INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2000/02–4–380-381

Development of Bio-decomposable (Jiffy) Pots for Raising and Transplanting Nursery Plants

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ABSTRACT

Jiffy Pots are very effective in plant transplantation. Different materials were used like paper, clay, animal manure, pure organic matter and partially decomposed leaves to make a substitute of Jiffy, in order to facilitate the transplanting of nursery raised plants on commercial basis.

Key Words: Jiffy pots; Bio-decomposition; Nursery plants

INTRODUCTION

Transplanting has many advantages over direct seeding. In high premium seed crops, direct seeding becomes uneconomical. Similarly, in areas where raising of crops by direct seeding is not possible due to short photo-periods, transplanting of nurseries has been the most suitable practice. Nursery transplanting may be very successful in relay cropping. In rainfed agriculture, to avoid unsynchronized sowing time with rains, nursery raised seedlings may prove a great success.

Many horticultural and agricultural crops are raised in nurseries under controlled environmental conditions before transplantation. Nursery raising is done either in earthen baked pots, polythene tubes or in small pots. The seedlings are transplanted in field either alongwith pots or polythene tubes which are non-biodecomposable, and prevent them from transplant shock (Garner & Chaudhary, 1976). These pots restrict root growth and later on deteriorate soil structure. Seedlings, which are transplanted bare-rooted suffer root damage and transplanting shock. In this way ability of roots to absorb water and minerals is affected.

Efforts have been made to grow plants in small decomposable (Jiffy) pots made up of peat pellet (Robinson, 1975). Seedlings growing in Jiffy are directly transplanted in fields where they decompose very quickly and do not restrict root proliferation. Although Jiffy products have been in horticulture business for over 40 years but they are not commercially available in Pakistan.

Wyatt and Mullins (1989) grew seedlings of sweet corn in commercial growing medium in speeding cellular trays, peat pots or peat pellets under green house conditions for three days before transplanting by mechanical transplanter. Plant height, stems diameter, plant fresh weight (FW) and dry weight (DW) after transplanting were greatest in plants grown in peat - pellets. Cellular trays produced less transplants as a result of root restriction. Transplants grown in peat pots became the earliest maturing plants in field experiments. Plants grown from transplants produced edible ears 14-21 days earlier than those from direct sowing. Sramek and Dubsky (1997) performed experiments to make a substitute for peat in Czech Republic. Composted bark, primary and secondary sludges from paper mills, waste composted wood chips, wood waste fibers cultifiber and coier fiber were used to prepare media equal to peat. All had more nutrients than peat. Paper mills, primary and secondary sludges had high Ca and pH values. Composts made up from paper sludges, wood chips or wood waste fibers require higher level of N and it decayed quickly. Different plant species grown showed that peat free or reduced peat growing media could be developed from these species but no one was good substitute for all.

If Jiffy is made locally from some cheap material to grow seedlings for transplanting, it would be helpful to overcome different problems faced by farmers especially in Barani areas where rain is uncertain and scarce. It is realised that apart from those containers made from peat, other material such as clay, paper, pure organic matter, animal manure etc. can also be used. Keeping in view, the need of a substitute for peat, an effort has been made to make Jiffy from local material of low cost, decomposable and directly transplantable in the field.

MATERIALS AND METHODS

In order to make bio-decomposable and directly transplantable containers, two studies were conducted. Pots were made of different sizes, shapes with different growing media, to check the effect on seed germination before and after transplantation.

Method 1. The materials used in first method were, Paper, Clay, Cow dung, (Paper+Clay+animal manure). English Newspapers were soaked in water for 12-14 hours to remove any water soluble toxic substances. It was then mashed and pots were made by adding German

glue, to keep it intact. Clay pots were made by making saturation paste of water and clay. Paper, clay and animal manure were mixed in equal ratio (1:1:1). Cocoon shaped pots with length 1.5 - 2 cm and circumference 20 - 22 cm were made by hand and air dried.

Method 2. In second method, material used Decayed animal manure, Municipal Solid Waste, Partially and completely decomposed leaves. Well rotten organic matter was used to avoid infestation by weed seeds. Partially decomposed leaves were taken from composted material. Pots were hand made and oven-dried for 24 hours. A depression was made in the centre to place the seeds. Pots were small in size measuring length 1 - 1.5 cm. When roots emerged from these pots, they were transplanted in soil. Integrity of pots, growth of plant, decomposition during seed germination were measured and the experiment was replicated four times.

RESULTS AND DISCUSSION

The evaluation of decomposable pots was done for their firmness by qualitative rating and it was observed that on air drying all pots were intact. Fungus appeared on hollow pots made of paper, which were not completely dried. Another set of pots was oven dried at 105°C for 24 hours and all the pots were intact and non brittle. Clay pots showed some cracks while paper pots and those made of partially and completely decomposed leaves appeared relatively better, without any cracks. These pots were divided into two groups. One was placed in a shallow tray and was filled with water whereas the second group was moistened by sprinkling water from the top. None of the pots dissolved after absorbing moisture and were firm and intact.

Pea seeds were sown in hollow pots while wheat was sown in solid pots. Germination and emergence of both was normal. Pea seed germinated after four days while wheat germinated after three days. The roots of growing seedlings were observed for any abnormality or deformation. Plants in all pots showed a normal root growth and there was no difference because of different pot materials. When the seedlings were two weeks old, they alongwith pots were transplanted in the field. Pots made up of cow dung and animal manure decayed in three days whereas pots made of clay and paper, clay animal manure took five and six days to decompose.

Pots made for transplanting fully support the growth of the plant. Both air drying and oven drying remain them intact without any brittleness. Moisture did not dissolve the pot and their shape was retained after daily watering. This shows that there is a considerable scope of making such pots from different materials, instead of looking for very expensive peat.

Seeds of pea and wheat sown showed good germination in pots of all materials. Structure or material difference made no effect on duration of germination of seeds. It appears that the composition of the material did not have any adverse effect on the process of germination of various seeds, rather it supplemented by some promoters or nutrients to enhance the seedling growth. However, it requires further testing of the pots to be used as point source for application of various chemicals like fungicides, fertilizers, growth regulators etc. The pots did not restrict root growth, dissolved in the soil quickly and allowed roots to proliferate in the rhizosphere, It shows that this technique has a lot of potential having no threat to any type of soil degradation thus they are environment friendly.

These pots could be employed on large scale for general cropping. However, its efficiency and economics needs to be evaluated. Seedlings can be raised in these pots at right time of planting and when there is moisture in the form of rain they can be transplanted in field. In areas, where direct seeding due to photoperiodic effect is short, these may initiate plant growth indoors and at time they can be transplanted. Certain crops, like Paddy and Celery which do not give a good yield by direct sowing, use of these pots may thus assure a good uniform quality crop.

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(Received 18 August 2000; Accepted 10 September 2000)