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# Technology development for preparation of Instant soup mix powder from yam, drumstick leaves and roselle calyces

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**Abstract**
Nowadays everybody is in a hurry of time and wants the food items which require less time for cooking and convenient for preparation, due to changing lifestyle, there is change in food habits of people. Instant soups play an important role in balancing the nutrients needed for people to stay healthy and can be used as an alternative breakfast food. Generally, yam, drumstick leaves and roselle calyces are not part of our routine diet besides having such a good nutritional and therapeutic value. Hence, there is scope of increasing utilization of such food. Nowadays people are very conscious towards their health so, they prefer healthy plus nutritious food. Yam is also a good source of vitamins A and C, and of fiber and minerals soluble dietary fiber and phytochemicals such as Tannins (Phenolic compound) which helps in treating Cancer. Also, drumstick leaves add more nutritional value in terms of proteins, vitamin C, polyphenols, beta-carotene etc. Roselle calyces contain anthocyanin's as major coloring agents which are potent antioxidants. The aim of present research study was to develop instant soup mix powder from yam, drumstick leaves and roselle calyces and its nutritional evaluation along with other vegetables and spices. The chemical composition of selected sample ($T_3$) was moisture 4.23%, protein 12.40%, fat 1.49%, ash 7.04%, carbohydrates 71.04%, fibers 3.8%. Finally, it could be concluded that sample $T_3$ containing 25% yam flour, 5% drumstick leaves powder and 1.5% of roselle calyces powder was superior in terms of sensory as well as nutritional quality. The $T_3$ sample is a great source of energy with an energy value of 347.17 Kcal.

**Keywords:** Yam, instant soup mix, roselle calyces, nutritional, powder, thickener

## Introduction
Soup is generally combination of ingredients such as vegetables green leaves with juice, water or other liquid. In order to make hot soups solid ingredients are boiled in liquids in a pot until the flavors are extracted, forming a broth. Ingredients which are commonly used as thickeners in soup include rice, lentils, flour and grains. As the population and industries grew more people chose to work alone, away from home after finishing school for the employment. They have less time to prepare food now. As a result, most of them consume foods that require less preparation time without thinking about the health benefits. Instant soups play an important role in balancing the nutrients needed for people to stay healthy and can be used as an alternative breakfast food (Mathangi *et al*., 2017) [11].

In comparison to canned soups, dry soup mix contains vegetables in a variety of forms. People enjoy these soup mixes because they are simple to prepare. Because they are convenient, hygienic, have a long shelf life and are easy to carry. Instant mixes have become increasingly popular among all dehydrated products in recent years. It is available in a variety of packages, which lowers the cost of transportation and food preparation takes a very short amount of time (Premavalli *et al.*, 2005) [18].

Soup is a primary liquid dish that is typically served hot or warm and is created by blending vegetables with stock and various thickening agents. It is classified as a heterogeneous food. Instant soup cooks faster and is almost ready to eat. It plays a significant part in preserving the people's nourishment by including a variety of dried foods. On the international market, there is a high demand for Instant soup mixes. Instant soup mix can be a great source of nutrition for the many millions of hungry people across the world. (Islam *et al.*, 2018) [9].

About 100 g of yam contains 118 calories, making it a good source of energy. A large amount of oligosaccharides and polysaccharides are also present. Yams supply more than 20% of the recommended daily amount of carbohydrates. Yam starches give off energy and support healthy mitochondrial activity. Yams also contain a lot of fiber (the Chinese yam contain good

amounts of dietary fiber). Starch makes up the majority of the carbohydrates in yams. Compared to other tubers, yam starches have greater amylose/amylopectin ratios. (McPherson & Jane, 1999; Wu *et al.*, 2016). Yam proteins (about 1.53g/100g- 5.0g/100g) are rich in phenylalanine and threonine but contain only limited amounts of the sulphur containing amino acids (cysteine and methionine) and tryptophan. They are also conjugated proteins that contain phytochemicals and minerals that are essential for good health. More protein is found near the peel (skin) (Ezeabara & Anona, 2018) [4].

The amount of vitamins in various yam cultivars varies. The vitamin content of yams is also impacted by soil and environmental management strategies (Udensi *et al*., 2008) [20]. Depending on the yam variety, vitamins $B_1$, $B_3$, $B_5$, $B_6$, C, E, biotin and folic acid may be present in significant amounts (Ezeocha & Ojimelukwe, 2012) [5].

Drumstick leaves have a calorific value of 1296.00 kJ/g (305.62 cal/g), a crude protein content of 27.51%, a crude fiber content of 19.25%, a crude fat content of 2.23%, a crude ash content of 7.13%, and a moisture content of 76.53%, according to the report of (Oduro *et al*., 2008) [14].

The nutritional and therapeutic benefits of *Moringa oleifera* are currently attracting considerable attention on a global scale. Moringa leaves are abundant in tocopherols, ß-carotene, protein, vitamins, minerals and important sulfur-containing amino acids, which are infrequently found in diets (Foidl, Makkar & Becker, 2001 [8]; Ogunsina, Radha & Singh, 2010 [15]; Oliveira, Silveira, Vasconcelos, Cavada & Moreira, 1999). According to Fahey (2005) [6], Moringa leaves have seven times as much vitamin C as an orange, four times as much vitamin A as a carrot and three times as much potassium as a banana, protein content is double that of milk, calcium is four times more than milk. The leaf contains a number of plant chemicals that act as antioxidants (Sreelatha & Padma, 2009 [19]; Verma, Vijayakumar, Mathela & Rao, 2009) [22]. Because of these advantageous traits of *Moringa oleifera*, its seeds, leaves and bark are used to make a variety of dishes, including salads, drinks, soups and medicines (Foidl *et al*., 2001) [8].

The nutritional analysis of Roselle calyces revealed that the carbohydrate content (68.7%) was the highest, followed by crude fiber (14.6%), ash (12.2%) and other minerals. The aromatic, astringent and cooling herb roselle is widely used in the tropical region. The blooms include gossypetin, glycoside hibiscin, and anthocyanin. Along with having choleretic and diuretic effects, they may also lessen blood viscosity, increase intestinal peristalsis and lower blood pressure. The kidney and digestive systems are internally tonified with Roselle blooms. Additionally, they have tonic, diuretic and laxative properties. These are reported to be used to treat debility and to be antibacterial, astringent, aphrodisiac, digestive, demulcent, purgative and resolvent (Luvonga *et al.*, 2020) [10].

## Materials and Methods

The present investigation was carried out in Department of Food Engineering and Department of Food Chemistry and Nutrition, College of Food Technology, V.N.M.K.V., Parbhani during year 2021-22.

### Materials

The good quality of yam, drumstick leaves, roselle calyces, corn starch, black gram, bell pepper, mushroom, green chilli, sweet corn, peas, carrot, garlic, onion, black pepper, coriander, salt were procured from Parbhani local market.

### Chemicals and glasswares

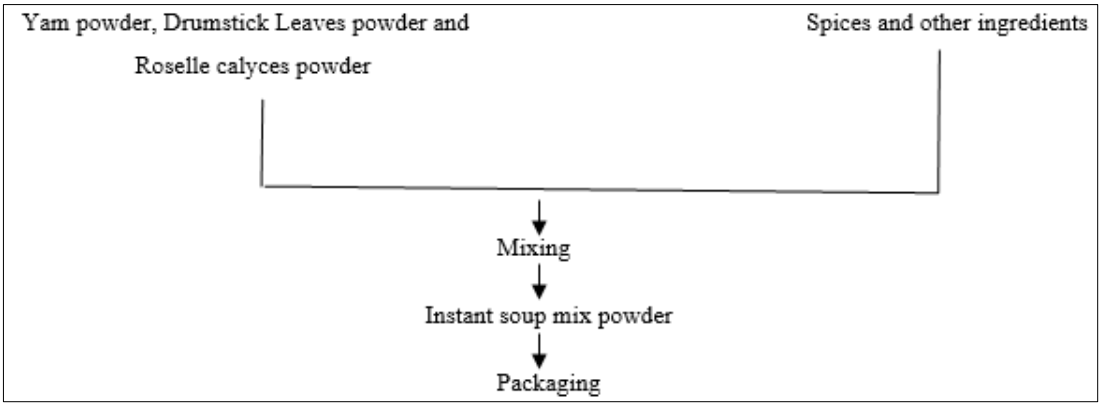
Chemicals and glasswares used during research study were available in the Department of Food Engineering, College of Food Technology V.N.M.K.V., Parbhani.

### Methods

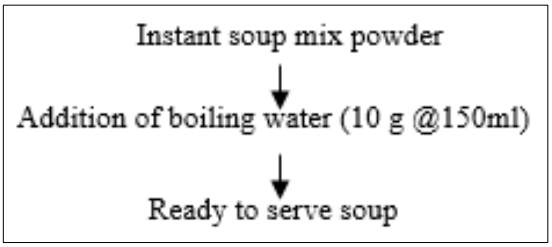
#### Preparation of Instant soup mix powder

Adeola *et al*. (2012) [2] process was modified to use slicing rather than dicing in order to make the yam flour. To prevent enzymatic browning, yam tubers were washed, drained and then peeled, cut and soaked in sodium metabisulphite solution (800 ppm for 20 min). After that, the yam slices (5 mm) were blanched at 70 °C for 10 minutes. Sliced yam samples were dried in a cabinet drier for 72 hours at 60 °C, then ground into flour to make fine yam flour. The drumstick leaves were de-stalked, washed and blanched at 100°C for 3 minutes before being spread out on racks for 10-15 minutes to drain the water. The leaves were then arranged on trays and dried in a cabinet drier for around 4 hours at 55°C. The dried leaves were ground into fine powder. The method for making powder from roselle calyces was quite similar that of making powder from Moringa leaves. This involved washing, draining and blanching the roselle calyces at 90 °C for 3 minutes. Following blanching, the calyces were moved to a cabinet dryer and dried at 55°C for 5 to 6 hours. Black gram is germinated, dried and milled to get flour. All other vegetables blanched and dried at 60°C in cabinet drier except onion and garlic.

**Preparation of Instant soup mix powder**



**Preparation of Instant soup**




**Optimization of ingredients**

For the preparation of the Instant soup mix, all the ingredients were combined in accordance with the recommended ratio (Table 1). Each sample was tested on a nine-point hedonic scale (9-like very much, 1-dislike very much) and 15 trained members determined whether the sample was acceptable. The panelists evaluated the samples sensory qualities, including their appearance, colour, flavour, taste, consistency and overall acceptability. The control sample ($T_0$) was prepared using only corn starch while other samples prepared by using different proportion of yam flour, drumstick leaves powder and roselle calyx's powder. Other ingredients except corn starch, yam flour, drumstick leaves powder, roselle calyces and black gram powder were kept constant in all variants. Different trials were taken by changing the ratio of yam flour to corn starch was varied to 1:1, 3:4, 5:9 and 2:5 while different amounts of drumstick leaves powder (3 g, 4 g, 5 g and 6 g), roselle calyces powder (1 g, 1.5 g, 2 g, and 2.5 g) and black gram (5 g, 3.5 g, 2 g and 0.5 g) were used as given in Table 1. Prepared soup mix samples were tasted by panelists. From the panel's findings, the most preferred quantity of yam flour for the soup mix was chosen.

**Table 1:** Formulation of Instant soup mix powder

| Ingredients | $T_0$ | $T_1$ | $T_2$ | $T_3$ | $T_4$ |
|---|---|---|---|---|---|
| Yam powder | - | 35 | 30 | 25 | 20 |
| Corn starch | 70 | 35 | 40 | 45 | 50 |
| Drumstick leaves powder | - | 3 | 4 | 5 | 6 |
| Roselle calyces powder | - | 1 | 1.5 | 2 | 2.5 |
| Black gram powder | 9 | 5 | 3.5 | 2 | 0.5 |
| Bell Pepper | 2 | 2 | 2 | 2 | 2 |
| Green chili | 1 | 1 | 1 | 1 | 1 |
| Mushroom | 2 | 2 | 2 | 2 | 2 |
| Sweet corn | 4 | 4 | 4 | 4 | 4 |
| Peas | 2 | 2 | 2 | 2 | 2 |
| Carrot | 2 | 2 | 2 | 2 | 2 |
| Spice mix | 5 | 5 | 5 | 5 | 5 |

**$T_0$** – 70 g Corn starch + 0 g Yam flour + 0 g DLP + 0 g RCP + 9 g BGP
**$T_1$** – 35 g Corn starch + 35 g Yam flour + 3 g DLP + 1.0 g RCP + 5 g BGP
**$T_2$** – 40 g Corn starch + 30 g Yam flour + 4 g DLP + 1.5 g RCP + 3.5 g BGP
**$T_3$** – 45 g Corn starch + 25 g Yam flour + 5 g DLP + 2.0 g RCP + 2 g BGP
**$T_4$** – 50 g Corn starch + 20 g Yam flour + 6 g DLP + 2.5 g RCP + 0.5 g BGP
DLP- Drumstick leaves powder
RCP- Roselle calyces powder
BGP- Black gram powder

**Proximate analysis**

The control and $T_3$ sample were analyzed for moisture, carbohydrates, protein, fat, fiber and ash content by standard AOAC methods. Protein content was analyzed by kjeldahl method and total carbohydrate content was determined by subtracting the measured protein, fat, ash and moisture from 100. Calorific value was estimated by multiplying the percentages of protein, fat and carbohydrate with their respective physiological fuel value. All the determinations were done in triplicate and the results were expressed as the average value.

**Moisture content**

Moisture content was determined as per the method given by AOAC (2005) [1]. It was calculated using following formula:

$$\% \text{ Moisture} = \frac{\text{Initial weight} - \text{final weight}}{\text{Total weight of sample}} \times 100$$

**Fat**

AOAC (2005) [1] method using Soxhlet apparatus was used to determine crude fat content of the sample. The percentage of crude fat was expressed as follows:

$$\% \text{ Crude Fat} = \frac{\text{Final weight of flask} - \text{Empty weight of flask}}{\text{Weight of sample}} \times 100$$

**Protein**

Protein content was determined using AOAC (2005) [1] method. Percentage of nitrogen and protein calculated by the following equation:

$$\% \text{ Nitrogen (N)} = \frac{(\text{Sample} - \text{Blank}) \times \text{N of } H_2SO4 \times 0.014 \times \text{D.F.}}{\text{Weight of sample (g)}} \times 100$$

$$\% \text{ Protein} = \% \text{ Nitrogen} \times 6.25$$

**Total carbohydrate**

Difference method used to determine total carbohydrate (AOAC, 2005) [1].

$$\text{Total Carbohydrates} = 100 - \%(\text{Moisture} + \text{Fat} + \text{Protein} + \text{Ash}$$

**Ash**

Drying the sample at 100 ºC and churned over an electric heater. It was then ashes in muffle furnace at 550 ºC for 5 hrs. It was calculated using the following formula:

$$\% \text{ Ash} = \frac{\text{Weight of crucible with ash} - \text{Weight of empty crucible}}{\text{Total weight of sample}} \times 100$$

**Crude fiber**

Crude fiber content was determined using AOAC (2005) [1] method. Percentage of crude fiber was calculated by the following equation:

$$\% \text{ Crude Fiber} = \frac{\text{Weight of residue} - \text{Weight of ash}}{\text{Weight of sample}} \times 100$$

## Results and Discussion

### Sensory evaluation of product

A number of trials were conducted by taking different composition of yam powder, corn starch, drumstick leaves powder, roselle calyces powder, black gram powder and keeping other ingredients constant. Finally, four different formulation of Instant soup mix powders were made using varying quantities of above major ingredients as given in Table 1.

In the preliminary sensory evaluation test different soup mixes were prepared using different formulations. The sensory evaluation was carried out with the help of trained and semi trained panel members using the 9-point hedonic scale using different parameters such as appearance, color, taste, flavour, consistency and overall acceptability. The mean score of different sensory characteristics of the soup mixes for different formulations are summarized in the Table 2 and same depicted in spider web chart in figure 1.

The sensory characters were scored based on 9-point hedonic scale ranges from 9 for like extremely to 1 for dislike extremely. During sensory evaluation it was observed that the formulation $T_3$ which includes 25% yam powder, 45% corn starch, 5% drumstick leaves powder, 2% roselle calyces powder and 2% black gram powder was most acceptable with overall acceptability score 8.6. As stated in Table 2, compared with control sample $T_0$ the sequence of overall acceptability was highest to lowest $T_3 > T_2 > T_4 > T_1 > T_0$. In prepared formulations, sensory score of control sample along with formulation $T_1$ was lowest. As given in Table 1 and Table 2, it was proven that $T_1$ formulation were least acceptable in all the parameters of sensory evaluation.

**Table 2:** Sensory evaluation of different instant soup mixes

| Samples | Appearance | Color | Taste | Flavor | Consistency | Overall Acceptability |
|---|---|---|---|---|---|---|
| $T_0$ | 7.7 | 7.4 | 7.5 | 7.5 | 7.1 | 7.4 |
| $T_1$ | 7.8 | 7.4 | 7.5 | 7.4 | 7.5 | 7.5 |
| $T_2$ | 7.8 | 7.5 | 7.6 | 8.2 | 8.0 | 8.2 |
| $T_3$ | 8.1 | 8.4 | 8.5 | 8.2 | 8.0 | 8.6 |
| $T_4$ | 7.6 | 7.5 | 7.6 | 8.0 | 7.9 | 7.7 |
| SE± | 0.073598 | 0.090139 | 0.080623 | 0.109924 | 0.100208 | 0.131814 |
| CD @ 5% | 0.22185 | 0.27171 | 0.24302 | 0.33135 | 0.30206 | 0.39733 |

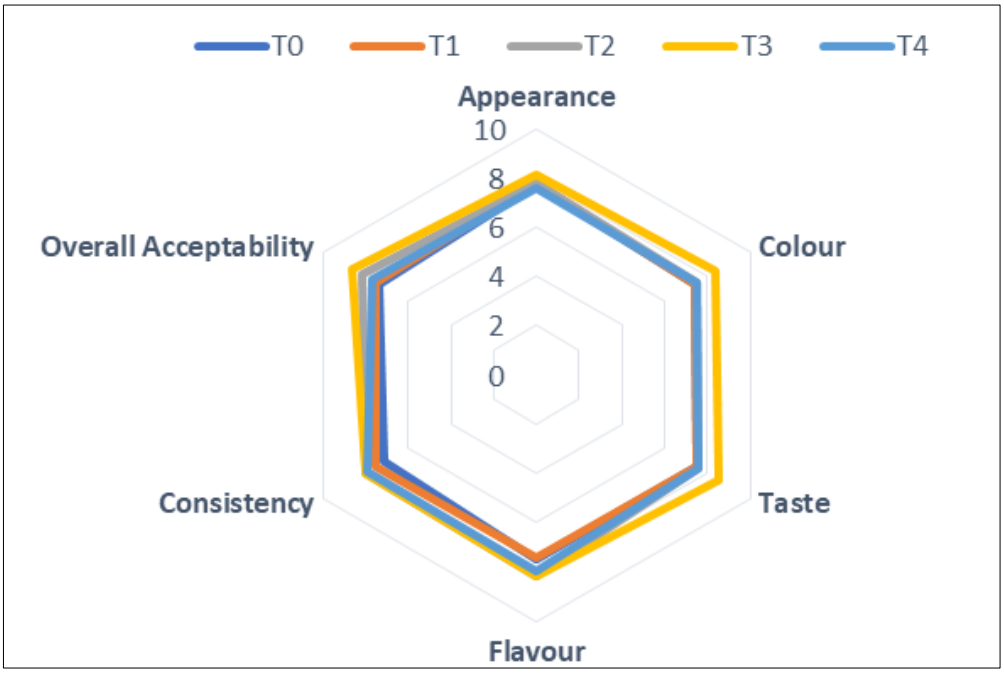



**Fig 1:** Sensory evaluation of instant soup mixes

### Chemical composition of control sample ($T_0$) and selected sample ($T_3$)

The data obtained from the table 3 revealed that moisture content in $T_0$ and $T_3$ sample was 4.85±0.01% and 4.23±0.02% respectively. Moisture content in $T_0$ and $T_3$ sample values agrees with values reported in (Dhiman *et al.*, 2017) [3]. Ash content in $T_3$ sample was 7.04 ±0.15% higher value than 6.81±0.01% ash content in $T_0$ sample. Fat content in $T_0$ sample was 0.58±0.15% lower value than 1.49±0.2% of fat in $T_3$ sample. Fat content in soup sample agrees with results reported by (Verma & Morga, 2017) [21]. Protein content in $T_0$ sample was 8.50±0.025% lower value than 12.40±0.05% protein content in $T_3$ sample. Protein content of selected sample agrees with results given by (Farzana *et al.*, 2017) [7].

**Table 3:** Chemical composition of control sample ($T_0$) and selected sample ($T_3$)

| Parameters | $T_0$ | $T_3$ |
|---|---|---|
| Moisture (%) | 4.85±0.01 | 4.23±0.02 |
| Protein (%) | 8.50±0.025 | 12.40±0.05 |
| Fat (%) | 0.58±0.15 | 1.49±0.2 |
| Carbohydrates (%) | 76.17±0.04 | 71.04±0.12 |
| Crude fiber (%) | 3.09±0.2 | 3.8±0.02 |
| Ash (%) | 6.81±0.01 | 7.04±0.15 |

*Each value is average of three determinations

Carbohydrate content in $T_0$ and $T_3$ sample was 76.17±0.04% and 71.04±0.12%. Carbohydrate content of $T_0$ sample was found coherent with results reported by (Niththiya *et al.*, 2014) [13]. Ash, fat, protein and carbohydrate has lower value in $T_0$ sample was due to absence of yam flour, drumstick leaves powder and roselle calyces powder in $T_0$ sample. Total dietary fiber content in $T_0$ and $T_3$ sample was 3.09±0.2 and 3.8±0.02. Hence $T_3$ sample found superior in terms of nutritional value than $T_0$ sample.

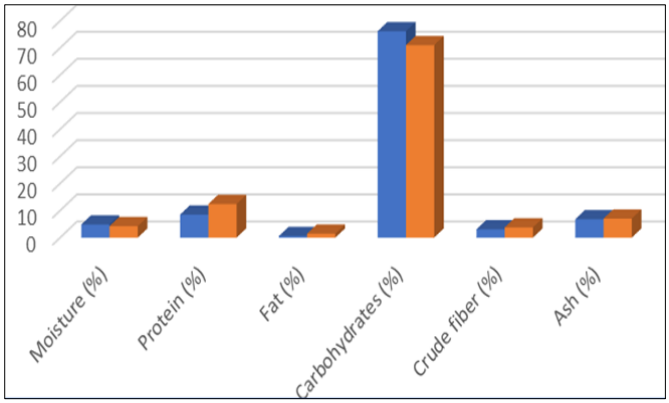



**Fig 2:** Proximate analysis of control T0 and T3 soup mix

## Energy value of control sample ($T_0$) and selected sample ($T_3$)

**Table 4:** Energy value of control sample ($T_0$) and selected sample ($T_3$)

| Parameters | $T_0$ | $T_3$ |
|---|---|---|
| Carbohydrates (%) | 76.17±0.04 | 71.04±0.12 |
| Fat (%) | 0.58±0.15 | 1.49±0.2 |
| Protein (%) | 8.5±0.025 | 12.40±0.05 |
| Energy (Kcal) | 343.9±0.15 | 347.17±0.14 |

*Each value is average of three determinations

The data obtained from Table 4 showed that the energy value of $T_0$ sample contains 343.9±0.15 Kcal per 100 g. The total energy of $T_3$ sample was found to be 347.17±0.14 Kcal per 100 g respectively. Total energy value was lower in $T_0$ sample due to lower values of fat and protein content than $T_3$ sample. Energy value was found near to results of (Niththiya *et al.*, 2014) [13].

## Conclusion

The planned research study for the preparation of instant soup mix powder has proven to be nutrient dense. The product achieved good sensory review and was standardized using various combinations. The demand for convenience foods that are ready to cook has increased as a result of shifts in lifestyles. Yams are one such food that has the potential to be used as an ingredient in convenience foods because of its outstanding nutritional and remarkable organoleptic qualities. Yam tubers also have a lot of starch, which helps soups to thicken. Therefore, there is no need to use any external thickening agent. Yam has a wealth of medicinal potential due to the presence of phytochemicals such as polyphenols. Moringa leaves are a beneficial food ingredient that can be added to instant soup to improve its nutritional profile, sensory profile and protein content. Roselle calyces seem to be a good and promising source of naturally occurring red colourants that are water soluble. Spices and vegetables enhanced the soup's flavor. Finally, it could be concluded that sample $T_3$ containing 25% yam flour, 5% drumstick leaves powder and 1.5% of roselle calyces powder was superior in terms of sensory as well as nutritional quality. The $T_3$ sample is a great source of energy with an energy value of 347.17±0.14 Kcal.

## Future of scope

The necessity for functional foods has emerged as a consequence of people's choices increased health consciousness. Such a food can be prepared by mixing yam flour which has great phenolic content, drumstick leaves powder rich in protein, vitamins and minerals and roselle calyces powder which contains lots of antioxidants such as anthocyanins. It will be used as food for iron deficiency diseases also against cancer in upcoming days. As soup contain dehydrated ingredients it has long shelf life and easy to transport. It can be consumed at breakfast, lunch or in dinner time. It is easy to prepare and takes less time to cook, hence working families will find it extremely useful.

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