A practical and low cost microbiotest to assess the phytotoxic potential of growing media and soil

Chris Blok (PPO), Guido Persoone (MicroBioTests Inc.) and Gerrit Wever (PPO)
e-mail: Chris.Blok@wur.nl

Introduction

Testing growing media and soil improvers for harmful components is important for quality control and the prevention of risks. Legislation also presumes the use of a biotest to detect harmful substances. A good biotest should provide the possibility to grow plants in close contact with the material to test but without interference of the physical characteristics of the latter. To achieve optimal implementation the biotest should be simple and cheap.
A new microbiotest (called Phytotoxkit) has been developed to meet these demands and has been compared with a more traditional biotest.

The microbiotest

The new phytotoxicity test can basically be performed with any kind of plant species. The standard Phytotoxkit microbiotest makes use of one monocotyledon Sorghum saccharatum (Sorgho) and two dicotyledonous plant species Lepidium sativum (garden cress) and Sinapis alba (mustard), in 3 replicates. The assays are performed in special transparent test containers which allow for direct observations and length measurements by image analysis or manual measurement at the end of the assay. After wetting the substrate to leak out conditions, the material is placed in the test containers and covered with a filter paper. The seeds are placed in a row on top of the filter paper, near the middle ridge. The plastic container is closed and incubated vertically at a temperature of 25 ºC. The growth of shoots and or roots is measured after 3 days.

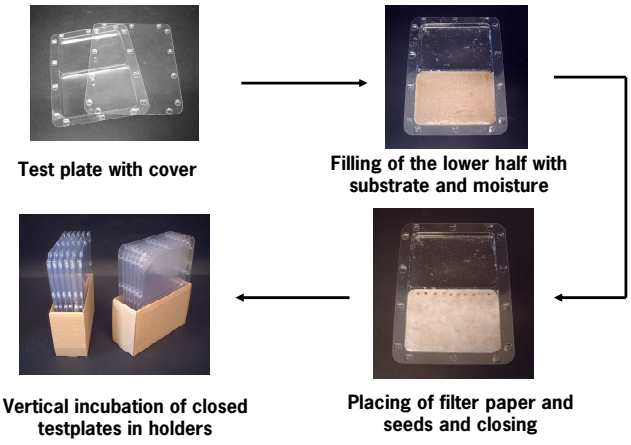

Fig. Use of the Phytotoxkit..

Comparison

To evaluate the microbiotest, it was compared with a 'standard' phytotoxicity test with lettuce, as used by the RHP foundation. In this test bark was mixed (25% of volume) with fertilized (1 kg/m^3 PG-mix) white peat (pH 5.5). After 2 weeks growing in containers in a greenhouse the fresh weight of 90 sown plants was determined. The test was performed in quadruplicate.
Two types of bark were tested. For the microbiotest the root and shoot length were determined after 3 and 7 days using image analyses.

Results and discussion

After 3 days growth differences are already discriminating. The response of mustard is the strongest followed by garden cress. Sorghum reacts less pronounced, slower and later.

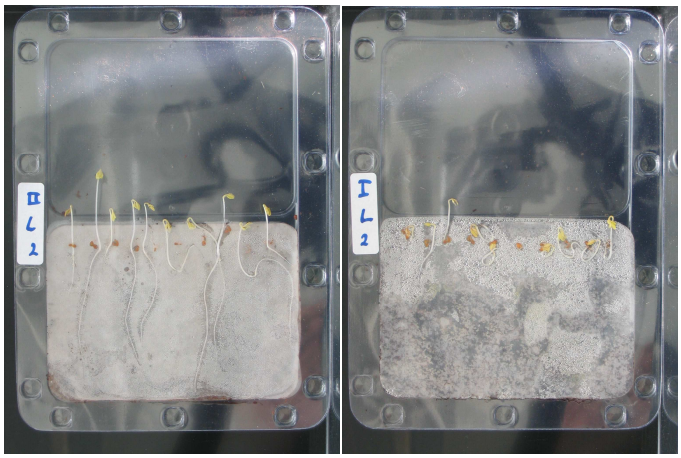

Fig. Results of garden cress after 3 days (left test plate reference bark and right suspicious bark).

In most cases the response of the shoots is stronger than the response of the roots, probably because the food reserve in the seed is used primarily for the growth of the root, making it less dependent on the environment.
The overall accuracy (l.s.d.) of the microbiotest is less when compared to the reference test. However as the level of growth reduction for the microbiotest is higher and the number of replicates is 3 while the reference test has 4 replicates, the level of detection can be matched.

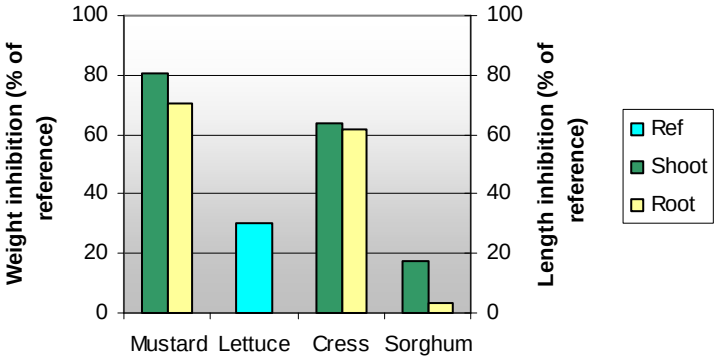

Fig. Relative results of suspicious bark as percentage inhibition of the reference bark (microbiotest length of root and shoot of mustard, cress and sorghum; reference test the weight of lettuce).

Conclusion

The microbiotest is a quick and practical bioassay with a high resolution. The number of replicates should preferably be 4 or more instead of 3. The method has potential to become an international standard.

Applied Plant Research
Kruisbroekweg 5, 2671 KT Naaldwijk
P.O. Box 8, 2670 AA Naaldwijk
The Netherlands
Tel.: +31-174-636700
Fax: +31-174-636835
E-mail: infoglastuinbouw.ppo@wur.nl
Internet: www.ppo.wur.nl

MicroBioTests Inc.
Industriezone "De Prijkels"
Venecoweg 19, 9810 Nazareth
Belgium
Tel : **+32-9 3808545**
Fax: **+32-9 3808546**
E-mail: **microbiotests@skynet.be**
Internet: **www.microbiotests.be**