

Role of proso millet (*Panicum miliaceum*) as preventive diet in lifestyle disorders

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Abstract

The incidence of lifestyle diseases like hypertension, diabetes mellitus, dyslipidemia and overweight/ obesity associated with cardiovascular disease is increasing rapidly. In past few decades, due to increased westernization in life style and due to enhancement of economy, there is increase in prevalence rate of these diseases among Indian population. Ayurveda, an ancient science, describes ways to prevent and manage lifestyle disorders, through proper dietary management and lifestyle advises, in form of *Dincharya* and *Rutrcharya*. Millets have been major staple diet in Central India but after the advent of high yielding varieties of rice and wheat, millets got sidelined from our food basket. In Ayurveda, Proso millet is mentioned in *trundhyana varga*. It possesses *madhura Kashaya rasa, katu vipaka, ushna virya* and is *kaphavatta shamak*. In its constitution we can find *prithvi, vayu, jal, and tej mahabhut*. Due to its *bruhanitya* property it can be useful in malnutrition, on contrary due to its *laghu, ruksh guna, vilekhana karma* it can be used in obesity. In present review article the less explored, underutilized, nutrient rich, commercial available Proso millets are enlightened for its phytochemical and other activities which may benefit the people in overcoming various lifestyle disorders.

Keywords: Lifestyle disorders; Proso millet; Cardiovascular disease; Diabetes mellitus; Obesity

1. Introduction

“Lifestyle diseases” the simplest definition of this term is – a disease that is caused due to the health damaging choices made by us in our day to day life. It is estimated that worldwide, approximately 14.2 million people between age group of 30 to 70 die every year due to lifestyle disorder. Cardiovascular diseases, diabetics, stress obesity, sleep disorders and some form of cancers can be listed under section of lifestyle disorders.

In Ayurveda, basically promotion of health and prevention of disease is given more importance than treatment of disease. Health and disease is depended on three factors – *Ahara (diet)*, *Vihara (lifestyle partices)* and *Oushadi (drug and therapies)*. Among these, food (*ahara*) is considered as important one. *Pathya* is defined as *ahara* (diet) which is congenial to a person according to his constitution, habitat, digestive capacity of body. Most health problem develop due to wrong eating habits. Ayurveda has given a detailed description of food in term of different aspects like quality, quantity and time which varies according to age, sex, constitution, habitat, digestive power, season, disease and also linking of patient (i.e. *Prakruti*). The proper intake of diet not only can prevent many health diseases but also play major role in management of disease.

Consumption of Proso millet reduce risk of heart disease, protect from diabetics, improve digestive, muscular and neural system, lower risk of cancer, detoxify the body, increase immunity in respiratory diseases, and are protective against several degenerative diseases such as metabolic syndrome and Parkinson disease.

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2. Concept of Ahara (diet)

Any material in universe, according to Ayurveda is composed of five basic element- the *Panchamahabhootas*, and also consists *tridoshas*. The constituents of body are also made of this *mahabhootas*. Planning and indulging in the diet balancing these elements maintain the homeostasis in the body.

Each dietary item may have *dosha* aggravating, *dosha* pacifying or *dosha* balancing action in body. Specific diet has been mentioned in Ayurveda to maintain the balance of *dosha* distributed due to various factors like season, age etc. The planning of diet, based on certain principles mentioned in *Astavidhi vishessayatam* is very rational and specific. Also specific principles are describe for consuming diet.

3. Morphology:^[1]

Proso millet (*Panicum miliceaum*) is warm season grass with growing season of 60-100 days. It ranges from 30 to 100 cm tall, with few tillers and has as adventitious root system. Grains are round about 3mm long and 2mm wide, and enclosed in a smooth hull, which is typically white or creamy-white, yellow or red in colour, but may be grey, brown or black. Millets are highly nutritious cereal grain used in human consumption. Unique characteristics, such as drought and heat tolerance make Proso millet a promising alternative cash crop.

Table 1 Taxonomic hierarchy:^[2]

Kingdom	Plantae
Subkingdom	Tracheobionta
Division	Magnoliophyta
Class	Monocotyledons
Order	Cyperales
Family	Poaceae
Genus	Panicum
Species	<i>Panicum miliaceum</i>

3.1. Ayurvedic aspect

- In Ayurveda *Panicum miliceaum* is mentioned in *trunghayna varga*. Various synonyms are mention for it in different *samhitas* and *Nighantu*.
- In *Raj Nighantu* it comes under *shayladi varga* as *varak* and *sthula kangu*, *ruksh priyangu* are said as its *prayayvachak*.^[3]
- In *Bhavprakash Nighantu* it is mentioned as *cheena*, one of *shrudradhyana* and said to have similar properties as that of "*kangu*".^[4]
- In *Kaiydev Nighantu* also, it is mentioned as "*cheenak*" and *shyamak*, *vankrodravy*, *trunbijak*, *uddalak*, is given as its synonyms.^[5]
- In *Vagbhata Samhita* it is mentioned as "*shyamak*" in "*Annarupavigyaniyam*" *adhyaya*.^[6]
- In *Dhanvantari Nighantu* it is mentioned as "*priyangu*" in *suvarnyadi varga* and "*cheenak*" is given as its *prayay*.^[7]

Table 2 RAS PANCHAK:^[8]

RASA (taste)	Madhur (sweet) Kashaya (astringent)
VIRYA (POTENCY)	Ushna
VIPAKA	Katu
GUNA (PROPERTIES)	Ruksha Laghu

	Grahi
KARMA(ACTIONS)	Bhagnasandhankrut Vilekhanam Bruhaniya Dahagnam.
DOSHAGHANTA	Kaphapitta samak Vattprakopaka

4. Modern aspect:[9]

Table 3 Nutritional value per 100g

Proteins	9.7
Carbohydrates	6.7
Fats	4.6
Fibers	7.6

Table 4 Minerals compounds (mg%)

Phosphorus	156-230
Magnesium	78-140
Calcium	8-20
Ferrous	0.8-5.2
Zinc	1.4-2.6

5. Millets benefits

5.1. Millets and Aging

- The chemical reaction between the amino group of proteins and the aldehyde group of reducing sugars, termed as non-enzymatic glycosylation, is a major factor responsible for the complications of diabetes and aging.
- Millets are rich source of antioxidants and phenolics; like phytates, tannins etc; leading to its antioxidant activity which is important in maintaining health and preventing aging and metabolic syndrome

5.2. Millets and Phytochemicals

- Millets are abundant sources of phytochemicals and micronutrients. Millets consists of Phytochemicals such as phenolics (bound phenolic acid-ferulic acid, free phenolic acid-protocatechuic acid), lignans, β -glucan, inulin, resistant starch, phytates, sterols, tocopherol, dietary fibers and also carotenoids.
- The main polyphenols present in Proso millet are phenolic acids and tannins, while flavonoids are present in small amount; which act as antioxidant and play important role in the body immune system

5.3. Millets and Celiac Disease ^[10]

- Celiac disease is an auto-immune disease triggered by the ingestion of gluten in genetically susceptible individuals. As millets are gluten-free, they are excellent option for people suffering from celiac diseases and gluten-sensitive patients who are irritated by the gluten content of wheat and other more common cereal grains.

- Millet is an alkaline forming food. It is recommended to consumes Alkaline based diet to achieve optimal health,. Millet's soothing alkaline nature help to maintain a healthy pH balance in the body, when it combines with digestive enzymes that is crucial to prevent illnesses.

5.4. Millets as Nutraceutical

From previous to present time, there is tremendous change in concept of food consumption. While previous era emphasis on survival, hunger satisfaction, health maintenance ,the current era emphasis on encouraging the use of nutraceutical foods which promise to promote better health and well-being thus helping to reduce the risk of chronic diseases such as obesity, diabetes, CVD and cancer. Millets consists of nutraceutical properties in the form of antioxidants which prevent deterioration of human health.

5.5. Millets and Diabetes [11]

- It has been reported that there is lower incidences of diabetes in millet-consuming population. Millet's phenolics helps to inhibits pancreatic amylase reduce postprandial hyperglycemia by partially inhibiting the enzymatic hydrolysis of complex carbohydrates.
- Proso Millets is rich source of zinc which plays important part in insulin mechanism and help to control blood sugar level.
- Alpha amylase inhibition properties of Proso millet and the high viscosity of the soluble fiber delay digestion and absorption and this help to slow down release of sugar in blood stream.
- It reduce postprandial hyperglycemia by partially inhibiting the enzymatic hydrolysis of complex carbohydrates.

5.6. Millets in cardiovascular diseases:[12]

- Proso Millets contain potassium which keep blood pressure low by acting as vasodilator.
- It improve plasma level of "Adiponectin" which plays important role in increasing level and effect of HDL.
- It reduce serum triglycerides.
- The high fibers present in millets plays major role in lowering cholesterol and eliminating LDL from the system.
- The phytochemicals like alkaloids, flavonoids inhibit the intestinal absorption of both endogenous and exogenous cholesterol and increase faecal cholesterol excretion.

5.7. Millets in obesity:[11]

- Proso millets inhibit the release of obesity related pro-inflammatory cytokines, it reduces fat mass by decreasing hypertrophy of adipocytes.
- It reduces obesity associated lipids release in the blood.
- It regulates hepatic lipogenesis.

5.8. Millets in cancer:[13]

- Proso millets contain DPPH free radical scavenging activity.
- They contain certain phytochemicals like phenolic acids, flavonoids. These phytochemicals are biologically active organic substances that are in involve in preventing colon cancer, other digestive cancer, prostate and breast cancer.
- They help in identifying active compounds responsible for disease.

5.9. Other Benefits

- It consist majority of healthy "PUFA"
- Recognized as high energy nutrition food which help in proper nourishment and thus helpful in malnutrition.
- It contain 37-38% dietary fibers, which is highest among cereals.
- It plays significant role in providing nutraceuticals components such as phenols, tannis , phylates along with other nutrients

6. Discussion

- Ras panchaka of Proso millets show that it possesses kashaya rasa, katu vipaka, ushna virya and is kapha shamaka, also it contains vilekhana property which all contributes to kleda shoshan and srothas avrodhbransh which are main attributes of medoroga (obesity) samprapti. Thus, it is very useful in medaroga (obesity).
- Accumulation of fats, cholesterol and other substances in the walls of arteries is main cause of cardiovascular disease. Proso millets do scavenging (lekha) of these accumulated substances and help to reduce risk of cardiovascular diseases.
- It has brihaniya property due to which it helps it prakrut vridhi of all dhatus and thus give proper nourishment and is useful in malnutrition. Proso millet is bhagnasandhakar, so it works on asthi dhantu and thus it can be useful in musculoskeletal diseases.
- The presence of good amount of iron, calcium and phosphorous in Proso millet will be a boon especially for the menopausal women whose minerals loss is being met by these minor millets. The presence of phytochemicals like flavonoids, phenolic compounds and other antioxidants proves minor millets to be a good nutraceutical food when consumed regularly can protect us from the chronic complications like Diabetes mellitus, cardiovascular diseases and cancer which threatens the people of many countries.

7. Conclusion

- Millets are easily available and cheap in cost. Millets consist of many major and minor nutrients like fats, carbohydrate, various good proteins, dietary fibre, vitamins and minerals as well as antioxidant and different phytochemicals.
- The main focus of this study undertakes to concern and developing specific agenda for these crops which must be recognized as an important food and introduce the millets as a nutritious food, for the fulfillment of the nutritional need of global population and also to promotes its cultivation.
- This study enlightened the nutraceutical properties of millets and the application of millets as alternative cereals which is potentially healthy to elaborate therapeutic food products like protein and energy rich diet, diet for diabetes, gluten free diet, CVD, etc.
- This study is to promote the use of millets as “food medicine”. Millet is source of antioxidants such as phenolic acids and glycyated flavonoids. Millet foods has the quality of potential prebiotic and can enhance the viability of probiotics with potential health benefits. **In conclusion, minor millets are being consumed by** many people nowadays, it because lot of awareness about its goodness is being created among the people and this research will also be an added step for the people running behind fast and junk foods.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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