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Almost 97.2% of total water on our planet is saline. In arid and semi-arid parts which constitute about 33% of the total land in the world, the fresh surface water resources are not adequately available. Ground waters constitute the major source of supplemental irrigation in these areas but, unfortunately, it is scarce and saline in nature which is usually responsible for soil salinity and sodicity problems in these areas. The major factor inhibiting the plantation of fruit crops in some parts of India is the use of poor quality water for irrigation. It has been established that plants are adversely affected by high salinity more conspicuously at germination and initial stages of plant growth.[1] The adverse affect of salinity results in enhanced mortalities thereby causing a lot of wastage in terms of precious plant material, labour, money and time spent apart from disheartening the person taking up the endeavour. Thus, the inevitable need of good quality water for plants at nursery stage necessitates working out suitable techniques to harness even the poor quality ground waters in inland arid areas and sea waters in coastal areas.

Solar desalinating irrigation system for nurseries in saline water areas

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Efforts have been made to utilise otherwise unsuitable water with large desalination units but they are too costly and complicated to be adopted by an ordinary farmer. Some relatively simpler and smaller units have also been developed,[3,4] but they seem all to be very expensive. Moreover, they do not provide *in-situ* irrigation to the plant but have to be installed separately adjacent to each plant. Considering the importance of the problem and keeping in view an ordinary farmer or amateur interested in raising nursery in the areas having only saline water, a novel device named 'Jalshuddhi' has been developed for desalination of saline water and simultaneously *in-situ* irrigation at nursery stage.

Description of the device

The device is a double walled earthen pot — a coupling of two earthen pots of different diameters and heights, joined at the base such that the bottom of the inner pot is open.

The diameter of the outer pot is 25cm at the top and 18cm at the base whereas the diameter of the inner pot on top and at the base is 15 and 12cm, respectively. The height of the outer pot is 30cm while that of the inner one is 27cm.

Saline water is filled into the annular space between the two pots. The circular surface of the water is capped with funnel-shaped transparent polythene sheet such that it is embedded up to 2.5cm depth in the soil contained in the polythene bag placed in the internal pot. Alternatively, the height of both the pots can be kept at 30cm but in that case the portion of the polythene cap which encircles the margin of the outer pot should be about 3cm in height from the brim of the outer pot so that when the central portion of this cap is embedded in the inner pot there is a slope directed towards the inner pot.

The device works on simple principle of condensation. The water evaporates from the annular space and condenses on the polythene cap. The wall of the cap being sloping towards the inner pot at an angle of 45°, the condensed droplets run down in the soil of the inner pot.

Thus moisture to the soil of the inner pot is supplied through the condensate which is completely free of soluble salts.

Method of use

The outer surface of the external pot is made impervious by curing with cement or painting with enamel paint, and saline water is filled up in the annular space between the pots.

A polythene bag filled with nursery mixture is placed in the inner pot and the seed is sown in this polythene bag. The polythene bag is used in the inner pot so as to avoid direct seepage of saline water to the soil.

The funnel shaped polythene cap is now placed on the pots such that its margin is around the brim of the outer pot and the central portion is embedded in the polythene bag of the inner pot. Care has to be taken to ensure that the margin of this cap around the brim of outer pot is airtight, otherwise sufficient condensation will not take place.

The saline water once filled will keep on providing fresh water to the seed for about ten days. As the seed germinates and grows, the water requirement will increase which may necessitate early refilling.

Once the nursery stage of the plant is over and it is ready for transplanting in the field, i.e. in about 2-3 months depending upon the type of plant, the polythene cap is removed and the polythene bag with the plant is taken out from the inner pot.

The coupling of two pots is fixed in the field at the place where the plant is to be transplanted such that the brim of the outer pot is in line with the field surface. The polythene bag around the plant is now removed and the plant with the earthball is transplanted in the inner pot. Transplanting is done usually in the rainy season, so the plant will be able to grow further with fresh rain water.

By the time the rainy season is over, the plants are sufficiently mature to become capable of tolerating saline water irrigation better than they would at the nursery stage.

Now the saline water is filled directly in the annular space of pots and the circular surface of the water is covered by a polythene sheet or an earthen lid. It has to be borne in mind here that at this stage the degree of salinity of irrigation water should not be much higher than the critical tolerance limit of the plant chosen. It will not work as 'Jaltripti', a device for successful establishment of tree plants with limited water.[2] Thus by adopting this technique, afforestation can be done in areas where establishment of nursery is difficult due to poor quality of water.

Merits of the Jalshuddhi

1. Seed germination and sapling growth of even sensitive plants is possible in areas having saline water;
2. Desalination and irrigation is done simultaneously;
3. The device is not very costly (about Indian Rupees 7/- per unit);
4. Irrigation frequency is very low, thus it saves labour;
5. Polythene caps are reuseable;
6. It is very simple in operation so there is no need for a technician;
7. Can be operated easily by an ordinary farmer.

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