

I.2: Design, development and commissioning of deep root drip irrigation system for horticultural crops

With an aim to develop environment/surroundings conducive for nurturing scientific temperament, landscaping activities are undertaken at the Centre. These mainly comprise of afforestation & gardening. The purpose of the activities is to cover barren, degraded land with green cover by planting trees of commercial, medicinal, ornamental & bio-fuel value using aesthetic planning so as to provide green, colourful & dust free environment in the campus. The available water resource also needs to be used in the best possible manner to fulfill the vision of per drop more crop (PDMC). PDMC is a scheme being implemented by Government of India, which focuses on micro level storage structure, efficient water conveyance and application, precision irrigation systems through efficient water conservation and water management practices.

To tackle the water scarcity problem in the Centre, micro irrigation systems have been adopted by installing sprinkler irrigation system for lawn areas and surface drip irrigation system for trees, shrubs and ground covers. In conventional surface drip irrigation system, water and nutrients are delivered on the surface. Compared to the use of other irrigation systems, drip irrigation system has huge savings on water, fertilizer, energy, pesticide and labour. It also helps to reduce weed-growth, soil-erosion & spread of diseases on foliar parts of plants. Surface drip irrigation system has some limitations, which include wastage of 80% of water because of evaporation due to hot surface of the farmland, irregular supply of water to the root system due to more distance between roots and surface, weed-growth in the wet zone around irrigated tree, shallow growth of roots, etc.

To overcome the limitations of surface drip irrigation system, an alternative deep root (sub surface) irrigation (DRI) system has been designed in the Centre. This includes laying of conventional surface drip irrigation system to carry water up to tree basin including fixing of suitable emitters followed by pouring water through perforated plastic pipes inserted vertically into a ground near the root zone of planted tree species. The DRI system is commissioned in the “Nursery campus” of the Centre with an aim to assess the effect of two different types of drip irrigation systems along with different types of growing media on the growth of “Arjuna” plant (*Terminalia Arjuna*), which is an important indigenous medicinal tree species.

The deep root drip irrigation system has been developed using poly vinyl chloride (PVC) pipes of 25 mm outer diameter (OD) and 300 mm length, as shown in Figure I.2.1. Holes of 2 mm size were drilled at spacing of 50 mm along the length on all sides of the pipe. These PVC perforated pipes were filled with gravel and sand so as to avoid clogging. Smooth surface of PVC pipe with side opening guides water down and out. The 2 mm side holes/openings restrict soil particles from entering the pipes. This acts as a filter and hence extra filter material is not needed. Water exits through the side holes with minimal entry

of soil particles into the PVC pipe. PVC pipes are long-lasting, reusable and recyclable and hence can be used with all kind of emitters. Figure I.2.2 depicts the schematic of potted plant of “*Terminalia Arjuna*” irrigated with DRI system.

The results show that highest value of increase in stem height, girth, branching and sprouting of leaves in “Arjuna” saplings were recorded in plants, which were grown in potting mixture containing black cotton (BC) soil, red soil and vermin-compost in 60:20:20 proportion by volume and irrigated with the DRI system. The data in respect of percentage change in growth parameters indicates significant improvement in growth pattern of “Arjuna” plants, which were irrigated through the DRI system as compared to the conventional surface drip irrigation system.

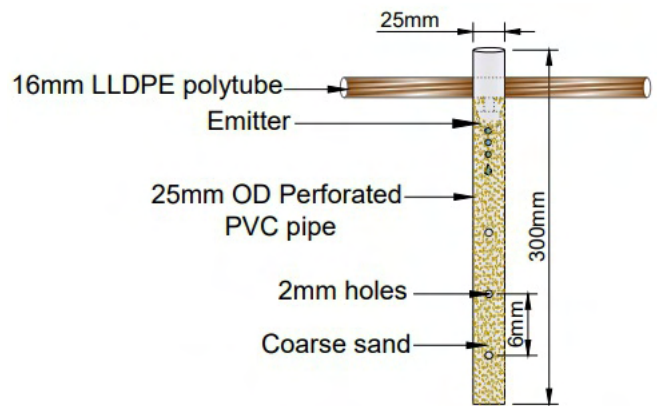


Fig. I.2.1: Design of 25 mm perforated PVC pipe.

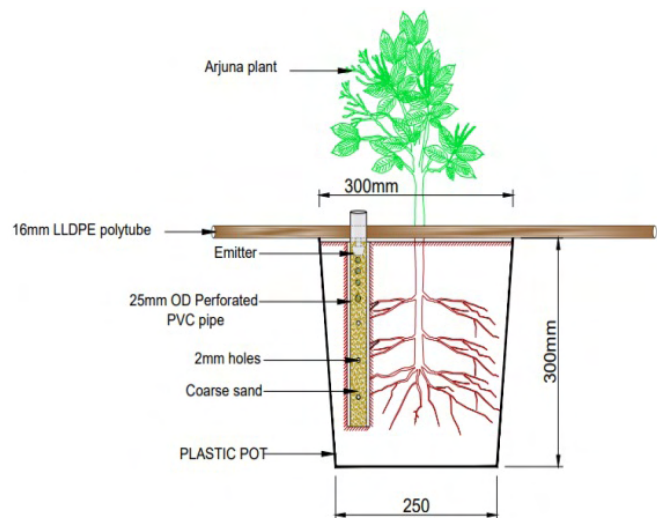


Fig. I.2.2: Schematic of potted plant of “*Terminalia Arjuna*” irrigated with DRI system.

The findings prove that DRI system not only minimizes the run off of water, but also prevents water loss through evaporation. DRI system has also been commissioned in the field at “LIGO campus” in the Centre.

Reported by:
Govind Parchani (parchani@rrcat.gov.in)