

Minimising arsenic poisoning in crops

On World Soil Day each year, the University of Warwick looks at ongoing research into the growing of crops in arsenic-contaminated soil without the edible part of the plant being affected. Arsenic in soil is a worldwide problem. Found in soil and water all over the world, arsenic is a cancer-causing chemical. Absorbed by plant roots, the chemical can enter to the edible part of the crop.

The chemical is carcinogenic and is naturally found in water supplies and soil, particularly in Bangladesh and the north-eastern part of India.

Arsenate is the most abundant form of arsenic and is structurally similar to phosphate. Therefore, it is easily incorporated in to plant cells through phosphate uptake pathway – the process of the roots absorbing nutrients.

However, when a plant absorbs arsenic it can translocate it up to the edible part of the plant – ultimately arsenic enters the food chain. Plants have an inherent capacity to cope with arsenic stress by producing metal-chelating peptides called phytochelatins (PCs).

PCs detoxify the arsenic and restrict the movement of arsenic in the roots. Which in turn helps to reduce the root-to-shoot translocation of Arsenic. Phytochelatins are therefore essential in trapping the arsenic absorbed by the plant in the roots.

Scientists at the University of Warwick wanted to make plants with more phytochelatins in the roots, to stop any of the arsenic escaping and travelling up the shoot to the



edible part of the plant.

This is being done by making transgenic plants with reduced cytokinin hormone in the roots. This means phytochelatin is boosted and can detoxify and hold more arsenic in the root.

Dr Mohan TC, from Dr Alex Jones Laboratory, School of Life Sciences at the University of Warwick is doing this pilot study in transgenic Barley and is now looking at doing it in rice plants, thanks to funding from the Medical and Life Sciences Research Fund (MLSRF), UK.

“To stop the cancer-causing arsenic entry into the food chain, it is essential to develop safe crops, through restricting the translocation of arsenic to edible part”, Dr Mohan says.

“In our current project, we are trying to manipulate cytokinin hormone in rice plants through genetic engineering and we expect to increase the roots detoxification capacity of the transgenic rice.”