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Arsenic hyperaccumulation efficiency depends on time and tissue in *Pteris vittata*

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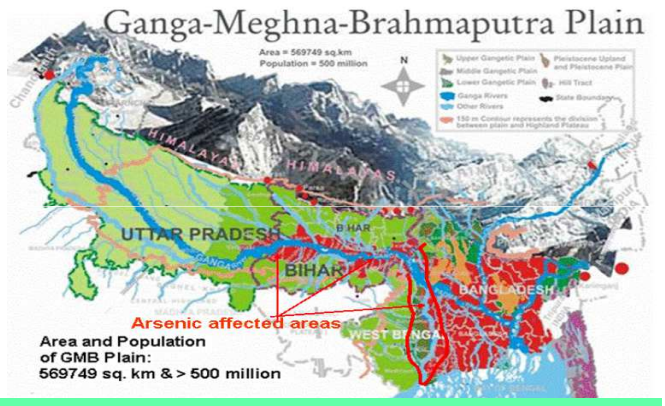
The metalloid arsenic is a toxic environmental pollutant. Arsenic pollution becomes serious due to mining, mineral, smelting and tannery industry. Leaching of naturally occurring arsenic into drinking water aquifers, has been reported in many countries including India and Bangladesh. Available engineering methods for remediation is costly and difficult. Many plant species reported to accumulate arsenic. *Pteris vittata* has been reported as arsenic hyperaccumulator. An Indian eco-type of *P. vittata* has been used to study the arsenic accumulation. The plants were grown in arsenic containing soil along with soil without arsenic (control). The ferns were separated into two portions, i.e., above ground (fronds), stage specific as well as tissues from different position of pinnae and below ground (roots and rhizomes). Futher, it was also harvested at different time interval. Dried fern samples (0.1 g) were digested with mixture of concentrated nitric acid and perchloric acid. Heavy metal measurement in foliar and root samples was performed with ICP-OES. Tissue specific arsenic accumulation indicates that juvenile leaf contains highest arsenic than mature leaf. Middle pinnae of mature leaf show high arsenic content compared to upper and lower pinnae. Among the underground parts of the plant, rhizome contains high arsenic than roots. Further, time dependent arsenic accumulation study indicates that active accumulation of arsenic starts from day 7 to day 30 in leaf tissue, while in roots, day 3 to 7 show sudden increase and no much drastic change in accumulation from day 7 onwards.

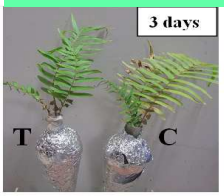
Arsenic contamination B.K. Mandal, K.T. Suzuki / Talanta 58 (2002) 201–235

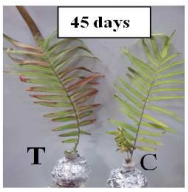
Arsenic contents in the soils of various countries

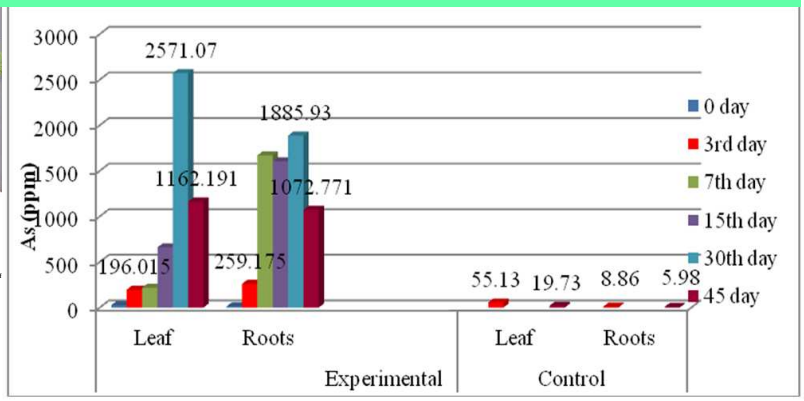
Country	Types of soil/sediment	Number of samples	Range (mg kg^{-1})
West Bengal, India	Sediments	2235	10–196
Bangladesh	Sediments	10	9.0–28
Argentina	All types	20	0.8–22
China	All types	4095	0.01–626
France	All types	–	0.1–5
Germany	Berlin region	2	2.5–4.6
Italy	All types	20	1.8–60
Japan	All types	358	0.4–70
	Paddy	97	1.2–38.2
Mexico	All types	18	2–40
South Africa		2	3.2–3.7
Switzerland		2	2–2.4
United States	Various states	52	1.0–20
	Tiller	1215	1.6–72

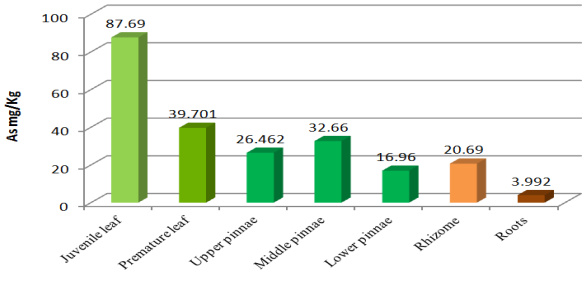
http://www.cgwb.gov.in/documents/papers/incidpapers/Paper%208%20-%20Ghosh.pdf











Arsenic accumulation (mg Kg^{-1} dry biomass)

Tissue type arsenic accumulation	
Juvenile leaf	87.69 ±5.49
Premature leaf	39.701±2.58
Upper pinnae	26.462±2.66
Middle pinnae	32.66±3.82
Lower pinnae	16.96±2.94
Rhizome	20.69±1.88
Roots	3.992±0.36

Time and tissue type dependant arsenic accumulation			
Days	Leaf	Roots	Total As
0	25.36±2.52	12.341±2.19	37.701
3	196.015±6.19	259.175±13.67	455.19
7	216.545±7.12	1668.975±6.67	1885.52
15	659.135±7.8	1603.4±4.95	2262.535
30	2571.07±8.88	1885.93±2.51	4457
45	1162.191±7.3	1072.771±5.28	2234.962

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