PlantPaper®

Rooting and distribution of roots

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1. Background

Paper pots are used for propagation of cuttings and seeds in a small volume of growing medium allowing efficient production in the horticultural industry. The paper pots need to fulfil a set of requirements in relation to quality, design, bio-degradability and dimensionally stability in order to meet market demands. A new product on the market is PlantPaper®. It is a 100% bio-based and natural product containing no glue or fossil oil-based plastic. It is 100% decomposable with no contaminants left after composting. In the present study PlantPaper® was tested in terms of rooting of cuttings, root penetration through the holes of the paper and establishment after transplanting to bigger pots for two different plant species (Osteospermum and Pelargonium).

2. Experimental design and registrations

Four cultivars of Osteospermum (‘Fire Burst’, ‘Maseru’, ‘Softly Pink’, ‘Yellow Halo’) and four cultivars of Pelargonium (‘Balcon Imperial Red’, ‘Decora Red’, ‘Toscan GM Falco’, ‘Toscan GM Falco’) were rooted in PlantPaper® (Sungrow A/S, Esbjerg, DK) containing peat (Pindstrup 1, Pindstrup Mosebrug A/S, Ryomgaard, Denmark) in the last week of October 2015. 180 cuttings were divided between three 60-hole multitrays and regarded as replicates (Modiform, Leusden, The Netherlands) for each cultivar. The Osteospermum cuttings were treated with 0.15% Pomoxon to initiate and advance rooting and 0.01% Amistar fungicide and covered with a clear plastic to keep the environment moist. The Pelargonium cuttings were treated with 0.01% Amistar fungicide and covered with fleece. The experiment was carried out in a greenhouse with a set point temperature of 20 °C (vents open at 25 °C). Artificial light was turned on at 04:00 h and turned off at 22:00 h to maintain a photoperiod of 18 hours. The plants were watered from above keeping the growing medium moist and the plastic and fleece were removed after two to three weeks when roots started to appear at the bottom of the paper pots.

2.1 Registration

In the last week of November four cultivars (‘Maseru’, ‘Softly Pink’, ‘Balcon Imperial Red’ and ‘Toscan Okka’) and first week of December (‘Yellow Halo’, ‘Fire Burst’, ‘Decora Red’ and ‘Toscan Falco’) were registered in terms of rooting capability and root distribution in PlantPaper® (10 pots x three replicates for each cultivar). The number of empty pots (unsuccessful rooting), cracks in the welding of the paper and fungal growth was also registered. The remaining plantlets were potted up in 10 cm pots with Pindstrup 2, and pinched just above the fourth or fifth leaf. The plants were distributed on three tables (three replicates) and ebb-flood fertigated. In the first week of January 2016 four cultivars (‘Maseru’, ‘Softly Pink’, ‘Balcon Imperial Red’ and ‘Toscan Okka’) and second week (‘Yellow Halo’, ‘Fire Burst’, ‘Decora Red’ and ‘Toscan Falco’) were registered in relation to root distribution in the pots (10 pots x three replicates).
3. Results

3.1 Rooting and distribution of roots in PlantPaper®
Rooting of the Pelargonium cuttings was 100% for all cultivars except 'Decora Red'. In Osteospermum only the cultivar ‘Maseru’ rooted with 100%, whereas the rest of the cultivars rooted with a success rate of 65-75%. We found no cracks of the welding and no fungal growth on PlantPaper® in any of the individuals.

The distribution of roots in the upper and lower part of PlantPaper® significantly differed between the cultivars, whereas there was no difference between replicates. For Osteospermum, 1-10 roots were observed in the upper part and more than 10 roots were observed in the lower part of the pot. The same result was seen for the Pelargonium. In Figure 1, the distribution of roots in the upper and lower part of PlantPaper® illustrate that 56 - 85% of the roots were found in the lower part of the pot depending on cultivar. The roots were penetrating both the holes in the side of the pot and the bottom of the pot (Figure 2 and 3).

![Fig. 1. The distribution of roots in PlantPaper® measured as the percentage of all the roots for four cultivars of Osteospermum and four cultivars of Pelargonium. Grey bar is the lower part of the pot, whereas grey stippled bar is the upper part of the pot.](image1)

![Fig.2. Images of Plantpaper® with roots distributed on the upper and lower part. A. Osteospermum ‘Yellow Halo’ and B. Pelargonium ‘Fire Burst’.](image2)
3.2 Root distribution in 10 cm pots
Four weeks after potting in 10 cm pots all cultivars of *Pelargonium* and *Osteospermum* had roots growing on the outer surface of the growing medium. Only *Pelargonium* ‘Decora Red’ showed relatively poor root growth, which was probably related to the cultivar. The root distribution in the upper and lower part of the pot was approximately 60% of the roots in the lower part and 40% in the upper part for all cultivars except *Osteospermum* ‘Maseru’ and ‘Fire Burst’ where 80-85% of the roots were positioned in the lower part of the pot (Figure 4 and 5).

![Figure 4](image_url)

**Fig. 4.** The distribution of roots in 10 cm pots measured as percentage of all roots for four cultivars of *Osteospermum* and four cultivars of *Pelargonium*. Stippled grey bar is upper part of the pot, filled grey bar is lower part of the pot.

![Figure 5](image_url)

**Fig. 5.** The distribution of roots shown for *Osteospermum* A. ‘Softly Pink’, B. ‘Fire Burst’, and *Pelargonium* C. ‘Decora Red’ and D. ‘Toscana Falco’.
4. Conclusion

Rooting of cuttings can be carried out successfully in PlantPaper®. The root growth was distributed in both the upper and lower part of the pot, and the quality of both shoot and roots were ranging from very good to acceptable depending of the cultivar. The cultivar differences in root distribution in PlantPaper® were followed by similar root distribution in the larger 10 cm pots.