METAM SODIUM ON STRAWBERRY: EXAMPLE OF COMMERCIAL REPLACEMENT OF METHYL BROMIDE IN SPAIN AND FRANCE

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The use of metam-sodium as soil fumigant before planting strawberry tends to become a common practice in Europe since the product has proven to be a viable alternative to methyl bromide (Fritsch, 1998). Chemical disinfection is often a necessary step before planting strawberry as this intensive crop suffers a lack of rotation that exposes the plants to damaging soil borne pathogens (*Phytophtora cactorum, P. fragariae, Verticillium dalhiae, Colletotrichum acutatum*) and nematodes (*Pratylenchus penetrans, P. crenatus, Meloïdogyne hapla, Xiphinema*) (Girault, 1992). In this purpose, metam-sodium is used in Spain for the production of strawberry and in France for the disinfection of nurseries for strawberry plants.

To express its biocidal properties, metam-sodium requires a proper technique of application that aims to compensate the limited diffusion of the fumigant in the soil. Our previous work found that a high level of efficacy, comparable with those of methyl bromide, is achieved when metam-sodium is applied through the drip-irrigation system or direct injection within the soil followed by mixing (Rabasse, 1995).

The work presented here summarizes three years of efficacy trials conducted in Spain and one efficacy trial conducted in France; where both methods of application were tested with methyl bromide as reference. In all trials, metam-sodium gave a strong increase of yield in comparison with the non-treated, while the rate of 1,200 l/ha gave similar yield increase to that obtained with methyl bromide. These results, along with the increased use of the product on commercial strawberry fields, support that metam-sodium is a fast growing alternative fumigant to methyl bromide for the production of strawberry.

Materials and methods

The Spanish study conducted three successive campaigns (1996-97, 1997-98 & 1998-99), each time on 4 different sites located in the region of Huelva. The treatments were repeated 4 times on plots of 50m² each. Treatments were applied in autumn, where metam sodium was applied 3 to 6 weeks before planting and methyl bromide was applied 2-3 weeks before planting.. During the campaigns 1996/97 and 1997/98, metam-sodium was applied according to 3 various models: either at 1,200 l/ha or 600 l/ha by drip irrigation and sealed with polyethylene film mulch, or at 1,200 l/ha by drip irrigation and sealed with water. During the

campaign 1998/1999, metam-sodium sodium was applied either at 1,200 l/ha by drip irrigation and sealed with polyethylene film mulch or water, or at 1,200 l/ha by injection at 20 cm depth in the beds. Methyl bromide was applied in all plots, at the rate of 500 kg/ha and covered with a VIF (Virtually Impermeable Film). The French trial was conducted in south-west of France at the Ciref Douville (Inter-regional Research Center for Strawberry) in 2000, with 4 repetitions. Metam-sodium was applied by injection or drip irrigation at 1,200 l/ha and the plots covered with polyethylene film mulch. Methyl bromide was applied at the rate of 400 kg/ha and covered with a VIF.

Results

French trial. All treatments increased significantly the yield in comparison to the control. The highest yield increase (44%) of fruits in "Class Extra" was obtained with metam-sodium applied by drip-irrigation, while metam-sodium applied by injection and methyl bromide increased the yield of fruits in this Class by 33.7% and 32.3% respectively. The overall marketable yield was increased with metam drip-irrigation, metam injected and methyl bromide by 57.8%, 69.1% and 43.1% respectively.

In the Spanish trials, as shown in Table 1, all treatments significantly increased the marketable yield of each plot. Metam sodium at 1,200 l/ha applied by drip irrigation or injection and sealed with polyethylene film mulch gave similar to higher increase of marketable yield than methyl bromide (17.6% and 17.1% vs. 16.2% for methyl bromide). This increase of yield is observed each year, in each location.

Metam sodium at 600 l/ha or at 1,200 l/ha without sealing increased the marketable yield by 8.9% and 9.9%.

Conclusion

Drip-irrigation or shank applied metam sodium at 1,200 l/ha and sealed with a polyethylene film mulch produces yield at least as good as the standard MetBr.

References

Fritsch, J. 1998. Strawberry crops in France: different methods to apply methyl bromide and metam sodium in open fields. 1998 Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions

Girault, M. 1992. Soil diseases in strawberry crops – CTIFL Info N°86

Rabasse, J.-M. 1995. Improved application techniques for metham sodium in Alternatives to Methyl Bromide for the Southern European Countries 1998. DG XI, EU, CSIC, Madrid, 201-204

Table 1: Yield in t/ha obtained on each site for the 3 years of trial.

yield in t/ha	**1996/1997**		**1997/1998**		**1998/1999**		
	yield	% increase /untreated	yield	% increase /untreated	yield	% increase /untreated	
Site 1	**MS-196H** *(24 pickings)*		**MS-197H** *(23 pickings)*		**MS-198H** *(17 pickings)*		
METAM 1.200 l/ha drip irrig. + plastic mulch	33,8	*11,2%*	46,5	*25,0%*	28,6	*18,6%*	
METAM 1.200 l/ha injected + plastic mulch	-	-	-	-	28,3	*17,2%*	
METAM 600 l/ha drip irrig. + plastic mulch	32,4	*6,6%*	43,7	*17,5%*	-	-	
METAM 1.200 l/ha drip irrig. + water seal	31,3	*3,0%*	42,6	*14,5%*	26,6	*10,5%*	
MetBr 500 kg/ha + VIF	32,8	*7,9%*	45,8	*23,1%*	27,1	*12,4%*	
Untreated	30,4	-	37,2	-	24,1	-	
Site 2	**MS-296H** *(20 pickings)*		**MS-297H** *(28 pickings)*		**MS-298H** *(20 pickings)*		
METAM 1.200 l/ha drip irrig. + plastic mulch	40,5	*17,7%*	48,7	*16,0%*	25,0	*15,6%*	
METAM 1.200 l/ha injected + plastic mulch	-	-	-	-	25,6	*18,3%*	
METAM 600 l/ha drip irrig. + plastic mulch	38,1	*10,8%*	45,7	*8,8%*	-	-	
METAM 1.200 l/ha drip irrig. + water seal	38,6	*12,2%*	45,8	*9,0%*	24,8	*14,7%*	
MetBr 500 kg/ha + VIF	39,4	*14,5%*	48	*14,3%*	25,7	*18,6%*	
Untreated	34,4	-	42	-	21,6		
Site 3	**MS-396H** *(30 pickings)*		**MS-397H** *(32 pickings)*		**MS-398H** *(13 pickings)*		
METAM 1.200 l/ha drip irrig. + plastic mulch	38,1	*15,5%*	52,1	*34,6%*	13,3	*10,3%*	
METAM 1.200 l/ha injected + plastic mulch	-	-	-	-	13,4	*11,7%*	
METAM 600 l/ha drip irrig. + plastic mulch	34	*3,0%*	43,7	*12,9%*	-	-	
METAM 1.200 l/ha drip irrig. + water seal	34,3	*3,9%*	44,4	*14,7%*	12,9	*7,1%*	
MetBr 500 kg/ha + VIF	37,1	*12,4%*	52,7	*36,2%*	13,3	*10,7%*	
Untreated	33	-	38,7	-	12,0	-	
Site 4	**MS-496H** *(24 pickings)*		**MS-497H** *(19 pickings)*		**MS-498H** *(14 pickings)*		
METAM 1.200 l/ha drip irrig. + plastic mulch	48,5	*8,0%*	26,9	*13,5%*	16,3	*22,8%*	
METAM 1.200 l/ha injected + plastic mulch	-	-	-	-	16,0	*20,1%*	
METAM 600 l/ha drip irrig. + plastic mulch	46,5	*3,6%*	25,4	*7,2%*	-	-	
METAM 1.200 l/ha drip irrig. + water seal	47,3	*5,3%*	25,4	*7,2%*	15,2	*14,2%*	
MetBr 500 kg/ha + VIF	48,3	*7,6%*	27	*13,9%*	16,0	*20,4%*	
Untreated	44,9	-	23,7	-	13,3	-	
	Average of the 4 sites 96-97		**Average of the 4 sites 97-98**		**Average of the 4 sites 98-99**		**Average of 3 years**
METAM 1.200 l/ha drip irrig. + plastic mulch	40,2	*12,8%*	43,6	*23,0%*	20,8	*17,1%*	17,6%
METAM 1.200 l/ha injected + plastic mulch	-	-	-	-	20,8	*17,1%*	17,1%
METAM 600 l/ha drip irrig. + plastic mulch	37,8	*5,8%*	39,6	*11,9%*	-	-	8,9%
METAM 1.200 l/ha drip irrig. + water seal	37,9	*6,2%*	39,6	*11,7%*	19,9	*11,9%*	9,9%
MetBr 500 kg/ha + VIF	39,4	*10,4%*	43,4	*22,5%*	20,5	*15,5%*	16,2%
Untreated	35,7	-	35,4	-	17,8	-	