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Original Research Article

Formulation and Quality Evaluation of Sisnu *(Urtica plaviflora)* Soup Powder

Geeta Bhattarai[1*], *Pratigya Thapaliya*[2] *and Dambar Bahadur Khadka*[2]
[1] Central Department of Food Technology, Tribhuvan University, Dharan, Nepal
[2] Central Campus of Technology, Tribhuvan University, Dharan, Nepal

***Corresponding Author:** Geeta Bhattarai, Central Department of Food Technology, Tribhuvan University, Dharan, Nepal
Email: bhattarai_geeta10@yahoo.com

Abstract

Stinging Nettle *(Urtica plaviflora)*, locally known as *Sisnu*, is a nutritionally and medicinally important vegetable. Changes in the chemical constituents of fresh *Sisnu* on blanching and drying were studied. A typical formulation of *Sisnu* soup powder was developed using *Sisnu* powder, corn flour, salt, garlic powder, citric acid and chilli powder. The physicochemical characteristics and storage stability of the soup powder were studied. Stinging nettle plants of 30-35 days tender shoots with four leaves along with bud were collected from Panchkanya VDC, Sunsari, Nepal and blanched (90°C for 2.5 min.), dried (70°C±3) and powdered to an average particle size of 150 µm. The moisture, vitamin C, total chlorophyll and total phenol contents for fresh, blanched and dried *Sisnu* were 79.4, 80.2 and 7.95% (wb); 28.6, 17.54 and 14.23 mg/100 g dry matter; 16.9, 14.54 and 13.34 mg/g dry matter, and 2.98, 2.68 and 2.49 mg GAE/g dry matter respectively. Drying significantly reduced ($p < 0.05$) the vitamin C, chlorophyll and total phenol contents in the dried *Sisnu*. Storage stability study revealed that the *Sisnu* soup powder could be packaged in a laminated packaging material (PS/ Metallic foil/PE) of 0.05 mm thick and stored at ambient condition (18-20 °C, 83-88% RH) for 60 days without significantly affecting in its chemical and organoleptic properties.

Key words: Sisnu (*Urtica plavifolia*, blanching, drying, soup powder, storage stability,

Introduction

Stinging nettle (*Urtica plaviflora*), locally called as *Sisnu*, is an important traditional food item as well as an important medicinal plant used in the traditional therapy (Panta and Sundriyal 2016; Garnier et al., 1961). Some other reported functional properties of the plant were: anti-inflammatory, antimicrobial, anti-rheumatic and acute diuretic, hypotensive effects (Saklani and Chandra 2012; Gulcin et al., 2007; Tahri et al., 2000) cardiovascular effect and stimulation of proliferation of human lymphocytes (Hosbas and Gazi 2008; Wagner et al., 1989). Nutritionally, young leaf and tender shoot are good sources of minerals especially iron, calcium and potassium, and antioxidant vitamins such as vitamin A, vitamin C, vitamin E. It also possesses a quality protein over other leafy vegetables (Rafajlovska et al., 2013; Saklani and Chandra 2012; Wetherilt 1992). These days, *Sisnu* is found in groceries in fresh as well as in powdered forms (Panta and Sundriyal 2016; Gharti, 2009). As all fresh vegetables are perishable and they need to be processed and preserved in such a way that their medicinal and nutritional properties are minimally reduced. Among the different methods of food preservation, *Sisnu* can be preserved by drying and the powder can be used for different food formulations, like soup. But *Sisnu* powder alone has a bland flavor with an unacceptable mouth feel, taste and poor water dispersability. Hence this work was carried out to prepare a *Sisnu* soup powder using *Sisnu* powder, corn flour and other natural food additives and to assess the storage life of the soup powder at room temperature.

Materials and methods

Fresh young shoots of stinging nettle (*Urtica plaviflora)* variety *Gharaiya*, of 30-35 days maturity with four leaves and a bud were collected from Panchkanya VDC, Sunsari District, Nepal. The shoots were then sorted and graded according to the maturity and nutritional composition of the fresh sample was analyzed. Then, shoots were blanched (90°C for 2.5 min.), dried (70 ± 3°C) and ground to an average particle size 150µm. The fresh, blanched and dried *Sisnu* shoot were analyzed for their moisture, vitamin C, chlorophyll and total phenol contents. To use corn flour as a dispersing agent, locally available corn was cleaned, soaked, dried and milled. A trial was carried to develop a *Sisnu* soup recipe containing *Sisnu* powder, corn flour, salt, citric acid, garlic powder and chilli powder (Table 1).

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The *Sisnu* soup powder was analyzed for its physical and chemical parameters (moisture content, vitamin C, chlorophyll and total phenol content). The powder was packed in a "Laminate" (PS/Metallic foil/PE) of 0.05 mm thickness, kept in a chamber having temperature and RH in the range of 18- 20° C and 83-85 % respectively to assess the effect of storage condition on moisture, vitamin C, chlorophyll, total phenol content and sensory properties at 0, 15, 30, 45 and 60 days of storage.

Table1: Formulation of *Sisnu* soup powder

Ingredients	Amount (%)
Sisnu shoot powder	67.00
Corn flour	17.00
Salt	10.00
Garlic powder	3.50
Citric acid	1.50
Chilli powder	1.00

Determination of physical parameters

The TSS of *Sisnu* soup was measured by using pocket refractometer as per Ranganna (2000). The water absorption capacity of the flour was determined by taking 5 g of sample and 50 mL of distilled water in a centrifuge tube. The tube was allowed to stand for1 h, centrifuged, and the amount of water absorbed by the sample was calculated (Kulkarni et al., 2006).

The bulk density of soup powder was determined by placing a sample in a 100 mL graduated cylinder with gentle uniform tapping during filling. The cylinder was filled to the mark and the weight of the powder was measured. The bulk density was calculated and the result was expressed as g/mL.

Determination of chemical parameters

The moisture content was determined by hot air oven method as per AOAC (1990). Total chlorophyll was determined as per Sadasivam and Manickam (1992). Total phenol was determined with the Folin- ciocalteau reagent and finally obtained sample was taken for measurement of absorbance at 650 nm against a reagent blank as per Sadasivam and Manickam (1992). Crude protein by Kjeldhal method, crude fiber, and crude fat, vitamin C by titration, calcium and potassium were determined as per Ranganna (2000).

Sensory evaluation

Organoleptic evaluation of soup powder was performed by semi trained panelist using 9 points hedonic rating tests .

Data analysis

The experimental data were analyzed using one-way ANOVA-with no blocking and with replication using Gens-tat discovery edition 3rd. The means were compared by Least Significant Difference (LSD) method at 5% level of significance.

Results and Discussion

Chemical composition of *Sisnu* shoots

The analytical values for chemical constitutes of *Sisnu* shoot are presented in Table 2. The moisture content of the fresh *Sisnu* shoot used in this study was 79.4 ± 0.09% (wb) and the value was similar (76.9%, wb)) to that reported by Wetherilt, (1992). The chlorophyll (16.9 ± 0.21 mg/g,db) and vitamin C (28.6 ± 0.34 mg/100 g, db) contents of the *Sisnu* shoots were analogous to that reported by Thapaliya (2010). The total phenol content of the fresh *Sisnu* shoot was similar (2.5 mg GAE/g, db) to that reported by Akis (2010), but it was lower than that reported by Hudec et al. (2007) (7.62 mg GAE/g, db).

Table 2: Composition of *Sisnu* shoots.

Parameters	Values*
Moisture content (%, wb))	79.4 ± 0.09
Protein (g/100g)	23.17 ± 0.81
Crude fiber (g/100g)	7.11± 1.10
Ash (g/100g)	6.2 ± 0.86
Fat (g/100g)	2.04 ± 0.54
Vitamin C (mg /100 g)	28.6 ± 0.34
Calcium (mg/100g)	408.16 ± 0.72
Potassium (mg/100g)	332 ± 0.56
Chlorophyll (mg/g)	16.9 ± 0.21
Total phenol (mg GAE/g,)	2.98 ± 0.34

*Values are means of triplicate samples ± Standard deviation., Except moisture content, all values are on dry basis.

Comparison of fresh, blanched and dried *Sisnu* shoots

No significant differences ($p<0.05$) were found between moisture contents of fresh and blanched *Sisnu* shoots, but significant differences were found in vitamin C, total chlorophyll and total phenolic contents among fresh, blanched and dried *Sisnu* shoots (Table 3). Blanching incurred about 10% loss in total phenol of the fresh *Sisnu* shoot. Amin et al. (2004) found 31-51% loss in total phenol content of spinach of different species when blanched for 5 min. Blanching causes solubilization and hence results in the loss of some total phenolic compounds (Joubert, 1990). Furthermore, the degradation of phenolic substances may be induced by heat during blanching (Souza et al., 2008). Similarly, drying of blanched shoots resulted an additional 6.44 % loss in total phenol which was quite low than the values reported by Souza et al., (2008) (45 to 53% for bed drying of unblanched *Rosemary*. Similar results in the loss of vitamin C and total chlorophyll on drying were also reported by Thapaliya, (2010).

Physical and chemical properties of the *Sisnu* soup powder

The total soluble solids (TSS) of the soup was found to be 4 °Bx. Similar result was also observed by Palanchoke (2009) in potato soup. The bulk density was determined to be 0.62 ± 0.04 g/mL (Table 4).

The bulk density of the potato soup flour reported by Palanchoke (2009) was 0.89 g/mL, which more or less agrees to our finding. The bulk density of *Sisnu* soup powder found in this study was higher than that reported for corn flour (0.37 g/mL) by Olayemi et al., (2008). The variations in the result might be due to the variations in the raw material. The water absorption capacity of the soup powder was determined to be 178.00 ± 0.55 g/100 g, (Table 4), but the value was very lower

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than that found by in potato soup powder. The variation in the value may be due to the variation in chemical properties of raw material.

Table 3. Comparison of fresh, blanched and dried *Sisnu* shoots.

Components	Fresh	Blanched	% change *	Dried	% Change**
Moisture content (%, wb)	79.40 ± 0.09[a]	80.20 ± 0.22[a]	+ 0.8	7.95 ± 0.03[b]	-77.5
Vitamin C (mg/100g, db)	28.6 ± 0.34[a]	17.54 ± 0.21[b]	-38.7	14.23 ± 0.19[c]	-50.24
Chlorophyll (mg/g, db)	16.9 ± 0.21[a]	14.54 ± 0.11[b]	-13.96	13.34 ± 0.09[c]	-21.06
Total phenol (mg GAE/g, db)	2.98 ± 0.34[a]	2.68 ± 0.02[b]	-10.01	2.49 ± 0.00[c]	-16.44

Values are means of triplicate ± standard deviation, (+) indicate % gain and (–) indicate % loss.
*% change between fresh and blanched shoot, ** % change in Fresh and blanched dried shoot, same letter along the row represent statistically no significantly different in values at p = 0.05).

Storage stability of *Sisnu* soup powder

The *Sisnu* soup powder was packed in "Laminate" (PS/ Metallic foil/PE) of 0.05 mm thick and kept under ambient condition (18-20°C and 83-85% RH). The samples were analyzed for chemical (moisture, vitamin C, total chlorophyll and total phenol contents) and organoleptic properties at 0, 15, 30, 45, and 60 days during storage. The changes in various components during storage are depicted in Figure 1.

Moisture contents of the product were found to be 8.02, 8.31, 8.59, 8.84 and 8.95% (wb) at 0, 15, 30, 45 and 60 days of storage respectively. Statistically, no significant differences ($p > 0.05$) in the moisture contents were found among the samples over 60 days of storage. Similar result was also found by Rokhsana et al. (2007) for legume based soup powder stored in poly packs (0.01 mm thickness).

Similarly, vitamin C contents were found to be 10.42, 10.27, 9.94, 9.61 and 9.52 mg/100 g dry matter at 0, 15, 30, 45 and 60 days of storage respectively. Statistically, storage period had no significant effect on the vitamin C content of the samples. Degradation of vitamin C is induced by air, light, heat, alkali and the nature of the packaging material. The effectiveness of the material as a barrier to moisture and oxygen as well as the chemical nature of the surface exposed to the food are important factors for determining the stability of ascorbic acid (FAO, 2012).

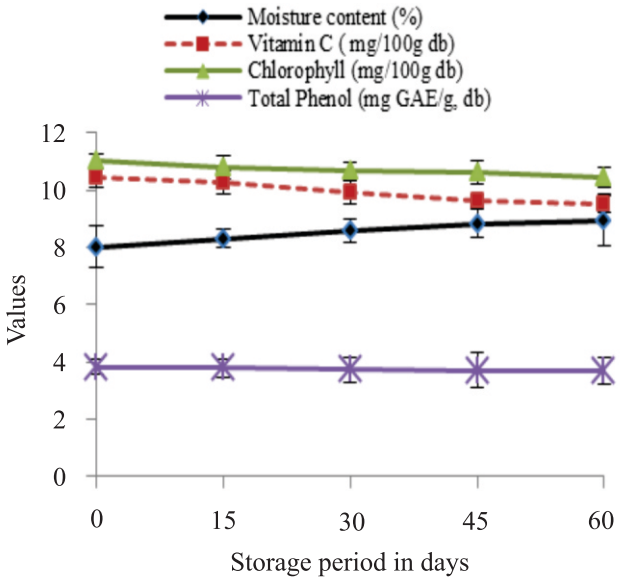

Figure 1: Change in moisture, vitamin C, chlorophyll and total phenol upon storage (Values are means of triplicate ± standard deviation)

Table 4. Chemical composition of *Sisnu* soup powder

Parameters	Values *
TSS (°Bx)	4.00
Bulk density (g/ml)	0.62 ± 0.04
Water Absorption Capacity g/100g	178.00 ± 0.55
Chemical Parameter	
Protein (g/100g db)	24.60 ± 0.09
Crude Fiber (g / 100g, db)	7.61 ± 0.41
Ash (g/100g, db)	6.92 ±0.34
Fat (g/ 100g ,db)	1.93 ± 0.98
Calcium (mg/ 100g, db)	318.50± 0.44
Potassium (mg/100g db)	272.21 ± 0.65

*Values are means ± standard deviation of triplicate samples

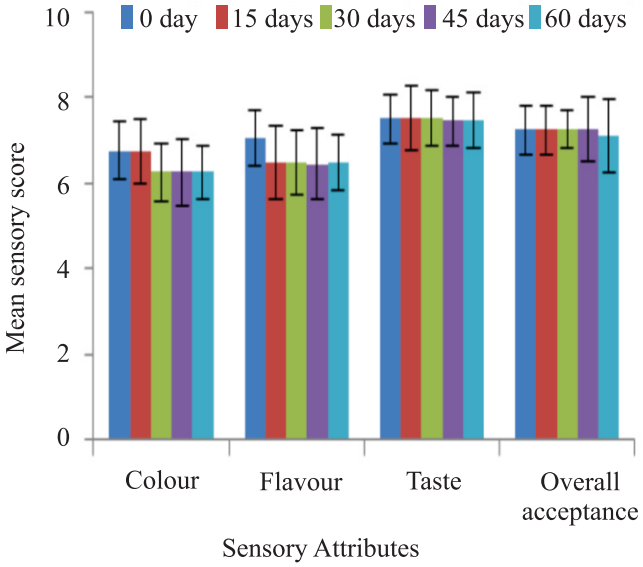

Figure 2: Effect of storage time on the sensory quality of *Sisnu* soup.

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Chlorophyll contents of the product were found to be 11, 10.8, 10.65, 10.59 and 10.47 mg/g dry matter at 0, 15, 30, 45 and 60 days of storage respectively, and the values were statistically not different by LSD from each other. Chlorophyll (green pigment) of the plant is degraded due to the action of acid, heat and chlorophyllase enzyme (Shafiur Rahman and Perera, 2007). Since, blanching inactivates naturally occurring enzymes of plant tissues, chlorophyllase enzyme present in the *Sisnu* during blanching is also inactivated.

Total phenol contents of the product were found to be 3.82, 3.79, 3.74, 3.71, and 3.69 mg GAE/g dry matter at 0, 15, 30, 45 and 60 days of storage respectively. Statistical analysis did not show significant differences ($p > 0.05$) in the total phenol contents. This might be due to the inactivation of polyphenol oxidase and other deteriorating enzyme during blanching, prior to drying as mentioned by Shafiur Rahman and Perera (2007).

Sensory evaluation of *Sisnu* soup prepared from stored soup powder showed that storage time had no significant effect on the sensory quality attributes (color, flavor, taste and overall acceptance) of soup over 60 days of storage (Figure 2). Similar results were also reported by Rokhsana et al. (2007) for legume based soup powder when stored in poly packs of 0.01 mm thickness .

Conclusion

This study concludes that *Sisnu* (*Urtica plaviflora*) shoot is nutritionally a good source of protein, fibre, minerals (like calcium, potassium), vitamin C, chlorophyll and total phenolic. A good quality *Sisnu* soup powder can be prepared by blending *Sisnu* powder (67%), corn flour (17%), salt (10%), garlic powder (3.5%), citric acid (1.5%) and chilli powder (1%). The soup powder packed in laminate (PS/Metallic Foil/PE) of 0.05 mm thick can be kept for 60 days at ambient condition (18- 20^{o} C and 83-85 % RH) without significant change in quality.

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