

I N T R O D U C T I O N

Andhra Pradesh is an important agricultural state. Red soils constitute about 65 per cent of the total cropped area of the state of which 30 per cent is in the Telangana Region, which constitute the major part of the state covering nine districts having red sandy loam soils. These light textural type of soils are locally known as Chalkas. The soils are mostly developed from granites and located on plateau elevations with appreciable slopes upto 3 per cent, and are conducive to erosional hazards. These soils are sandy loam to sandy clay loam, shallow to moderate in depth, about neutral in reaction and poor in soil structure. They have low available moisture, nutrients and organic matter.

The main physical problems of the soils are high permeability, low water holding capacity, poor fertility and proneness to quick drying and becoming hard and compact giving rise to crusting at the surface. When water content becomes low, the plough layer becomes very high in bulk density and hard, impeding root elongation. As the cultivation in these soils is mainly rainfed, moisture becomes a limiting factor for crop production. The rainfall of the region is about 600-800 mm per annum, concentrated mostly in the month of June to October. Short term drought and dry spells commonly occur in these semi arid tracts during rainy season. The farmers of this region have to wait to plough their fields till monsoon rains set in. Lakhs of

hectares of land, thus remain uncropped, or even when cropped produce very low yields due to unfavourable soil conditions. The fertiliser use efficiency of these soils are very low and nutrient losses are also high. It does not encourage the farmers to use high levels of inputs. The farmers in the region incorporate locally available black earth rich in montmorillonite clay to improve the physical condition of the soil.

Due to their extensiveness, there is immediate necessity to investigate in the range of chemical, physico-chemical, physical and mineralogical, properties being encountered in order to develop suitable management practices. The management practices when once developed to these soils will help to improve the productivity. Even a little increase in productivity will mean a quite lot to the farmers as the productivity and economic condition of the farmers cultivating the soils is very low. Further there is also necessity to understand a phenomenon of crusting and to know how the crust strength is effected by different management practices in order to overcome the adverse effects of crusting in these soils specially if it occurs at the time of sowing of the seeds. Though the effect of different amendments on crust strength have been studied and their possible effects on the growth of the plant have also been studied in the past, they lack complete information for the field management of these soils. The cases of these beneficial effects of these amendments have not been analysed systematically to evolve the necessary

management practices to overcome the adverse effects of crusting in these soils keeping the above in view, it has been felt essential to conduct both laboratory and pot culture experiments with the chalka soils with the so called locally known 'Chalka' (Red sandy loams) with the following specific objectives :

1. To assess the chemical, physico-chemical and minerological properties of these soils.
2. To assess the optimum moisture content, depth of placement of seeds to shorten the meantime of emergence of the seedling in different seasons to overcome adverse conditions such as hardening and crusting problem of the emerging seedlings.
3. To find out the effect of different organic amendments (powdered paddy straw, groundnut shell powder, farm yard manure), gypsum, kaolinite and bentonite clay on the physical conditions of the soils, and their response on the yield with pearl millet (*Pennisetum typhoides* L.) followed by groundnut crop (*Arachis hypogaea* L.).
4. To find out the basic relation between the moisture content and crust strength of the soil.
5. To assess whether there is any reduction in soil strength with the use of organic amendments such as paddy straw, groundnut shell powder, farm yard manure, gypsum, kaolinite and bentonite clay.

The data collection under different experiments were so designed as to suggest the range of variation in the chemical, physico-chemical, physical and mineralogical properties, draw conclusions regarding the development of crust formation under laboratory conditions, studied the depth of sowing at different levels of moisture and in different seasons for different crops in the crust prone soil. Efforts have also been made by using the Instron for studying the penetration resistance of crust prone soil . The residual effects of incorporation of different amendments such as powdered paddy straw, groundnut shell powder, farm yard manure, gypsum, kaolinite and bentonite clay are also proposed to be studied on the different properties of these soils.