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Effect of sub-surface drainage (SSD) system with different filters (envelopes) on improvement of chemical properties of salt affected and water logged soil

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ABSTRACT

The subsurface drainage system was installed on 8.81 ha of salt affected and water-logged soils at Agricultural Research Station K. Digraj in December, 2002 by using corrugated perforated 80 mm PVC pipes with three types of filter *i.e.* coarse sand, geotextile envelope and geotextile envelope + coarse sand filter. The average depth of collector and lateral drains was 1.32 m. The spacing between two laterals was 25 m. After completion of four year (December, 2002 to Dec., 2006), the results revealed that the coarse sand filter was found superior over geotextile envelope and geotextile envelope + coarse sand filter by lowering the values of pH, EC, SAR and ESP of the salt affected and water logged soil.

Key words : Subsurface drainage, Filter, Chemical properties, Salt affected soil.

The salt affected and waterlogged area in India estimated as 11.534 Mha of which about 3.0 Mha are coastal saline soils which have been developed due to seawater intrusion (Tyagi, 1999). In Maharashtra, sugarcane crop is being grown on large area, which requires more irrigation water even under restricted drainage conditions. Mann and Tamhane (1910) estimated that 6-7 per cent of the area was being damaged annually due to application of heavy irrigation to deep black soils with insufficient drainage. Inglish and Gokhale (1928) observed a relation between damage caused and intensity of irrigation in black cotton soils of Deccan. There is a regular increase in the development of salt affected area on the major canals of Western Maharashtra. Therefore, the salt affected and waterlogged area is increasing day by day in Maharashtra, estimated as 6.45 lakh hectare (Tyagi, 1999).

The function of envelope materials is not only to protect the pipe drain from silting up but also to reduce the entry resistance. The perforated corrugated PVC drainage pipes are not completely pervious; their perforated area occupies only 1-2 % of total pipe surface. Compared to flow towards on ideal, commercial drain cause an extra head loss due to flow concentration towards the isolated inlet opening. This flow produces an extra resistance, which is known as entrance resistance. Drain filter material reduces the entrance resistance and improves the effectiveness of the system.(Willardson,1987 and Stuyt,1989).

Broughton (1976) and Broadhead *et al*. (1983) conducted experiments to evaluate the performance of different synthetic filter materials in order to study the effects on silting up the drain pipes.

Granular material such as graded coarse sand and fine gravel, is widely used in semi-arid and arid regions, it provides an effective and durable filter if available at reasonable cost and if properly installed. Now a days synthetic filter materials are available world wide and accepted due to its cost factor and ease of installation without considering the effectiveness of filter materials.

In view to above the research experiment was under taken to study the effect of sub-surface drainage (SSD) system with different filters on improvement of salt affected and water logged soil.

MATERIALS AND METHODS

The subsurface drainage system with corrugated perforated PVC pipes was installed on 8.81 ha of salt affected and waterlogged soils at Agricultural Research Station K. Digraj in December, 2002. The experimental initial soil status of salt affected and waterlogged soil was pH-8.13 to 8.52, EC 2.22 to 17.82 dS/m, ESP 7.04 to 17.50. The hydraulic conductivity was in the range of 0.0236 to 0.0579 m/day. The water table fluctuations recorded was in the range of 0.265 to 1.85 m from the surface in different seasons. The design and layout was fixed according to slope and soil properties. Perforated corrugated PVC pipes of 80 mm diameter were used for lateral drains and non perforated corrugated PVC pipes of 80 mm diameter were used for collector drains. The average depth of collector and lateral drains was 1.32 m. The spacing between two laterals was 25 m. Coarse sand, Geotextile envelope and Geotextile envelope + Coarse sand filter were used as filter material in subsurface drainage system because drain filter material reduces the entrance resistance and improves the effectiveness of