Evaluation of proximate composition, minerals and micronutrient contents of finger millet herbi dumpling”

Abstract

Finger millet is an important crop in Maharashtra, Orissa, and Tamil Nadu. Millet production and consumption have been on the decline for some years. Finger millet samples were gathered from regional locations in Nashik and Kolhapur, Maharashtra. These were also taken as samples for chemical composition and proximate analysis. Standard analytical procedures were used to determine the results. The result of the chemical composition , Nashik (sample one) was found to be Ca mg(6.19), Mg (0.52), Fe (1.09), Zn (1.74± 0.96), Cu (0.10), P (8.90) These findings suggest that finger millet is a good source of calcium and phosphorus. These can be utilised as calcium supplement foods, and their composite flours can be used to preserve a variety of nutrient-dense recipes that can be employed as part of a supplement feeding regimen.

Keywords: Ragi Flour, Herbi Dumpling, nutritional composition, finger milet , micronutrient, proximate composition

Introduction

“The term millet is derived from the French word “mille’’ which means thousand, with a handful of millet containing up to 1000 grains” (Shahidi &Chandrasekara, 2013). Finger millet (*Eleusine coracana*) popularly well-known as ragi, nachni or Nagli is one of the important millets grown broadly in different regions of India and Africa ((Muktar, et.al., 2018; Majumder *et al*., 2006). “Finger millet is a drought resistant crop and used as a staple food in India as well as African countries” (Devi *et al.,* 2014).

“Finger millet is similar to reddish mustered and it is fast growing cereal crop that reaches at maturity level within 3 to 6 months and sometimes in only 45 days” (Dida et al. 2006).Commonly, it is harvested in December and January. Finger millet is similar to protein rice (6-8%) and fat (1-2 %) and better than rice and wheat with reference to minerals and micronutrients (Kumari, P. L. and Sumathi, S. 2002; Dubey, P. and Mishra, S.). “Finger millet is an

enriched of carbohydrates, proteins, minerals, sugars, starch and dietary fibre. The proximate composition of finger millet grains has been studied by many researchers" (Wadikar et al., 2007). Finger millet is also a major source of micro nutrients especially of calcium and iron (Verma *et al*., 2013). Calcium and Iron play a significant role in the human body. Deficiency of calcium can lead to muscles pain and increase the risk of fractures. Deficiency of iron can lead to Anaemia (Verma and Mishra, 2018). Therefore, Ragi plays a key role as a natural treatment for several patients who suffering from Anaemia, diabetes, muscles pain and also bone fractures. Finger millet is capable of fulfil the requirement of calcium and iron in human body (Siddiqui, *et al*., 2015).

"Utilization of Finger millet involves traditional and other processing methods such as soaking, malting, cooking, fermentation, popping and radiation" (Rao and Muralikrishna, 2001). "These processes are utilised to improve digestibility and nutritional quality of micronutrients and inhibitory activities of antinutrients such as phenols, phytic acids and tannins" (Pawar and Dhanvijay, 2007).

Eryngium foetidum, *Rumex acetosa* and *Centella Asiatica* were used in preparation of herbidumbling. *Eryngium foetidum* is popularly known by several local names, such as Mexican coriander, spirit weed, fit weed, cilantro and bhandhania (Duke JA., 2009). "This herb is used by indigenous people of Northeast India as a kitchen food. The fresh leaves of *Eryngiumfoetidum* contain over 85% moisture, 3.3% protein, 0.6% fat, 6.5% carbohydrate, 1.7% ash, 0.06% phosphorus and 0.02% iron (Culantro, 1999). The nutritional value of the plants growing in Assam, India and South China has been well-known" (Youkai, *et al.*, 2005).

Rumex acetosa is commonly known as 'Sorrel' and this perennial plant is mainly distributed in eastern Asia, Europe, and America (Kato T. and Morita Y., 1990). "This herb is used in food products with medicinal properties related to its tannin content (Vasas, *et al.,* 2015). Previous studies reported that *Rumex acetosa* possessed antioxidant, anti-hypertensive, antiviral, and anticancer effects" (Qamar, *etal.,* 2011; Gescher, *et al.,* 2011; Lee, *et al.,* 2005).

Centella Asiatica is popularly known as Gotu Kola, Asiatic pennywort, Indian pennywort or Spadeleaf and it comes from Apiaceae family. This herb has been used as vegetable in China, Southeast Asia, India, Sri Lanka, Oceania, and Africa from a long time period. This herb is traditionally used for the treatment of several diseases such as skin diseases, rheumatism,

inflammation, syphilis, mental illness, epilepsy, hysteria, dehydration, and diarrhea (Yu QL, *et al.*, 2006). In India, *Centella asiatica* is used as medicine for trigger the memory and forskin diseases and nerve related disorder treatment (Jamil, *et al.*, 2007), In China, it is indigenously called as Gotu kola, and over 2000 years ago, it was one of the well-known as "miracle elixirs of life" (Diwan, *et al.*, 1991).

In this study, the herbi dumpling can be defined as a final product obtained by ragi flour, corn flour sugar, Dehydrated Carrot powder, dehydrated pea powder, Eryngium foetidum powder, Rumex acetosa powder, Centella Asiatica powder, and salt (Taynath, 2018). "Herbi dumpling preparations should be analyzed the proximate composition, minerals, micronutrients and the influence of processing on the nutritional functionality. Hence, the information generated in the present investigation will be useful for their certification as quality food for consumers. The rising demands of users for healthy and nutritious food have encouraged the researchers to develop value added food products" (Tiwari, A. and Mishra, S., 2018; Mishra, V. and Mishra, S. 2020). Hence, this study focuses on preparation of herbidumbling as a final product using ragi flour, corn flour, dehydrated Carrot powder, dehydrated pea powder, Eryngium foetidum powder, Rumex acetosa powder, Centella Asiatica powder, and salt (Taynath, 2018). Herbi dumpling preparations should be analyzed for proximate composition Minerals and micronutrients for their certification as quality food for consumers.

Material and Method

The present investigation was carried out in the Department of Food Science and Nutrition, School for Home Science, Babasaheb Bhimrao Ambedkar University, A Central University, Lucknow, Uttar Pradesh, India. The proximate analyses were carried out in triplicates and the results obtained were the average values. The estimation of the various food parameters in herbi dumplings was carried out using the methods of AOAC (1990). Protein was determined as Kjeldahl nitrogen x 6.25. Carbohydrate (nitrogen-free extract) contents were calculated by the difference method.

Preparation of Herbi Dumplings

Tools: Dehydrator, Mixer and grinder, Weighing machine, Measuring spoon, Steam box, Gas stove and Packaging bags.

Estimation of calcium

The technique provided by (Piper, 1950) may be used to estimate calcium (13). An acid and methyl red indicator solution are used to neutralise the cereal ash's silica-free solution. The calcium in the sample is then transformed to calcium oxalate, which is precipitated by adjusting the pH. After that, the calcium content is evaluated by titrating the calcium oxalate with potassium permanganate standard. Calculate the quantity of Ca in the aliquot collected using the following relationship and give the findings as mg/100g of plant sample.

1ml of 0.1N $KMnO_4$ = 4 mg of Ca or 5.8 mg of CaO

Estimation of magnesium

The technique of (Piper, 1950) may be used to estimate magnesium (13). It is determined by preparing magnesium ammonium phosphate in the calcium preparation filtrate, using citrate as the solution. Finally, the $Mg_2P_2O_7$ is weighed and transformed into the Mg by multiplying. The relationship is seen below.

0.2184 × weight of $Mg_2P_2O_7$ = weight of Mg

Estimation of iron

The technique of (Lindsay and Norvell, 1978) was used to determine iron levels (9). H_2SO_4, HNO_3, and $HClO_4$ are used to wet ash the sample. The colour of an aliquot of the extract is measured in a photometer at 535m after it has been treated with thioglycollic acid. Using the standard curve, calculate the quantity of iron (ferric) form in the sample and express it as mg/100g of sample.

Estimation of zinc

“Zinc can be determined by the method described by (Cowling and Miller, 1941)(3). Colorimetrically based on the extraction of all dithizone metals from a sample solution, separation of zinc and other metals from copper by shaking with HCL, and re-extraction of zinc from this solution with dithizone in the presence of sodium diethyldithiocarbamate, which forms stable complexes with all metals present except zinc, so that zinc is the only metal that passes into the dithizone-carbontracholride phase in the second extraction with dithizone. At 535cm, the colour intensity is red colorimetrically. Using the standard curve, calculate the quantity of zinc in the aliquot sample and express the findings as mg/100g of sample” (Cowling and Miller, 1941).

2.2.5 Estimation of copper

The technique of (Callan and Henderson, 1929) may be used to determine copper (2). The copper salt of diethyldithiocarbamic acid is obtained by treating the copper recovered from sample ash using the wet oxidation process with sodium diethyldithiocarbamate. At 440nm, the golden brown hue created is colorimetrically read. Over the pH range of 5.7 to 9.2, the procedure is sensitive and unaffected by pH. Calculate the quantity of copper in the sample using the standard curve and express the findings as mg/100g of sample, taking the dilution factor into account.

Estimation of phosphorus

“The technique given by (Piper, 1950) may be used to figure out how much phosphorus there is (13). The sample ash was dried using a carbonate-nitrate fusion combination, and the ash was extracted with TCA. Acid molybdate solution with 1,2,4- amino-naptholsulphuric acid reagent The intensity of the blue colour is proportional to the quantity of phosphorus present. The colour intensity is photometrically measured at 660nm”.

Proximate analysis for sample

Estimation of total solid

The total solids content was determine by gravimetric method as per IS: 1479 (part- II), 1961(7).

$$\text{Total Solid (\%)} = \frac{\text{Weight of residue} * 100}{\text{Weight of sample}}$$

Estimation of moisture

Moisture content in the sample was determine bysubtracting the total solids content from 100 in the sample(16).

Moisture (%) = 100 - total solids (%)

Estimation of total fat

The fat Content was determine by Gerber method as described in IS: 1224 (part-I), 1977(6).

Estimation of protein

The protein percentage of millet was determine by estimating the per cent nitrogen by Micro-Kjeldhal method as recommended in IS: 1479 (part II), 1961(8).
Where,

A = Volume in ml N/10 NaOH in blank determination
B = Volume in ml of N/10 NaOH in the rest
W = Weight in mg of sample taken

The protein per cent was calculated by multiplying nitrogen percentage with factor 6.25.

Protein (%) =Percent total nitrogen × 6. 25

Estimation of Crude Fiber

The fiber content was determine by Calculating crude fibre on dry wt. basis by giving correction for the moisture content(11).
W1- W2□□
Crude fiber % by wt =100

W

Where,
W1 = wt in gm of Gooch crucible and contents before ashing.

W2 = wt in gm of Gooch crucible containing asbestos and ash.

W = wt in gm of the dried material taken for the test.

2.3.7 Estimation of carbohydrate

Carbohydrate content in sample is estimated by subtractions method i.e.(16).

Carbohydrate = Total Solids - (Fat + Protein + Ash)

Collection of Ingredients: The herbs *Eryngium foetidum*, *Rumex acetosa*, *Centella Asiatica* leaf collected from market located in Guwahati. Ragi flour, corn flour, carrot and peas are purchased from market in Lucknow.

Preparation of leaf powder of herbs: Collect fresh Eryngium foetidum, Rumex acetosa, Centella Asiatica leaves, processed to remove dirt and another field damaged portion. The clean and fresh leaves dried in dehydrator at 35°C for 8 hours. Collect all dried leaves were ground into powder in a grinder.

Preparation of Herbi Dumplings : Collect all the ingredients and mixed it. Add water and knead into soft dough and divide the dough into equal portion and roll out each portion into a round and filled with grind vegetables. Heat a steamer and steamed each herbi dumplings on a slow flame for 10 to 15 minutes.

Table.1. Ingredients of herbi dumplings

S.No.	Ingredients	Amount (in gm)
1.	Ragi flour (Finger millets)	200 gm
2.	Corn flour	200 gm
3.	Dehydrated Carrot powder	20 gm
4.	Dehydrated pea powder	20 gm
5.	*Eryngium foetidum* powder	10 gm
6.	*Rumex acetosa* powder	20 gm
7.	*Centella Asiatica* powder	20 gm
8.	Salt	According to taste

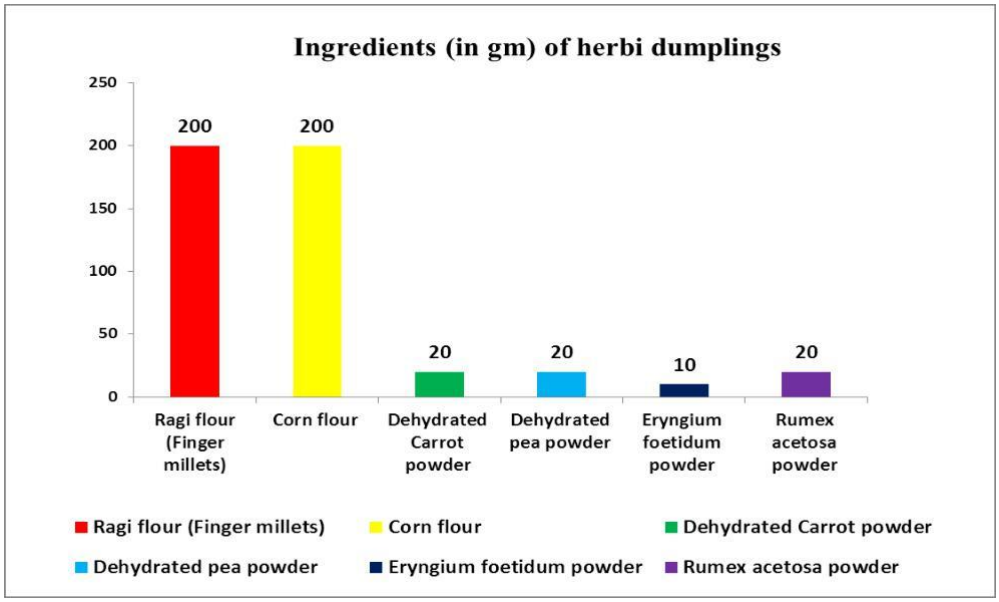

Figure.1. Ingredients of herbi dumplings

Packaging: Food packaging is the most important and reliable process is necessary for food containment. This is the common method to safely control and protect the food against physical, chemical, biological and environmental factors. Aseptic packaging was used for the packaging of final product of herbidumbling in the form of flour. It is a well-accepted packaging method for the preservation of liquid and particulate foods. It is a type of thermal sterilization. It is a method in which commercially sterilized food product is placed in a sterilized packet and seal under aseptic environment. It is highly recommended for the preservation of fruit juices, tomato paste and food products. Paper and plastic are commonly used in aseptic packaging. Apart from this, foil wrap, plastic bags, metal cans & bottles, and various metal containers are used in aseptic packaging.

Result and Discussion

Proximate Composition

The result and discussion of the study are based on quality and sensory evaluation of herbi dumplings. Table 2 presents proximate composition of the herbi dumplings. The moisture content of herbi dumpling is 7.99 % and it can be stored for long time without spoilage. The value of 3.11 in herbi dumpling is considered appropriate, because it aids absorption of glucose, poison, fat and also increase fecal sample. The crude lipid content obtained for herbi dumplings was 1.12 %. Ash content of 2.49 % was obtained as a result for herbi dumpling. Crude fibre in food is an indication of the level of non-digestible carbohydrate and lignin. The crude protein of herbi dumpling is 11.32%. The carbohydrate content of herbi dumpling was 79.44%. The product is a good source of carbohydrate. The caloric value of herbi dumpling was 354.54 kcal/g. An average person requires 2000-3000 kcal per day (Jones et al., 1985). Herbi dumpling as a food fulfills the caloric requirement of the body.

Table.2 Proximate Composition of HerbiDumbling

S. No.	Component	Value
1.	Moisture	7.99%
2.	Crude Fibre	3.11%
3.	Crude Fat	1.12%
4.	Ash	2.49%
5.	Crude Protein	11.32%
6.	Carbohydrates	79.44%
7.	Energy (Kcal.)	354.54(Kcal.)

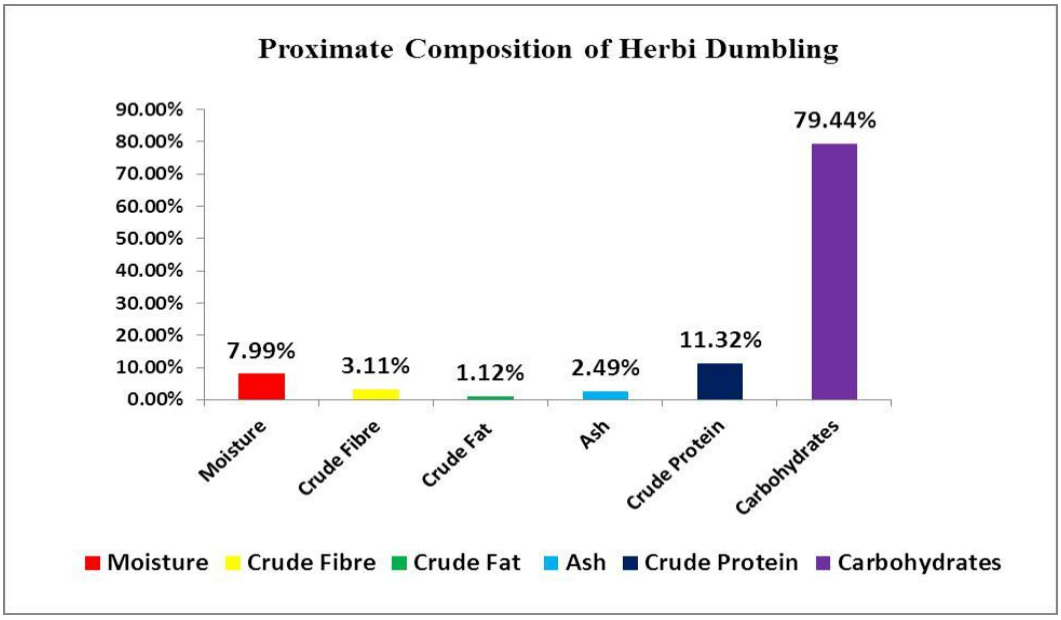

Figure.2. Micro Nutrients of HerbiDumbling

Table 3 presents the result of minerals and micro nutrients of herbi dumpling in mg/kg dry matter. The sodium content was 5.89 mg/g. The potassium content was 8.19 mg/g. The value obtained for calcium was 6.19 mg/g. The iron content was 1.09 mg/g. The manganese content was 0.52mg/g and copper content was 0.10 mg/g.

Table 3 Macro Minerals and Micro Nutrients of HerbiDumbling

S. No.	Macro Minerals and Micro Nutrients	Concentration mg/g
1.	Sodium	5.89
2.	Potassium	8.19
3.	Calcium	6.19
4.	Iron	1.09
5.	Manganese	0.52
6.	Copper	0.10

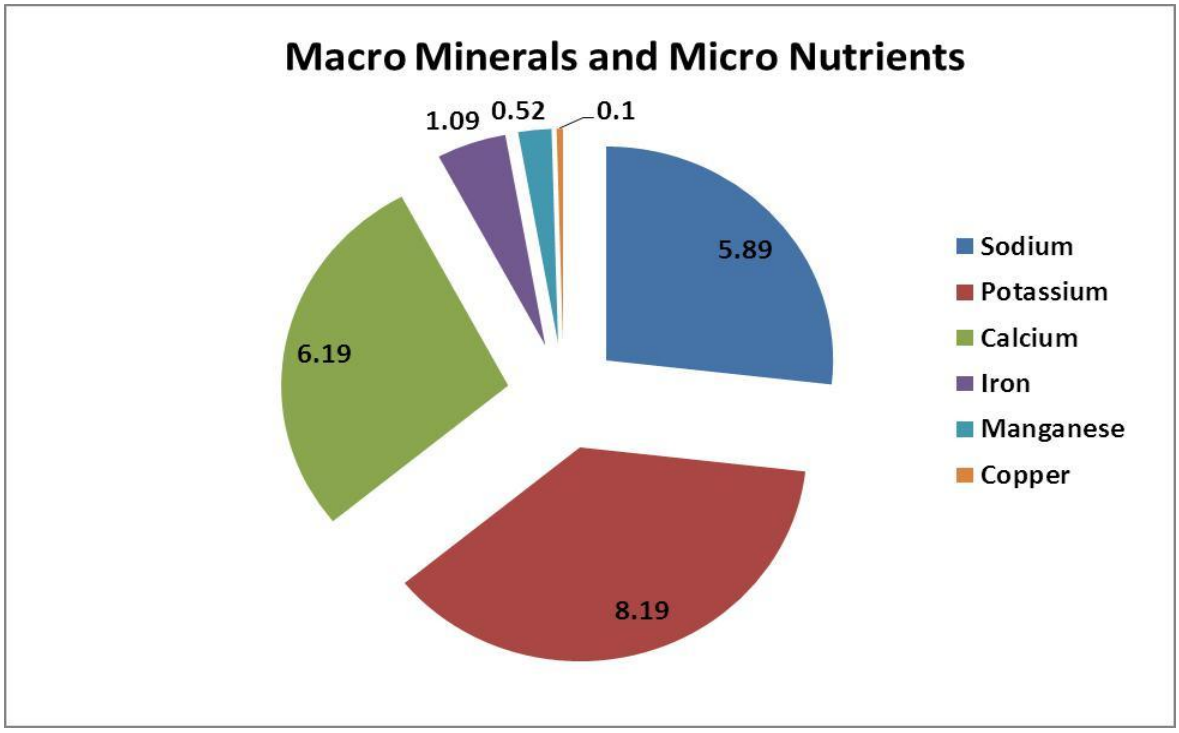

Figure.3. Macro Minerals and Micro Nutrients of Herbi Dumplings

Conclusion

In the present investigation attempts have been made to study of finger millet herbi dumpling for proximate composition minerals and micronutrients content. The result of the study shows that the incorporation of ragi flour is found to be most acceptable to obtain herbi dumplings with improved nutritional value and health benefits. In present study the efforts are made towards the nourishment of herbi dumplings with ragi flour can be more beneficial for several disease such as anaemia, diabetes, brittle bones, osteoporosis and also increase bone strength.

Recommendation

1. This product can be useful for diabetes and obese patients as well as growing children.
2. The herbi dumplings cheap in cost and easy to prepare so it can be used daily to fulfill the requirements of nutrients.

References

1. Devi, P.B., Vijayabharathi, R., Sathyabama, S., Malleshi, N.G. and Priyadarisini, V.B. (2014). Health benefits of finger millet (Eleusinecoracana L.) polyphenols and dietary fiber: A review. J. Food Sci. Technol. 51: 1021-1040.

2. Pawar, P. A. and V.P. Dhanvijay, 2007. Weaning foods: An overview. Beverage Food World, 34(11): 27-33

3. Rao S.M.V.S.S.T. and G. Muralikrishna, 2001. Nonstarch polysaccharides and bound phenolic acids from native and malted finger millet (Ragi, Eleusine coracana, Indaf-15). Food Chem., 72 : 187-192.

4. Shahidi, F., &Chandrasekara, A. (2013). Millet grain phenolics and their role in diseases risk reduction and health promotion – review. Journal of Functional Foods, 5(2), 570-581.

5. Siddiqui, Rafat, Ajmal Mohammed, and Z. Aleem. (2015). "Utilization of finger millets and soy flour in the preparation of papad." International Journal of Processing and Post-Harvest Technology, 41- 47.

6. Taynath, Santosh Jagannath, Adhau, Gajanan Wamanrao and Said, Prashant Pandharinath, 2018. Development and Sensory Evaluation of Ragi-Wheat Composite Cake. Current Research in Nutrition and Food Science, Vol. 06, No. (1), 142-147.

7. Verma, S. and Mishra, S. (2018). “Preparation and Nutritional Composition of Noodles and Papads using Ragi Flour.” International Journal of Science and Research (IJSR), 253-255.

8. Verma, Veenu, and Patel, S. (2013). "Value-added products from nutri-cereals: finger millet (Eleusinecoracana)." Emirates Journal of Food and Agriculture, 169-176.

9. Wadikar, D.D., Premavalli, K.S., Satyanarayanaswamy, Y.S. and Bawa, A.S. (2007). Lipid profile of finger millet (Eleusine coracana) varieties. J. Food Sci. Technol. 44:79-81.

10. Tiwari, A. and Mishra, S., (2018). Nutritive Evaluation Of Wheat Bran Biscuits Incorporated With Flaxseed. International Journal of Science and Research, ISSN: 2319-7064.

11. Mishra, V. and Mishra, S. (2020). Formulation of Jowar Laddu Incorporated With Banana Peel Powder and Aswagandha Powder. International Journal of Scientific Research in Science and Technology, 82-87, ISSN: 2395-601.

12. Kumari, P. L., and Sumathi, S. (2002). Effect of consumption of finger millet on hyperglycemia in non-insulin dependent diabetes mellitus (NIDDM) subjects. Plant Foods for Human Nutrition, 57(3-4), 205-213.

13. Dubey, P. and Mishra, S., (2020). Dietary implication of miracle cereal Finger Millet (Eleusine Coracana) and It's product development. Aegaeum Journal, 8(7), 1306-1316.

14. De Wet, JM J (2006). Eleusine coracana (L.) Gaertn. Record from Protabase. Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa / Ressourcesvégétales de l'Afriquetropicale), Wageningen, Netherlands.

15. Duke JA. (2009). Duke's handbook of medicinal plants of Latin America. USA: CRC Press, Taylor and Franci, 298–300.

16. Prasad PRC, Reddy CS, Raza SH, Dutt CBS. (2008). Folklore medicinal plants of North Andaman Islands, India. Fitoterapia, 79:458–64.

17. Ramcharan C. Culantro (1999). A much utilized, little-understood herb. In: Janick J, editor. Perspectives on new crops and new uses. Alexandria, VA, USA: ASHS Press, 506–9.

18. Youkai X, Hongmao L, Xiansheng D and Chunfen X. (2005). Study on nutritional contents of Eryngium foetidum cultivated under different intensities of sunlight. Chinese J Trop Crops, 1:75–8.

19. Kato T, Morita Y. (1990). C-glycosylflavones with acetyl substitution from Rumex acetosa L. *Chem Pharm Bull.***38**(8):2277–2280.

20. Vasas A, Orbán-Gyapai O, Hohmann J. (2015). The genus Rumex: review of traditional uses, phytochemistry and pharmacology. *J Ethnopharmacol.***175**:198–228.

21. Qamar, HM-U-D, Qayyum R, Salma U, Khan S, Khan T, Shah AJ.,(2011). Vascular mechanisms underlying the hypotensive effect of Rumex acetosa. Pharm Biol, 56 (1):225–234.

22. Gescher, K, Hensel A, Hafezi W, Derksen A, Kuhn J., (2011). Oligomeric proanthocyanidins from Rumex acetosa L. inhibit the attachment of herpes simplex virus type-1. Antivir Res, 89 (1):9–18.

23. Lee, N-J, Choi J-H, Koo B-S, Ryu S-Y, Han Y-H, Lee S-I, Lee D-U., (2005). Antimutagenicity and cytotoxicity of the constituents from the aerial parts of Rumex acetosa Biol Pharm Bull, 28 (11):2158–2161.

24. Yu QL, Duan HQ, Takaishi Y and Gao WY., (2006). A novel triterpene from Centella asiatica. Molecules, 11(9):661-5.

25. Jamil, S. S., Nizami, Q. and Salam, M.,(2007). Centella asiatica (Linn.) Urban-a review. Nat Prod Radiance, 6(2):158-70.

26. Diwan, P.V., Karwande, I. and Singh, A.K., (1991). Anti-anxiety profile of mandukparni (Centella asiatica) in animals. Fitoterapia 1991;62:253-7.