

## Nutraceutical Properties of Bangladeshi Rice Varieties

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### Editorial

Bangladesh is a diversified rice cultivable land. Rice is the main staple food and one of the most reliable energy sources from its carbohydrate portion since the prehistoric days in Bangladeshi population. A total of eighty-six high-yielding varieties (HYVs), including both inbreds and hybrids, have been released by Bangladesh Rice Research Institute (BRRI) up to now from its establishment in 1970. At present, total milled rice production is about 34.8 MT which is supposed to be enough to meet the domestic requirement of feeding approximately 170 million populations. Rice scientists especially BRRI scientists have the shoulder responsibilities to attain the goal of adequate rice production with updated HYVs. In response to this crucial demand, BRRI releases many HYVs including biotic and abiotic stress tolerant modern HYVs every year or alternate. Since we are maintaining 2.06 MT rice as surplus production and there has been comparatively less progress on addressing the quality aspects of rice, so, special emphasis should now be to focus on the rice grain quality improvement and its potential nutraceutical aspects to expose its imperative role to contest with commonly non-communicable diseases in Bangladeshi population such as heart disease, cancer, diabetics etc. Grain Quality and Nutrition (GQN) Division of BRRI has already identified some promising nutraceutically enriched modern HYVs such as black rice, antioxidant enriched rice, low glycemic index rice, anti-depressive alias gamma amino butyric acid (GABA) enriched pre-germinated brown rice and micronutrient enriched rice, specially Zn enriched rice etc. Nutraceutical is defined as a food or part of a food that provides health benefits, including the prevention and/or treatment of a disease. The consumption of nutraceutical foods from cereals, vegetables, fruits, nuts, mushrooms, etc., play a pivotal role as curative and preventive measure of some non-communicable diseases (NCDs). Having versatile functional properties, rice as a food is unique, easily digestible, hypoallergenic and the source of quality protein. Due to rice's staple role most of the required nutrients including minerals for human as of 49 are supplied by rice itself [1]. Malnutrition in Bangladesh is thought to be alarmingly high. According to FAO (2017) and World Development Indicators (WDI, 2016), 36.1%, 14.3% and 32.9% children under 5 years of age are suffering from stunting, wasting and underweight respectively in Bangladesh, with the prevalence of undernourishment (PoU) of about 24.4 million (15.1%) [2,3]. The national prevalence of Zn deficiency is 44.6% and 57.3% in preschool age children and non-pregnant non-lactating women respectively [4,5]. Absorption of minerals such as  $Zn^{2+}$ ,  $Ca^{2+}$ ,  $Mg^{2+}$  and  $Fe^{2+}$  in the small intestine is therefore inhibited due to their chelation by phytate which has been known well to decrease mineral bioavailability [6-8]. Estimation of molar ratio of phytate to minerals such as  $Zn^{2+}$ ,  $Ca^{2+}$ ,  $Mg^{2+}$  and  $Fe^{2+}$  is seems very important parameter for the understanding bioavailability of minerals. Shozib et al. [9] surveyed a total of 68 high-yielding varieties (HYVs) in Bangladesh. They reported that BRRI dhan43 and BRRI dhan42,

grown in upland Aus, have higher amounts of Zn at  $38.4\text{ mgkg}^{-1}$  and  $27.0\text{ mgkg}^{-1}$  respectively (based on  $8.0 \pm 0.5\%$  degree of milling). BRRI dhan43 has other important minerals like Fe, Ca, P at the concentration of  $17.0\text{ mgkg}^{-1}$ ,  $68.1\text{ mgkg}^{-1}$  and  $2.5\text{ mgkg}^{-1}$ , respectively. In support of bioavailability, molar ratio of phytic acid to Zn (PA/Zn); Fe (PA/Fe); Ca(PA/Ca) and P (PA/P) are found lower in BRRI dhan43 among all 15-selected high Zn enriched HYVs by 3.56, 6.93, 1.24 and 25.69 respectively followed by BRRI dhan42 (data not shown). Therefore, both BRRI dhan43 and BRRI dhan42 could potentially be used as parental source for the development of micronutrient enriched rice (MER) advance breeding lines particularly for Aus (pre-monsoon or kharif-1) season. BRRI has released four Zn enriched varieties namely BRRI dhan62 ( $20.0\text{ mgkg}^{-1}$ ) and BRRI dhan72 ( $22.8\text{ mgkg}^{-1}$ ) for Aman (monsoon or kharif-2) season and BRRI dhan64 ( $24.0\text{ mgkg}^{-1}$ ) and BRRI dhan74 ( $24.2\text{ mgkg}^{-1}$ ) for Boro (dry winter or rabi). Diabetes specially type2, is considered as a major global health problem with increasing prevalence throughout the world, especially in Asia, including Bangladesh [10,11]. Epidemiological studies focus on the adverse health consequences of carbohydrate enriched food and diets which are readily and extensively digested [12-14]. The glycaemic index (GI) ranks food on the basis of their propensity to raise blood glucose. Lower GI foods and diets provoke only transient, moderate postprandial glycaemia and improve insulin sensitivity in NCDs [15-20]. In 2017, Shozib et al. [21] surveyed a total of 72 BRRI HYVs for low GI rice screening and three HYVs such as BR16, BRRI dhan46 and BRRI dhan69, are found as low GI rice ( $GI \leq 55$ ), 50 HYVs are found as intermediate GI rice ( $GI 56-69$ ) and the rest 19 HYVs are found as high GI rice ( $GI \geq 70$ ). Rice has phenolic compounds which are able to inhibit the formation or reduction of the concentrations of reactive cell-damaging free radicals [22,23]. In 2012, Dutta et al. [24] reported that, among all tested HYVs of rice in Bangladesh, variety BR5 contains the highest total phenolic content (TPC), ferric reducing antioxidant power (FRAP) and total antioxidant capacity (TAC). In 2015, Shozib et al. [25] showed how dietary administration of rice improves the antioxidant status in blood of the experimental long-evans rat. Pre-germinated Brown Rice (PGBR) alias germinated brown rice (GBR) enhances the bio-availability of nutrients by neutralizing phytic acid during the process of germination. PGBR has been found to be optimum for getting the highest non-essential amino acid such as gamma amino butyric acid (GABA), an inhibitory neurotransmitter content [26]. The nutrients which have increased significantly include GABA, lysine, vitamin E, dietary fiber, niacin, magnesium, thiamine and riboflavin [27]. PGBR has been reported to exhibit many physiological effects, including anti-hyperlipidemia, anti-hypertension, and the reduction in the risk of some chronic diseases, such as cancer, diabetes, cardiovascular disease, and Alzheimer's disease [28]. Muhammad et al. [29] reported that, among the tested rice HYVs, BRRI dhan31 generates high level of bioactive component, GABA at PBGR condition. Black rice consisting of black paricap or black kernel is especially rich in anthocyanin pigments, phytochemicals, proteins,

vitamins, minerals and antioxidant properties. In Bangladesh, Black rice (BRRI Black Rice, BBK1) has been found with low GI values for both brown and polished rice condition (48 and 51 respectively). BBK1 has high protein content of 9.5% and higher gamma oryzanol [30]. Other Bangladeshi local black rice varieties, such as Gabura, Muktahar and BK10, are also very promising in this regard. In grain quality and nutrition (GQN) division of Bangladesh Rice Research Institute (BRRI) we are trying to do research activities on nutraceutical properties of rice in Bangladesh to combat against NCDs.

## Conflict of Interest

The author declares no conflict of interest.

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