Source : www.thehindu.com Date : 2022-04-17

A BETTER MILLET FOR POTENTIAL IRON DEFICIENCY

Relevant for: Indian Economy | Topic: Major Crops, Cropping Patterns and various Agricultural Revolutions

Huge gain: Iron absorption was three-fold higher from the low phytate grain than the market variety. | Photo Credit: Special Arrangement

Is iron deficiency universal and profound in India? Is it due to dietary iron deficiency? With the Indian vegetarian diet, containing 8.5 mg iron/1,000 Kcal-energy, women who eat adequately (enough energy for a sedentary lifestyle), should have an iron intake of about 15 mg/day, matching their daily iron requirement (15 mg/day). Adult men with their lower iron requirement (11 mg/day), and those eating for an active lifestyle with higher energy intake, are even better off. Therefore, dietary iron deficiency is not the major problem. Nor is iron deficiency the common cause for deficiency anemia in India; it is only one cause. Other nutrients like vitamin B12, folate and protein are also important. Indeed, anemia itself may be over-diagnosed, since surveys using capillary blood will overestimate the prevalence of anemia, and there is some doubt that the hemoglobin cutoff to diagnose anemia is incorrectly high, overestimating its prevalence.

Therefore, when body iron deficiency occurs, it is less likely to be due to an iron-deficient diet, and more likely due to poor absorption of dietary iron. With poor, cereal-based diets, iron is not well-absorbed, because of a substance called phytate that is present in cereal grains, which binds tightly to dietary iron and impedes its absorption. Similarly, drinking tea or taking paan after meals also blocks iron absorption because of other inhibitory substances called polyphenols, which also bind iron tightly. Chronic body inflammation also blocks iron absorption from the intestine.

This iron absorption blockade can be overcome by eating fruits (vitamin C) with meals, or simply changing behavior, like avoiding tea with meals. Alternatively, dietary iron intake could be increased in a natural manner, by eating iron-rich grains like millets, which will increase iron intake naturally, and not excessively. It is laudable that there is interest in promoting millet consumption in India for adults and children: these ancient grains are good for us in many ways, and not just for their rich iron content. They are also high in calcium, zinc, magnesium, potassium, dietary fibre, and important vitamins such as thiamine, riboflavin, folic acid, and niacin.

Millets are therefore a great solution for increasing dietary iron density, offering much more than a single nutrient to the diet. Replacing just 100 gm of the daily cereal (rice) intake with finger millet (ragi) will increase the daily iron intake by 50%, and calcium by 350%. These are spectacular benefits, but they can be offset due to the high intrinsic phytate content of the ragi grain, which could reduce iron absorption. Even so, this ancient yet local grain, offering more than a single nutrient, should be a dietary staple, with strategies devised to enhance absorption of its iron.

One such agricultural research strategy is to find a natural finger millet variety with the same rich iron content, but with a lower phytate content, to offer better iron absorption. A recently published collaborative study published in the journal *Frontiers in Nutrition* does just that. Teams at the University of Agricultural Sciences, Bengaluru (UASB) led by Prof M.S. Sheshashayee and our team at St. John's Medical College, Bengaluru screened hundreds of Indian finger millet accessions to identify a grain variety with low grain phytate content, but the usual high iron content. This specific accession was grown repeatedly over three years, to ensure that the low phytate content was consistent across seasons, without any yield penalty.

Whole genome sequencing showed a variation in the phytate transporter gene responsible for storage of phytate in grains. In this unique collaboration between agricultural and health sciences, iron absorption from this low-phytate millet grain was then measured in adult women in comparison with a market variety using a very accurate dual iron-stable-isotope erythrocyte incorporation method. Iron absorption was almost three-fold higher from the low phytate grain compared to the high-phytate market variety.

This is a promising and sustainable strategy. Yet, in India, the contrary path of iron fortification of staple foods is followed. This is a single nutrient approach that simply increases the chemical iron content of the diet, supplying about 10 mg/day per fortified food. It is counter-productive when iron deficiency is not universal, and absorption is the problem. Then, the fortified intake can be excessive when no iron deficiency exists, and excess iron is harmful: it is pro-oxidant, with many side effects, increasing the risk of diabetes, and unabsorbed iron can turn colonic bacteria towards an unhealthy typology.

Addressing the supply side of iron through natural means, like improving natural iron absorption from iron-rich grains, is a much better and holistic strategy than single nutrient efforts like chemical iron fortification of cereals, which has its own logistic problems, costs and health risks. As natural and ancient grains that provide a diversity of nutrients, millets, with their high natural iron content, low water requirement and low environmental footprint, would be an excellent and sustainable strategy to mitigate any existing iron deficiency in India, while promoting general health of populations, including risk-reduction for chronic diseases.

(Rajashekhar Reddy is Postdoctoral Fellow, St John's Medical College, Bengaluru, and Anura Kurpad is Professor of Physiology, St John's Medical College, Bengaluru)

END