Pallavi Tomar
M.Sc. Research Student,
Food Science and Nutrition
Department, Chandra Shekhar
Azad University of Agriculture &
Technology, Kanpur,
Uttar Pradesh, India

Dr. Seema Sonkar
Assistant Professor,
Food Science and Nutrition
Department, Chandra Shekhar
Azad University of Agriculture &
Technology, Kanpur,
Uttar Pradesh, India

Nutritional and sensory evaluation of *Moringa oleifera* fortified pasta

Pallavi Tomar and Dr. Seema Sonkar

Abstract
Present study was undertaken to evaluate the quality of pasta supplemented with different proportion of Moringa powder. Three treatment (T1, T2 and T3) of Pasta were prepared by using rice flour and different proportion of Moringa powder. Control sample containing only 100% Maida. All the treatment was evaluated for the nutritional and sensory quality. In India pasta is used as a fast food and if the nutritional properties of the pasta will be enhanced then it can be easily useful as a regular food. Pasta with ideal sensory and physical quality is characterized by elasticity and strength of the dough, high tensile strength and minimum cooking losses. India is largest producer of Drumsticks with an annual production of 1.1 to 1.3 million tons of tender fruits from an area of 380km 2. Drumsticks are a store house of important and anti-nutrients. All the parts of this tree are useful for Nutritional, Medicinal and Allied purpose. Drumsticks can be an extremely valuable source of various nutrients for people of all ages. Drumsticks is the richest source of Iron, beta carotene, providing micronutrient including protein, vitamin c, folic acid, Zinc and also calcium and potassium (Gopalan, 2000) Drumsticks leaves also contain good amount of Folates, Thiamine, Pyridoxine and Niacin, Antioxidants such as Flavonoids. Drumsticks are full of essential disease preventing nutrients. In India tradition maintains that the nearing tree can cure 300 diseases. The investigation was carried out in the Food Science and Nutrition Department, College of Home Science, CSA U & T, Kanpur. For this study Drumsticks powder has been prepare by sun drying method. Pasta (extruded product) has been prepared from the Drumsticks powder. Each product has three treatments and one control along with three different replications. Prepared product evaluated with sensory evaluation. According to Sensory Evaluation T1 (7.47) were Best in the product of Pasta among the three treatment that is ''liked moderately and liked slightly''. So, the study suggests that drumstick can be used for prepared fortified food products because of its high acceptability and nutritional and medicinal quality.

Keywords: *Moringa oleifera*, organoleptic property, nutrients

Introduction

The drumstick tree is a small fast growing tree which is native to India. Development of food products conforming to consumer needs is the biggest challenge for processed food industries. Food formulators perceive health and wellness as the consumer trend. With the changes in the socioeconomic scenario talking place at a rapid pace, increased participation of women in work force and altered attitudes to leisure activities, the time for planning and cooking foods has significantly reduced. This has given boost to the manufacture and marketing or convenience foods. The Moringa consumed by humans throughout the century in diverse culinary ways. Almost all parts of the plant used for taste, flavour or as vegetable and seed activities culturally for its nutritional value, purported medicinal properties. Pasta is traditionally Italian food made by refined wheat flour it can also made by durum wheat or mixed grain. In India pasta is used as a fast food and if the nutritional properties of the pasta will be enhanced then it can be easily useful as regular food. Pasta product are widely accepted by the children and elder persons, but the major problem is that they are not accepted pasta as a healthy food due to low nutrients and dietary fibres. (Mishra *et al*., 2016) [12] presence of various types of antioxidant compounds make *Moringa oleifera* plant a valuable source of natural antioxidants and a good source of nutraceutical. The objective of this investigation was critically planned to assess the characteristics of *Moringa oleifera* powder in a order to further use a functional food ingredient in the food and pharmaceutical products of concern also

Corresponding Author:
Pallavi Tomar
M.Sc Research Student,
Food Science and Nutrition
Department, Chandra Shekhar
Azad University of Agriculture &
Technology, Kanpur,
Uttar Pradesh, India

basically to enhance this important less explored readily available in certain parts of the country in a self stable easily usable from the masses for the purpose. The leaves can be dried, ground into a powder and stored without refrigeration conditions for many months and without loss of nutrients. The dried powder is completely edible and is used in soups and a variety of traditional foods. The Moringa leaves are quite versatile as they can be eaten fresh, cooked, or stored as dried powder. the powdered Moringa are packed with nutritional properties as they are a rich source of protein (23.78g/100g), fiber (11.8g/100g), Beta carotene (36800ug/100g), vitamin C (56g/100g) and minerals like calcium (3467mg/100g), iron(19mg/100g), phosphorous (215mg/100gh) and potassium (1467mg/100g). The *Moringa oleifera* also perform various pharmacological activities in our system, such as analgesic, antihypertensive, antitumor activity, and anti-inflammatory effects. The calorie content in *Moringa oleifera* is also less, making it suitable for obese patients. Along with nutritional properties, the leaves are loaded with medicinal benefits as they possess flavonol and phenolic acid which have the ability to inhibit prostate cancer and breast cancer. Root, bark, flower and leaves are used for treatment of infectious disease along with cardiovascular and gastrointestinal disorders. It has been found that the *Moringa oleifera* contain natural antioxidants such as vitamin C, tocopherols, flavonoids and other phenolic compounds. Studies report the multipurpose use of different parts of drumstick tree in food for human consumption such as bread, Pasta, biscuits and soup.

Materials and Methods
Raw materials i.e. Drumsticks was purchased from Chandra Shekhar Azad University of agriculture and technology, Kanpur. Pearl millet and corn was purchased from the local market of Kanpur. Other ingredients from for making pasta were also purchased from the local market in a single lot.

Preparation of Moringa flour
Wash the Moringa pods and leaves. Then remove the outer layer of Moringa pods. Now Moringa pulp, pods, leaves spread on the cloth and let it dry in sunlight and cover with mosquito net while drying. After drying, dried Moringa put into mixer and crumble them into fine powder and sieved to get fine powder.

Preparation of Moringa pasta
Mix the drumstick powder, rice flour, corn flour in a bowl. Then well prepared the soft dough with help of water for 3-4 minutes. Now with pasta machine or by hand roll dough out to desired thinness or use knife to cut in to strips of desired width. Then dry the pasta in sunshine for two days and keep in air tight container, and keep for 3 months in room temperature. After the preparation Moringa pasta, were packed separately in laminated aluminium foil according to the treatments and labelled individually. Different combinations of Moringa pasta were assessed for Organoleptic and nutrition qualities.

Sensory analysis of Moringa pasta
Sensory evaluation (9 point hedonic score card) Sensory evaluation of the control and formulated product was done using a semi-trained panel of 30 members. The panelists scored on the basis of Color and appearance, odour, flavour, texture and overall acceptability on a 9- point hedonic scale as described by FAO (Food and Agriculture Organization).

Statistical analysis
The results were statistically analyzed by determining Arithmetic mean. The difference in quality parameters and acceptability scores of the product were determined statistically using analysis of variance techniques using Completely Randomized Design (CRD) (Snedecor Sand Cochan, 1968).

Result and Discussion
The present study was undertaken to study the nutritional and organoleptic characteristic of fortified food product developed from drumstick (*Moringa oleifera*). Nutritional characters that were studied included Moisture, Ash, Protein and Iron content.

Control-100% Maida
T1- 70% Rice flour+ 20% corn flour+10% Drumstick powder
T2- 70% Rice flour+15% corn flour+15% Drumstick powder
T3- 70% rice flour+ 10%corn flour+ 20% Drumstick powder
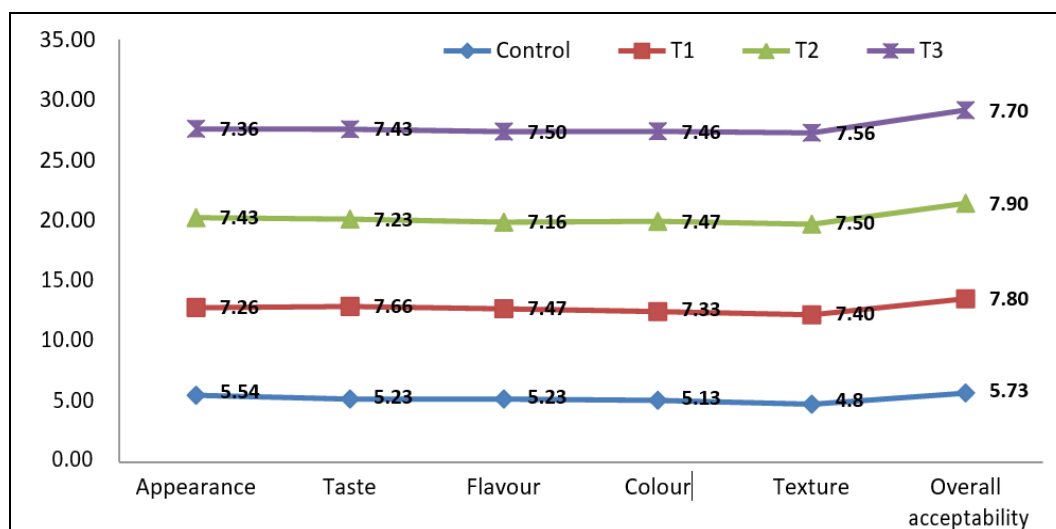
Sensory analysis of Moringa pasta

Fig 1: Sensonory analysis of Moringa Pasta

Table 1: Sensory Analysis of Moringa Pasta

Products	Appearance	Taste	Flavour	Colour	Texture	Overall acceptability
Control	5.54 ± 0.19	5.23±0.21	5.23±0.26	5.13±0.24	4.80±0.22	5.73±0.16
T1	7.26 ± 0.21	7.66±0.15	7.47±0.12	7.33±0.15	7.40±0.12	7.80±0.12
T2	7.43 ± 0.15	7.23±0.11	7.16±0.12	7.47±0.12	7.50±0.09	7.90±0.19
T3	7.36 ± 0.18	7.43±0.15	7.50±0.15	7.46±0.18	7.56±0.16	7.70±0.18
C.D (P≤0.05)	0.55	0.56	0.47	0.57	0.48	0.57

Values are mean ± SE of Thirty Independent Determinations

Appearance
Mean sensory score of Appearance of *Moringa* Pasta ranged from 5.54 – 7.36. Maximum score of 7.43 was shown by T2 sample, falling in "Like moderately'' category and 7.36 was shown by T3 sample, falling in "Like moderately'' category. Minimum score of 5.54 was shown by control sample, falling in "Neither like nor dislike'' category. While T1, T2 and T3 sample result were also encouraging T1, T2 and T3 sample was "Like moderately'' achieving 7.26, 7.43 and 7.36 score. All types of pasta were differed significantly (P≤0.05) for their appearance in comparison to control pasta.

Taste: Mean sensory score of Taste of *Moringa* Pasta ranged 5.23 – 7.43. Maximum score of 7.66 was shown by T1 sample, falling in "Like moderately'' category and 7.43 was shown by T3 sample, falling in "Like moderately'' category. Minimum score of 5.23 was shown by control sample, falling in "Neither like nor dislike'' category. While T1, T2 and T3 sample result were also encouraging T1, T2 and T3 sample was'' like moderately'' achieving 7.66, 7.23 and 7.36 score. There was significant difference observed in the taste of all types of pasta in comparison to control.

Flavour: Mean sensory score of Flavour of *Moringa* Pasta ranged 5.23 – 7.50. Maximum score of 7.50 was shown by T3 sample, falling in "Like moderately'' category and 7.47 was shown by T1 sample, falling in "Like moderately'' category. Minimum score of 5.23 was shown by control sample, falling in "Neither like nor dislike'' category. While T1, T2 and T3 sample result were also encouraging T1, T2 and T3 sample was'' like moderately'' achieving 7.47, 7.16 and 7.50 score. In respect of flavour, all types of pasta were differed significantly in comparison to control.

Colour: Mean sensory score of Colour of *Moringa* Pasta ranged 5.13 – 7.46. Maximum score of 7.46 was shown by T3 sample, falling in "Like moderately'' category and 7.47 was shown by T2 sample, falling in "Like moderately'' category. Minimum score of 5.13 was shown by control sample, falling in "Neither like nor dislike'' category. While T1, T2 and T3 sample result were also encouraging T1, T2 and T3 sample was'' like moderately'' achieving 7.33, 7.47 and 7.46 score. There was significant difference observed in the colour of all types of pasta in comparison to control pasta.

Texture: Mean sensory score of Texture of *Moringa* Pasta ranged 4.80 – 7.56. Maximum score of 7.56 was shown by T3 sample, falling in "Like moderately'' category and 7.50 was shown by T2 sample, falling in "Like moderately'' category. Minimum score of 4.80 was shown by control sample, falling in "Like slightly'' category. While T1, T2 and T3 sample result were also encouraging T1, T2 and T3 sample was'' like moderately'' achieving 7.40, 7.50 and 7.56 score. In respect of texture, all types of pasta were differed significantly in comparison to control pasta.

Overall acceptability: Mean sensory score of Overall acceptability of *Moringa* Pasta ranged 5.73 – 7.70. Maximum score of 7.90 was shown by T2 sample, falling in "Like moderately'' category and 7.70 was shown by T3 sample, falling in "Like moderately'' category. Minimum score of 5.73 was shown by control sample, falling in "Neither like nor dislike'' category. While T1, T2 and T3 sample result were also encouraging T1, T2 and T3 sample was'' like moderately'' achieving 7.80, 7.90 and 7.70 score. There was significant difference observed in the overall acceptability of all types of pasta in comparison to control pasta.

Moisture
The moisture content of the pasta range from 2.05 -1.83%. Maximum moisture content in treatment 2 (2.44%), whereas treatment 1 showed minimum (1.35%) moisture content. Control and treatment 3 had 2.05 and 1.83% moisture content, respectively. Statistical analysis of data showed that the moisture content of all types of pasta differed significantly.

Ash
Total ash content of foodstuff represents the total mineral content of the food. The pasta contains total ash content of (9.76 – 8.55%). Maximum ash content in control (9.76%) and treatment 198.96%), whereas treatment 2 and treatment 3 had 8.84% and 8.55% ash content, respectively. The ash content of T1, T2 and T3 pasta was found statistically similar.

Protein
Protein is necessary for tissue synthesis and body building and it is needed for the synthesis for enzyme, hormones and neurotransmitters. Protein content of pasta range from (8.82 – 5.94%). The maximum protein content in control (8.82%) and treatment 2 (7.36%). Whereas, treatment 1 and treatment 3 showed maximum (5.63%) and (5.94%). The results of present study indicated that the protein content of all types of pasta differed significantly.

Iron
The data in table shows that the iron content of pasta ranged from 13.34 - 36.65mg/100gm. Maximum score of treatment 3 (36.65mg/100gm). Minimum content of iron in control (13.34mg/100gm). Treatment 1 and treatment 2 had 18.33 and 20.73mg/100gm iron content, respectively. From the results of present investigation observed that the iron content of all types of pasta differed significantly.

Conclusion
Mean sensory score of appearance of *Moringa* pasta ranged from 5.54 – 7.36. Maximum score of 7.43 was shown by T2 sample, falling in "Like moderately'' category. Mean sensory score of taste of *Moringa* pasta ranged 5.23 – 7.43. Maximum score of 7.66 was shown by T1 sample, falling in "Like moderately'' category. Mean sensory score of Flavour of *Moringa* pasta ranged 5.23 – 7.50. Maximum score of 7.50 was shown by T3 sample, falling in "Like moderately''

category and 7.47 was shown by T1 sample, falling in "Like moderately'' category. Mean sensory score of Colour of *Moringa* Pasta ranged 5.13 – 7.46. Maximum score of 7.46 was shown by T3 sample, falling in "Like moderately'' category. Mean sensory score of Texture of *Moringa* Pasta ranged 4.80 – 7.56. Maximum score of 7.56 was shown by T3 sample, falling in "Like moderately'' category. Mean sensory score of Overall acceptability of *Moringa* Pasta ranged 5.73 – 7.70. Maximum score of 7.90 was shown by T2 sample, falling in "Like moderately'' category and 7.70 was shown by T3 sample, falling in "Like moderately'' category.

The moisture content of the pasta varied from 2.05 -1.83%. Maximum moisture content in treatment 2 (2.44%). The pasta contains total ash content of (9.76 – 8.55%). Maximum ash content in control (9.76%) and treatment 1 8.96%). Protein content of pasta ranged from (8.82 – 5.94%). The maximum protein content in control (8.82%) and treatment 2 (7.36%). The iron content of pasta ranged from 13.34 - 36.65mg/100gm. Maximum score of treatment 3 (36.65mg/100gm). So, with the current status of nutritional quality of pasta and growing demand of nutritious foods, it seems worthwhile to take efforts in enhancing the nutritional value of pasta.

References

1. Gidami AB, Panga JT, Sarwatt SV, Chone BE, Shayo NB. Nutrient and antinutrient contents in raw and cooked young leaves and immature pods of *Moringa oleifera.* Ecol. Food Nutr. 2004;93(6):399-411.
2. Gidami AB, Panga JT, Sarwatt SV, Chone BE, Shayo NB. Nutrient and antinutrient contents in raw and cooked young leaves and immature pods of *Moringa oleifera.* Ecol. Food Nutr. 2004;93(6):399-411.
3. Gopalakrishnan L, Doriya K, Kumar DS. *Moringa oleifera*: A review on nutritive importance and its medicinal application. Food science and human wellness. 2016 Jun 1;5(2):49-56.
4. Mahmood KT, Mugal T, Haq IU. *Moringa oleifera*: A natural gift-A review. Journal of Pharmaceutical Sciences and Research. 2010;2(11):775.
5. Makkar HPS, Becker K. Nutrients and antiquality factors in different morphological parts of the *Moringa oleifera* tree. The Journal of Agricultural Science. 1997;128(3):311-322.
6. Nambier VS, Daxini M, Bhadalkar K. Nutritional and sensory evaluation of dried drumstick leaf (*Moringa oleifera*) recipes. Indian Food Packer. 2003;(11-12):156-161.
7. Nambiar VS, Parnami S. Standardization and Organoleptic evaluation of Drumstick (*Moringa oleifera*) leaves incorporated into traditional recipes. Trees for life Journal. 2008;3(2):1-7.
8. Ogunsina BS, Radha C, Indrani D. Quality characteristics of bread and cookies enriched with debittered *Moringa oleifera* seed flour. International Journal of Food Sciences and Nutriton. 2011;62(2):185-194.
9. Kaur S. Nutritional value and value-addition in Drumstick-A review. Int. J Agric. Food Sci. 2021;3(2):36-41. DOI: 10.33545/2664844X.2021.v3.i2a.55
10. Seema S, Preeti T, Nand K. Development and nutritional analysis of products fortified with Moringa (*Moringa oleifera*). Hort Flora Research Spectrum. 2015;4(1):86-88.
11. Payal S, Khan BL, Yadav MPS, Seema S. Effect of drumstick leaves' extracts on the nutritional quality of 'Moringa Paneer' Prepared from different blend of cow milk and leaves extract. Progressive Agriculture. 2010;10(1):98-101.
12. Piyush Mishra, Devedra Kumar Bhatt. A study on department of fortified pasta woth ginger powder IOSR journal of environmental science, toxicology and food technology. 2016;10(8):14-18.