Spatial Variation of Arsenic over an Irrigated Command Area of Rice Field and Related Factors

A.T.M. Farid[1], K.M. Hossain[1], M.A. Haque[1], R. Sen[1], G.M. Panaullah[2], C.A. Meisner[2], R.H. Loeppert[3], J.M. Duxbury[4]

[1] Division of Soil Science, Bangladesh Agricultural Research Institute, Gazipur, BANGLADESH (ssdbari@dhaka.net)
[2] CIMMYT, BANGLADESH (g.panaullah@cgiar.org)
[3] Professor, Soil & Crop Sciences Dept., Texas A&M University, USA (r-loeppert@tamu.edu)
[4]/ Professor, Cornell University, USA (jmd17@cornell.edu)

INTRODUCTION

The widespread arsenic (As) contamination in ground water and in soils of Bangladesh pause a real threat to Bangladesh. In majority cases As level is > 200 ppb and in extreme cases even more than 700 ppb. Arsenic contamination, which has invited numerous questions to be settled, also opens multiple issues to work on. One important issue is to whether As comes with flood water or is being pumped is still debatable. There have been findings in favor of both. The present study was undertaken to answer this as well as to find the spatial and temporal variations of As in groundwater, drain water and in soil.

MATERIALS AND METHODS

An investigation was conducted to study the water quality of 96 shallow tube wells (STW) and soil quality of corresponding 96 irrigated soils during March, 2002 in Meghna Estuarine Floodplain Soils, Brahmanbaria. Samples from the corresponding irrigated crop fields of rice straw and grain grown in those irrigated areas were also analyzed. Standing and flowing water samples at different time and distance were collected from the STW channels in containers previously containing dilute HCl. Soil samples (0-15 cm depth) were collected from the corresponding spots towards the direction of running water. Soil and plant samples were digested in tri-acid mixture and the extracts and water samples were analyzed by Hydride generator-AAS after reduction of As(V) to As(III) with KI and ascorbic acid. Other parameters of soil and water samples were also analyzed using Hunter's (1980) method.

RESULTS AND DISCUSSION

There was no variation of As content in irrigation water of a specific Shallow Tube Well sampled within a day. But variation was significant when sampled at 15 days interval. It was lower initially (194.7 ppb on 2nd February, 03), highest at the middle (202.3 ppb on 1st March, 03) and again declined (192.4 ppb) on 3rd April, 03 at the later stage of pumping. The scenario was quite meaningful when As was determined in irrigation channels at 15 meter interval both for running and standing water and their corresponding soils. No variation was found in running water but variation was there in standing water after cease of irrigation. Arsenic content decreased with the distance from the source in a regular way and there was a good negative correlation ($r = 0.89$) between water As content and the distance. Significant variation was also found in the corresponding soil samples ($r = 0.84$) which implies that soil possess a good As absorption capacity. Determination of oxalate extractable Fe shows good correlation ($r = 0.59$) with the soil As content which is mainly responsible for As accumulation as total Fe contains 70% non-crystalline Fe-oxide.

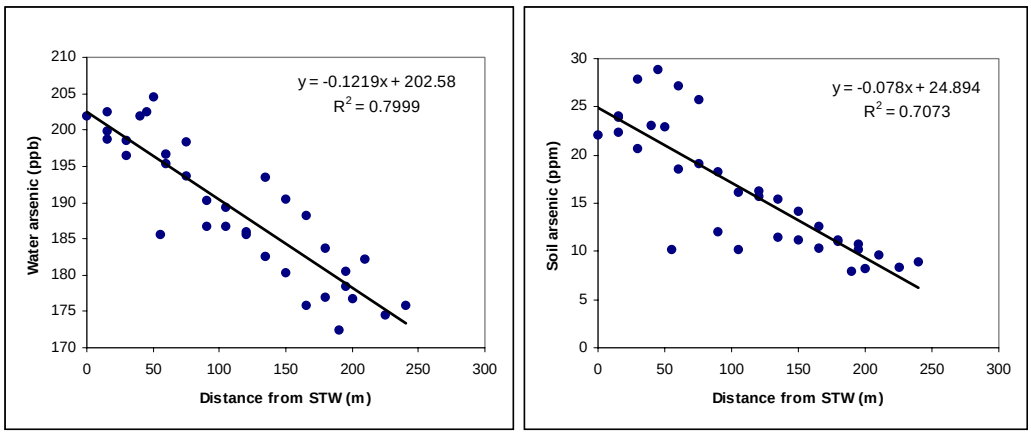

Fig 1. Relations between distance from the Shallow Tube Well, and water and soil arsenic content at Brahmanbaria.

It is evident from data that As is being pumped and retained by the soil as influenced by soil mineral. However, confirmation needs more time series data.

CONCLUSION

There was little temporal variation of As in irrigation water but there was noticeable seasonal variation. There was not much variation of As in flowing water but standing water As was higher at near point and lower at far point of the STW. Significant variation was also found in the corresponding soil samples of the irrigation channel probably due to the variation of soil properties.

REFERENCES

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