Organic Substrate Mixes for Potted Plants — Are They a Realistic Alternative?©

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INTRODUCTION

Choice of growing media and nutritional strategy is the greatest challenges when a grower considers changing to organic ornamental production. Potted plants need continued access to plant nutrients during their development. Thus production routines allowing both functional inputs of nutrients before start of plant production and supplemental nutrition with water-soluble organic nutrients during production are needed. The first steps in making an organic potting plant production medium would be to test the available and certified organic growing media on the market integrating the know-how on mycorrhiza, composting technology, and the use of nutrient buffers (e.g., Hansen and Nielsen, 1999; Jensen and Leth, 1998; Nielsen and Rasmussen, 2000). The aim should be to develop uniform, homogeneous, and high quality organic substrates. At the same time water and nutrition technologies should be adapted to the special demands of an organic production, since organically bound nutrients are released in a different way than inorganic nutrients.

MATERIALS AND METHODS

In an experiment with *Pentas lanceolata* the aim was to test the ability of the plants to exploit the plant nutrients present in an organic growing medium. Three cultivars, 'Mars', 'Venus', and 'Polaris', were tested. Here we only show the results for the cultivar 'Mars'. The other cultivars responded in a similar way. In this experiment we used Alternative Soil (Alternativjord, Svalöf Weibull, Sweden) a peat-based mix, which was composted with cow manure for 2 years, thereafter combined with chicken manure and composted for an additional year. This compost was combined with light Swedish peat, clay, perlite, gypsum, lime, and dolomitic lime. In addition to this we added the following components to the substrate: blood meal, Pholin (lava-based magnesium and micronutrients), chicken manure, and ground alfalfa straw, in order to test the effect of additional organic materials. The experiments were carried out on ebb-flood benches where irrigation to each bench was handled individually; the organic plots were irrigated with rainwater. The control used was Pindstrup special mix, a peat-based mix with clay and inorganic nutrients (Pindstrup, Ryomgaard, Denmark), which was fertigated with standard nutrient solution.

Content of plant available nitrate (NO_3-N) in the growing media was measured at the start of the experiment and at the start of flowering (Table 1.). From start of flowering, all treatments received the same standard mix of inorganic fertilizers as the control plants. Thereafter the plants could not be considered organic. The aim of this late fertigation was to investigate if it would be possible to use the declining nutrient availability as an alternative method for growth regulation. We wanted to establish if the nutrient stress that was evident in the plants, leading to nitrogen and sulphate deficiency symptoms, could be corrected late in the production process. The experiments were carried out at the Danish Institute of Agricultural Sciences, Aarslev, Denmark.

Table 1. Content of plant available nitrate (NO_3-N) in the growing media measured at the start of the experiment and by start of flowering.

Treatment (no.)	NO_3-N ($mg \cdot L^{-1}$)	Start	Flowering
1.	Control substrate (Pindstrup special mix)	145	275
2.	Alternative Soil (basic mix)	197	47
3.	Alternative Soil (+ 2 kg blood meal/m^3)	407	154
4.	Alternative Soil (+ 0.5 kg Pholin/m^3)	271	108
5.	Alternative Soil (+ 3 kg chicken manure/m^3)	221	43
6.	Alternative Soil (+ 5 kg ground alfalfa straw/m^3)	228	36

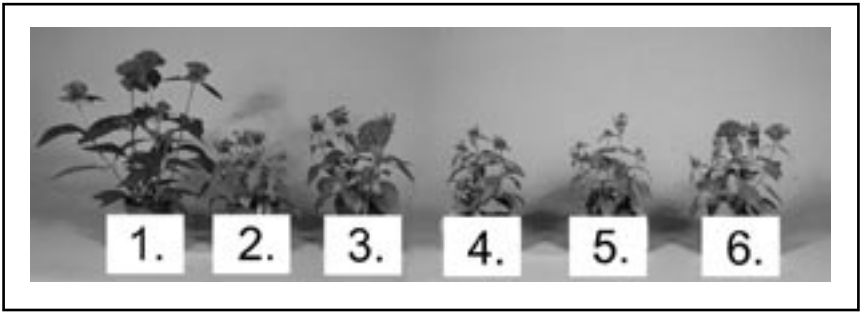

Figure 1. Plants of the different treatments (see Table 1) at start of flowering (still organic).

Figure 2. The same plants as shown in Fig. 1 after 14 days of irrigation with standard inorganic fertilizer.

RESULTS AND DISCUSSION

The older the plants were, the more pronounced the difference was between the control plants, grown in conventional substrate (Pindstrup special mix) and fertigated with a standard mix of inorganic fertilizers, compared to plants grown in Alternative Soil irrigated with rainwater not added fertilizers (Fig. 1).

Fourteen days after onset of standard fertigation the plants had recovered from their nutrient stress symptoms (Fig. 2). It was also clear that the plants that had

received standard fertigation throughout the production period were way too tall and should have received chemical growth regulation. The plants grown in "Alternative Soil" and irrigated with rainwater until beginning of flowering and hereafter fertigated with the standard mix of inorganic fertilizers had developed into plants with an acceptable compact quality without chemical growth regulation. We are not yet able to produce an organic potted plant product of high quality, but we are closer to the target. The results show a clear need for a certified organic water soluble fertilizer that the grower can use as a supplement to the organic nutrients in the growing medium, e.g., Alternative Soil, at the beginning of flowering. At the Danish Institute of Agricultural Sciences, Department of Horticulture, a range of water soluble organic fertilizers available on the market were analysed. In general the nitrate content was too low. Among these products a fish blood/fish bone product (Nu-Gro, Brøste A/S, Denmark) was different from the rest. It contained more nitrate and the ammonium content was low (10%) compared to nitrate. A product with a relatively high amount of nitrate and relatively low ammonium content and acceptable sulphate content would be capable of solving the nutritional disorders we saw in this experiment. Nu-Gro is still not certified for organic use in Denmark, but when this happens trials with organic potted plants can be undertaken. Many challenges still lie ahead before an organic production of high quality potted plants can be initiated, but a functional strategy for the nutrition of organic potted plants could be an important step in this direction.

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