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IIT Roorkee Researchers identify new enzyme from Yak cheese

08 May 2018 | News

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Indian Institute of Technology Roorkee Researchers have identified a new enzyme from yak cheese that has the potential to improve the nutritional value of cereals by improving bioavailability of vital minerals.

This will be of great benefit to India where deficiency of micronutrients such as phosphorous, iron, calcium and zinc is a major health issue particularly for vegetarians.

In plants, phosphorous is stored mainly as organic phosphorous called ‘phytate,’ which is an anti-nutritional factor (ANF). Nuts, seeds, beans and whole grains are rich in phosphorous, while vegetables and fruits have lesser quantity. Despite this, people with vegetarian diets not only exhibit deficiency of phosphorous as well as other minerals. This is because humans lack an enzyme called phytase needed to convert phytate into free phosphorous for absorption by the body.

The newly identified enzyme promises to address this problem. It has been found to effectively dephytinize the phytate and generate free phosphorous. Researchers have also shown that it also helps to increase bioavailability of iron, zinc, magnesium and calcium.

Speaking about the importance of this project to the country, Dr. Naveen Kumar Navani, Associate Professor, Department of Biotechnology, IIT Roorkee, who led the research, said, "As per FAO reports, micronutrient deficiency (also regarded as Hidden Hunger) afflicts one in three people globally. This results in severe debilitation at mental and physical level specifically for children. Enzymes like Phytase have ability to reduce such burden of hidden huger by making non-available micronutrients available for the body"

Elaborating on his research, he said that the Phytase enzyme was identified, cloned and characterised from a probiotic bacterium called 'Lactobacillus fermentum NKN51.’ The bacterium was isolated from ethnic cheese (called churpee) made from milk of Himalayan yak from Khardong village in Nubra valley, Leh. The enzyme has been named ‘phyLf.’

Dr. Navani and his team were now collaborating with Dr. AjitYadav of Indian Council of Agricultural Research (ICAR) - Central Avian Research Institute, Izzatnagar, to apply this purified phytase enzyme along with other plant derived antimicrobials to see their efficacy on reducing the load of pathogenic bacteria like Salmonella and improving the growth performance of poultry. In the long term, this enzyme could be used in enhancing the micronutrient availability to infants, pregnant women and the elderly.

Dr. Navani said that Nuts, Seeds, Beans and Whole Grains were rich in phosphorous while vegetables and fruits have lesser quantity. Dephytinisation of durum wheat and finger millet flour with the purified enzyme, followed by in-vitro model of gastric digestion showed increased levels of bio-accessibility and dialyzability of iron, zinc, magnesium and calcium contents.

Conventionally, phytase enzymes are derived from fungi and are considered fit for use to improve nutritive values of poultry and other livestock feeds. Dr Navani said that his team was looking for a source that could be used to improve food items consumed by humans - a food grade bacterium. They tried samples of milk and other dairy products of cow, buffalo, sheep and goat from different parts of the country.

The research was funded by the National Agricultural Science Fund of Indian Council of Agriculture Research (ICAR) and Uttarakhand Council of Science and Technology. The researchers have published results of their work in a recent issue of journal Bioresource Technology.