FOOD SAFETY AND QUALITY PARAMETERS OF BROWN RICE

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Executive Summary

Brown rice is considered as one of the healthiest and mineral-rich food commodities (Zahra& Jabeen, 2020). It contains minerals and essential nutrients that can reduce the prevalence of malnutrition and chronic diseases (Upadhyay & Karn, 2018). In 2022, the exportation of organic brown rice was valued at USD 425,000 (TrendEconomy, 2023). More Filipino farmers venture into brown rice production as more Filipino consumers switch from white to brown rice (Philippine News Agency, 2021). However, several studies have reported food safety issues associated with the consumption of brown rice particularly aflatoxin (Sales & Yoshizawa, 2015), *Bacillus cereus* (Rodrigo et al., 2021), and inorganic arsenic (Malabadi et al., 2022; U.S. FDA, 2016). Considering the nutritional value of brown rice, the food safety hazards associated with its consumption, and increasing market opportunities and demand for brown rice, there is a need to develop standards that will protect consumer health and facilitate trade. The main objective of this study is to collect relevant scientific and technical information on the food safety and quality parameters for brown rice that will be used as a basis for the development of a Philippine National Standard (PNS) specific to brown rice.

A qualitative method was used to collect and analyze information on the food safety and quality parameters for brown rice from relevant international, regional, and national standards, interviews of key informants, and collected locally produced brown rice samples. Respondents for the key informant interviews were brown rice producers identified by Philippine Rice Research Institute (PhilRice).

The major findings of this study are as follows:

1. Food safety parameters for brown rice are defined in terms of Maximum Residue Limits (MRL) for pesticides, maximum level (ML) for total aflatoxins and inorganic arsenic, and microbiological limits for yeasts, molds, aerobic plate count, and coliforms.

2. Codex established MRL for a total of 23 pesticide active ingredients in brown rice. Only six active ingredients in Codex had corresponding pesticide MRL in ASEAN (2,4-D, carbendazim, carbofuran, fenthion, and iprodione). Nine active ingredients (2,4-D, acephate, carbendazim, carbofuran, iprodione, isoprothiolane, sulfoxaflor, tebufenozide, and triflumezopyrim) in Codex had corresponding MRL registered under the Department of Agriculture (DA)- Fertilizer and Pesticide Authority (FPA). All active ingredients in ASEAN were harmonized with Codex pesticide MRL while only two active ingredients (2,4-D and triflumezopyrim) in DA-FPA were harmonized with the Codex MRL. DA-FPA MRL values for acephate, carbendazim, iprodione, and tebufenozide were found to be stricter or higher than those established by Codex. On the other hand, three active ingredients (carbofuran, isoprothiolane, and sulfoxaflor) in DA-FPA were more lenient or less strict than Codex. Furthermore, 12 active ingredients with pesticide MRL in Codex were not registered for rice in the Philippines.

3. The ML for total aflatoxins (20µg/kg) and inorganic arsenic (35mg/kg) adopted by PNS/BAFS 194:2022 (General Standard for Contaminants and Toxins in Food and Feed–Product Standard) were harmonized with Codex.

4. No microbiological limits were set by Codex for brown rice but the Department of Health (DOH)- Food and Drug Administration (FDA) has set microbiological limits for cereals and grains under FDA Circular No. 2013-010 for the following parameters: yeast and mold count (YMC), aerobic plate count (APC), coliform, and *Escherichia coli*.

5. Parameters for brown rice classification were based on grain size (kernel length) and grain shape (kernel width). Brown rice classifications of the National Seed Industry Council (NSIC) system were comparable to both Codex and PNS.

6. For grading of brown rice, 14 parameters were identified which were: head rice, whole, kernel, broken kernels, chips/brewers., chalky, damaged, yellow/discolored kernel/heat-damaged/red kernel, immature kernel, contrasting/other types of rice, paddy, glutinous rice, foreign matter, and moisture content.

7. Overall grades of collected samples varied due to differences in specification per grading parameter for each standard. Further, parameters such as broken, immature, damaged, and chips/brewers were the main causes of the downgrade in the quality of the collected samples.

The major recommendations of the study are as follows:

1. Adopt the pesticide MRL set by Codex in general to be consistent with the obligations under the World Trade Organization (WTO) – Sanitary and Phytosanitary (SPS) Agreement.

2. For the four registered pesticide MRL by the DA-FPA that were higher (stricter) than the Codex pesticide MRL (i.e., acephate, carbendazim, iprodione, and tebufenozide), DA-FPA may consider re-evaluation of the pesticide risk assessment conducted for these active ingredients.

3. For those registered pesticide MRL by the DA-FPA that were lower (less strict) than the Codex pesticide MRL (i.e., carbofuran, isoprothiolane, and sulfoxaflor), DA-FPA may consider adopting the Codex pesticide MRL as the minimum level.

4. Adopt the ML values for total aflatoxins and inorganic arsenic set by relevant Codex and PNS standards for brown rice.

5. Adopt grain classes and limits per class used by NSIC for grain classification.

6. For the grading of brown rice, the 14 identified parameters may be considered in the development of the PNS.

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