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Rice fortification with iron (II) fumarate by spherification: A preliminary study

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Iron deficiency is one of the most prevalent malnutrition issues in developing countries including Sri Lanka. Current solutions to iron deficiency include diet diversification, supplementation, food fortification and biofortification. Studies have shown that the micro encapsulation technique increases the bioavailability of iron. In Sri Lanka, no studies have attempted to fortify rice with iron using the microencapsulation techniques. This study investigates the effectiveness of spherification technique to encapsulate iron (II) fumarate in a rice matrix. Rice variety BW 361 (BW: Bombuwala) was used in this study. Rice seeds were dehulled, polished and flour was prepared. Iron encapsulated beads were prepared using spherification technique. Different concentrations of sodium alginate (SA: 1-5 % w/v), calcium chloride (CC: 3-7 % w/v) and rice flour (RF: 1-4 % w/v) were used in the preparation of iron encapsulated beads. Iron fumarate (1 % w/v) was used in all the experiments. The properties (shape, color, hardness and degree of dehydration) of beads obtained under different ratios of SA, CC and RF were determined by visual examination and by considering these properties the best beads were selected. The Iron content entrapped in the best beads that were formed under optimum conditions of SA, CC and RF was determined by a colorimetric method (AOAC 944. 02). Iron encapsulated beads produced under varying ratios of SA, CC and RF showed difference in shape, color, hardness and degree of dehydration. The shape of the beads ranged from irregular to spherical depending on the ratios of SA and CC whereas color ranged from white to gray depending on the concentration of RF. Further, hardness of beads varied from very soft to hard. Moreover, the degree of dehydration of beads ranged from low to high. Of the different combinations studied, 5 % SA, 3 % CC, 1-2 % RF along with 1 % iron fumarate produced the best iron encapsulated beads. These beads were hard, spherically shaped, white/white brown in color with a low degree of dehydration. Further, this technique allowed 72 ± 1 % iron to be entrapped in the iron encapsulated beads. It could be concluded that SA: CC: RF: iron fumarate at 5:3:2:1 ratios provide the best iron entrapped particles. Therefore, spherification technique could be an effective technique to encapsulate iron (II) fumarate. Further experiments are being carried out for the production of iron fortified rice grains.

Keywords: Rice fortification, Iron (II) fumarate, spherification