The use of fumigants and grafted plants as alternatives to methyl bromide for the production of tomatoes, vegetables and strawberries in Italy

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SIS S.p.a. is the largest Italian fumigation Company

Italy is the largest Me Br consumer in Europe
How does SIS provide professional soil fumigation service to farms?

- Through the extension service of a network of 40 agronomists;
- Performing the fumigation directly in the farm with teams of specialized operators: all product is applied exclusively by professionals;
- With in-house developed and produced equipment and technology.
To comply with the Montreal Protocol, SIS has pursued three main lines of investigation:

- R&D and production of grafted plants;
- R&D and production in soil-less cultivation;
- R&D and commercial introduction of chemical alternatives.
SIS produces vegetable seedlings at nursery CENTRO SEIA

- CENTRO SEIA produces over 70 millions of plants per year in a nursery of more than 5 hectares of modern greenhouses;
- A growing portion are grafted plants;
- Seedlings are delivered all over Italy and in several European countries.
Grafted plants

Offer:
- Tolerance to nematodes;
- Resistance to soil born diseases;
- Vigor and tolerance to low temperatures.

Require:
- modern greenhouses;
- better farming skills;
- higher investments (per Ha).
Soil less farming at SIS

- Tomatoes are produced in six Ha glasshouses soil less farm;
- Results are excellent in quality and quantity:
  
  But:

- Technology imply high investments in the glasshouses and requires a technical competence not commonly available.
Yield comparison between several rootstocks and standard tomato

Fondi (Italy) 2003

Not grafted plant index = 100
Chemical alternatives

- SIS has actively cooperated with some of the main international research institutes and chemical firms committed to Me Br replacement;
- SIS has executed the registration trials of two new key formulations.

- In November 2001: registration of CONDORSIS, nematocide fumigant, the only formulation in Italy based on 1,3-d which is authorized for use in greenhouses (Dow AgroSciences B.V.);

- In July 2002: registration of TRIPICRIN, based on chloropicrin, fumigant with fungicidal and herbicidal action (Triagriberia S.L.)
Since 2002 SIS spa has converted the surfaces treated with Methyl Bromide into co-applications of Condorsis and Chloropicrin at a rate equivalent to:

<table>
<thead>
<tr>
<th>Year</th>
<th>% converted</th>
<th>N° of growers</th>
<th>N° of applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>5%</td>
<td>200</td>
<td>465</td>
</tr>
<tr>
<td>2003</td>
<td>36%</td>
<td>1.534</td>
<td>2.931</td>
</tr>
<tr>
<td>2004 (August,)</td>
<td>45%</td>
<td>2.000</td>
<td>4.000</td>
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</table>
Strawberry yield comparison, Battipaglia (Naples) 2002/2003

Gr/plant

- Control
- MeBr bed fumigation 40 gr/sm
- MeBr broadcast fumigation 40 gr/sm
- CP 20 + Condorsis 24 gr/sm
- CP 30 + Condorsis 24 gr/sm
- CP 40 + Condorsis 24 gr/sm

Yield values:
- Control: 394.3
- MeBr bed fumigation: 454.2
- MeBr broadcast fumigation: 499
- CP 20 + Condorsis: 570.2
- CP 30 + Condorsis: 598.3
- CP 40 + Condorsis: 592.4
Production of strawberry plants in nursery

Plants / Ha cv. Elsanta 2002/2003

Methyl Bromide

Chloropicrin + Condors
Production of strawberry plants in nursery

Plants/Ha cv. Thetis

- Methyl Bromide
- Chloropicrin + Condorsis

Bar chart showing production of strawberry plants per hectare for different treatments.
Tomato crop comparison, Terracina (Lt)
2003

- MeBr 40 gr/sm
- CP 20 + Condorsis 24 gr/sm
- CP 30 + Condorsis 24 gr/sm
- CP 40 + Condorsis 24 gr/sm
Other crops yield comparison

- Eggplant
- Melon
- Zucchini

Kg / s.m.

- MeBr 40 gr/sm
- CP 25 + Condorsis 24 gr/sm
Methyl Bromide

Chloropicrin + Condorsis
Chloropicrin + Condorsis

Methyl Bromide
• Products are applied with machines developed by SIS:

• In open fields with shank injector that seal the soil with VIF immediately after the application;

• In the greenhouses, products are applied thru the drip irrigation system on the soil previously covered with vif.
Pros and cons

- Overall results are excellent: equal or better than MeBr;
- Weed control as shank injected is inferior to MeBr;
- Some limitations at low temperature;
- Pre transplanting interval longer than MeBr.
Conclusions

- The alternatives to MeBr exist: the answer may be different in the different farming realities;
- Grafted plants, soil less and chemistry are at different degree the solutions;
- The ability to offer a full technical service in the farm is indeed the key to success;
- Chemistry, CHLOROPIRICRIN + CONDORSIS in association, are the closest and easiest alternatives to Me Br.