Nutritional Profile of Moringa Stenopetala Species Samples Collected in Different Places in Ethiopia and their Comparison with Morniga Oliferea Species

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Abstract

Among various types of Moringa species, Moringa stenopetala (M. stenopetala) is native to Ethiopia, Northern Kenya and Eastern Somali and is the most economically important species after M. oleifera. Moringa tree, well known as Shiferaw or Aleko in Ethiopia, is getting a great popularity although little is studied to understand its nutritional composition. Hence, this study has collected Moringa stenopetala (M. stenopetala) samples from 19 locations in Ethiopia to generate a national data on its nutritional profile. The fresh green leafy vegetables obtained from farming area in different provinces in Ethiopia were dried and physicochemical analysis was carried out employing standard methods of analysis. The samples collected had a mean value of 8.09%, 28.44%, 0.7%, 11.62%, 12.63%, 38.49%, 274Kcal of moisture, protein, fat, crude fiber, ash, carbohydrate and energy respectively. Moreover, the samples had a mean value of 54.85 mg/100gm, 1,918 mg/100gm, 2.16 mg/100gm, 0.78 mg/100gm, 38.19 mg/100gm, 2,094 mg/100gm and 214.10 mg/100gm of Fe, Ca, Zn, Cu, P, K and Na respectively. The mean values of Vitamin C and beta-carotene was also seen to be 28.49 mg/100gm and 12.95 mg/100gm respectively. The mean value of the anti-nutritional factors analyzed – phytate and tannin – was 378.44 mg/100gm and 358.89 mg/100gm respectively where as molar ratio of phytate to iron, zinc and calcium was analyzed to be 0.67, 17.56 and 0.012 respectively. Since the phyate to zinc molar ratio is above 15, its bioavailability was observed to low. There has been a statistically significant difference in the mean values of all nutrition composition parameters between study regions– Tigray, Amhara, Oromia, SNNPR and Dire Dawa – except for tannin content of the samples. These finding reveals that M. stenopetala species of Moringa tree in Ethiopia has appreciable nutritional profile which can be of a great input to fight the long overdue malnutrition problem in Ethiopia.

Introduction

There are about 13 or more species of *Moringa* within the monogeneric family, Moringaceace and growing in tropical and sub-tropical areas around the world. Among various types of Moringa species, *Moringa stenopetala* (*M. stenopetala*) is native to Ethiopia, Northern Kenya and Eastern Somali and is the most economically important species after *M. oleifera* (Olson, 2001). Moringa tree is well known as Shiferaw or Aleko in Ethiopia. In Sothern Ethiopia Moringa leaf is used as kale or cabbage for human consumption and animal feed. In Gamo Gofa, the leaves of M. Stenopetala are part of the staple diet of population. Kurkurfa is a paste which prepared from M. stenopetala and cereals such as Sorghum, maize, millet and barely is perceived as delicious food among a population (Abuye et al. 2003). It is widely distributed in the Rift Valley of southern Ethiopia (Bekele, 1993; Edwards *et al.,* 2000) and is used as vegetable food for human consumption and animal feed resources during dry period (Abuye *et al.,* 2003). The edible parts of the Moringa tree are exceptionally nutritious (Rams, 1994; Teketay, 2001). In addition to that leaf parts are promising as a food source in the tropics because the tree is full of leaves during the dry season when other foods are typically scarce (Fahey, 2005).

Recent studies conducted by Melesse *et al.* (2009) and Negesse *et al.* (2009) indicated that leaves of *M. stenopetala* are rich in protein (28.2-36.2%) and contain considerable amounts of essential amino acids. The leafy part of Moringa could thus be used as a protein supplement for other food products. The nutritional information of M. Stenopetala leaves is available in the literature. However, little bit is known about the nutritional profile of M. Stenopetala indigenous to Ethiopia which not included M. Stenopetala growing in different province of the country. .

The primary objective of the present research was to investigate the nutrients composed in Moringa leaves from different provinces in Ethiopia and to determine its potential as a nutritional supplement

Materials and Methods

Plant Samples

Fresh green leafy vegetable were obtained from farming area in 11 different provinces in Ethiopia i.e. Kewote , Dewa chefa 1, Dewa chefa 2 , Kallo 1, Kallo 2, Alamata, Mekele zuria, Tahitay Koraro, Kafta Humera and Bahir Dar Zuria. The leaves of M. Stenopetala were collected from Northern tropical parts of Ethiopia on Dec., 2013.

Fresh M. Stenopetala branches from matured moringa trees were cut and twigs and leaflets were then spread on suite jute and dried in the open air till the leaves were dried. The dried leaves were grounded using mortar and pestle at 1 mm size. After that the powder kept in air-tight plastic containers at room temperature (25°C) for further analysis. The leaves from each province were assayed and analyzed individually in duplicates. Ascorbic acid was determined by photometric method using methods of Vitamin assay. Phosphorus was estimated according to the method of Fiske and Subbarow. Tannin was determined by Maxson and Rooney method.

Chemical analysis of the ingredients and diets

Proximate analysis procedure including the percentage of moisture content, crude protein,
crude fat, ash contents and crude fiber in the sample were determined by The Association of
Official Analytical Chemists methods (AOAC, 1990). Ascorbic acid was determined by photometric method using methods of Vitamin assay. Phosphorus was estimated according to the method of Fiske and Subbarow. Tannin was determined by Maxson and Rooney method.

Result and Discussion

Proximate content

According to the results obtained, the mean of the dried samples collected were found to have a moisture content of 8.09 %. The mean value of the protein content of the samples was seen to be 28.44% with samples from SNNPR having statistically significant edge over the other regions with a mean value of 31.15%. This value is close to the protein content of Moringa Olifera samples analyzed by Moyo*et al* by 2011 which was 30.29% for a moisture content of 9.5%.

The fat content of the collected samples was analyzed and averaged to be 0.7% with samples collected from Dire Dawa having the highest of all the regions with an average mean value of 1.22%. The average content of ash of the samples collected was 12.63% with samples from SNNPR and Dire Dawa having the highest content (14.94 and 14.98 % respectively).

Result and Discussion

Whereas, the mean value of Crude fiber content of the samples was 11.62% with samples from SNNPR having the highest crude fiber content of 12.92% along with Tigray (11.24%) and Amhara (12.22%).The carbohydrate content of the samples collected gave an average value of 38.49where samples from Oromia registering the highest, 41.66%. With a mean value 274Kcal, the energy values of the samples collected all regions has no statistically significant difference among each other except samples SNNPR which has a significantly lower energy value.

Mineral content

The amounts of Iron in the 19 samples collected from all over Ethiopia had an average mean value of 54.85mg/100gm. A statistically significant difference was observed with the iron content of samples collected from Dire Dawa, 83.36mg/100gm, and Amhara region, 34.85 mg/100gm while the mean values of Iron content for samples collected from the other three regions was observed to be statistically similar. Whereas, samples from SNNPR hadthe highest mean value of Zinc (2.44mg/100gm) compared to the other regions while the mean value of Zinc of the all five regions was 2.26mg/100gm.

With a mean value of 49.31 mg/100gm, Tigray region samples had the highest phosphorus ($P<0.05$) value where as Dire Dawa had the smallest value 21.84mg.100gm. The total mean value of phosphorus of the collected samples from all regions was 38.19mg/100 gm. considering copper value; 0.78mg/100gm was the mean value while the highest copper value registered was from Dire Dawa with a mean value of 1.18gm/100gm.

The content of potassium of the collected samples has been found appreciable with a mean value of 2,094.5 mg/100gm where as the sodium content was found to be 214.10mg/100gm. Samples from all regions has statistically significant similarity in potassium content except samples from Tigray which is slightly lower than the others. Whereas, samples from SNNPR have registered to have a statistically higher sodium value along with samples from Oromia and Tigray region making samples from Amhara and Dire Dawa a little lower with a mean values of 100.68mg/100gm and 207.14mg/100gm respectively. The mean ratio of potassium to sodium was found to be 9.78 which is another good characteristic if consumed by individuals with hypertension and heart problems.

Antinutritional factors and Vitamin Content

The average phytate content of the samples collected all over the country was found to be 378.44mg/100gm with samples from Amhara having the smallest phytate content of 302.53mg/100gm. The other regions have a statistically significant similarity on their phytate content. Similarly, the mean value of tannin of the collected samples was 358.89mg/100gm with all regions having a statistically significant similarity. The molar ratio of phytate to iron, zinc and calcium was analyzed to be 0.67, 17.56 and 0.012 respectively. Since the phyate to zinc molar ratio is above 15, its bioavailability was observed to low. The mean values of Vitamin C and beta-carotene was also seen to be 28.49 mg/100gm and 12.95 mg/100gm respectively.

Conclusion

- Nutritional variations was observed among the samples obtained from different regions
- Could be attributed to the genetic background of the plant, in terms of ecotype and cultivar, environmental factors
- This include the soil and climate (Sanchez-Machado et al., 2009)
- M. Stenopetala leaves are rich in nutrients and has potential to be used as protein and mineral resource for animal and human food formulations
- Drying the leaves assists to concentrate and reduce some of the anit-nutritonal factors
- M. Stenopetala leaves in Ethiopia has comparable and appreciable nutritional profile as M. Olifera
- Processing is required to reduce the phytate content so that minerals like Zinc can be used by the body during consumption
- Statistically significant difference in the mean values of all nutrition composition parameters between study regions

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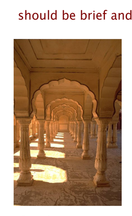

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