NEW DEMONSTRATIONS OF ALTERNATIVES TO MB FOR STRAWBERRY IN SPAIN. 2003 RESULTS.

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The first National project INIA SC 97-130 on alternatives to Methyl Bromide (MB) was finished in 2002. Results for strawberry in Huelva have been presented in MBAO Conference and elsewhere (López-Aranda et al., 2000, 2001, 2002a). Particularly, in 2002, five field scale demonstrations using the most promising alternative solutions (López-Aranda et al., 2002b) were started. These demonstrations showed very similar yields to the standard use of MB standardized use in the area for 1,3D-pic (Telopic™) and Dazomet (Basamid™). In contrast, soil solarization with simultaneous Metam Sodium shank-application or simultaneous biofumigation gave poorer results.

In 2003, we started a three-years (2003-2005) new National project INIA: "Optimization and new implementation in Methyl Bromide alternatives. Strawberry fields and High-elevation nurseries. Critical uses". To enhance technology transfer processes on this topic, another batch of field demonstrations for strawberry has been developed in Eastern coast area of Huelva. Two private farms have been selected: Occifresa Inc. (Avitorejo, Moguer) and Cumbres Malvinas Inc. (Malvinas, Palos de la Frontera), located in the center of very important strawberry crop areas in Huelva. Both farms are representative of the technology, environment (soil, water and climatic standards) and soil-borne and aerial pathological status in strawberry cultivation at Huelva. Cv. 'Camarosa' was cultivated following conventional cultivation practices under large plastic tunnels. Soils of each orchard have been fumigated by MB-pic shank-application for more than 10 years. Four field scale demonstrations were carried out on each farm: a) 1,3D-pic (61-35) (Telopic™) shank-applied under pre-formed beds mulched with black P.E. film (40 cc/m^2 of treated area); b) 1,3D-pic (61-35) shank-applied under pre-formed beds mulched with VIF black film (20 cc/m^2 of treated area); c) Dazomet broadcast incorporated with rotovator (50 g/m^2 and sealed with transparent P.E. film before mulching with black film); d) standardized MB-pic (50-50) shank applied under preformed beds (40 g/ m^2 of treated area), as standard control. Fumigations were applied on September 26-27, 2002, and planting dates were October 17-18, 2002, with a standard plant density of 67,400 and 71,200 plants/ha, respectively (Table 1). Harvesting period is presented in Table 3.

Soil samples from each demonstration and orchard were analyzed before and after treatments and at the end of the cultivation period. Plant samples were analyzed before planting. No lethal soil-borne fungi and phytoparasitic nematodes were present at the moment of planting. Plant survival (%), just after plantation dates and at mid growing season (April 1, 2003), was optimal for every demonstration and location (Table 2). Plant diameter (cm) and number of leaves (Table 2), followed similar tendencies to the commercial yields (Table 3). Table 3 shows harvesting period (January to May), extra-early, early, medium and total commercial yield per plant. Average fruit weight and percentage of second commercial category of fruit are presented in Tables 4 and 5, respectively. Finally, data regarding the weeding on the top of beds is presented in Table 6.

The results obtained, one more year, after six-year work (1998-2003), showed that the agronomic and morphologic response of cv. 'Camarosa' to 1,3D-pic (61-35) was similar to that obtained with BM-pic (50-50), even with 50% dosage under black VIF film. The yield obtained with the application of Dazomet was a bit lower than for the other fumigants. These alternatives could represent an appropriate short and medium-term solution to MB ban in environments with low levels of lethal soil-borne strawberry pathogens, such as Huelva crop area. However, EU policy on future 1,3 dichloropropene and/or chloropicrin utilization is uncertain. For this reason, application for critical use exemption (CUN) for the Spanish strawberry industry has been presented and recommended by MBTOC in 2003.

References

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Table 1. Demonstrations. Preliminary data.

Location	Field demonstration	Plot history	Demo. surface (m^2)	Application period	Planting date	Planting density (plant/ha)	Large tunnel cover date
Occifresa	Telopic	+10 years with MB and strawberry	470	Sept., 26	Oct., 18	67363	Nov., 26
	Telopic VIF		470	Sept., 26	Oct., 18	67363	Nov., 26
	Dazomet		470	Sept., 26	Oct., 18	67363	Nov., 26
	MB standard		470	Sept., 26	Oct., 18	67363	Nov., 26
C. Malvinas	Telopic	+15 years with MB and strawberry	470	Sept., 27	Oct., 17	71203	Nov., 12
	Telopic VIF		470	Sept., 27	Oct., 17	71203	Nov., 12
	Dazomet		470	Sept., 27	Oct., 17	71203	Nov., 12
	MB standard		470	Sept., 27	Oct., 17	71203	Nov., 12

Table 2. Plant survival after re-plant, and plant size (1).

Location	Field demonstration	Plant survival (%)		Plant diameter (cm)			Number of leaves per plant		
		Oct.31	Apr.01	Dec.23	Feb.20	Apr.21	Dec.23	Feb.20	Apr.21
Occifresa	Telopic	99.6	99.8	22.7	30.8	36.0	7.5	15.4	29.1
	Telopic VIF	99.0	99.8	21.0	28.0	33.5	7.9	15.5	27.3
	Dazomet	98.9	99.8	23.9	32.5	35.8	8.2	18.7	32.5
	MB standard	99.1	99.8	20.1	27.9	35.1	7.0	14.8	28.6
		Oct.31	Apr.01	Dec.27	Feb.21	Apr.22	Dec.27	Feb.21	Apr.22
C. Malvinas	Telopic	99.4	99.1	28.2	33.5	41.5	9.9	23.3	37.6
	Telopic VIF	99.3	99.3	26.5	35.7	43.0	10.3	26.9	42.7
	Dazomet	99.2	99.3	28.1	35.1	42.9	10.8	21.5	37.3
	MB standard	99.4	99.5	30.8	34.5	42.8	10.7	21.9	39.2
(1) Sampling size for diameter and leaves: 15 plants/demo. for each date									

Table 3. Harvesting dates and commercial yield in g/plant.

Location	Field demo.	Harvesting period			Commercial yield (g/plant) until end of			
		First	Last	nº pic.	February	March	April	May
Occifresa	Telopic	Jan. 17	May. 21	22	121	407	873	1112
	Telopic VIF	Jan. 17	May. 21	22	116	419	847	1085
	Dazomet	Jan. 17	May. 21	22	109	342	756	967
	MB standard	Jan. 17	May. 21	22	104	371	793	1055
C. Malvinas	Telopic	Jan. 5	May. 21	22	130	294	676	952
	Telopic VIF	Jan. 5	May. 21	22	108	269	645	908
	Dazomet	Jan. 5	May. 21	22	102	259	619	828
	MB standard	Jan. 5	May. 21	22	123	314	691	971

Table 4. Fruit weight.

Location	Field demonstration	Fruit weight (g/u.). Sample of 40 fruits.						
		Feb. 5	Mar. 6	Mar. 26	Apr. 16	May 6		Average
Occifresa	Telopic	27.2	30.1	26.5	21.1	17.9	-	24.6
	Telopic VIF	26.3	28.1	25.7	20.4	19.9	-	24.1
	Dazomet	32.7	31.5	26.3	21.5	19.4	-	26.3
	MB standard	26.4	28.8	28.6	24.6	20.9		25.9
		Feb. 7	Mar. 4	Mar. 21	Apr. 9	Apr. 24	May 14	Average
C. Malvinas	Telopic	33.9	37.3	29.6	21.8	25.2	18.0	27.6
	Telopic VIF	33.8	39.2	27.9	24.0	25.2	18.6	28.1
	Dazomet	31.4	37.7	28.7	22.7	24.2	17.7	27.0
	MB standard	35.6	38.4	31.3	23.3	26.0	20.0	29.1

Table 5. Percentage of second category yield (1).

Location	Field demonstration	% of second category fruits until end of		
		February	March	May
Occifresa	Telopic	5.6	5.2	3.3
	Telopic VIF	8.2	6.1	4.0
	Dazomet	7.3	5.6	3.8
	MB standard	4.5	5.3	3.3
C.Malvinas	Telopic	9.5	11.6	19.3
	Telopic VIF	9.9	11.8	15.7
	Dazomet	10.3	11.0	16.2
	MB standard	9.5	11.6	15.8
(1) These large differences between locations are due to different commercial criteria				

Table 6. Weeding on the top of raised beds.

Location	Field demonstration	Weeding date	Time of weeding (min/demo.)	Weed biomass (g/demo.)
Occifresa	Telopic	Dec. 12	15.5	85
	Telopic VIF	Dec. 12	14.9	76
	Dazomet	Dec. 12	15.3	94
	MB standard	Dec. 12	12.4	40
C.Malvinas	Telopic	Dec. 2	20.2	77
	Telopic VIF	Dec. 2	18.5	66
	Dazomet	Dec. 2	16.9	99
	MB standard	Dec. 2	19.7	107