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Nutritional profile & health benefits of Jhangora: A mini review

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Abstract

Indian barnyard millet (Jhangora) is a wholesome diet package and also rich in fibre and minerals. Its properties like Low carbohydrate, low glycemic Index and gluten free grains add additional benefits against various health issues like obesity and diabetes. This article highlights the importance of Jhangora in terms of its Nutritional Values and Pharmacological Benefits.

Keywords: Jhangora, Indian barnyard millet, diabetes, weight loss, obesity, micronutrients

Introduction

Millets, in due course of time, have gained popularity among the main stream population of Asia and western world and its overall production has been skyrocketed in yesteryears. Barnyard millet is a minor millet crop, which also has hit the chart. Barnyard millet belongs to genus *Echinochloa*, comprises of two major species, *Echinochloa esculenta* and *Echinochloa frumentacea*. Both the species are acceptable for human consumption and animal feed. Despite its nutritional and agronomic benefits, barnyard millet has remained an under-utilized crop. Special feature of most of the millets, apart from rich source of crude fibre, crude protein and antioxidants, is that they are less susceptible to biotic and abiotic stresses and therefore, needs less care as standing crop in the field. Apart from basic nutrients barnyard millet grain contains more micronutrients (iron and zinc) than other major cereals (Renganathan *et al.*, 2020) [24]. *Echinochloa frumentacea* is also known as Indian barnyard millet, sawa millet, Japanese millet, billion-dollar grass or Jhangora (in Hills of Uttarakhand). Other common names to identify these seeds include "Oodalu" in Kannada, "Bhagar" in the state of Maharashtra and "KuthiraiVaali" in Tamil Nadu (Hilu *et al.*, 1994) [7]. Jhangora has evolutionarily modified itself to adapt in both the warm and temperate conditions, and therefore possess rich gene pool for stress tolerance and other abiotic stresses. Understanding molecular mechanism behind this inherited capability to tolerate stresses could be a helpful tool in developing modified cultivars of Barnyard Millet (Renganathan *et al.*, 2020) [24]. or other agronomic crops by transfer of the genes interest.

Consumption Trend

During religious fasts and festivals in India, Jhangora seeds are cooked and consumed, therefore known as Vrat ke Chawal, in Hindi (USDA, NRCS). The millet is small and spherical in size, and white in colour. Taste is accepted among all the age groups and highly economical. Traditionally the grains are given to the patients to medicate maladies like biliousness and constipation. As compared to other millets, Jhangora is highest flavonoid concentration in its seeds (47.55 mg QE/g extract) and its slow digestibility makes it a natural designer food (Veena *et al.*, 2005) [31]. According to WHO, about 422 million people worldwide have diabetes, the majority living in low-and middle-income countries, and 1.6 million deaths are directly attributed to diabetes each year, barnyard millet could become an ideal food. Seeds/ grains are gluten free and therefore could be consumed by everyone (Arora & Srivastava, 2002; Lee *et al.*, 2009; WHO) [3, 4]. In many states of India (like Kerala, Karnataka, Assam, Uttarakhand, Himanchal) many various dishes from the use of barnyard millets, are already popular like Idli, Dosa, paniyaram, Idiappam, Papad, Halwa, Roti, Puttu, Upma, Adai, Khakra, Kheer, Sweet Kolulattai, Adhirasam, Kesari, Sweet Adai, Vadai, Pakoda, Ribbon Pakoda, kolukattai, Merukku, Thattu Vadai, Vadagam etc. (Malathi *et al.*, Booklet, TNAU) [15].

The flour is compliant and therefore, used in preparing various other delicacies like baby foods, snacks, and other dietary products (Vijayakumar *et al.*, 2009 [33]; Anju and Sarita, 2010 [21]; Surekha *et al.*, 2013) [13, 21, 28]. Value addition is also possible by adding the flour of Jhangora with other cereal flours to increase nutritive value, without much affecting the taste (Veena *et al.*, 2004; Surekha *et al.*, 2013) [31, 28]. For example, as reported by Jaybhaye and Srivastava in 2015 [8], Jhangora flour can be used to make ready-to-eat snack, along with mash potato and tapioca powder in the ratio of 60:37:3. In vitro protein digestibility (IVPD) is governed by tannin content, though Jhangora has less tannin content (approx. 03%) as compared to other millets, this could further be reduced by enhanced quality processing techniques, especially in the value-addition strategy of food industries.

Nutritional Values and Pharmacological Benefits

Millets are reported to be plentiful source of dietary fibre (about 22%) by International Journal of recent scientific research, which is why they are suitable as diet for weight control. Millets are also abundant source to bioactive compounds and antioxidants, which also contribute in weight control and also prevent various health issues. Proposed explanation to weight check is, high fibre in millets gives the feeling and create an emotion of full stomach and therefore, lessen the urge to consume more food, this is how indirectly more calories are avoided and weight gain could be checked. (Organic lifestyle 2020) [18]. Joshi & Srivastava, 2018 [9] analysed PRJ-1 variety of barnyard millet, as a substitute for rice for diabetic patients and reported that Jhangora has crude protein, crude fat and crude fibre content (percent value 9.39, 2.0, 6.3) which is significantly higher as compared to rice. Similarly, the total dietary fibre (11.4%), resistant starch (12.81%), tannin (67.8%) and total antioxidant activity (59.23%) of barnyard millet was higher comparative to staple cereal, rice.

The role of polyphenols and carotenoids in diet is also recognized, these compounds are twofold higher in barnyard millet than finger millet (Panwar *et al.*, 2016) [19]. Phenolic acids and tannins are major polyphenols in Jhangora. Though flavonoids are in diminutive amount, still they act as antioxidant and play crucial roles in strengthening the body's immune system (Moreno *et al.*, 2014) [16]. Fe content in Jhangora is estimated to be about 15.6–18.6 mg/100 g (Saleh *et al.*, 2013 [25]; Renganathan *et al.*, 2017 [23]; Vanniarajan *et al.*, 2018) [31], which is quite high and abundant as compared to staple cereals and other millets. High CHO: Fibre ratio make sure that the release of sugars will be slow in the blood stream, and this way help out in maintaining blood sugar level. Kumari and Thayumanavan, 1998 [13] in an experiment, reported that seeds of Jhangora lower the blood glucose, serum cholesterol, and triglycerides in rats. Likewise, alkaloids, steroids, glycosides, tannins are also present in adequate amount in Jhangora and thus contributes to various medical benefits like being antioxidant, anti-carcinogenic, anti-inflammatory, antimicrobial, having a wound healing capacity, biliousness, and alleviating constipation-associated diseases (Kim *et al.*, 2011; Ajaib *et al.*, 2013; Moreno Amador *et al.*, 2014; Borkar *et al.*, 2016; Nguyen *et al.*, 2016; Sayani and Chatterjee, 2017) [10, 1, 17, 26]. Some pharmacological benefits of Jhangora (Barnyard Millet) are enlisted here under:

1. Low glycemic index: facilitates formation of resistant starch and therefore recommended for patients with CVS

disease and diabetes mellitus (Kim *et al.*, 2011) [10].

2. Gluten free food: therefore, healthy for people, with celiac disease, intolerant to gluten (Ciaccia *et al.*, 2007) [5]
3. High fibre content: prevents constipation, bloating and cramping (Rao and Bhaskaracharya, 2017) [22].
4. Rich in micronutrients: like Mg, thus lessens effects of migraine and cardiac attack. Phytic acid help in over-casting cholesterol. (Shahidi *et al.*, 2012) [27].
5. Abundant source of phenolic acids and tannins, phenolics may be cogent in the interception of cancer tenderness and progression in vitro (Kim *et al.*, 2010) [11].
6. Rich in Anti-oxidants, like Ferulic acid: which act as free radical scavenger and therefore possess anti-inflammatory activity, and plays role in anti-aging and metabolic syndrome. (Rajasekaran *et al.*, 2004 and Hegde *et al.*, 2002) [21, 6].
7. Seeds extracts contains proteins, that are anti-microbial and inhibit growth of *Rhizoctonia solani*, *Macrophomina phaseolina*, and *Fusarium oxysporum* (Radhajejalakshmi *et al.*, 2003) [20].

Future Prospects

Jhangora could be studied more efficiently as a potential crop in science of Biofortification. Seeds of Jhangora are rich in Fe and Zn, and strategies could be made to study, gene transfer possibility against various micronutrients, to other agronomic crops already in cultivation in mainstream agriculture. The rich gene pool for tolerance against various biotic & abiotic stresses, along with micronutrient traits, paves the way for functional genomics studies (Renganathan *et al.*, 2020) [24].

Discussion & Conclusion

Indian barnyard millet or Jhangora, is rich in minerals, antioxidants and flavonoids. Its is also a rich source of crude fibre and crude protein, and also gluten free, which makes it a viable option against treat biliousness, constipation, obesity & diabetes. *En masse*, all these attributes make Jhangora a suitable and secured food. In overall health and nutritional well-being. In spite of these features Jhangora is underutilized crop an very less popular, though now its gaining momentum among health conscious working class. Research funding must be diverted towards breeding trails to explore its gene pool and potential. NGOs and extension officials must collaborate in popularizing its nutritional and health benefits among farm women and children. Popularity among consumer class will also help in earning extra income for the growers and thus in better standard of living. Moreover, investment in post-harvest technologies for better processing and value-addition in Jhangora and other millets is very crucial at the moment (Renganathan *et al.*, 2020) [24].

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