

Arsenic in Soil Poses Danger to Humans and Plants

Arsenic is an element found naturally occurring in Earth's crust. It makes its way into soil and groundwater through physical and chemical weathering of rocks. When ingested, arsenic can have serious effects on human health.



Arsenic in Agriculture

Arsenic in soils can dramatically reduce agricultural yields because it builds up in plant tissues, where it attacks metabolic pathways, energy systems, and cell replication processes.

Arsenic in Food

Arsenic is toxic at any dose, but some level of exposure is unavoidable. Human activities like mining and refining of metal ores can increase the prevalence of arsenic in soil and groundwater. In the United States, approximately 300 people are exposed to unhealthy doses of arsenic; in Bangladesh, however, that number exceeds 30,000,000. It is estimated that 1 in 5 Bangladeshis will die from arsenic poisoning.

Arsenic Uptake by Plants

Plants are adept at collecting diffuse materials from the soil and concentrating it in their tissues. The same pathway acts as entry point into the body for nutrients, water, and arsenic.

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As

74.92 g/mol

Arsenic is one of the 118 elements on the periodic table. It is similar to phosphorous, an element that is critical to many cell functions.

○ Arsenic

○ Phosphorus

1 The plant's immune and mineral uptake systems mistake arsenic for phosphate.

2 The epidermis and endodermis are protective layers of cells that keep most metals and toxins out of the plant body - but this phosphate mimic fools the outermost defenses.

6 In plants, arsenic causes stunted growth, physiological disorders, and death.

5 Plants lack an excretory system: once a toxin gets in, it usually does not get out. The plant will usually immobilize the toxin in some innocuous part of the cell (like the watery central vacuole), keeping it away from delicate, vital cell processes.

4 The plant delivers arsenic to all places it would normally send phosphate: leaves, growing tips, stem, flowers, and fruits.

3 Arsenic enters the xylem and phloem, which make up the transport system.

Epidermis (upper skin)

Endodermis (inner skin)

Phloem (transport sugars)

Xylem (transport water)

