# STRAWBERRIES CROPS IN FRANCE : DIFFERENT METHODS TO APPLY METHYL BROMIDE AND METAM SODIUM IN OPEN FIELDS.

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In Dordogne, region of France South West, intensive strawberries crops in small farms without rotation are severely damaged by soil born pathogens (*Phytophtora cactorum, Ph.fragariae, Verticillium dalhiae, colletotrichum acutatum*) and sometimes by nematodes (*Pratylenchus penetrans, P.crenatus, meloïdogyne hapla and Xiphinema diversicaudatum* ). (Girault, 1992).
In this region, chemical soil disinfestations before planting increase yields in average between 50% to 150% as shown by field experiments since 1984 (Fritsch, 1997). This is the reason why this crop accounts for 20% of the methyl bromide (MeBr) used in France in terms of surfaces.
Facing to the MeBr European restrictions since 1st January 1998 (-25% on 1991 consumption) and to the decisions adopted during the seven meeting by the parties of the Montreal Protocol, new ways to apply MeBr in agriculture are developped. For five years, we carried out several field experiments on half normal dosages of methyl bromide and the use of gas tight plastic films.

The experiment presented here is a good example for comparing some changes in soil disinfection with two fumigants. Objectives are : to verify the real efficiency with low dosages of methyl bromide mixed under gastight plastic sheets and to find new solutions to apply metam sodium (MS) which could be one of the chemical alternatives for the short term.

## 1 - Material and method

There are four replicates for each treated and control plot. The size of each plot is 20 m long i.e.60 strawberry plant.

### 1.1 - fumigants application.

**(a)** - MeBr at normal dosage (80 g/m2) and sheeting with a normal low density polyethylene (Permeability Coefficient, PC according the french standardization NFT 54-195 at 20°C : 63g/m2/h)
**(b)** - MeBr at half-normal dosage (40g/m2) with a standardized barrier film (or Virtually Impermeable Film, VIF) of 50 microns tick (PC : 0.10 g/m2/ h)
In both cases, MeBr is injected at 20 cm depth using the cold gas application in strips.
**(c)**- MS applied by drip irrigation at a normal dosage, 1300l/ha.
**(d)** - MS applied at the same dosage by injection in soil at 30 cm depth with a sheeting ( low density polyethylene)

### 1.2 - Monitoring of gas concentrations.

**MeBr** :
Only gaseous phase is effective against pathogens. Gas concentrations are taken during the 95 hours of the exposure time at 25 cm depth. A thermalconductivity meter (Gow Mac, Model 20-800) connected to probes is used to measure gas concentrations. Then, Concentration Time Products (CTPs, in g*h/m3) are calculated for each measure point.
**MS** :
This compound produces methylisothyocyanante (MITC) wich is the main active ingredient on pathogens. To take a sample of gaseous phase in the soil, a gas sampling bulb previously emptied of air is connected at a probe. The gas-mix is collected and atmospheric pressure is retablished. Then, MITC is analysed by gas chromatography using a thermoionic detector.
Gas concentrations are measured at 30 cm depth during 215 hours ( exposure time) only on the treatment **(d)**. CTPs are expressed in the same unit that for MeBr.



### 1.3 - Yields.

During the growing season, April - June 1997, eleven harvests have been carried out to quantify yields of each plot.

## 2 - -Results and discussion

Table 1 shows a significantly increasing of yieds on all treated plots even if the control obtain a fairly good level of production.

**MeBr** : Both treatments with methyl bromide (a) and (b) have the same CTPs and yields without significative difference :low dosage of MeBr plus VIF gives the same efficiency that standard treatment.

**MS** : The obtained CTP on treatment (d) is good as we know thanks to preliminary laboratory experiments either in terms of gas concentration by itself as in terms of biological efficiency of MITC on different pathogens. In term of yields, there isn't a difference between treatments (c) and (d).

Metam sodium applied by drip irrigation or by injection with a full sheeting can be described as interesting alternatives even if yields are significantly inferio to methyl bromide, but still high compared to the control.

## Conclusion

To keep maximun growers of strawberries in this country and for control atmpospheric emissions of MeBr, it is thought that implementation of half normal dosages of MeBr and standardized gastight plastic sheets should be quickly carried out. Futhemore, new experiments on chemical or non chemical alternatives are necessary to prepare the phase out of MeBr. Chemicals alternatives such as metam sodium could be a serious solution for the short term, but Integrated Pest Management (IPM) should be developped on this crop.

Table 1 : Effect of two fumigants applied with different technologies on yields of strawberries (experiment dated on 1996 - 1997 - Douville) -

| **Treatment** | **CTPs g*h/m3** | **Marketable yields** | | |
|---|---|---|---|---|
| | | **g/plant** | | **relative yield increase** [2] |
| Control, ( untreated ) | - | 696 | c[1] | 100 |
| **a** - MeBr 80 + PE | 3557 | 1063 | a | 153 |
| **b** - MeBr 40 g + VIF | 2996 | 1047 | a | 150 |
| **c** - MS 1300L/Ha drip irrigation | - | 966 | b | 139 |
| **d** - MS 1300l/Ha+sheeting | 682 | 924 | b | 133 |

1 - Values followed by different letters are significantly different, (P=0.05)

2 - yield treated plot/yield control plot.

### References

Fritsch,J. (1997), Soil disinfestation for vegetables crops in France: methyl bromide uses and studied alternatives. National meeting on vegetable crops organized by the french Plant Protection Service. Monpellier, 30-31 January 1997.

Girault, M. (1992), Soil tiredness in strawberries crops - INFO CTIFL n°86.