

## ABSTRACT

Benzimidazole fungicides used for present studies were 2-(3-pyridyl) benzimidazole, 2-(2-fluorophenyl)-1H-benzimidazole, N-(1H-benzimidazole-2-ylmethyl) acetamide, benomyl and methyl 1H-benzimidazole-2-carboxylate (carbendazim). Sulfonylurea herbicides studied were nicosulfuron, cinosulfuron, metsulfuron-methyl, iodosulfuron, rimsulfuron, triasulfuron, chlorimuron-ethyl and Chlorosulfuron. These sulfonylurea herbicides are used in Pakistan against a wide range of broadleaf weeds as well as some grasses whereas Benzimidazole fungicides being used in Pakistan against various plant diseases in cereals, fruits, vegetables and other crops.

The pesticides were investigated for their sorption-desorption behavior on four Pakistani soils having different geographical conditions ranging from hilly areas to desert areas and different soil minerals such as silica, alumina, bentonite, goethite, muscovite and Montmorillonite by using batch equilibrium method. The techniques used for present study were UV-VIS spectrophotometry, HPLC, and XRD. By using UV-VIS spectrophotometry and HPLC the data obtained in all tests showed that adsorption co-efficient isotherm for pesticides in four tested soils were well fitted the freundlich equation. The isotherms were non linear in maximum cases with slope  $n < 1$  resembling the L type curve. Adsorption-desorption isotherms were obtained and Freundlich constants ( $K_f$ ,  $K_{f(des)}$ ,  $K_{des}$ ,  $K_{om}$ ,  $K_{foc}$  and  $K_{oc}$ ) were calculated. Soil Organic Matter (SOM) and pH were considered to be important factors leading to differences in sorption capacity.

In XRD studies, sorptions of pesticides with soils were measured by the change in basal spacing. The larger increase in basal spacing attributed to perpendicular arrangement of pesticides into interlayer of clay contents. Whereas relative smaller difference indicates parallel arrangement of pesticides into interlayers. In some cases there is no change in basal spacing however HPLC technique shows sorption, which may be due to surface adsorption.

In general Benzimidazole fungicides and Sulfonylurea herbicides showed a greater degree of adsorption on Ayubia soil, which is northern hilly area of Pakistan. This was attributed to high organic contents of soil. Moreover adsorption behavior also significantly affected by the soil pH values and sand contents. Soil with high sand content had less vacant sites/surface areas and resulted in minimum adsorption.

The results of adsorption and desorption study on minerals can be used to predict the sorptive behavior of the synthesized compounds on different soils of known composition. Detailed statistical studies of data were carried out as positive contribution for the ongoing data collection by the environmental agencies of Pakistan.