

Environment

Failure to move conservation policies towards a more sustainable development has manifested itself in a range of environmental problems, particularly in agriculture sector in Pakistan. In addition to deforestation and desertification issues across much of country's territory, agro-chemical contamination, particularly by irrational use of hazardous pesticides has raised the problems of food chain, human and environmental health. Therefore, research based protection and conservation of environment including land, water, air and diversity of fauna and flora are crucial for sustenance of society and sustainable development. Research at PARC is focused on pesticide residue problems and fertilizer loading and fate in agricultural land, water, food chain and their effect on human health.

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Land Resources

• Boron and Zn sorption and transport was studied using two calcareous soils: (a) Lyallpur, fine silty, mixed, hyperthermic Ustalfic Haplargid and (b) Sultanpur, coarse silty, mixed, hyperthermic Ustollic Camborthid. The soils were varying in clay content and vadose zone structure. The sorption isotherms were developed and fitted to Langmuir equation. Lyallpur soil series had slightly greater adsorption partition coefficient (k_d) both for B (1.17 vs. 1.10) and Zn (21 vs. 18) than Sultanpur soil series. In Lyallpur soil series columns, B arrival was immediate but the peak concentration lower than Sultanpur (Figure 1). The breakthrough of B in Sultanpur soil series occurred after about 10 cm of cumulative drainage, rise in effluent concentration (C/C_0) was fast and then peak to concentration one. Zinc leaching through the soil columns was very limited as the peak concentration ratio was only 0.05. The study demonstrates effect of soil structure on B transport and has implications for the nutrient management in soils. The distribution of dyed area reflected differences in nature of dye paths in soils. Fingering flow in massive loam Sultanpur and macropore flow in clay loam Lyallpur

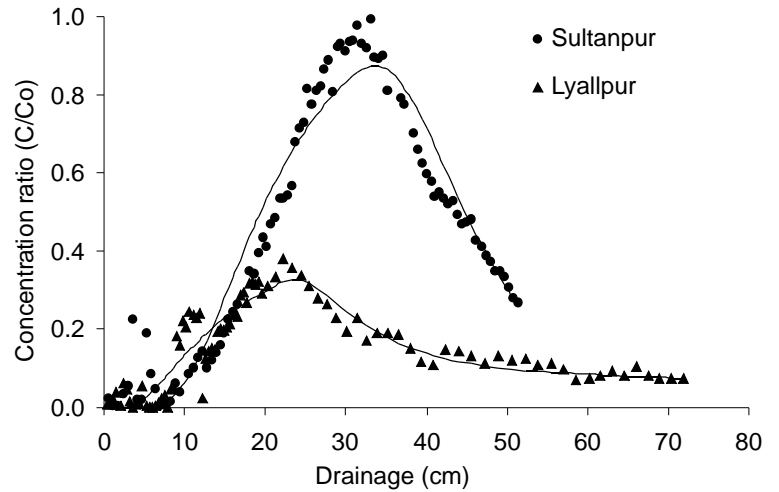


Figure 1. Boron breakthrough curves of Sultanpur and Lyallpur soil series

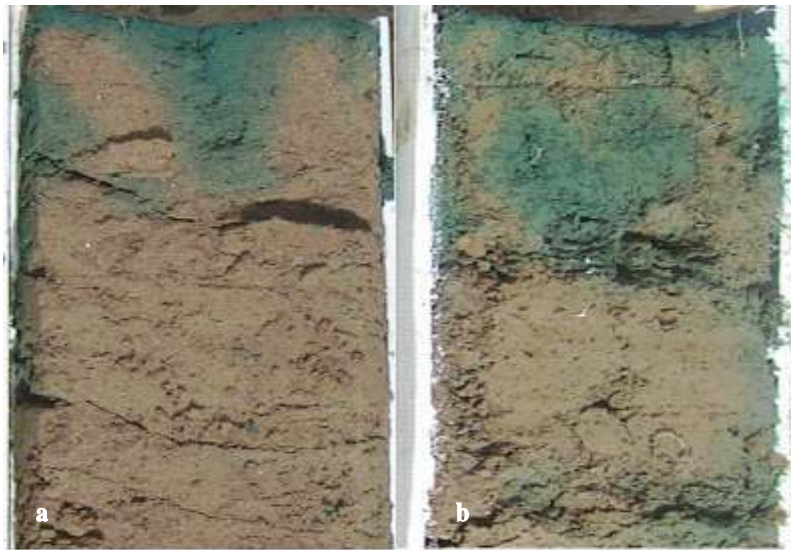
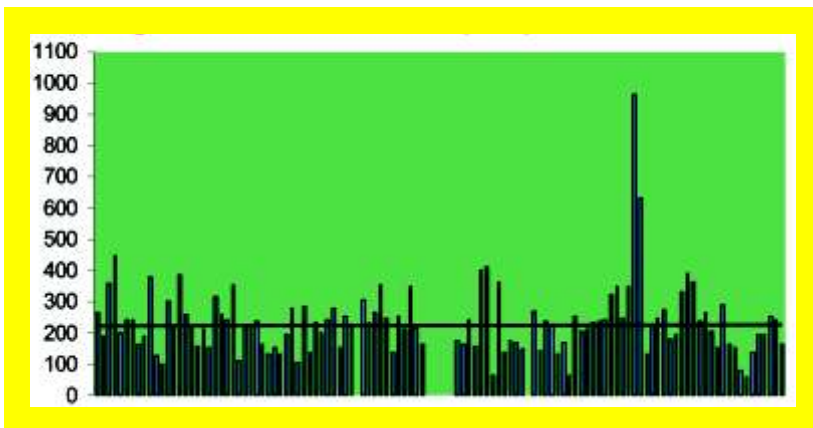


Figure 2. Pattern of blue dye staining in two soil series (a) Sultanpur and (b) Lyallpur



Quetta rainfall (mm) 1891-2007

soil where the dye moved through macropores and then, moved outward perpendicular to the flow paths suggesting diffusion into the matrix (Figure 2).

AZRC, Quetta

• Historical rainfall data and long term averages showed that 2005-06 received only 70 mm rainfall during the cropping season. Other critical incident was severe dry and cold spell during January, 2006 when the

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air temperature remained more than -8°C for a week and went as low as -15°C . This cold wave hit the whole province and badly damaged the horticultural crops even in the most hot areas of the province viz.

- Dahadar, Sibi and Harnai.

AZRC has established an automatic weather reporting station at AZRC to help dryland research and planning. AZRC has more than 100 years agromet data. Rainfall during 2006-07 was recorded at 333.4 mm and was fairly distributed; long term rainfall data have an average of 223 mm therefore the report year may be called as a good year as regards rainfall. Yellow rust on the local wheat is a common problem during the good rainfall years, which badly affected the dryland Sailaba wheat.

SARC, Karachi

Agro-Chemical Pollutants in Food Chain and Environment

- An alarming level of pesticides residue contamination (72%) and maximum residue levels (MRL's) violation (35%) was observed in 148 samples of fruits and vegetables collected from farmers' fields (62 fruits and 86 vegetable samples).
- Out of 45, 32 mango samples were positive for one or more pesticide residues and MRL violations occurred in 13 samples. Methamidophos and Endosulfan are persistent pesticides, which most frequently violate MRL's.
- One hundred and two samples of fruits and vegetables were collected from different exporting companies for pesticide residue analyses. The residue data generated after analyses showed that even exporter's samples were contaminated at an alarming rate.
- The most common pesticides were Endosulfan, Methamidophos, Imidacloprid, Deltamethrin, Bifenthrin, Cyhalothrin, Profenophos, Thiophnate-Methyl and Fosetyl Aluminium.

Spraying of Pesticides

- Toxicity of Malathion (LC50s) against common fresh water fish (*Channa punctatus*), was 8.58 mg/l after 96 hours followed by 16.62 and 25.32 after 72 and 48 hours of treatment respectively.

Plant Genetic Resources

- Taxonomic studies of aquatic plants of Pakistan revealed 150 species found in wetland habitats. Several species were invasive weeds choking irrigation, while some provided habitat to migratory birds for breeding and shelter. Many species have economical uses as well like species of *Saccharum* (Sarkanda) used for cheap furniture and window blinds, *Vetivera* (Khas) used in desert cooler screens. Some plants are used in herbal medicines like *Hygrophila* (tal makhana), *Nelumbo* (phool mukhana). Some unique species in high altitude wetlands included endemic species like *Ranunculus lobatus*.



Distribution of wild onion in the wetland habitat of Burzil lake