Arsenic and fluoride in soil from Lahore and Kasur districts, Punjab, Pakistan.

#Ｆａｒｏｏｑｉ Ａｂｉｄａ[1]; 益田 晴恵[2]; 日下部 実[3]; Ｍｕｈａｍｍａｄ Ｎａｓｅｅｍ[4]
Abida Farooqi[1]; Harue Masuda[2]; Minoru Kusakabe[3]; Naseem Muhammad[4]

[1] 阪市大・理・地; [2] 阪市大・理・地; [3] 岡大・地球研; [4] パキスタン地調・地
[1] Dept. Geosci., Osaka City Univ; [2] Dept. Geosci., Osaka City Univ.; [3] ISEI, Okayama Univ.; [4] Geoscience Labo. GSP, Pakistan.

The groundwater contamination As up to 2.4 mg/L and F- up to 23 mg/L had already been reported from the area. Based on the chemistry of those groundwaters, soil was estimated to be a source of the contaminants. Thus, 120 soil samples from the surface and 30 cm depths mostly from the agricultural lands were collected and analyzed chemically for F- and As. Phosphate fertilizers are also one of the sources of high F- in agricultural areas, fertilizer samples DAP were analyzed for F-.

The study area is semi-arid to arid region. The soils are permeable and lack organic matter. The underlying sediments are mostly coarse, sand intercalating fine to very fine sand and silt layers. The XRD data show that main minerals are quartz, muscovite, and clay minerals such as montmorolinite. The pH of the soils shaken with water was more than 8 and leachable fluoride in soil samples was detected using selective F- ion electrode. High F-concentrations up to 18 ppm with average of 4 ppm were determined in samples taken from 30 cm and low concentrations in surface samples 2.5 ppm.

Total As in soil samples was analyzed by hydride generation atomic spectroscopy. Comparatively high concentrations of As are observed in the surface soil samples average 10 ppm and 8 ppm in samples from 30 cm. High As and F- are observed in the vicinity of the brick kiln areas, and As and F- shows the same distribution patterns. The fertilizers sample contain 60-250 ppm of water soluble F-. Fluoride concentrations correlates positively with the pH of water leaching soil, indicating that relatively large amount of F- was dissolved into the groundwater from the alkaline soils. Presence of high As in the surface soil implies the contribution of anthropogenic sources most probably the atmospheric pollution, coal combustion by wet and dry deposition and arsenical pesticides.

Intensive mineral weathering and high evaporation rate, under high pH and oxidizing conditions produces the formation of highly alkaline water, which would dissolve the fluoride and adsorbed arsenic on the mineral surfaces in the soil.