ALTERNATIVES TO METHYL BROMIDE FUMIGATION FOR TOMATOES IN ROMANIA GREENHOUSES

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The consumption of methyl bromide has started in Romania greenhouses since 1972. Small quantities of methyl bromide are also used in grain storage (all storage uses were covered by the domestic production).
In Romania, the total area devoted to greenhouse production reached 1378 ha: 418 ha are heated greenhouses and 960 ha are not heated; from total area 450ha are managed by public company and 928 ha belong to private growers. The tomatoes represent the most important crops grown under protection, generally adopting a continuous monoculture. Since crop rotation is rarely adopted, the reduction of yield, both in quantity and quality, progressively affects the crops, thus making necessary the adoption of soil disinfestations practices. Recent investigations showed that after 4 years of continuous tomato monoculture a yield reduction up to 48% occurred.
Soil steaming (sheet steaming), an efficient but costly technology, and methyl bromide fumigation was commonly adopted for soil disinfestations in Romania. Before 1995, the quantity of methyl bromide adopted for soil fumigation was 251 metric tons. Since the adhering to the Montreal Protocol, the Romanian government recently decided to discontinue importing methyl bromide, starting in 2003, and to phase out by 2005.

Demonstration trials for testing alternatives to methyl bromide to control corky root, root knot induced by nematodes and weeds, were organized in tomato greenhouse production systems at nine different locations in Romania. This summary are reported the results obtained in the first cycle 2005(autumn 2004/spring 2005) on tomatoes cultivated in Brasov and Bucharest area.
The efficacy of the chemical fumigants metham sodium , dazomet and grafted plants on resistant rootstocks alone or in combination were tested and compared to that of methyl bromide and untreated soil. The efficiency of soil disinfestations was assessed by measuring weed density (number of weeds/m^2, fresh weed weight g/m^2), severity of corky root induced by Pyrenochaeta lycopersici and severity of root galls induced by nematodes [root index (0-5)] and the total marketable yield. The incidence of P. lycopersici and the presence of galls induced by nematodes were visually assessed at the end of the trials on 15% of the plants harvested from the middle of the plots.

Some of the general findings from the research on tomatoes include the following:

- The use of metham sodium combined with drip irrigation system appeared to be an efficient and safe way to practically apply the soil fumigant as reported in other countries for several fumigants and non-fumigant compounds. Metam sodium alternatives have a very good efficacy in pest, pathogens eradication and some weeds as secondary effect.
- Dazomet treatment has a preventive, eradication efficacy only for nematodes and soil pests, secondary herbicide effect being very low. Dazomet, even though it was an effective alternative to methyl bromide, is only available in Romania as a powder formulation, risky to be handled due to dust production. Moreover it should be remembered that repeated applications of metham sodium and dazomet could incite an accelerated degradation of methyl-isothiocyanate (MITC) causing the progressive reduction of the effectiveness of MITC generators against several soil borne diseases.
- The combination of short soil solarization periods may be considered as a means to reduce the rates of soil fumigants required. Unfortunately soil solarization is not easy to use under Romanian conditions because of the short time available between the 1st and the 2nd crop cycle (July - August) as well as the geographical position of the country.
- Grafted plants on resistant rootstocks offer a valid alternative to the use of fumigants as they seem to improve the quality, the quantity and the duration of the harvest period. The use of grafted plants has lead to the reduction of the nematode attack as well as of same soil diseases; in the Romania conditions, it appears that the leading farm of the grafted plants tomato culture will be 50% of the normal density of the plants lead with 2 stems.
- Romanian nurseries however, can only produce a limited number of grafted plants with satisfactory commercial quality. If facilities and equipment needed for grafted plant production become more available, of wide scale adoption of this technology would be possible.
- Due to the high variability between the available cultivars, the choice of appropriate rootstocks has to be considered in order to enlarge the knowledge and to introduce feasible scion/rootstock combinations adapted to the different seasons and to the different growing systems into the market (the testing of rootstock for tomatoes, other than Beaufort).
- All alternatives had a low herbicide effect; the testing of experimental variants would be must to include possibilities of reducing weeds incidence.

All the current methyl bromide substitutes and control measures for controlling soil borne pathogens in greenhouse-grown vegetables crops have limitations, compared with methyl bromide. Therefore, soil disinfestations with combined fumigant formulations alone or in combination with soil solarization and steaming, and the use of plant resistance are powerful tools for vegetable growers in order to significantly reduce the soil inoculums.

The demonstration plots carried out in Romania are still in progress and constitute the first action to solve problems related to soil disinfestations.