Sustainability, Agri, Food and Environmental Research, (ISSN: 0719-3726), 11(X), 2023: http://dx.doi.org/ 10.7770/safer-V11N1-art2552

Role of small millet crops in food security of western Satpura in Nandurbar District (MS), India

Papel de los pequeños millets en la seguridad alimentaria de Satpura occidental en el distrito de Nandurbar (MS), India

Amshya Padvi

Prof. Ramakrishna More Arts, Commerce and Science College, Akurdi Pune (MS), India 411044., Affiliated to Savitribai Phule Pune University, Pune (MS), India.

Author for Correspondence: atpadvi@gmail.com

ABSTRACT

Small millets are nutri cereals comprising of foxtail, proso and barnyard millet. These are one of the oldest foods known to humanity. These are one of the several species of coarse cereal grasses in the family of Poaceae, cultivated for their small edible seeds. The term millet includes many small-grain cereals. Grain-based on size, millet is classified as the major and minor grain millet. In the study area cultivated proso millet (Mor), Foxtail millet (padi and rala) and Barnyard millet (banti), etc small millets. These crops occupied 31.35 percent of the total cultivated area and are mostly grown on the hill slope. Small millets cultivated during the rainy season and also unmanured and unfertilized conditions. Small millets are highly nutritious and are better in protein, oil, mineral, calcium content than rice and wheat. These small millets are usually cooked as rice after dehulling in the study area. Small millets are used as a substitute for rice flour in various snack foods. They were primarily stored in larger quantities in Kothi for up to fifteen years for food security and used as animal feed. Regular consumption of small millets reduces lifestyle (diabetes), cardiovascular, gastrointestinal diseases.

Keywords: Cropping System, Food Security, Nutritional Value, Small Millet, Wooden Plough.

RESUMEN

Os milhetos pequenos são cereais Nutri compostos por foxtail, proso e milheto. Esses são um dos alimentos mais antigos conhecidos pela humanidade. Estas são uma das várias espécies de gramíneas de cereais grossos da família Poaceae, cultivadas por suas pequenas sementes comestíveis. O termo painço inclui muitos cereais de grãos pequenos. Com base no tamanho do grão, o painço é classificado como o painço do grão maior e menor. Na área

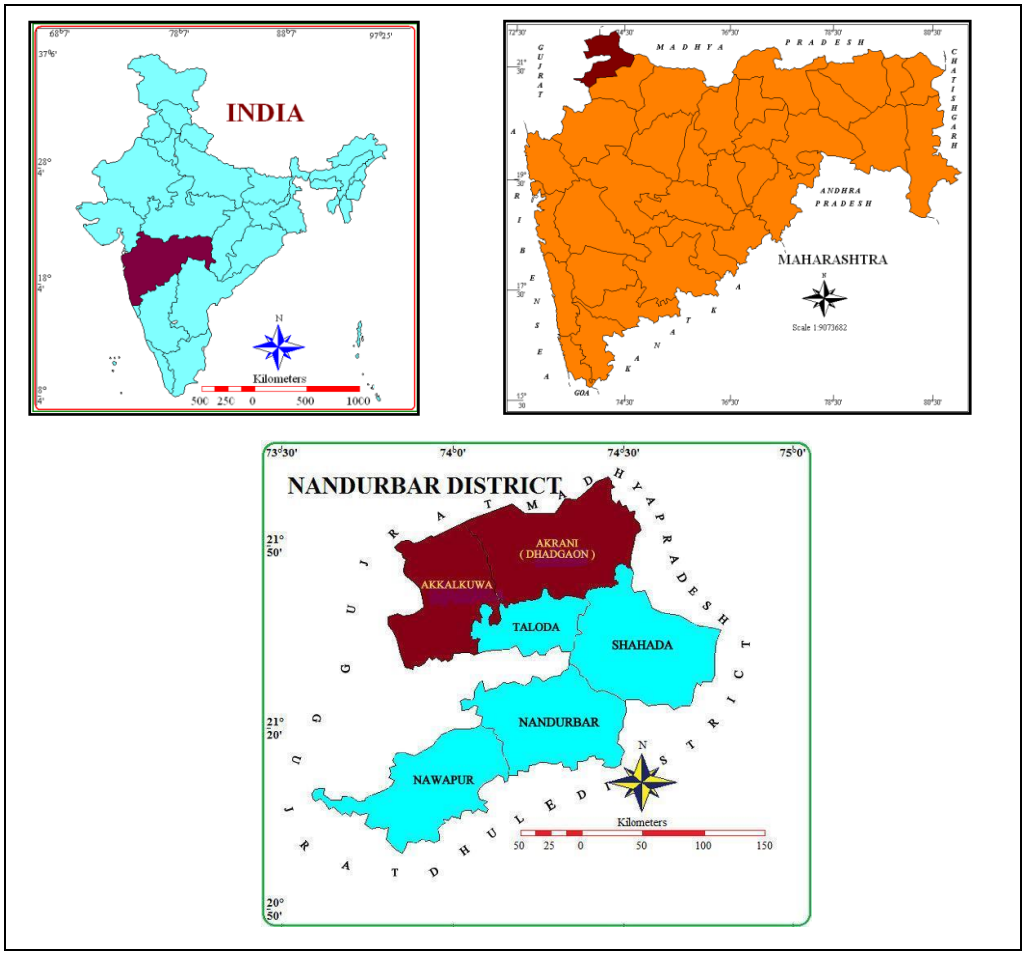
de estudo cultivou-se proso milheto (Mor), milheto Foxtail (padi e rala) e milheto Barnyard (banti), etc. painço pequeno. Essas safras ocuparam 31,35% da área total cultivada e são principalmente cultivadas na encosta da colina. Painço pequeno cultivado durante a estação chuvosa e também em condições não adubadas e não fertilizadas. O painço pequeno é altamente nutritivo e tem melhor teor de proteína, óleo, mineral e cálcio do que arroz e trigo. Esses pequenos painços são geralmente cozidos como arroz após o descasque na área de estudo. O painço pequeno é usado como substituto da farinha de arroz em vários lanches. Eles foram armazenados em grandes quantidades em Kothi por até quinze anos para segurança alimentar e usados como ração animal. O consumo regular de milho pequeno reduz o estilo de vida (diabetes), doenças cardiovasculares e gastrointestinais.
Palabras clave: Sistema de cultivo, Seguridad alimentaria, Valor nutricional, Mijo pequeño, Arado de madera.

INTRODUCTION

Small millets are Nutri cereals comprising of foxtail, proso, and barnyard millet. These are one of the oldest foods known to humanity. These are one of the several species of coarse cereal grasses in the family of Poaceae, cultivated for their small edible seeds. The term millet includes many small-grain cereals. Grain-based on size, millet is classified as the major millet which includes sorghum and pearl millet and many types of small millet like proso millet (Mor), barnyard millet (Banti), Foxtail millet (Rala and Padi) finger millet (Nachani), etc. Western Satpura of Akkalkuwa and Akrani tahsils in Nandurbar district are mostly scheduled tribe population lives about 90 percent of the total population. The tribes, dependent primarily on their agricultural produce. Agricultural products mainly consisted of cereals, oilseeds, various types of millet and, traditional vegetables. The area is under cultivation was 34.00 percent, and among those irrigated areas was 2.83 percent. In the Study area, Mor, Bant and Rala & Padi, etc small millet crops are cultivated for grain and fodder. These are the second largest crops that occupy 31.35 percent of the cultivated area and are mostly confined to hilly areas. Small millets are highly nutritious and are better in protein, minerals, and calcium contain. These small millets are usually cooked as rice after dehulling in the study area. Small millets are used as a substitute for rice flour in various snack foods. They were primarily stored in larger quantities in Kothi for up to fifteen years for food security and used as fodder (cattle feed).

Material and methods

Location of the study area: The Nandurbar district extends between 21^0 0′ to 22^0 03′ north latitudes and 73^0 33′ east to 74^0 32′ east Longitudes. The Nandurbar district lies in the North-Western part of Maharashtra in India. The district is bounded to the South and South-east by Dhule district, to the west and north is the state of Gujarat, to the north and north-east is the state of Madhya Pradesh. Akkalkuwa and Akrani Tahsils (Satpura) extended 21^0 30′ 45″ north to 21^0 54′ 30″ north latitudes and 74^0 47′ 15″ east to 74^0 7′ 30″ east longitude. These tahsils are located in the northern part of the Nandurbar district and also in state.



Figur:01 Location Map of the Study Are

The geographical area of these tahsils is 13474.67 sq km. The tahsils bounded to the north & North West by the Gujrat and North East and East by the Madhya Pradesh state, and south is the Taloda and Shahada tahsils. Most of this region is covered by Satpura mountain ranges, and between Narmada valley in the north and Tapi valley in the south. The Satpura Mountains are the maximum area spread between Akkalkuwa and Akrani Tahsil. It is about 30 km. broad and forms a wall in the northern part of the district (fig.1).

OBJECTIVES

The objective of the present study is to understand and study the role of small millet crops in the food security of Western Satpura in the Nandurbar District. The main objectives of the study are:

i. To identify the cropping system in the study area.
ii. To studying nutrient composition and health value of small millets.
iii. To studying the utilization of small millets for human food and animal feed.
iv. To studying storage systems of small millets for food security in the study area.

Data sources and methodology: The present study is based on both primary as well as secondary data. The primary data is collected through questionnaires, Observations, investigation, and personal discussions with villagers of dominant tribal farmers; the researcher has been conducting the intensive fieldwork. Out of 284 villages of the Satpura Mountain area in Akkalkuwa and Akrani tahsils, 22 villages are selected as sample villages by random sampling method. About 560 households were selected as sample households. It has helped us to better understand and information about cropping systems, area under the cultivation of small millet crops, its utilization, and storage facilities in the study area. The secondary data is collected through the unpublished record of the government and various publications such as toposheets, district census handbook of Nandurbar District 2011etc.

RESULTS AND DISCUSSION

1. CROPPING SYSTEMS:

In the sample villages under cultivation were 34.00 percent, and out of this cultivation area was 2.83 percent under irrigation. Tribal communities predominantly depend on agriculture, cattle, and forest subsistence. The Akkalkuwa and Akrani tahsil in the Satpura region is an essentially agricultural dominant region involving cent percent working force in agricultural practice. It is in the mountainous region where tribal peoples developed a plot for agriculture on the terrain slopes .Traditionally Maize (Makka), hybrid Jowar, pulses like tur, udid, chawli, moong and channa, oilseeds like Khursani (black teel), Soyabean, groundnut, indigenous crops (small millets) such as Mor, Banti and Padi / Rala, etc. were cultivated in sample villages.

Table 1: Cropping systems of Sample Villages (Area in Acres).

Cropping Systems	Cereals	Pulses	Oil Seeds & Cash Crops	Small millet crops		
				Mor (Proso Millets)	Banti (Barnyard Millets)	Rala & Padi (Foxtail Millets)
Area	1348.50	639.85	312.35	550.8	430.65	69.25
Percentage	40.24	19.09	9.32	(Total area Small millet crops 1050.70 Acres) 31.35		

Source: Household interview questionnaire.

The distribution of crops is uneven (Table 1), the highest proportion of crops is cereals with 40.24 percent followed by indigenous crops (Small millets), pulses and cash crops & oilseeds with 31.35, 19.09 and 9.32 percent respectively. In the Satpura mountain area are three indigenous (small millets) crops that are cultivated for grain and fodder. These are the second largest crops that occupy 31.35 percent of the cultivated area and are mostly confined to hilly areas.

Most Important Small Millets in the study area as follows.

a) PROSO MILLET:

Scientific name: Panicum miliaceum (L.)

Local name: Mor

Proso millet (Mor) is a short season crop (50 to 70 days) that grows in low rainfall areas. It releases energy over a longer period of time after consumption allowing one to work from morning to evening without getting tired. The same is not true with rice. This has much protein crude fibre, minerals, and calcium. The Health benefits of proso millet come from its unique properties. It is completely gluten-free and has significant amounts of carbohydrates and fatty acids. It is a cheaper source of manganese as compared to other conventional sources like spices and nuts. It contains high amounts of calcium which is essential for bone growth and maintenance. It has been shown to reduce cholesterol levels and also reduce the risk of heart diseases. It also prevents breast cancer among other diseases. (Figure 2 (a).

b) BARNYARD (BANTI) MILLET (Echinochloa Colona):

Scientific name: Echinochloa crusgalli (L.) P. Beauvois

Local Name: Banti

Barnyard millet (Banti) is a good source of protein, which is highly digestible and is an excellent source of dietary fibre with a good amount of soluble and insoluble fractions. The carbohydrate content of barnyard millet is low and slowly digestible. In its millet, the major fatty acid is linoleic acid followed by palmitic and oleic acid. It also shows a high degree of

retro gradation of amylase, which facilitates the formation of higher amounts of resistant starches. Hence it can be potentially recommended for patients with cardiovascular disease and diabetes mellitus. Barnyard millet is most effective in reducing blood glucose and lipid levels. In today's scenario of increased diabetes mellitus, this millet could become an ideal food. It is also an appropriate food for patients intolerant to gluten which causes celiac disease. (Figure 2 (b).

c) FOXTAIL MILLET:

Scientific Name: Setaria Italica (L.) P. Beauvois

Local Name: Padi and Rala

Foxtail millet is one of the oldest cultivated millets in the study area. Foxtail millet was consumed as the staple food. It has 1 to 2.5 feet tall and about 1cm thick (figure: 2(c). It has a double quantity of protein content compared to rice. It controls blood sugar and cholesterol. It increases disease-resistant capacity when consumed and is considered an ideal food for people suffering from diabetes and gastric problem. Foxtail millet provides a host of nutrients has a sweet nutty flavour and is considered to be one of the most digestible and non-allergic grains available. It contains fibre, protein, calcium, and vitamins. It is a nutritive food for children and pregnant women. It is rich in dietary fibre and minerals such as copper and iron that keeps one’s body strong and immune. And also good quality dry fodder available for cattle feed. (Figure 2 (c).

a) Proso (Mor) Millet Crop

b) Barnyard (Banti) Millet Crop

c) Foxtail Millet Crop

d) Proso Millet (Seed)

e) Barnyard Millet (Seed)

f) Foxtail Millet (Seed)

g) Dehulled Proso Millet Grain (Varai/Bhogar)

h) Dehulled Barnyard Millet Grain (Varai/Bhogar)

i) Dehulled Foxtail Millet Grain (Varai/Bhogar)

Figure 2: Small millet crops, seeds and grain in the study area.

2. NUTRITIONAL AND HEALTH VALUE OF SMALL MILLETS:

Table 2: Nutrient composition of small millets compared to Rice (per 100 g)

Name of small millets	Protein (g)	Fat (g)	Minerals (g)	Fibre (g)	Carbohydrates (g)	Calcium (g)	Phosphorus (g)	Iron (mg)
Barnyard millet	6.2	2.2	4.4	9.8	65.5	27	188	5.0
Foxtail millet	12.5	4.3	3.3	8.0	60.9	31	290	2.8
Proso millet	12.5	4.3	3.3	8.0	60.9	31	290	0.8
Rice	6.8	0.5	0.6	0.2	78.2	45	160	0.7

Source: Nutritive Value of Indian Foods, Ed. Gopalan et al., National Institute of Nutrition, Hyderabad, 2007.

The nutritional value of small millet in the diet cannot be underestimated. Regular consumption of millet reduces lifestyle (diabetes), cardiovascular, gastrointestinal diseases.

To popularize small millet consumption, it is important to understand the important benefits of the nutritional health of the small millet. However, data on the nutritional composition of small millets are scanty. Therefore, an attempt is made to compile a brief grain composition and nutritional profile of small millet as represented in table 2.

Under their composition, small millets are quite comparable to rice or wheat in their nutritive value (table 2). Some of them are even better in protein, oil, and mineral content than rice. The protein content of proso, barnyard, and foxtail millets varies from 6.2 (g) to 12.5(g) per 100 grams. Small millets contain about 4 percent fat, which is higher than rice. Small millets contain a higher level of calcium among cereals. The small millet is a staple food of the tribal people of Western Satpura in the Nandurbar District. In comparison to the major grains like maize, sorghum, and pearl millet, information on processing small millet for food and industrial use is very limited.

3. UTILIZATION OF SMALL MILLETS

Small millets are an important crop grown for food and feed in western Satpura in Nandurbar District.

a) FOR HUMAN FOOD:

In the study area, all these small millets are usually cooked as rice after dehulling. In addition, barnyard and proso millets are consumed as roti (Bhakri), after the dehulled grain has been milled into flour. Small millets are also used as a substitute for rice flour in various snack foods. The varieties of small millets traditionally produced were locally consumed and were hardly sold. They were primarily stored for food security. A simple meal of small millet grain like Mor, Banti, Padi/Rala, Rice, and udid or tur dal were served to villagers during major communal activities. These are building or repairing the house, agricultural activities, marriage, and socio cultural & religious events as part of reciprocity.

b) FOR FODDER (CATTLE FEED):

The harvest residues of all these small millets are extensively used as animal feed.

4. STORAGE OF SMALL MILLETS

Millets are usually stored in Kothi, a storage structure made with bamboo and plastered with mud and cow dung (Figure 3(a). Insect damage during storage is minimal compared with heavy insect damage in sorghum and pearl millet. This might be one of the reasons why households store small millets in larger quantities for food security. The small millets are a relatively, long shelf-life and also ambient conditions the storage in bamboo Kothi for up to ten to fifteen years.

5. WOODEN PLOUGH (STORAGE FOR CATTLE FEED):

Traditionally the tribal people construction their wooden plough near the main house. The plough constructed of supporting wooden poles with wood or bamboo thatch is known as '*Mandav'* in local people. It is a flat structure with a height that is up to 7 to 10 feet. The use of plough is stored cattle feeds like more, banti, padi or rala (small millets), rice, tur, etc. grass-like dried paddies in the dry season (figure 3(b).

a) Kothi (Storage for small millets)

b) Wooden Plough (Storage for cattle Feed)

Figure 3: Storage Facilities of Small Millets in the study area

6. POTENTIAL OF VALUE ADDED PRODUCTS FROM SMALL MILLETS:

Small Millets are Nutri-cereal foods are highly nutritious and have a high nutrient content, including protein, essential fatty acids, dietary fibre, B-vitamins, and minerals such as calcium, iron, zinc, potassium, and magnesium. They help provide health benefits such as reducing blood sugar levels (diabetes), blood pressure regulation, thyroid, cardiovascular, and celiac diseases. Therefore, in the meantime, the development of technology is essential for making millet value-added products. Demand and market for foods that are readily available at a convenient and reasonable price will be available especially in urban areas where awareness for nutrition is increasing. All products are nutritionally rich and beneficial for all ages. There is potential for millet value-added products in the modern age.

Some food products are as follows:

a) Products from proso millet grain: Proso Millet Rawa Idli, Proso Millet Khaja, Proso Millet Burfi, Proso Millet Samosa, Proso Millet Payasam, PROSO Millet Tomato Rice, PROSO Millet Sweet Roti, Multi Millet Idli, Multi-Millet Laddu, etc.

b) Products from barnyard millet grain: Barnyard Millet Cutlet, Barnyard Maheri, Barnyard Indiana, Barnyard Millet Pudina Rice, Barnyard Payasam, Barnyard Millet Pizza etc.

c) Products from foxtail millet grain: Foxtail Millet Kheer, Foxtail Millet Mango Rice, Foxtail Millet Cutlet, Foxtail Millet Coconut Rice, Foxtail Millet Vegetable Biryani / Chicken Biryani, Foxtail Bread, Foxtail Millet Bisebelle Baat.

CONCLUSION

Small millets are an important crop grown for food and fodder (cattle feed) in western Satpura in Nandurbar District. In the sample villages under cultivation was 34.00 percent, and tribal communities predominantly depend on agriculture, cattle, and forest subsistence. The highest proportion of crops is cereals with 40.24 percent followed by indigenous crops (Small millets). Small millets are the second-largest crops occupy 31.35 percent of the cultivated area and are mostly confined to hilly areas. These are proso millet, barnyard millet, and foxtail millets. Small millets are highly nutritious and are better in protein, oil, mineral, calcium, and fiber content than rice and wheat. In the study area, all these small millets are usually cooked as rice after dehulling. Small millets are also used as a substitute for rice flour in various snack foods. The varieties of small millets traditionally produced were locally consumed and were hardly sold. They were primarily stored in larger quantities in Kothi for up to fifteen years for food security. Also, all these small millets are extensively used as cattle feed. Regular consumption of small millets reduces lifestyle (diabetes), cardiovascular, gastrointestinal diseases.

ACKNOWLEDGEMENTS

I am thankful to various Revenue Departments of Akkalkuwa and Akrani tahsil office, BAIF (Bharatiya Agro Industries Foundation) Malpada branch, Tahsil Akkalkuwa, TRTI (Tribal Research & Training Institute, Tribal Development Department Government of Maharashtra, Pune, who helped either by giving data and information by giving co-operation.

Last but not least, a bunch of special thanks for all Talathi, Gramsevak, Sarpanch, Police Patil, Karbhari, and of sample villages the respondents, villagers. Thanks to middlemen (Latya) involved in NTFPs business, local traders, medicinal plant (Bhagat) specialists of the Western Satpura region of Akkalkuwa and Akrani Tahsils in Nandurbar District (MS), who directly or indirectly helped and supported this huge work. I thank all of them who have directly or indirectly helped for executing this study.

REFERENCES

Bamji, M. 2013 "Role of millets in nutritional security of india." Policy paper. New Delhi: Mr. H.C. Pathak, Executive Secretary on behalf of National Academy of Agricultural Sciences NASC, Dev Prakash Shastry Marg, New Delhi.

Census of India, 2011 District Census Handbook Nandurbar District.

Doggett, H. 1986 "Small millets-a selective overview." Small Millets in Global Agriculture. Bangalore: Oxford & IBH Publishing Co.PVT.LMT. New Delhi, 3-17.

Dubey, G. C., 2014 "Nutritional properties of minor millets: neglected cereals with potentials to combat malnutrition." Current Science, 1109-1111.

Gopalan, C. R., 2012 "Nutritive value of indian foods." Hyderabad: National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India.

Tandon, J.P., S. S. 2015 "Guidelines for testing crop varieties under the all- India Coordinated Crop Improvement Projects." New Delhi: ICAR-Directorate of Knowledge Management in Agriculture, Indian Council of Agricultural Research, New Delhi.

Jiaju, C.1986 "Importance and genetic resources of small millets with emphasis on foxtail millet. (Setaria italica) in China." Small Millets In Global Agriculture. Bangalore: Oxford & IBH Publishing Co. PVT. LMT, New Delhi, 93-100.

Malleshi, N. G. 1986 "Processing of small millets for food and industrial uses." Small Millets In Global Agriculture. Bangalore: Oxford and IBH Co. PVT. LMT, New Delhi, 326-338.

Padvi, A T, 2016 "Role of indigenous food crops in tribal livelihood of Western Satpura in Akkalkuwa tahsil Nandurbar Nistrict". Scholarly Research Journal for Interdisciplinary Studies, 9171-9178.

Rao, B. D. 2016. "Millet recipes - a healthy choice." Rajendranagar, Hyderabad: ICAR-Indian Institute Of Millets Research.

Received: 10th May 2021; Accepted:24th Jule 2021; First distribution: 20th September 2021.