Oral presentation: 235

Iron fortification of four rice cultivars in Northern Province through parboiling process

S. Sivashankar* and K. D. P. P. Gunathilake

Department of Food Science and Technology, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, (NWP) Sri Lanka.
*sivashankarlfn@gmail.com

Iron deficiency is a widespread micronutrient deficiency in humans. Use of iron supplementation tablets and iron fortified food is not common in developing countries. This study focus on parboiling as a cost-effective alternative method to fortify iron in four rice cultivars often consumed by people in low income category in the Northern Province to increase the iron concentration and bioavailability of iron in rice. Four paddy cultivars (Bg, 300, Bg 406, Mottakarupan and Pachchaperumal) were parboiled in deionized water containing FeEDTA (250 mg Fe/kg paddy rice), made by mixing ferrous sulfate ($FeSO_4$) with ethylene diamine tetra acetic acid disodium salt (Na_2EDTA) in acidic pH of 5.50 - 5.70. Iron content in rice was determined using atomic absorption spectroscopy and the bioaccessibility and bioavailability were evaluated using simulated gastrointestinal digestion and dialysis method. Triangle test was done to evaluate the sensory properties of the fortified rice using 30-untrained panelists. Addition of iron during the parboiling process resulted in increased concentration of iron (40 - 80 mg/kg) in grain compared to unfortified rice cultivars (30 - 35mg/kg) ($p < 0.05$) depending on the cultivar. Iron concentration in iron fortified grain was negatively correlated with the concentration of iron in unfortified grain ($r = -0.812$, $p < 0.01$). Iron retention test was conducted by rinsing the grain thoroughly three times using de-ionized water followed by oven drying at 70^0C for 72 hr. Iron fortified parboiled rice retained up to 75.51 - 99.67% iron after rinsing treatment. However, there was no correlation between total iron content and the magnitude of iron losses in fortified parboiled rice grains of four rice cultivars caused by rinsing ($p>0.01$). The bioaccessibility and bioavailability of iron in rice cultivars (unfortified and fortified) were evaluated by *in vitro* digestion. The bioavailability of iron in fortified rice was significantly increased compared to unfortified rice ($p< 0.05$) depending on rice cultivars. There was no correlation between bioavailability of iron and concentration of iron in (fortified and unfortified) rice cultivars ($p > 0.01$). In conclusion, Pachchaperumal rice cultivar is more suitable for iron fortification since iron fortification did not change the sensory attributes. Parboiling is an effective method to fortify iron into rice grains and iron fortified rice is a vehicle for improving iron status in rice based diets consumed by low income people.

Keywords: Bioavailability, iron fortification, parboiling, rice