SHORT COMMUNICATION

Sorghum-based *dry snacks*-traditional nutricereal food from the Jalgaon region of Maharashtra

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Abstract

In recent times of increase in lifestyle disorders and to achieve the goal of ending hunger by providing nutritious food, the year 2023 is being observed as the "International Millets Year". Millets are early growing, low maintenance with high nutritional value, it is light for digestion, which makes it ideal for consumption for people trying to lose weight, are diabetic and aiming for lifestyle modification. The article focuses on *Sorghum*, the wonder grain by stating its importance from the ancient times of Ayurveda and its recipes that have been passed along generations in Maharashtra. These recipes can be used as a healthy option and replacement of food products made from refined flour.

Key words: Bibdi, jalgaon, jowar, Maharashtra, millets, sorghum, United Nations

INTRODUCTION

The United Nations adopted the global goals of sustainable developments where one of the goals is to attain zero hunger till the year 2030. The objective of the goal is to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture.[1]

The year 2023 has been declared as the international millet year by the United Nations to meet the goals of sustainable development, that is, providing food which is nutritious, high in protein and carbohydrates, all packed in wonder grain-Millets. Millets are important for the management of lifestyle disorders. It has been reported that regular consumption of millets leads into better post-prandial blood glucose and improvement in correcting HbA1C levels.[2] Pearl millet (Bajra) and *Sorghum* (Jowar) are most used millets in India.

Diet is one of the important pillars of health according to Ayurveda, followed by sleep and celibacy, which are also called as *trayopstambha*. Millets can be used for preparing healthy snacks, instead of regular refined flour, oil, and sugar-based snacks, such as biscuits, potatoes, and rice-based snacks.

Millets are highly nutritional, non-glutinous foods. They are the non-allergenic. Millets are early-growing, low maintenance crop, which promote digestive health.

This article is based on traditional food products prepared from *Sorghum* millet, that is, Jowar, which can contribute to the market potential of millet-based products, purely due to its nutritional benefits. As per Ayurveda *Sorghum* is a *Shukadhanya*, which is cooling and nutritious. It is a heart-healthy grain having a low glycemic index (GI), which makes it very useful for patients who wish for lifestyle modification through a light diet.

This paper highlights the traditional Maharashtrian food recipes prepared from Jowar.

Traditional Recipes of *Sorghum*

Jowar is a staple crop of Jalgaon city of Maharashtra, a state in the western peninsular region of India. In Jalgaon

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district, recipes of *Sorghum,* that is, Jowar are traditionally prepared. These are evolved from ethnic groups and since time immemorial. Bibde is a dried *papad*-like food substance that can be stored for a year. It is either fried in oil or roasted to convert into tasty crisps. It is a healthy snack when consumed in roasted form. Instead of using processed cereals or biscuits, this food preparation is a healthy and tasty choice as a snack. Another recipe, Jowar Papad is purely prepared from *Sorghum*.

MATERIALS AND METHODS

[Recipe Description]

This article presents a protocol of preparation of this traditional snack as a millet-based recipe.

Process of Manufacturing Bibdi

These are dry food products in the form of papad (thin, round flaks). Bibdi are prepared using complex process which involves fermentation, cooking and drying. Its ingredients are primarily *Sorghum* (5 kg), rice (125 g), wheat (500 g), yellow chillies (100 g), salt, *Mishreya beej,* that is, dry fennel seeds (100 g), *dhanyaka beej,* that is, dry coriander seeds (100 g), sesame seeds (125 g), sago (125 g). Main ingredient is *Sorghum*, which is soaked in water for 6 days. It is strained on 6th day and grinded into paste. Rice is soaked in water for 3 days and grinded into paste. These two pastes and wheat flour are mixed together. Yellow chillies, fennel seeds, coriander seeds, are coarsely ground and added in the paste of *Sorghum*. Sago is soaked for an hour and added in this mixture. Sesame seeds are added as whole. This mixture is cooked in pre-boiled water in a large vessel for 45 min. Adequate amount of salt is added. Then it is covered by a lid for some time, followed by pouring over a wet cloth to make pellet, such as papad. It is thoughtfully allowed to dry and then stored. These are ready for storage. These can be fried or roasted, which makes a healthy snack. This is a traditionally famous food article from Jalgaon which is mainly millet based, along with medicinal ingredients, such as fennel (*Foeniculum vulgare Mill*.), coriander (*Coriandrum sativum*), and sesame seeds. It is observed that Ayurvedic medicinal ingredients are a part of diet of Indians. Rice may be replaced by wheat as an alteration in process by some. The product is seen in Figure 1a.

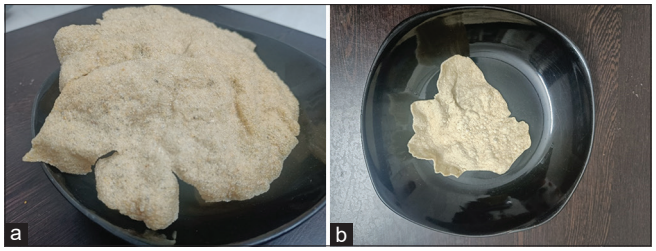

Figure 1: (a) Bibde after frying in oil. (b) *Sorghum* papad after frying in oil

Process of Manufacturing of *Sorghum* Papad

The only ingredient used is *Sorghum*. *Sorghum* is soaked in water for 6 days. On 7th day, it's taken out of water and dried. After completely drying its ground to make flour. This flour is used for making dough with addition of adequate salt. Papad are prepared using this dough and dried in sun and stored. Frying in oil or roasting makes it ready for consumption as a crunchy healthy snack. The ready product is seen in Figure 1b. Figure 2 shows both products in raw, roasted, and fried form.

DISCUSSION

Both products are traditional recipes prepared in the Jalgaon region, Maharashtra. The preparation process is lengthy and unique, which is carried out in summers where the maximum temperature soars upto 45°C or even higher. Unique process of soaking, cooking and mixing with certain ingredients, these are local recipes which are unexplored by the world. The probable mechanisms of processing and actions are discussed ahead.

Both are unique products that are prepared by initially soaking *Sorghum* in water for 6 days, which leads to acidic fermentation. Fermentation leads to making it *laghu*, slightly *Amla,* and light to digest. Lactic acid fermentation takes place in such process, which is known as *Amla janaksandhan* in ancient Ayurvedic literature. This helps further in preserving the products for longer than a year easily. These are best when roasted to make it an oil-free healthy food. The unique processing methods used in the preparation of these snacks render it crispy in consistency and good taste on roasting or frying.

Body constitution is an important aspect of Ayurved. *Sorghum* is light (*laghu*) to digest, and hence suitable for all body constitutions. It is *ruksha*; however, the processes, such as soaking in water in both the products described here, leads to acidic fermentation and *amla rasa utpatti*. The slight *amla* taste makes the product *vata* alleviating. Since the snacks mentioned here are fermentation and heat based the product becomes even more *laghu*. When roasted, persons of all body constitutions can consume it as a healthy snack. In roasted form it is suitable for persons. It is also suitable for patients. It should be consumed in moderation when fried. Both ways these products are suitable for all body constitutions. Apart from *Sorghum*, the *bibdi* also contains meagre amounts of rice (nourishing), wheat (nourishing and stickiness due to gluten), yellow chilies (pungent, taste enhancing, *tikshna*), salt, *mishreya beej, dhanyak beej*, sesame seeds and sago. The qualities of the ingredients are also contributing factors in the whole recipe, such as *mishreya beej* (*Foeniculum vulgare*) dry fennel seeds are sweet to taste, digestive, carminative, and useful in treating *agnimandya*. The seeds alleviate *vata* and *kapha*. Many useful activities, such as antibacterial,

Figure 2: Raw, roasted, and fried *Sorghum bibde* and *Sorghum papad*, traditionally prepared in Jalgaon region of Maharashtra

antifungalare reported.[3] D*hanyaka beejie* dry coriander seeds (*Coriandrum sativum*) exhibit actions viz. *mutral* (diuretic), *jwaraghna* (Anti-pyretic), *deepana* (improves digestion), *rochana* (improves taste), *grahi* (useful in mal-absorption) and *hridya* (beneficial for heart). As per latest research *C. sativum* is known as a functional food due to its wide range of cardiovascular benefits, such as antihypertensive, anti-atherogenic, antiarrhythmic, hypolipidemic and cardioprotective effects.[4] Sesame seeds (*Sesamum indicum* L.) are oil seeds which alleviate *vata*, are rich in protein and lipids and have many health benefits, such as antioxidant action, anti-inflammatory action, and cardiovascular system protection.[5] Sago (*Sabudana*) are small, rounded starch aggregates, which get partly gelatinized by heating Sago helps in making the mixture *picchil* and it further makes the *bibdi* dense and hard. Rice, wheat, and sago are in very less quantities in comparison with *Sorghum*. As few amounts of rice, wheat and sago are added, it leads to taste enhancement and help giving a *picchil* (sticky) consistency to the mixture, which helps for attaining the proper density and hardness to the finished product. Chilies should be avoided in recipe for pitta dominant body constitution.

Sorghum possesses *lekhana* (scraping) and *kleda-shoshana* (dries up excessive moisture) actions, which are useful in treating *Santapanajanya Vyadhi* (diseases due to over-nourishment of single or multiple tissues), such as obesity and diabetes.[6]

The *papad* prepared from *Urad* (black gram/*masha*) is very commonly used in Indian meals, but it is heavy for digestion, as *masha* are considered as *guru*. It can be replaced by *Sorghum*-based snacks.

Both products described herein contain *Sorghum* as a prime ingredient, which is gluten-free. Gluten seems a potentially important determinant in type 1 diabetes and type 2 diabetes.[7]

It has been known from previous research that all *Sorghum*-based foods showed significantly lower GI ($P < 0.01$) than their respective control (wheat/rice-based) foods. The GI of *Sorghum* products is <55.[8]

It is also reported that milling and cooking affect the GI of products. The GI of jowar decreases when it is boiled. Dietary fiber, resistant starch, rapidly digestible starch, alpha amylase inhibitors are the major contributing factors for lower GI values.[9]

Among all the available food processing techniques, fermentation is an age-long process, known to improve nutritional qualities, palatability, and consumer appeal. It

has been reported in an African research article that, such as the above-mentioned Indian products majority of these fermented food products in Africa evolve from ethnic groups and rural communities, industrialization and the application of improved food processing techniques have led to the commercial success and viability of derived products.[10]

It is reported through a research study in experimental animals that pre-administration of fermented *Sorghum* diet significantly protected against hyperglycemia and suppressed glucose utilization *via* glycolysis in the liver of alloxan-induced diabetic rats.[11] The products mentioned in this article can be widely used for replacement of refined flour-based snacks. Instead of wheat or refined wheat flour, it is preferable to consume *Sorghum* as it has a lower GI, for those who wish to tackle diseases, such as hypertension and diabetes mellitus. It has been reported that extruded *Sorghum* demonstrated to be a good alternative to control obesity in overweight men.[12]

In India and other parts of the world; vast variety of fermentation-based food products are used since time immemorial.[13] On the International Year of Millets, and with the help of millets and Ayurvedic plant-based ingredients, the society can get benefits for improving their food habits.

Challenges and Limitations

This short communication is limited to the introductory knowledge regarding traditional healthy snacks of *Sorghum*. Elaborated research can be planned on the *Sorghum*-based recipes by exploring process details and clinical effects. Evaluation of GI of these products can be estimated in fried and roasted form.

CONCLUSION

Specific fermentation, often referred to in traditional Indian context as a form of Amlajanak Sandhan (acidic fermentation) for sorghum (jowar), is a traditional, cost-effective, and highly efficient technique to improve the nutritional, sensory, and functional properties of sorghum, making it more digestible and nutrient-dense. The traditional recipes of sorghum are traditional know-how of Jalgaon region of Maharashtra, which can be explored by further research and innovation.

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