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CONSULTANCY FOR UNIDO IN CONNECTION WITH ALTERNATIVES FOR METHYL BROMIDE (2)

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SUMMARY

The fieldwork part of the mission took place from 6 to 10 June 1999 in Morocco. Prof. Dr. Mohamed Ammati (IAV Hassan II, Morocco), Mr. H. van Heijningen (Sosef company, the Netherlands) and the external expert Willemien Runia (PBG, the Netherlands) participated.

The external expert undertook preparations for this mission in the Netherlands. In Biougra-Agadir on the ARMONA nursery the results of the trials, performed during the cropping season 1998/1999, were reviewed and advice was given on the technical measures to be taken for the season 1999/2000 with regard to soilless cultures and steam sterilization.

1. REVIEW RESULTS TRIALS SEASON 1998/1999

1.1. SOILLESS CULTURE

Crop: tomato

Data: Coconut fibre in polythene bags (\pm 10 litre content). Three planting holes per bag; 1 or 2 plants per bag. Three drippers per bag. No recirculation of run-off water. Slits at the bottom of the bag for drainage purpose. Two different types of cropping system were compared; the V-system with 2 stems per plant and the traditional 1 stem per plant.

Remark: The yield was not yet available and cannot be compared with the other alternatives for methyl bromide, because the tomatoes were planted in coconut much later than in the soil. For that reason the decision whether or not to implement this method in the next series of experiments cannot be drawn on the basis of the yield. The roots could not be reviewed because they were dried out completely due to crop termination.

1.2. STEAM STERILIZATION

This method was not yet applied on this nursery.

The boiler has been transported from Larache to Agadir and will be tested by Dr. Ammati before the steam trials in August will start.

It is regrettable that such a small boiler was purchased; the quality of the steam will be less than with commercially used boilers. On the other hand if we succeed to achieve good results with this small boiler, trials on a commercial scale with an adequate boiler can be expected to be more successful. Offers for appropriate boilers were handed to Dr. Ammati.

Trenches were dug manually to establish the feasibility of the steaming trials. The structure of the sand was solid enough to let the trench in tact.

Therefore it was decided in consultation with Mr. Van Heijningen (Sosef company) that the soil is suitable for digging trenches, thus enabling the steam system to be applied properly.

It is suggested to install the steaming system in the first week of August, under supervision of the external experts, after which the trials can be performed immediately.

2. RECOMMENDATION EXPERIMENTAL SET-UP FOR THE CROPPING SEASON 1999/2000

2.1. SOILLESS CULTURE

- Initially Podzolan was suggested as substrate material. This material could be compared with coconut fibre to establish which substrate is most economical.
- Per substrate the best one of the cropping systems tested should be applied.
- With 2 plants on every bag and more space between every bag, the amount of substrate can be diminished.
- By making the slits, between the drippers somewhat above the bottom a water buffer can be created. The amount of water available per plant is much lower than in soil, which makes this system more vulnerable to technical problems like irrigation problems.
- Personal control of the irrigation system daily to prevent plant death due to clogging of the drippers.
- Steaming of the coconut bags in order to re-use them is not recommended when vascular root diseases or nematodes have been observed during the crop. There is always a risk that some bags are not steam sterilized well enough.
- Clogging of the drippers can be prevented by the use of chemicals on the basis of hydrogen peroxide. These oxidators react with the organic compounds in the nutrient solution.

2.2. STEAM STERILIZATION

2.2.1. Steaming system

The permanent steam system, which will be used in the trials, is the negative pressure steaming system. With this method steam is introduced under a steaming sheet and pulled into the soil by a negative pressure, created in the soil by a fan, which sucks air out of the soil through buried perforated polypropene pipes. Two tubes per 3 m bay width will be installed. The system will be dug in at a depth of 40 cm. The diameter of the steaming tubes in the soil is 8 cm (fibre wrapping included). Extra covering of the steaming tubes in the soil is not necessary.

2.2.2. Trial design

The area to be steamed at the same time will be:

- 4 plots of 25 m²; 8 x 3 m.
- 4 plots of 50 m²; 16 x 3 m.

The total area for the steam trials will be 24 m wide and 16 m long.

The first tube will be laid 75 cm from the outside of the plot; the intervals between the tubes will be 150 cm.

The boiler will be placed on the main walk and the main tube and fan will be installed opposite the boiler.

The steam will be introduced under the steaming sheet **opposite** the main tube and fan.

Fans are suitable in the Netherlands for a voltage of 380 Volt. In Morocco this voltage is almost nowhere to be found on nurseries. Mr. Van Heijningen will adapt the fan for the trials to 220 Volt.

The type, amount and prices of materials needed for these trials will be described to UNIDO by Mr. Van Heijningen from Sosef Company, the Netherlands.

2.2.3. Exposure time/dataloggers

Two sets of thermocouples connected with two dataloggers will be used to register the temperature at various depths during the trials. The dataloggers will show how the steam moves, horizontally as well as vertically. These data are necessary to decide which exposure time is needed. Two dataloggers are necessary; one ready for the trial running and one to be installed in the next plot to be steamed.

2.2.4. Installation thermocouples

Thermocouples will be installed all over the plot to be treated. Half the thermocouples should be installed above the steaming tubes and the other half between two steaming tubes (approx. 75 cm distance). Three thermocouples should be installed at various depths at each recommended measuring site. In the Netherlands at every measuring-site 3 thermocouples at various depths were attached to a wooden pole with waterproof tape. The pole was beaten into the soil with a hammer. The soil around the pole should be fastened in order to prevent the steam to travel along the pole downwards.

2.2.5. Anchoring steaming sheets

Plastic bags, filled with clean sand, will anchor the steaming sheets. These bags can also be used for the solarisation trials.

Anchoring steaming sheets with soil is undesirable because of the risk of reinfection from this non-disinfected soil. Moreover it requires a lot of heavy labour.

4. ADDITIONAL RECOMMENDATIONS

- It is recommended that the external expert in steam sterilization is present during the first trials at Biougra-Agadir in July, to ensure the optimum results with the equipment available.
- It is recommended that Mr. Van Heijningen from Sosef Company will be present during the first trials at Biougra-Agadir in July, to ensure the proper installation of the system and for optimum results with the equipment available.
- It is recommended that a local Moroccan student supplies the data from the datalogger at every requested moment during the steaming trials.