

THE LOWDOWN ON ZEARALENONE IN CEREALS

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

Zearalenone is a fungal toxin infesting cereals such as wheat, maize and barley. It attacks crops while they are growing, but can also develop when cereals are stored without being dried fully. While numerous studies document this toxin in cereals across the world, no data existed for India until now. This month, a *Journal of Food Science* study detected zearalenone in wheat, rice, corn and oats from markets in Uttar Pradesh. The study, by researchers from Lucknow's Indian Institute of Toxicology Research (IITR), found the substance in 70 of the 117 samples tested. The Food Safety and Standards Authority of India does not impose maximum limits for zearalenone, though the European Union (EU) does. Twenty-four of the U.P. samples exceeded the EU regulatory limits of 100-200 mcg/kg of cereals. Based on this, the authors say India should set limits on zearalenone in cereals. "It is definitely a worry," Mukul Das, a food toxicologist at the IITR and an author of the study, told *The Hindu*.

Fungal toxins are commonly found in food, and can be a public health concern, says Vasanthi Siriguri, a researcher at Hyderabad's National Institute of Nutrition, who was not involved in the study. India regulates the levels of some of these, including aflatoxin, deoxynivalenol, ergot and patulin. The first three infest cereals, while patulin is found in apples. Each of these toxins has been associated with disease outbreaks. For example, in 1974, a hepatitis outbreak in Rajasthan and Gujarat, which made 398 people sick and killed 106, was linked to aflatoxin in wheat. Meanwhile, chronic aflatoxin consumption has been shown to cause liver cancer. Given this, the International Agency for Research on Cancer (IARC) classifies aflatoxin as a Group 1 carcinogen, meaning there is enough evidence for its carcinogenicity. In zearalenone's case, there is no strong evidence of toxicity in humans so far, though several research groups are investigating, says Dr. Siriguri. As a result, the IARC classifies it as a Group 3 carcinogen, which means evidence is not sufficient for an evaluation yet.

Zearalenone behaves like oestrogen, the female sex hormone, and could cause endocrine disturbances in humans. Its nasty effects in animals, such as pigs, are documented. When fed with mouldy corn, pigs develop inflamed vaginas, infertility and other symptoms. This is why countries like Brazil regulate zearalenone levels in animal feed. In humans, the data are fuzzier. It is probably dangerous to humans too, but to be certain, we need to know how much humans consume, how it is metabolised, and how exposure is correlated with disease. Some experiments suggest its ill-effects: in one, when oestrogen-sensitive breast cancer cells were exposed to the chemical in a lab, they proliferated. In 2014, a Tunisian case-control study found a correlation between a zearalenone metabolite in urine and breast-cancer risk in women. But other studies did not find similar links. In the *Journal of Food Science* study, Dr. Das and colleagues also looked at National Sample Survey Office data on Indian diets to calculate how much zearalenone people could be consuming. They found that average daily consumption through wheat and rice was 0.27 and 0.3 mcg/kg of body weight — higher than the EU limit of 0.25 mcg/kg. In highly contaminated samples, exposure could be as high as 16.9 times the EU limit.

Dr. Siriguri says more data are needed from cereals in other States, and from other storage conditions, before India decides to set limits. Since zearalenone favours cool climates, such contamination could be limited to a few States. Also, strong epidemiological data linking human zearalenone levels with diseases such as breast cancer are important. The paper is an excellent starting point, since nothing was known about the chemical in India so far. It is time to build upon it.

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