Abstract

In the horticultural industry peat is the more used raw material for the formulation of cultural substrates; environmental and economic reasons, however, pushes the industry towards the search for alternative materials. Therefore, the purpose of this project was to evaluate different organic matrices of local origin, in order to improve the environmental sustainability of horticultural industry, favor closure of the waste cycle, develop and refine more sustainable techniques, reducing the greenhouse effect and keep and accumulate carbon in peat bogs. In particular, we evaluated the feasibility of compost (of Veneto origin) utilization, secondarily we evaluate the utilization of anaerobic digestion residues and rice hulls also.

The project involved two nurseries and in the department of Agronomy, Food, Natural resources, Animals and Environment of the University of Padova. In the 30 months of project, a total of 16 experiments were carried out involving 9 different plant genera and numerous varieties of herbaceous species and shrubs, for indoor or outdoor (rosa, Lonicera nitida, Abelia grandiflora, geranium, cyclamen, poinsettia, impatiens, tagetes and petunia).

In some trials, we tested only increasing percentages of compost. In other, increasing percentages of compost were assessed in with and without a 20% (v/v) of digestate from fruit and wine distillery stillage. The possibility to contain the peat to 40-50%, and to use of rice hulls and compost (in different ratios) for the remaining 60-40% was also evaluated.

The results obtained reveal the large variability of the response of species to the different percentages of compost, and other organic matrices, in the substrates.

In some experiments compost at the highest rates, but sometimes with 20% of compost only, brought some plants to death as well as a general reduction of plant growth (e.g. rose trial in 2012; rose, cyclamen and poinsettia trials at University of Padova, cyclamen trials in 2012 at Bernardi farm). Even when no death of plants was observed, there often was a tendency to decrease of plant growth with increasing percentage of compost (e.g. geranium, cyclamen, poinsettia trials 2013 at Bernardi farm). There were two exception, Abelia in 19 cm pot in the 2013 trials, in which the percentage of compost did not affect growth, and lonicera trials in which the presence of compost increased plant growth.

The negative effects of compost on plant growth can be due to the declaim of the physical-chemical characteristics of the substrates such as the increase of pH and electrical conductivity, and the decrease of the total porosity and the air filled porosity.

The variability plant response to compost among species and varieties are also due, at least in part, to the different compost used. In the first experiments, in fact, the used compost derived from municipal solid waste and yard wastes (grass clippings and trimmings) which have high values of salinity. However, even when compost from only yard wastes was used

the response was different and the negative effect that sometimes was observed may be due to high ratio of grass clippings/trimmings that led to compost by similar characteristics to those derived from MSW. The best results were obtained with the well mature compost from yard wastes which showed to increase the electrical conductivity of the substrates in a lesser extent. In addition to the maturity of the compost is possible that the run-off action of rainwater (composting process took place outdoors) has contributed to the reduction of electrical conductivity values.

The digestate often had little effect on plant growth or was positive in the lonicera trials. In both cases, the results are positive as it allowed to reduce the use of peat by 20% without compromising the production. However, the use of digestate, should not be indiscriminate because even this material may contain plant performance. This is probably due to the higher content of nutrients, and thus, to a greater salinity. Likely, the species that take advantage form compost, or at least tolerate it, are those with high nutritional needs.

Interesting appeared the use of perlite or rice hulls to improve the physical-chemical characteristics of the substrates containing compost, but to improve plant growth probably the rate of peat has to be higher.

In conclusion, the results of this project highlighted that organic materials such as compost, digestate and rice hulls are interesting for the partial replacement of peat in growing substrates. The variability of plant response, however, is high so the formulation of a universal mix is not recommended. If the use of these matrices in percentages higher than 20-30% is considered, the origin eventual maturity and the tolerance of species must be evaluated case by case.