-3 containing soup powder and mentioned that instant soup is containing more omega-3 (9.31%) than fried fish. They used some ingredients like fish powder, fish oil, tomato, milk powder, salt, vegetables and spices for their research.

Instant soup is a major element of instant food which is highly preferred food of modern society for simple, easy and instant preparation characteristics. Dhi-man *et al.* [19] conducted a study on storage ability of pumpkin instant soup is about six months. They used some other additive ingredients like moong pulse, tomato, spices and condiment's powder, pea, spinach and carrot for their study. Generally, people of developing country are suffering from malnutrition [20]. Instant soup may be a potential source to meet the demand of nutritional requirements. Rahman *et al.* [21] conducted a study in Bangladesh on instant fish soup and concluded that the percent fish powder was the best composition other two composition. They used ingredients like tomato, sugar, spices, cauliflower and salt for their study. Legume is a good source of vitamins, minerals and dietary protein. Rokshana *et al.* [22] conducted a research work on development and storage quality of soup powder which was made from legume and vegetables and reported that the quality was as usual up to six months.

Fish by-products are usually thrown away due to its no usability in traditional practice. But it gets a due attention from scientific world from last two decades. Now analysis shows that fish by-product is a great source of oils, hydrolysates, collagen, bioactive peptides and gelatin. So, fish is a potential item in terms of low price, high availability, easy processing and good source of nutrition [23]. Literature survey shows that there are so many researches have already done but a very few researches are found on fish based instant soup mix. The piece of study was undertaken to address the research gap and considering importance of the subject matter.

3. Materials and Methods

3.1. Components

Silver Carp (average weight 2.5 kg/fish) fishes were purchased from local aquatic products market of Wuxi city, Jiangsu province, China. Soybean, fresh tomato,

zinger, garlic and dried spices and other raw materials were purchased locally from super shop of the same city. Chemicals and equipment were used from ready stocks of food processing technology laboratory of Jiangnan University, Wuxi, China. All chemicals used were of the analytical reagent grade [21].

3.2. Preparation of Fish Powder

Collected fresh was tested organoleptically. Meat of the fish was found translucent. Fishes were beheaded by knife and scales, fins, gills, viscera were removed. Then fishes were washed with 1% brine solution. After that fishes were submerged with 1% turmeric powder solution for 10 minutes. Then fishes were cooked at 100°C for 10 min with 2% vinegar and 1% sesame oil solution [24]. After separation of all bones, fish was dried in an oven at 60°C overnight till complete drying. For drying it was spread on flat tray at a thickness of thin layer. The dried fish was ground by electrical grinder then was packed in LDPE bag and storage at room temperature.

3.3. Preparation of Tomato Powder

For Tomato powder making, tomato was cut into slices and cooked. Pulp was dried in an oven dryer for 4 hours at 60°C. Dried pulp was ground then was packed in LDPE bag and storage at room temperature.

3.4. Preparation of Full Fat Soybean Powder

Soybean powder was made little modification. Soybean seeds was washed then soaked in water for 8 hours for removing the hulls. Then soybean seed was dried for 65°C in an oven [23]. After that soybean seed was roasted and ground by electrical grinder (made in China). The ground powder was packed in LDPE bag and storage at room temperature.

3.5. Preparation of Garlic Powder

Raw garlic was blanching by 100°C hot water for 5 minutes and dried by oven drying at 65°C for 6 hours [18]. Then dried clove of garlic was ground by electrical grinder. The ground powder was packed in LDPE bag and storage at room temperature.

3.6. Preparation of Zinger Powder

Raw zinger was blended by electric blender and dried by oven drying at 65°C for 6 hours in thin layer. Then dried zinger was ground by electrical grinder. The ground powder was packed in LDPE bag and storage at room temperature [17].

3.7. Preparation of Spices Mix Powder

Dried cinnamon 30%, prickly ash 10%, cumin 25%, white pepper 10%, white paper 10% and sesame 25% were mastered by electric balance and roasted [25]. Then spices were ground by electric grinder to make spices mix. The ground

spices mix powder was packed in LDPE bag and storage at room temperature.

3.8. Processing Yield Percentage

The whole fish, tomato, zinger, garlic, spices mix and instant soup were weighed. The processing yield was calculated from weight of each final products multiplied by 100 and divided by the weight of their precursor product [26]. Three analytical replicates were performed for each treatment and mean value was calculated.

Processing yield % = Final products obtain \times 100/Raw weight of respective sample

3.9. Formulation of Soup Mix Powder

Four different formulations of soup mix were prepared by using different fish powder: soya powder ratios as given in **Table 1**. F0 was the control soup mix. Soup was prepared by re-constitution of instant soup mix with boiled water.

3.10. Proximate Analysis

Parameters of the proximate analysis (Moisture, Ash, Crude protein, Total carbohydrate and Energy) of the developed fish powder as well soup mix powder was analyzed [27].

3.11. Sensory Evaluation

The sensory assessment has been performed using the scoring test developed by Sudarsan *et al.* [9] ten panelists have been used to evaluate the sensory attributes of soup. The samples were blind-coded by special codes; the panelists were not informed about the experimental approach [1]. They were asked to give a score for each of color, appearance, odor, texture, taste and overall acceptability while the soup mix was prepared [19]. Then soup has been served to the panelists to complete the evaluation of the sensory attributes. The panelists were asked to wash their mouths with warm water between samples.

3.12. Statistical Analysis

The obtained data was statistically analyzed for analysis of variance (ANOVA) and consequently Duncan's Multiple Range Test (DMRT) has been used to

Table 1. Different formulation of powdered soup mix.

Formulation	Ingredients (%)								
	Fish powder	Soya powder	Tomato powder	salt	Sugar	MSG	Zinger powder	Garlic powder	Spices mix powder
F0	75	0	12	5	2	1	1	1	3
F1	65	10	12	5	2	1	1	1	3
F2	55	20	12	5	2	1	1	1	3
F3	45	30	12	5	2	1	1	1	3

determine significant difference [17] [28]. Data has been analyzed using the IBM SPSS software, version 20 at the 5% level of significance ($P = 0.05$).

4. Results and Discussions

4.1. Composition of Fresh Fish and Dried Fish Powder

The moisture content in fresh silver carp fish, mechanical dried fish powder was 76.7% and 7.78% respectively. The ash content in fresh fish 1.94% and that was in mechanical dried fish was 13.02%. The fat content in fresh fish was 2.11% and that was in mechanical dried fish 14.96%. The protein in fresh fish was 19.25% and that was in mechanical dried fish 64.24%. Protein, fat, ash of dried sample was increased but moisture content of dried samples was decreased [1]. The higher concentration of nutrients in the dried product is due to lower moisture content. The chemical composition of fresh fish & dried fish is given in the following **Table 2**.

4.2. Composition of Instant Fish Soup Mix

Among the three formulations Formulation No-2 was taken for analysis for its moisture, protein, fat, ash contents. The results are presented in **Table 3**. The moisture content in instant fish soup mix was 9.4%. The ash, fat and protein content were found to be 15%, 1.39% and 9.4%, respectively. The higher concentration of nutrients in the dried product was due to lower moisture content [23].

4.3. Sensory Evaluation of Instant Fish Soup Mix

The mean scores for color, texture, flavor and overall acceptability of three different amount of fish powder in Instant Fish Soup Mix are presented in **Table 4**.

The results expose that there are no significant variations in color which

Table 2. Composition of fresh and dried fish powder.

Parameters	Fresh fish	Dried fish
Moisture %	76.7	7.78
Ash %	1.94	13.02
Lipid (fat)%	2.11	14.96
Protein %	19.25	64.24

Table 3. The chemical composition of instant fish soup mix is given in the following.

Parameters	Soup mix formulation no 2 (mix 2) (55% fish powder)
Moisture %	9.5%
Ash %	15%
Lipid %	1.39%
Protein %	9.4%
Total Carbohydrate	64.71%

found by a two-way analysis of variance (ANOVA) for taste preference (**Table 4**). The calculated value of F test (7.9837) is greater than the tabulated value of F test (3.89). This indicates the color of the samples of instant fish soup mixes were equally accepted and the numerical score varied from 2.40 to 4.99 (**Figure 1**). This denotes that the taste of different samples of soup mixes is not similarly acceptable (**Table 4**). As shown in **Table 4** the flavor of Formulation-2 (55% fish powder) is the most satisfactory among the samples and is followed by sample-1 (65% fish powder), while the lowest score is given by sample-3 (45% fish powder).

The results explore that there are no significant variations in color which done by a two-way analysis of variance (ANOVA) for odor preference (**Table 4**) [29]. The calculated value of F test (1.2165) is smaller than the tabulated value of F test (3.89). It indicates the color of the samples of instant fish soup mixes were equally recognized and the numerical score varied from 2.70 to 4.45 (**Figure 2**).

The results discover that there are no significant variations in color which found by a two-way analysis of variance (ANOVA) for color preference (**Table 4**). The calculated value of F test (0.1874) is lower than the tabulated value of F test (3.89) [30]. It denotes the color of the samples of instant fish soup mixes are

Table 4. Means of sensory evaluation of instant fish soup mixes.

Formulation	Sensory characteristics									
	Taste		Odor		Color		Texture		Overall acceptance	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std
0	2.40b	0.50	2.70b	0.47	4.20b	0.41	4.25b	0.64	2.50b	0.51
1	3.30b	0.46	3.10b	0.30	4.35b	0.48	4.40b	0.49	3.30b	0.46
2	4.99a	0.03	4.45a	0.51	4.40a	0.50	4.45a	0.51	4.45a	0.51
3	3.60b	0.68	3.80b	0.41	4.30b	0.47	4.10b	0.72	3.70b	0.66

Note: The means with the same superscripts within a column are not significantly different at $p < 0.05$.

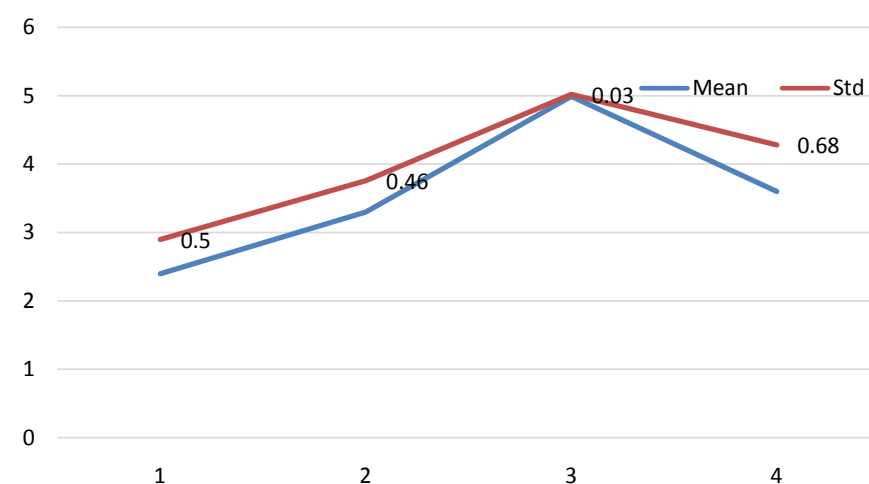


Figure 1. Showing the mean and standard deviation of taste of the sample.

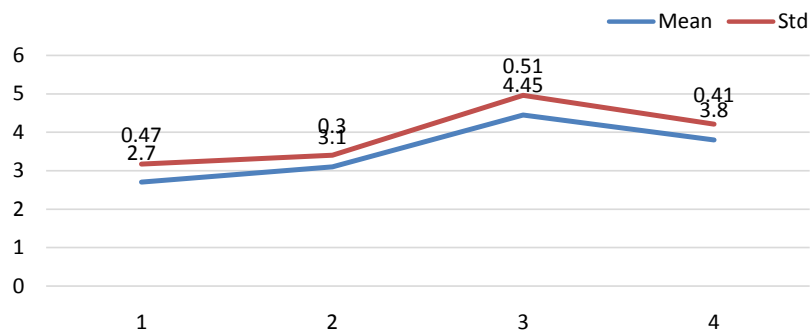


Figure 2. Showing the mean and standard deviation of odor of the sample.

equally accepted and the numerical score varies from 4.20 to 4.40 (**Figure 3**).

There is significant ($P < 0.05$) difference in texture (**Table 4**). The calculated value of F test (5.9857) is greater than tabulated value of F test (3.89). It mentions the texture of the samples of instant fish soup mixes are not equally accepted [31] and the numerical score varies from 4.10 to 4.45 (**Figure 4**).

It is apparent from the results of the ANOVA that there is a significant ($P < 0.01$) variation in general acceptability of the samples testes. The calculated value of F test (5.9371) is greater than tabulated F-value (3.89). As shown in **Table 4** the results show that formulation-2 has highest overall acceptability score among the samples tested and is followed by formulation-3 while formulation-0 got the lowest result [32]. Formulation-0 had the major part of (75% fish powder) fish powder. Formulation-1, Formulation-2 and Formulation-3 (mix-1) bears 65%, 55% and 45% fish respectively (**Figure 5**).

It is observed that Formulation-2 with 55% fish secured the highest scores in all spheres and get first rank as “like very much” [26]. The second position gets by formulation-3 with 45% fish powder for all quality factors and is classified as “like moderately”. Formulation-0 with 75% fish powder gets the lowest score among all factors and is classified as “like moderately”. All the products are similarly acceptable in terms of color but different from one another in terms of flavor and texture [33]. Thus, flavor and texture are over influencing factors. The **Figure 6** describes the particle size distribution of major samples.

The organoleptic taste test shows that soup sample with 55% fish powder gets the highest score in all aspect and is classified as “like very much” [34]. The soup with 55% fish powder gets the second highest score for all characteristics and is classified as “like moderately” while the soup with 75% fish powder secured lowest score and is classified as “like moderately”. The study clearly shows that fish flavor and texture are overriding factors influencing overall acceptability of soup from fish.

4.4. Processing Yield Percentage

It is observed that soybean powder is highest component in the processing yield. Spices mix powder followed the soybean powder among garlic powder, zinger powder, fish powder and tomato powder. The **Figure 7** describes the major samples used in the research.

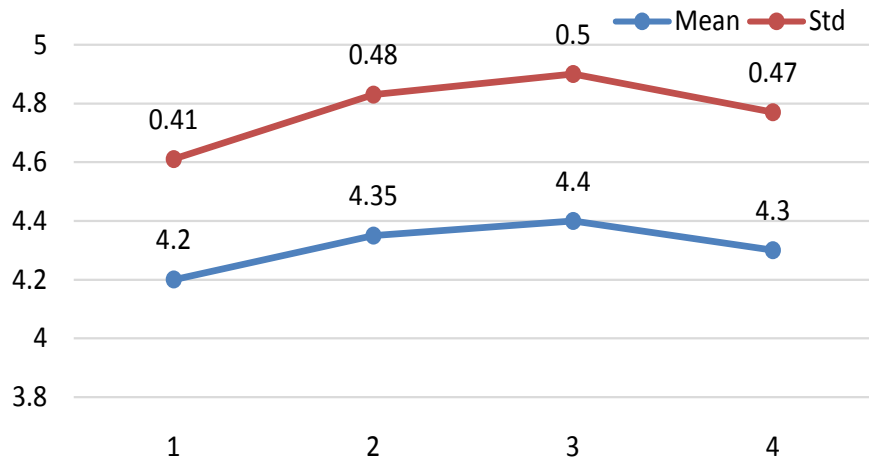


Figure 3. Showing the mean and standard deviation of color of the sample.

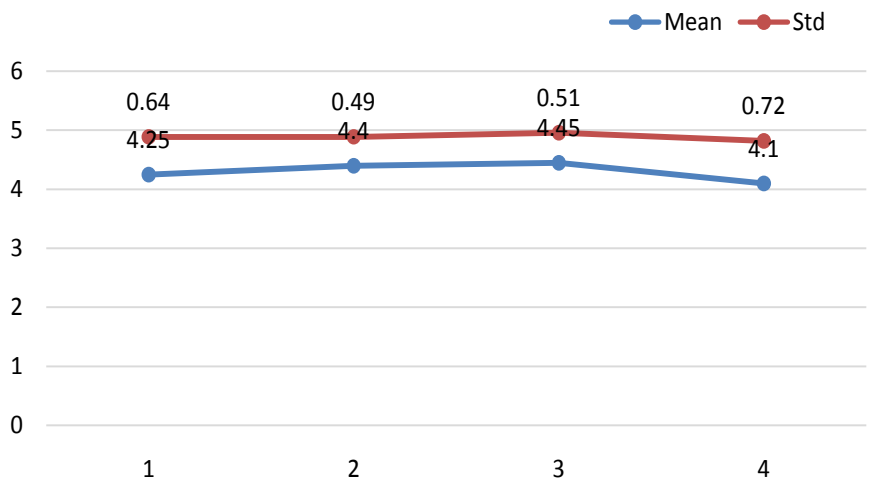


Figure 4. Showing the mean and standard deviation of texture of the sample.

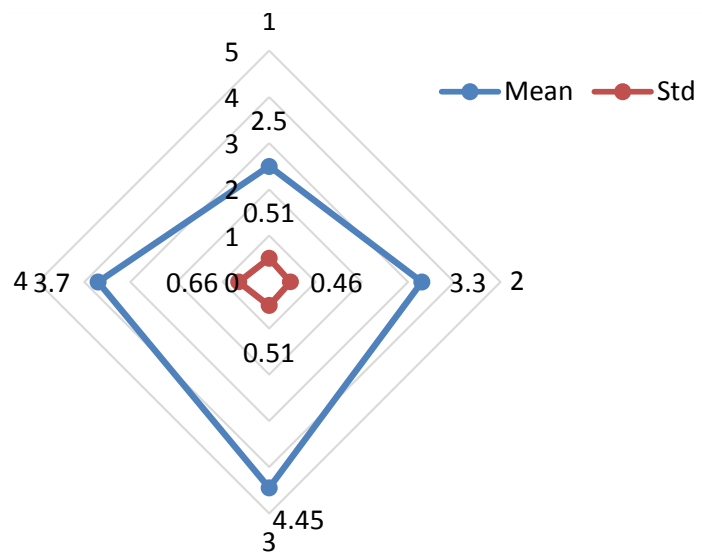


Figure 5. Showing the mean and standard deviation of overall acceptance of the sample.

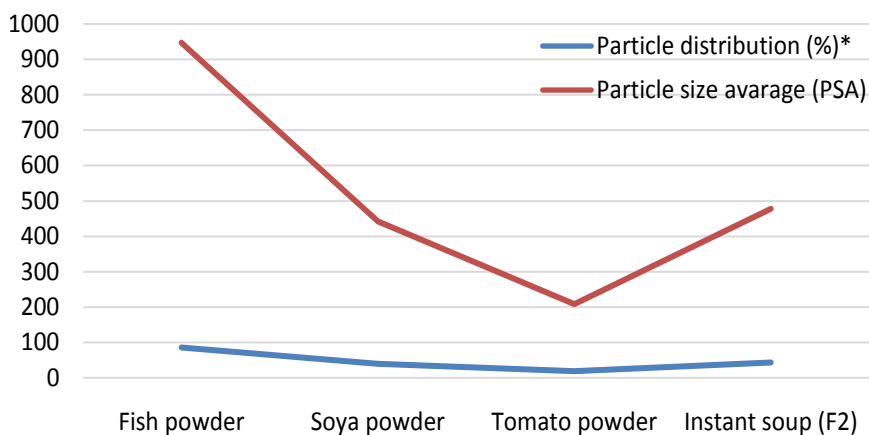


Figure 6. Showing the particle size distribution of the major samples.

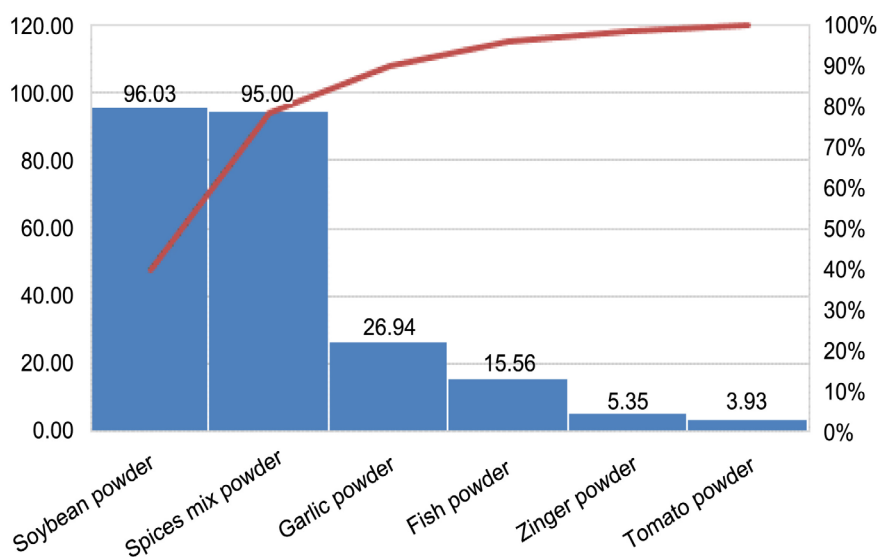


Figure 7. Showing processing yield percentage.

5. Conclusion

There is a great nutritious and technologically potential in instant fish soup which especially made from silver carp. This study revealed that 55% fish powder mix is the best composition for protein enriched instant soup mix. This instant fish soup may be a great source of nutrition in fast food and alternative of some other animal and plant proteins as value added materials. It can be a good source of value added food for commercial processed food production. This study suggests that further study is needed to produce instant fish soup mix for a large scale commercial production as well as quality evaluation is also necessary for maintain protein enrichment.

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Conflict of Interest Declaration

The authors declare no conflict of interest.

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