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Microplastics in Carolino rice from Portugal

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Abstract

Background: Food contaminants are substances unintentionally present in food that can threaten human health. Microplastics are an emerging and pervasive class of contaminants with a broad environmental distribution that can also contaminate foods [1]. Moreover, food processing and packaging can further contribute to microplastic contamination of food products [2]. Rice is among the most widely consumed foods globally. However, studies examining microplastics in rice remain scarce. **Objective:** The objective of this work was to assess microplastic contamination in a Portuguese-grown rice (Carolino variety), commercially available packaged either in paper or plastic. **Methods:** Triplicates of 1 kg of rice (Carolino variety) were acquired in Portuguese markets in 2023. Density separation was achieved by mixing about 25 g of rice with 75 mL of a saturated NaCl. After mixing for 1 min, the solution was left to rest for 24 h, followed by filtration of the supernatant (glass fiber filter of 1.2 µm pore, Whatman GF/C). Then, the filter was treated with 10 mL of 30% H_2O_2 (Labkem) to remove natural organic matter and with 0.01 mg/mL of Nile Red (Sigma-Aldrich), to stain microplastics. Fluorescent particles (i.e., suspected microplastics, MPs) were counted and photographed under fluorescent microscopy (Olympus BX43) and later measured in ImageJ. The best practices in contamination control were followed. The two procedural blanks showed low cross-contamination (0 – 1 MPs/filter). Data was recorded in Excel 365 and statistical analyses were performed in IBM SPSS Statistics (v19), with α=0.05. **Results:** The median concentration of microplastics in Carolino rice was 0.12 MPs/g. Most microplastics were fibers (median circularity of 0.043) with median dimensions of 518.2 µm. No statistically significant difference was observed between paper and plastic-packaged rice for these variables (p=0.845). **Conclusions:** Concentrations of microplastics in Caroline rice are similar to those reported in the literature, such as 0.30 MP/g in Indian rice [3]. Similar concentrations found in paper and plastic-packaged rice suggest contamination prior to packaging. An estimated annual intake of 1812 MP/person is expected for the Portuguese population, based on rice consumption (15.1 kg/person). Microplastics as external contaminants of Carolino rice do not seem to pose a grave risk to human health, considering concentrations and particle sizes.

Keywords: food safety; food contaminants; microplastics

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