CHAPTER - II

SCOPE & OBJECT

The study of the interaction of humus and clay fractions of the soil is a problem worthy of intense research for a variety of reasons. A knowledge of clay mineral - organic reactions might throw much light on some important geological proceses. The importance of clay humus interactions in modifying the physical and chemical characteristics of the soil has been long recognised by different scientists. Probably, the most important effect resulting from organic - inorganic interaction relate to aggregate formation and swelling properties.

The overall effect of organic materials is that they help to bring about aggregate formation and aggregate stability which serve to provide the soil porosity that permits more free movement of water, air, nutrients and roots, which is essential for plant growth. Had there been no interaction, clay particles would tend to stump into a solid mass which is not a condition for ideal plant growth.

It is also well known that humus plays an important role in the fertility of soil by creating a more favourable physical condition for plant growth by supplying to the plants a continuous stream of the necessary nutrients during its slow and steady decomposition with the help of microbial agencies. Hence it is possible to store humus for a longer period by coupling it with clay minerals thereby protect it from rapid deterioration.

Our knowledge of humus in the soil and particularly in relation to its interaction with clay is still meagre in several respects.

Humus is known to be adsorbed by clay particles, but the exact mechanism of this adsorption process is not clearly understood. Much remains to be learnt regarding the mechanisms involved in such reactions. Still some questions of, basic structural units of this soil organic matter, its complexing mechanism with clay minerals and the stability of these complexes are not known. To understand clearly the effect of humus in soil it is necessary to investigate the mode of union between clay and humus. It is likely that the understanding of the humus-clay complexes will be facilitated by a study of the interaction of clay with humus from the physical and physicochemical stand-points.

Many of the investigators in this field, made no distinction between humus and humic acid. Very few studies were made with humus as a whole, in the majority of cases, the organic materials used were only "humic acids". Our knowledge about the interaction of different components of the humus with clay minerals is still inadequate. In view of this, such studies will be of considerable interest to soil scientists and agronomists. It is with this idea that the present work has been undertaken. In this study, interaction with clay minerals viz. Bentonite of 2 : 1 lattice type and kaolinite of 1 : 1 lattice type have been studied with different fractions of the soil humus (i.e. soil humic acid, fulvic acid and hymatomelanic acid) and also those from peat (Peat humic acid and fulvic acid). The interaction with one synthetic (model) humic acid has also been studied. The basic points of our studies are given below :

(a) The characterisation of humic substances.

(b) The evaluation of cation exchange capacity of clay-humus mixtures as influenced by increasing adsorption of humus.

(c) Studies of the I.R. Spectra of clay, humus and their interaction products as also the involvement of functional groups in this interaction.

(d) Studies on the E.S.R. spectra of clay, humus and their interaction products to unveil the role of free radicals if any, during the interactions.

(e) Examination of the X-ray diffraction patterns of interaction products .