*Beretning nr. 207*

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# *A METHOD FOR SAND CULTURE EXPERIMENTS*

*(Særtryk af Det forstlige Forsøgsvæsen i Danmark, XXVI, 1960)*

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# A METHOD FOR SAND CULTURE EXPERIMENTS

BY

H. HOLSTENER-JØRGENSEN

In sand culture experiments with forest-tree plants we have successfully employed a method which, as far as we know, has never been used before. As the method we have developed may presumably be useful to others who conduct sand culture experiments, we have found it appropriate to give a brief description of the set-up and the working procedure.

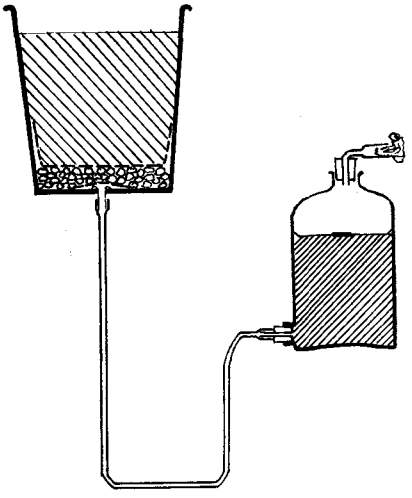

*Fig. 1.*

*Fig. 1* shows the set-up. The culture vessel is a polyethylene bucket with a cubic content of 6 l. The bucket is a mass-produced household article. The inside height of the bucket is 210 mm., and the inside mean diameter (note the trunkated cone shape) is 200 mm. In the bottom the bucket is provided with a connecting branch that fits into a rubber tube with an inside diameter of 4 mm. As connecting branch we have used the stem of a bicycle tube valve, another mass-produced, easily obtainable article. A rubber tube of a suitable length connects the bucket with an aspirator bottle of 2 l. capacity. The bottle is corked tight enough to prevent the intrusion of dust.

The bucket is filled in the following manner —

The connecting branch in the bottom is covered by a piece of nylon fabric with a diameter of approx. 100 mm. On this 1 kg. of small pebbles (diameter 5—10 mm.) is placed as a draining layer. Over this draining layer is spread a circular piece of nylon fabric with a diameter of 300 mm. This means that the nylon fabric will reach 50 mm. up along the sides of the bucket. Finally 7 kg. of clean quartz sand is cautiously poured into the bucket.

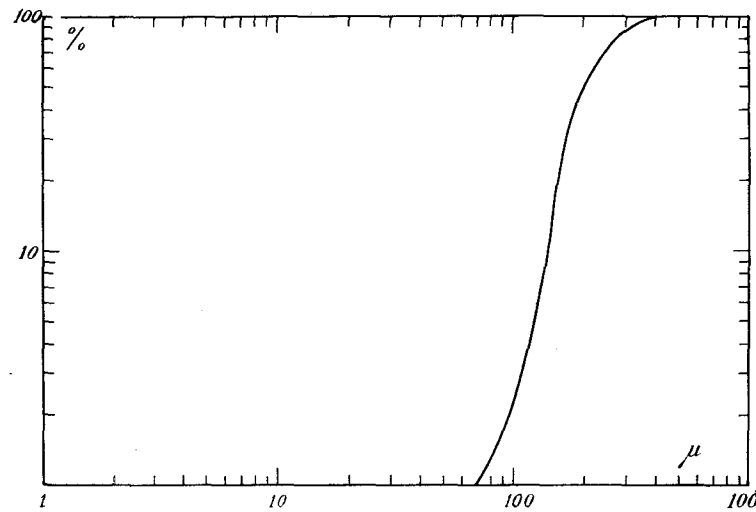


*Fig. 2.*

During this process care must be taken to ensure that the sand presses outwards against the nylon fabric, which lies up against the sides of the bucket, so that, after the filling, the sand cannot penetrate into the draining layer. *Fig. 2,* for the sake of completeness, shows the characterization of fineness of the quartz sand we have used.

The bucket is now covered tight enough to prevent evaporation. The aspirator bottle is placed on a level with the bucket, and 3500 ml. of distilled water or nutrient solution is added. When the sand is completely saturated, the bottle is lowered to below the level of the bucket (cf. the placing in *Fig. 1*).

Liquid will now drain from the bucket down into the bottle. The sand, nylon and draining layer employed by us can retain 2200 ml., and when the excess liquid (1300 ml.) has drained

into the bottle a notch indicating the liquid level is cut in the latter. The drainage takes from 15 to 30 minutes, and the time for its completion is easily observed, because the last drained millilitres carry along with them air from the draining layer. This air bubbles up through the liquid in the bottle. In practice the drainage is hastened by the fact that there is an unbroken liquid connexion between the vessel and the bottle during the drainage. The difference in level between the surfaces of the liquids will accordingly expedite the drainage.

The set-up is now ready for use, and the vessel prepared for planting or sowing. The test vessels are tended in the following manner —

(1) At suitable intervals the bottle is raised to the level of the bucket, or a little above. (In our set-up the bottle is placed on a shelf in a suitable height). The nutrient solution flows into the bucket and at the same time drives the air out of the bucket. When the sand is completely saturated (water on the surface), the bottle is again lowered to below the level of the bucket, after which the excess liquid from the bucket flows back into the bottle. Simultaneously fresh atmospheric air is sucked down into the sand.

(2) When the drainage is completed, the bottle is replenished to the notch. The amount of liquid lost is a measure of the evapotranspiration from the test vessels.

From this it appears —

(a) that the amount of liquid circulating in the system is constant,

(b) that the air in the vessels is periodically completely renewed,

(c) that the amount of water evaporated may be exactly ascertained.

It is a matter of course that the quantities stated apply only when, for instance, sand of the same degree of fineness as shown in *Fig. 2* is used. Where sand of a different degree of fineness or vessels of other dimensions are employed, the optimum amount of liquid must be ascertained through an experimental set-up.

Finally it should be stressed that this set-up —

(1) is simple and cheap to establish,

(2) is easy to tend,

(3) is efficient, since in our experience (4 years of experiments) the plants thrive under the conditions thus established.

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