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ROLE OF MILLETS AND ITS IMPORTANCE IN NEW MELLINIUM

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ABSTRACT

Millet is a generic term applied to any of various small seeded cereals and forage and frequently used in some countries as a general designation for sorghum, wheat or other native cereals. Millet is often considered to be a **"poor man's cereal".** Millets will continue to be major food crops in several countries, especially in Africa and India. These grains will be used for traditional as well as novel foods. However, there is a need to look into the possibilities of alternative uses. Value addition to food has assumed critical importance in the last decade due to socio – economic and industrial factors. Millets are amazing in their nutrient content. Each of the millets is three to five times nutritionally superior to the widely promoted rice and wheat in terms of protein, minerals and vitamins.

INTRODUCTION

Rapid urbanization involving changes in occupation patterns, life styles, family structures and value system reflected as changes in practices and in the level of physical activity. A large shift from consumption of coarse grains such as sorghum, barley, rye, maize and *Millet* to more refined cereals, like polished rice and wheat is seen especially among the urban population and higher income groups (Poongodi and Jemina, 2009). Minor millets are claimed to be future foods for better health and nutrition security. In the recent years, they are recognized as important substitutes for major cereal crops to cope up with the world food shortage and to meet the demands of increasing population of both developing and developed countries (Veena *et al*., 2004). India produces nearly 17.7 million tons of millet annually, amounting to 40% of its global production. It is also termed as 'nutricereal' in view of its good nutritional specialties such as complex carbohydrates, high proportion of dietary fibre and other of phytochemicals with nutraceutical qualities. However, it has remained as the food for poor and traditional consumers because of non-availability of ready-to-use or ready-to-eat convenience food products from the millet and also the limited efforts made to diversify its food uses by application of traditional and contemporary food-processing methods. They are used in several forms such as in preparation of rice, porridges, *laddu*, *nippattu*, *maldi*, *annam*, *muruku*, *karappawosa*, *ariselu*, *sangatti* and *roti* (Pushpamma and Chittemma Rao, 1981 and Geetha *et al*., 1994). Minor millets are a group of grassy plants with short slender culm and small grains possessing remarkable ability to survive under severe drought.

Today there is a significant change in the lifestyle of people owing to the rapid industrialization, improved socio-economic status, enhanced health facilities and increased life expectancy. Economic affluence coupled with sedentary lifestyles and changing food patterns are contributing to several chronic degenerative diseases such as diabetes mellitus, cardiovascular diseases,

cancer, etc. Diabetes mellitus is a silent disease and is now recognized as one of the fastest growing threats to public health in almost all countries of the world. Around 150 million people suffer from diabetes in the world, of which above 35 million are Indians, the highest number in any country. Diabetes is on an increase in India. The revised World Health Organization figures for the year 2025 is 57.2 million diabetics, the chief reason being urbanization and life style, besides heredity, race, age, nutritional status, stress, altered immune function, altered physiological and metabolic status, drugs and hormones. Within the allotted span, India shall also have the dubious distinction of having the maximum number of diabetics in the world. Western data suggests that Indians are more centrally obese at a given level of body mass index compared to white Caucasians and that Indians are more insulin resistant even at lower levels of body mass index. It is a fearful scenario for India since it has to tackle twin problems of communicable and non-communicable diseases in the next millennium.

Dietary modification, weight control, and regular exercise are the main approaches in the management of diabetes, diet being the sheet anchor. Because the risk of developing long term complications can be dramatically reduced with appropriate glycemic control, food ingredients that can attenuate postprandial glucose in persons with diabetes would be useful. New research findings in this area indicate the potential value of diets in prevention of such disorders. Infact, the preventive role of corrective nutrition is an ever evolving process. Currently, the challenge is to identify hypoglycemic diet supplements to control blood glucose levels.

Millets are not popular because the outer most layers of bran are fibrous, tough, irritation to tongue. The layers are resistant to water permeability so cooking is difficult – it takes more time to for cooking. It does not have gluten so the dough lacks in plastic characteristics. Millets are sold unpolished hence to be polished before grinding.

HEALTH BENEFITS OF MILLETS

Minor millets are high energy, nutritious foods comparable to other cereals and some of them are even better with regard to protein and mineral content. They are particularly low in phytic acid and rich in dietary fibre, iron, calcium and B vitamins. As the millets are consumed by the poor, they guard them against food and nutritional insecurity imposed by various agronomic, socio economic and political factors. Minor millets can thus act as a shield against nutritional deficiency disorders and provide nutritional security. The nutritive value of millets is comparable to other staple cereals like wheat and rice. Some of the millets are nutritionally better than common cereals in protein, fat and mineral contents

Glycemic index (GI) of food stuff is the blood glucose response after consumption in comparison with glucose as a reference food. Since the introduction of glycemic index concept, many studies have shown potential benefits of low GI foods. The low GI foods reduce hunger and increase satiety (Miller, 1993). Improvement in insulin sensitivity has also been reported with the consumption of low GI foods. The prolonged absorption of carbohydrate after the consumption of low GI foods help in lowering the blood glucose concentration (Salmeron *et al.*, 1997 a and b and Frost *et al.*, 1999). Studies have indicated advantages of inclusion of low GI foods in both diabetics and non-diabetics to lower the fasting blood glucose (Lawes *et al.*, 2004).

NUTRITIVE VALUE OF MINOR MILLETS

Crop/ Nutrients	Protein (g)	Fat (g)	Minerals (g)	Fibre (g)	CHO (g)	Calcium (mg)	Phosphorus (mg)	Iron (mg)
Cumbu	11.6	5.0	2.3	1.2	67.5	42	296	8.0
kuthiraivali	6.2	2.2	4.4	9.8	65.5	20	280	5.0
Ragi	7.3	1.3	2.7	3.6	72.0	344	283	3.9

Thinai	12.3	4.3	3.3	8.0	60.9	31	290	2.8
Varagu	8.3	1.4	2.6	9.0	65.9	27	188	0.5
Samai	7.7	4.7	1.5	7.6	67.0	17	220	9.3
Panivaragu	12.5	1.1	1.9	2.2	70.4	14	206	0.8

(NIN – ICMR, 2010)

The potential health benefits of dietary fibre have been demonstrated almost four decades ago by Burkitt *et al.* (1972). It was reported that dietary fibre reduces intestinal transit time, provides fecal bulk and in turn prevents constipation. Thus, it helps in providing protection against duodenal ulcers and colorectal cancers (Nyman and Asp, 1982). Millets have been reported to be the rich sources of dietary fibre (Wisker *et al.,* 1985). Resistant starch (defined as any starch that escapes digestion in small intestine) was also reported to exhibit a wide range of health benefits such as lowering caloric density and low glycemic response (Jenkins *et al.*, 1982 and Ring *et al.*, 1988). It was also reported to lower digestibility and act as a fecal bulking agent (Ranhotra *et al.*, 1991). Minor millets, with their low carbohydrate content, low digestibility and water soluble gum content (b-glucan) have been attributed to improve glucose metabolism. These grains release sugar slowly in the blood and also diminish the glucose absorption (Chen *et al.*, 1984 and Anderson *et al.*, 1991). The dietary fibre and resistant starch of minor millets have been attributed to exhibit hypoglycemic and hypolipidemic effects (Mani *et al.*, 1993, Slavin and Dwyer, 1994, Krishna Kumari and Thayumanavan, 1997 and Pathak and Srivastava, 1998). Further the antioxidative properties of minor millets against hyperglycemia and oxidative stress have also been studied, which is mainly determined by their higher reserves of phytochemicals like phenolics, tannins, phytates, micro minerals etc. (Hegde *et al.*, 2004). In addition, these grains have been demonstrated to exhibit beneficial effects on cholesterol levels, which is again attributed to their high dietary fibre and phytochemical content. It is reported that cardiovascular diseases, duodenal ulcers and hyperglycemia occur rarely in regular millet eaters

(Menon, 2004). For all these superior properties of minor millets, they can be designated as “nutritious millets”.

EXTRUSION COOKING

The extrusion cooking process is high temperature short time process in which moist, soft grain is fed into the extruder where the desired temperature and pressure are obtained over the required period of residence time. For cooking of the product generally external heat is not supplied, heat for cooking is achieved through shear and friction in the extruder. Extrusion cooking is used worldwide for the production of expanded snack foods, modified starches, ready to eat cereals, baby foods, pasta and pet foods (Deshpande and Pashadri, 2011). Extrusion cooking because of its low cost and continuous processing capability has been accepted as one of the most useful technologies during the recent years in the field of food processing. Millet flour can be substituted upto 20 % with the wheat flour in the preparation of noodles and pasta.

Devraju *et al.* (2003) developed pasta with Finger millet flour (50%), refined wheat flour (40%), defatted soy/whey protein concentrate (10%) and extruded using both cold (30°C) and hot water (75°C). Pasta with hot water extrusion was better in terms of cooking quality and also cooking loss found to be minimum (12%). Non-significant differences existed in the cooked pasta with respect to the sensory attributes. The pasta stored well for a period of 3 months with good sensory attributes. Acceptable breads, cookies and noodles with 10 to 20 per cent incorporation of Proso millet was developed by Lorenz and Dilsaver (1980).

Shanthi *et al.* (2005) studied on the effect of incorporation of Finger millet in pasta products. Refined wheat flour, whole wheat flour and soya flour were blended with finger millet in different proportions, with wheat and refined wheat flour as the main ingredient. Sensory evaluation revealed that incorporation of Finger millet up to 30% and soya flour up to 10 per cent was acceptable.

FLAKING

Millets (kudhiraivali / varagu)

↓

Soaking (2-3hrs)

↓

Tempering for 2-4hrs

↓

Steam cooking to soften (5mts)

↓

Roasting (200-240^0 C for 10-20sec)

↓

Flaking

↓

Drying in solar drier for 3 hrs

POPPING

Millets (kudhiraivali / Varagu)

↓

Soaking in water (1:1. 5, 1-2hrs) (moisture 19%)

↓

Draining

↓

Tempering (2-4hrs)

↓

Popping in roasted fine sand (BS 60 mesh sieve) (270^0 C)

↓

Popping

Extrusion cooking is one of the contemporary food processing technologies applied for preparation of a variety of snacks, speciality and supplementary foods (Harper 1985) and also for pet foods and aqua-feeds, but its application to food and allied uses has received very little attention (Malleshi *et al*., 1996). It offers many advantages over spray-drying and roller-drying technologies; namely, preparation of ready-to-eat foods of desired shape, size, texture and sensory characteristics at very low processing cost. Extrusion cooking also reduces the anti-nutritional factors, renders the product microbially safe and enhances the consumer acceptability.

EXTRUDED PRODUCTS

Pearled grains

↓

Soaked in water for 1-2 days

↓

Wet ground

↓

Mash cooked

↓

Extruded and dried

↓

Crispy product

(Noodles)

CONCLUSIONS

Millet is very easy to digest; it contains a high amount of lecithin and is excellent for strengthening the nervous system. Millets are rich in B vitamins, especially niacin, B6 and folic acid, as well as the minerals calcium, iron, potassium, magnesium and zinc. Relished for its nutritional value, being a rich source of carbohydrates and minerals, such as calcium, phosphorous and iron. Lignans, an essential phytonutrient present in millet, are very beneficial to the human body. Under the action of interstitial friendly flora, they are converted to mammalian lignans, which act against different types of hormone-dependent cancers, like breast cancer and also help reduce the risk of heart disease.

Regular consumption of millet is very beneficial for postmenopausal women suffering from signs of cardiovascular disease, like high blood pressure and high cholesterol levels. Children's intake of whole grains like millet and fish has been shown to reduce the occurrence of wheezing and asthma. A high source of fiber, millet is very beneficial against breast cancer in post – menopausal women. According to research and recent studies, consumption of millet can help women combat the occurrence of gallstones, as they are a very high source of insoluble fiber. This form of cereal grain is very high in phosphorus content, which plays a vital role in maintaining the cell structure of the human body. The key role of this mineral is that it helps in the formation of the mineral matrix of the bone and is also an essential component of ATP (adenosine tri-phosphate), which is the energy currency of the body.

A single cup of millet provides around 24.0% of the body's daily phosphorus requirement. This mineral is a very important constituent of nucleic acids, which are the building blocks of genetic code. Recent research has indicated that the regular consumption of millet is associated with reduced risk of type 2 diabetes mellitus.

This is mainly due to the fact that whole grains like millet are a rich source of magnesium, which acts as a co-factor in a number of enzymatic reactions in the body, regulating the secretion of glucose and insulin. Magnesium is also beneficial in reducing the frequency of migraine attacks. It is even very useful for people who are suffering from atherosclerosis and diabetic heart disease. To get the health benefits of millet, serve it warm with milk as an alternative to hot oat meal in the morning. Its nutty taste can be enhanced by gently roasting the grains in a pan on the stovetop. It can also be popped like popcorn to create a healthy "puffed" cereal. It can be ground into gluten-free flour and added to baked goods. One can also use it in soups, casseroles, and as a side-dish in place of rice. It is right time for potential minor millets like barnyard millet to be woven in the fabric of daily diet. Future trends need increasing productivity and trade (regionally and internationally) and adding value to products by improving / increasing processing and utilization in industry.

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