



DEVELOPMENT & SENSORY EVALUATION OF PROSO MILLET INCORPORATED IN BIRYANI.

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ABSTRACT:

Proso millet (*Panicum miliaceum* L.) is a minor millet grown in countries such as Asia, Australia, Europe and Africa. It is popularly known as panivaragu in Tamil. Proso millet is a drought resistant variety which is superior to other cereals, Vitamin-B1 and B2 is twice as high as rice, wheat and barley comparatively. This study was carried out to incorporate millet among adults in one of the India's well liked dish biryani. In the present study, Proso millet is used for the preparation of biryani where refined grain is replaced with proso millet. By using proso millet, vegetables, yoghurt, spices, onions, coriander leaves, and fried since many of the food industries faced an increased demand to produce healthier food products for a healthy life style by the consumers. This paper focuses on the new and changing role for incorporating authentic millets in the food industry. **Design of the study:** Millet biryani was developed onions used as a garnish. sensory characters including appearance, taste, color, texture, and smell of the millet biryani were assessed. Five-point hedonic scale is used to assess the sensory characteristics of the product. **Place of the study:** This experimental research was carried out by panel of thirty semi trained panel members, between the age of 18 to 26 years of age residing in Chennai using a Five-point hedonic scale. **Conclusion:** The findings of the study revealed that majority 53% percent of the respondents have not seen the proso millet, 70% percent of the respondents have consumed millet and millet based foods and millet incorporated vegetable biryani has been accepted by majority of the panel members.

INTRODUCTION:

Overweight and obesity becomes the largest global challenges for current and future generation. In India, obesity is rising as a crucial health issue notably in urban areas, substantially 30-65% of adult urban Indians are either overweight, abdominal obesity, or obese. (1) The grain, rice is an essential component of the south Indian diet, and type of rice used is often considered as an indicator of socioeconomic status (highly polished & brown rice) (2) Rice is mainly composed of carbohydrates, which constitutes majority of south Indian's intake of energy. During olden days' rice has been considered as a symbol of high status, where rice is served only to the guest and at important occasions like weddings, and during festivals. But nowadays, rice is mediated as symbol of status

seeking, high-quality food and become the staple food of majority of the households whereas, millets are staple food for the low income group and poor people. Millets are packed with nutrients, prevents disease, improves body strength and contains excellent stomach filling quality.

Proso millet is a member of sub-family panicoidae of the family poacea, belongs to the group small millets and constantly referred as minor millets. It was probably domesticated in central and eastern Asia, and was cultivated in Europe in Neolithic times. (3) The proso millet (*Panicum miliaceum* L.) is also called as panivaragu in Tamil, varaga in telugu. It is generally known as common millet, yellow hog, broom corn, brown millet, mijo (Spain), panic millet (France), and Gijang (Korea). Proso millet is currently grown in Asia, Australia, North America, Europe and Africa. (4) proso millet can be divided into five races: miliaceum, patentissimum, contractum, compactum, and ovatum (5) It has high resistant to heat & drought and it exhibit as fascinating crop since they need less water to grow, compared to any other cereals. (6) At present proso millet is grown all over India in more than half a million hectares with major areas in states like Tamil Nadu, Karnataka, Andhra Pradesh and Uttarkhand. (7) It is currently grown in countries like Asia, Australia, North America, Europe, and Africa. (8) The cost of internationally traded proso millet are highly-unstable and depend on supply and demand. During the year 1993-1998, proso millet produced in the USA is sold for between US\$88 and US\$550 per ton. The price during march 2003, for example was very high (US\$690) due to severe drought in the USA at the time of production. (9)

Subject to nutritional properties, proso millet does not contains gluten-forming proteins and its gluten free so, it'll be suitable for people with coeliac disease or who intolerance to wheat (10) It is a good source of minerals like calcium, phosphorus, potassium, sodium, magnesium, manganese, iron, magnesium and zinc. (11) The protein content was found to be (11.6% of dry matter) and was significantly rich in essential amino acids (leucine, isoleucine, and methionine) than protein present in wheat. (12)

OBJECTIVES OF THE STUDY:

1. To develop a new product using proso millet.
2. To analyze the sensory characteristics of the product developed using proso millet.
3. To popularize the proso millet among the college students by assessing their knowledge and awareness of proso millet.
4. To collect data from student's perspective.

Materials and methods:

This study was planned to obtain the information such as, knowledge, awareness of consumption of proso millet among college students in Chennai. It is an Exploratory study in which structured questionnaire is used to collect information from college students. Proso millet biryani was developed, regulated to assess sensory characteristics of the developed product. Five-point hedonic scale were used to assess the sensory characteristics of the proso millet biryani.

Procurement of raw material:

Proso millet was procured from the local departmental store in Chennai, Tamil Nadu, India.

Development of millet based product:

Biryani is an energy-dense food, which is commenced from the Persian word Birian which means 'fried before cooking' and Brinji the Persian word for Rice. One of the famous biryani consumed in India is Hyderabadi biryani, which commenced as a combination of Mughlai and Iranian cuisine from the kitchen of Nizam, emperor of the historic Hyderabad state. Hyderabadi biryani is a key part of the Indian cuisine and it prepared with various

ingredients like, refined rice (basmati rice), chicken, lamb or buffalo meat, yoghurt, spices, onions, coriander leaves, saffron, and fried onion is used as a garnish. According to data analysis report from food delivery apps reported that biryani was most popular dish ordered and consumed on regular basis. Basmati rice is the key ingredient in the preparation of Hyderabadi biryani was replaced 100% with proso millet. Sensory evaluation was done with the help of five-point hedonic scale.

Hedonic scale:

Five-point hedonic scale which include, appearance, color, texture, flavor, and smell were used to assess the sensory characteristics of proso millet biryani.

Results and discussion:

Table:1

Percentage distribution of respondents who have seen the proso millet and using it in cooking.

seen	Number of respondents	percentage
Yes	14	47
No	16	53
Using PM	Number of respondents	percentage
Yes	11	37
No	19	63

Table:1 shows that majority fifty-three percentage of the respondents have not seen the proso millet and forty-seven percentage of the respondents have seen it. Subject to usage of proso millet in cooking majority sixty-three percent of the respondents are not using the proso millet in cooking and only thirty-seven percentage of the respondent are using the proso millet in cooking.

It shows that majority (fifty-three percentage) of the respondents are not aware of proso millet, because it is very uncommon, rare grain crop and also due to decrease in productivity. The production of proso millet has been decreasing due to increment importance of few selected crops and due to the adaption of modern high-yielding varieties of major-crops like rice, wheat and maize. (13) Drastic decline in cultivated area and production has been observed during the year 1955-1956 the cultivated area of small millets is 5.34 million ha has been decreased to 0,80 million ha during 2011-2012 and the production during 1955 to 1956 is 2.07 Mt has been decreased to 0.46 Mt during 2011-2012 under six minor millets (finger, foxtail, proso, little, barnyard, and kodo millets) was recorded in India. (14).

Subject to usage of proso millet in cooking, majority sixty-three percent are not using proso millet in their cooking, the present generation prefers to eat fast foods and junk foods which contains high amount of fat, sodium, sugar, and Mono Sodium Glutamate. Hence their food palate is turned out to be addicted to modern diet, which urges them to have less preference about authentic food. (VM) This may be one of the reason for including proso millet in their diet. Including proso millet in their daily diet, may help in transforming the food security basket. (13) Intake of proso millet in regular diet may reduce cholesterol, TNF, phytate, and increase HDL and adiponectin. An increase in HDL and adiponectin can lower the risks of many hormone-dependent cancers, CVD and breast cancer. (15,16,17)

Table:2 Percentage distribution of respondents proso millet have more nutrients compared to other cereals

More nutrients	Number of respondents	percentage
Yes	21	70
No	9	30

Table:2 reveals the respondents' opinion on proso millet contains more nutrient than other cereals. Majority seventy percent of the respondents have the knowledge that proso millet contains more nutritive value than other cereals and thirty percent of the people denied the fact. Proso millet is a store house of minerals like calcium, phosphorus, potassium, sodium, magnesium, manganese, iron, magnesium and zinc. proso millet contains 11% (which may range from 11.0% to 14%) of protein per 100gms of grains, compare to rice, it has 7.5 of protein per 100gms and wheat has 14.4% of protein per 100gms (18) compared to wheat, proso millet contains 51% of essential amino acid (leucine, isoleucine, and methionine) index, which is found to higher than wheat. (12) compared to major cereal grains, proso millet contains high content of minerals. High content of anti-oxidants and fiber in proso millet helps in prevention of CVD and cancer. (19) The nutritive content of vitamins B1 & B2 is twice as high as wheat, rice or barley. (20)

Table:3 Percentage distribution of proso millet has low glycemic index and ideal food for diabetes patients.

Gluten-free	Number of respondents	percentage
True	20	67
False	10	33
Ideal food for diabetes	Number of respondents	percentage
Yes	26	87
No	04	13

Table:3 reveals that, sixty-seven percent of the respondents said true that, proso millet has low glycemic index whereas thirty-three percent of the respondents denied the fact. Eighty-seven percent of the respondents told that proso millet is an ideal food for diabetes and thirteen percent of the respondents denied the statement.

Nowadays, millets are showing rise in popularity for its ability to prevent diseases, and its immense nutritional properties notably, low GI & free from gluten. Compared to rice, wheat and barley, proso millet has a low glycemic index which makes an ideal food for people with cardiovascular disease (CVD) and type-2-diabetes mellitus. (19) Research evidences reveals that the low glycemic index (GI) carbohydrate diet help in the prevention of diabetes, obesity, and cardiovascular disease (CVD) (21). According to park et al., proso millet protein could be a potential therapeutic mediation in type-2 diabetes and also proso millet had shown to enhance the glycemic responses and insulin in genetically obese type-2-diabetic mice under high fat feeding conditions. (17)

Table:4 Percentage distribution of consumption of millet based food.

Consumption of Millet based food	Number of respondents	percentage
Yes	21	70
No	09	30

Table: 4, summarizes that seventy percent of the respondents have consumed the millet based food and thirty percent of the respondents have not tried the millet or millet based before.

Majority seventy percent of the respondents have consumed the millet based foods. At current, many companies have started to manufacture Products made out of millets, where millets are incorporated in cookies, biscuits, bread, savories & snacks and sold in local shops and departmental stores, which made more convenient for consumers to buy it, this may be a reason for higher percent of consumption. Nutritional properties of authentic

grains have created an accelerated promotion in the health food market. In united states, the gluten-free food market is growing which is noticeable from the surge of 0.9 billion dollars market in 2006 to 10.5 billion dollars in 2015 and is expected to be 23.9 billion dollars by 2020. (22) The proso millet in human food market has found its way to different bakery products, fermented products, brewing and breakfast cereals. (19) According to the Common Fund for Commodities (CFC) and International Crops Research Institute for Semi-Arid Tropics (ICRISAT) the industrial application of millets in developing countries is facing surge competition from other industrially produced grain. (23)

Table:5 Percentage distribution of proso millet's role in preventing ailments.

Ailments	Number of respondents	percentage
Prevents cancer	17	57
Prevents pellagra	15	50
Ideal for celiac disease	26	87

Table:5, discloses the role of millets in preventing ailments. Fifty-seven percent of the respondents accepted that, consumption of proso millet prevents cancer, fifty percent of the respondents have the knowledge that consumption of proso millet prevents pellagra, and finally eighty-seven percent of the respondents have accepted the statement; consumption of proso millet is ideal for people with celiac disease.

Millets are packed with high content of nutrients notably, Vitamin-B content as well as iron, calcium, potassium, magnesium and zinc, furthermore millets enhance the digestion process and manages sugar level which contribute to be the power house of nutrition. Subject to prevention of cancer, high content of fiber, anti-oxidants and complex carbohydrates in proso millet is found to be valuable in preventing cancer and cardiovascular disease (CVD). (24) In case of pellagra, deficiency of niacin leads to pellagra disease, in which skin becomes scaly, rough and starts falling off. Consuming proso millet may help to prevent pellagra disease. (25) celiac disease is one of the most common genetic disease in which, immune system causes damages to small intestine when gluten protein is consumed. Since millets are gluten-free, therefore it is an ideal option for people suffering from celiac disease. (26) Also, non-digestible carbohydrates present in the proso millet helps to enhance the growth of desirable microflora in the intestine. The consumption of proso millet helps to prevent constipation and found to be effective as preventive food against colon cancer. (19)

Table:6 hedonic scale-sensory evaluation of proso millet biryani

Hedonic scale	Very good	Good	Neither good nor poor	Poor	Very poor
Appearance	22	8	0	0	0
Color	19	8	3	0	0
Texture	18	10	2	0	0
Flavor	17	13	0	0	0
Taste	21	9	0	0	0

Table:6, reveals the results of sensory evaluation of proso millet biryani. The data acquired from panel of 30 respondents reveals that, proso millet biryani were found under the category of very good to neither good nor poor. Subject to appearance twenty-two panel members perceived that the appearance is very good, eight respondents perceived that appearance is good followed by color, scores 'very good' by nineteen respondents, 'good' by eight respondents and 'neither good nor poor' by three respondents. followed by texture, eighteen sensed the texture is very good, ten respondents sensed good and two respondents sensed neither good nor poor.

Subject to flavor, seventeen percent sensed very good, thirteen respondents sensed good. In case of taste, twenty-one respondents perceived that taste of the proso millet biryani is very good and nine percent of the respondents perceived that taste of the proso millet biryani is good.

Conclusion:

India has already the highest number of diabetes patient in the world and study by World Health Organization reveals that, in India the number of people with type-2 diabetes is estimated to rise from 19 to 57 million an increase of 195% by 2025. According to new Harvard school of public health, consuming white rice on regular basis may increase the risk of type-2 diabetes. Refined rice has high glycemic index which can rise the blood sugar level by increasing the risk of type-2 diabetes. Consumption of millets are declining nowadays due to lack of awareness on nutritional properties and addiction to junk food. But, millets have remained food for the traditional consumers and people belongs to low-income group. Proso millet is packet with nutrients like phosphorous, potassium, iron, magnesium, zinc, copper and boron. Food items like, biscuits, muffins, breads, breakfast cereals, papads, and laddoo (Indian desert) may have good scope in future if incorporated and emphasized among younger generation. From the preceding results, it has been revealed that, proso millet can be incorporated in biryani and accepted by majority of panel members.

Recommendations:

- ✓ Millets should be included in mid-day-meal scheme, at educational institutions notably primary schools.
- ✓ Millets should be distributed in the fair-price shops through public distribution system.

REFERENCES:

1. Misra A, Khurana L. Obesity and the metabolic syndrome in developing countries. *J Clin Endocrinol Metab* 2008;93(11 Suppl 1):S9-30.
2. Kumar, S., Mohanraj, R., Sudha, V., Wedick, N. M., Malik, V., Hu, F. B., ... & Mohan, V. (2011). Perceptions about varieties of brown rice: a qualitative study from Southern India. *Journal of the American Dietetic Association*, 111(10), 1517-1522.
3. Purselove, J.W. 1972 revsd. 1985. *Tropical Crops, Monocotyledons*. Logman, London.
4. U.S. National Plant Germplasm System Taxonomy: *Panicum miliaceum* L. Available online: <https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?id=317710>
5. de Wet, J.M.J., 1986. Origin, evolution and systematics of minor cereals. In: Seetharam, A., Riley, K.W., Harinarayana, G. (Eds.), *Small Millets in Global Agriculture*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India, pp. 19–30.
6. winch, t. (2006). *Cereal. Growing Food. A Guide to Food Production*. Dordrecht: Springer
7. A high yielding and early maturing panivaragu variety CO (PV) 5, A. Nirmalakumari, P. Sumathi, A. John Joel, N.Kumaravadivel, N.Senthil, P. Devan, Ar. Muthiah, T.S. Raveendran, T. Raguchander, S. Manoharan And S.Ganapathy Centre for Plant Breeding and Genetics, Tamil Nadu Agrl. University, Coimbatore - 641 003. 2008
8. Rajput, S.G., Plyler-harveson, T., Santra, D.K., 2014. Development and characterization of SSR markers in proso millet based on switchgrass genomics. *Am. J. Plant Sci.* 5, 175–186.
9. burgener, p. a., feuz, d. m. and holman, t. (2002). *Historical crop prices, seasonal patterns and futures basics for the Nebraska panhandle 1983–2001*. Lincoln, NE: University of Nebraska, Cooperative Extension Institute.
10. Millet © Woodhead Publishing Limited, 2013 p3
11. Devi, P.B.; Vijayabharathi, R.; Sathyabama, S.; Malleshi, N.G.; Priyadarisini, V.B. Health benefits of finger millet (*Eleusine coracana* L.) polyphenols and dietary fiber: A review. *J. Food Sci. Technol.* 2014, 51, 1021–1040.
12. Kalinova, J. and Moudry, J. (2006) Content and quality of protein in proso millet (*Panicum miliaceum* L.) varieties. *Plant Foods for Human Nutrition.* 61: 45-49.
13. Proso, barnyard, little, and kodo millets Hari D. Upadhyaya, Mani Vetriventhan, Sangam Lal Dwivedi, Santosh K. Pattanashetti, Shailesh Kumar Singh International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Genebank, Patancheru, Telangana, India. 2016
14. NAAS, 2013. Role of Millets in Nutritional Security of India. Policy paper No. 66. National

- Academy of Agricultural Science, New Delhi, p. 16
15. Habiyaremye, C.; Matanguihan, J.B.; D'Alpoim Guedes, J.; Ganjyal, G.M.; Whiteman, M.R.; Kidwell, K.K.; Murphy, K.M. Proso Millet (*Panicum miliaceum* L.) and Its Potential for Cultivation in the Pacific Northwest, U.S.: A Review. *Front. Plant Sci.* 2017, 7
 16. Coulibaly, A.; Kouakou, B.; Chen, J. Phytic Acid in Cereal Grains: Structure, Healthy or Harmful Ways to Reduce Phytic Acid in Cereal Grains and Their Effects on Nutritional Quality. *Am. J. Plant Nutr. Fertil. Technol.* 2011, 1, 1–22
 17. Park, K.O.; Ito, Y.; Nagasawa, T.; Choi, M.-R.; Nishizawa, N. Effects of Dietary Korean Proso-Millet Protein on Plasma Adiponectin, HDL Cholesterol, Insulin Levels, and Gene Expression in Obese Type 2 Diabetic Mice. *Biosci. Biotechnol. Biochem.* 2008, 72, 2918–2925.
 18. Devi, P.B.; Vijayabharathi, R.; Sathyabama, S.; Malleshi, N.G.; Priyadarisini, V.B. Health benefits of finger millet (*Eleusine coracana* L.) polyphenols and dietary fiber: A review. *J. Food Sci. Technol.* 2014, 51, 1021–1040.
 19. Beyond Bird Feed: Proso Millet for Human Health and Environment Saurav Das 1 , Rituraj Khound, Meenakshi Santra and Dipak K. Santra. 2019.
 20. Murzamadieva MA (1979) proso millet, kolos, Alma-ata 80 pp
 21. Brand-Miller, J., McMillan-Price, J., Steinbeck, K., Caterson, I., 2009. Dietary glycemic index: health implications. *J. Am. Coll. Nutr.* 28, 446S–449S.
 22. Grocer, P. Gluten-Free and Free-from Food Retail Sales in the United States from 2006 to 2020, Statista Research Department, 30 November 2018).
 23. FC and ICRISAT (2004). “Alternative uses of sorghum and pearl millet in Asia,” in Proceedings of the Expert Meeting, ICRISAT, Patancheru, Andhra Pradesh, India, 1-4 July 2003: CFC Technical paper no. 34
 24. Coulibaly A., Kouakou B., Chen J. (2011). Phytic acid in cereal grains: structure, healthy or harmful ways to reduce phytic acid in cereal grains and their effects on nutritional quality. *Am. J. Plant Nutr. Fertil. Technol.* 1 1–22. 10.3923/ajpnft.2011.1.22
 25. Das, B (2019), Millets For Weight Loss – Little Millet And Proso Millet, Poshan 2.0
 26. Gélinas, P., C. M. McKinnon, M. C. Mena and E. Méndez. 2008. Gluten contamination of cereal foods in Canada. *Int. J. Food Sci. Technol.* 43(7):1245–1252.
 27. Bhide, G. Millets for the Healthy Gut, December 2015