CHEMICAL AND NON-CHEMICAL ALTERNATIVES TO MB FUMIGATION OF SOIL FOR STRAWBERRY. 2000-2001 RESULTS.

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The field trials reported herein are part of the National project INIA SC 97-130 on short-term Methyl bromide (MB) alternatives for preplant soil fumigation in several crops. These experiments, corresponding to the 2000-2001 season, are the last of a series started in 1997. Provisional reports they were presented on the MBAO Conferences of San Diego 1999 (López-Aranda, 1999) and Orlando 2000 (López-Aranda *et al*., 2000); some characteristics of strawberry in the area of Huelva, relationships with MB issue, material and methods, and agronomic/morphological trends and results of the treatments evaluated in 1997-1998, 1998-1999 and 1999-2000 are provided in these references.

The field trials corresponding to 2000-2001 have been carried out in connection with the grower's organization (Freshuelva) in the two habitual locations: Avitorejo (Moguer) and Tariquejo (Cartaya), belonging to the collaborating farms Fresrica SAC and Torreagro SA, respectively. Both real scale experiments were designed following the same material and methods that in previous years. Short-term chemical and non chemical treatments are presented in Table 1. It was maintained identical alternatives in the same grounds than the previous years. The main changes have been: introduction of a new non chemical alternative by means of the application of electromagnetic waves during half-September of 2000 with a field prototype designed and manufactured by specialists of the area; introduction of VIF technology in Telopic (registered name of Telone C35 in Europe), by means of shank application of 20 cc/m^2 (50% dose) on preformed bed mulched with black VIF film (in substitution of former solarization with MB-Pic 10g/m^2 treatments). Finally, Dazomet has been incorporated under preformed beds by means of the multi-use machine. The plantation with cv. "Camarosa" was carried out at the last week of October 2000. Conventional practices for annual strawberry production were followed. Fruits were picked for fresh market from beginning of February until May 16th, 2001. Registered traits have been: % of plant survival, early and total yield, fruit size, weed control, plant size (diameter and number of trifoliate leaves). As observed in previous years, in this season of 2000-2001 the sanitary status of the trials was normal. In all cases, including controls, only a little amount of populations of *Meloidogyne* sp. with very low index of severity in plants was found in several plots of Tariquejo (Cartaya) location.

Table 1. Alternatives to MB. Strawberry trials 2000-2001. Huelva.

Treatments	Description
Control	Control without disinfestation
EMF	Electromagnetic waves whole surface
MB (40)	MB-Pic (67/33) 40 g/m^2 whole surface (standard)
Solarization	4 weeks: last July-third August
TeloneC35 (20) beds VIF	Telone C-35 Telopic 20 cc/m^2 pref. beds VIF
Solar. + Metam S (75)	4 weeks + 75 cc/m^2 Metam Sodium
Biofumigation	*Brassica* sp. + 5 kg/m^2 chicken manure
MB (40) Pref. beds	MB-Pic (50/50) 40 g/m^2 pref. beds
Metam S 175	Metam Sodium 175 cc/m^2 pref. beds
Dazomet (50)	Dazomet 50 g/m^2 pref. beds
MB (20) Pref. beds VIF	MB -Pic(50/50) 20 g/m^2 pref. beds black VIF
TeloneC-35 (40)	Telone C-35 Telopic 40 cc/m^2 pref. beds
Chloropicrin (40)	Chloropicrin 40 g/m^2 pref. beds

In 2000-2001, the chemical alternatives: Chloropicrin alone (40 g/m^2), Telopic (40 cc/m^2) and Telopic (20cc/m^2) under VIF film shank-applied on preformed bed, resulted in the highest yield, but at the same significance level than the dosage reductions (20 g/m^2) under VIF film and (40 g/m^2) on preformed bed shank-applied MB-Pic (50-50). The standard shank-applied (40 g/m^2) MB-Pic (67-33) broadcast (whole surface) ranked at a lower level of productivity than the former treatments (Table 2 and 3). Also Dazomet and soil solarization combined with shank-applied Metam Sodium (75 cc/m^2) ranked at a lower level of productivity than the former treatments. In the case of Dazomet this trend is slightly inferior to that of previous years, because its bad results at Tariquejo (Cartaya) location where problems of humidity on pre-plant drip irrigation were detected at the moment of fumigant incorporation; however, it can be observed that the behavior of this fumigant was satisfactory at Avitorejo (Moguer) location. Alternatives with soil solarization alone, biofumigation, electromagnetic fields and the non-fumigated controls produced significantly lower yield. Fruit size and weed control was affected similarly by treatments as productivity (Table 4 and 5). Once again, these 2001 results support that short-term alternatives (chemical and non-chemical) to MB exist for the strawberry industry in the area of Huelva. The economical evaluation of these new short-term alternatives to MB are in a cost effective manner. After four years of work, the National project INIA SC 97-130 has started in this 2001-2002 season with a real scale demonstration program including Telopic (40 cc/m^2 and 20 cc/m^2 VIF), Dazomet (50 g/m^2), solarization with simultaneous shank-applied Metam Sodium (75 cc/m^2) and with simultaneous biofumigation (5 kg/m^2 of chicken manure) in five different locations of the area of Huelva.

References

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Table 2 . Commercial (g/plant) and Relative yield * until May 16th . 2001.

	Avitorejo (Moguer)		Tariquejo (Cartaya)		Two locations average	
Treatments	g/plant	Relat. Yield	g/plant	Relat. Yield	g/plant	Relat. Yield
MB (40g) beds	824 a	115	619 a	111	722 a	113
Telopic (40cc)	819 a	114	659 a	118	707 a	111
Chloropicrin (40g)	806 a	112	613 a	110	709 a	111
Telopic (20cc) VIF	756 ab	105	590 a	106	704 a	110
MB (20g) beds VIF	805 a	112	591 a	106	698 a	109
MB (40g) w. surf.	**717 b**	**100**	**559 ab**	**100**	**638 b**	**100**
Dazomet (50g)	766 ab	107	417 cd	75	591 bc	93
Solariz. + MS (75cc)	684 b	95	469 bc	84	576 c	90
Biofumigation	592 c	83	431 cd	77	511 d	80
MS (175cc) beds	574 c	80	431 cd	77	502 de	79
Electromagn. waves	582 c	81	301 e	54	441 f	69
Control	559 c	80	302 e	54	430 f	67
Solarization	538 c	75	362 de	65	450 ef	70

*Relative yield = % of productivity versus standardized shank-applied MB (67-33), 40 g/m^2

Table 3. Early commercial (g/plant) and Relative yield * until March 31th . 2001.

Treatments	Avitorejo (Moguer)		Tariquejo (Cartaya)		Two locations average	
	g/plant	Relat. Yield	g/plant	Relat. Yield	g/plant	Relat. Yield
Telopic (40cc)	248 ab	113	119 a	102	183 a	107
Chloropicrin (40g)	248 ab	113	112 ab	96	180 ab	104
Telopic (20cc) VIF	243 ab	111	115 ab	98	179 ab	104
MB (20g) beds VIF	244 ab	111	110 ab	95	177 ab	103
Dazomet (50g)	262 a	119	91 bc	78	177 ab	103
MB (40g) beds	234 ab	106	116 ab	100	175 ab	103
MB (40g) w. surf.	**220 bc**	**100**	**117 a**	**100**	**168 abc**	**100**
Solariz. + MS (75cc)	223 b	101	102 ab	87	162 bc	94
MS (175cc) beds	188 cd	85	112 ab	96	150 cd	91
Biofumigation	184 d	83	98 abc	84	141 de	84
Solarization	174 d	79	76 cd	65	125 ef	72
Control	182 d	82	58 d	50	120 f	67
Electromagn. waves	172 d	78	65 d	56	118 f	66

*Relative yield = % of productivity versus standardized shank-applied MB (67-33), 40 g/m^2

Table 4. Final fruit size (g/fruit).

	Avitorejo (Moguer)	Tariquejo (Cartaya)	Two locations average
Treatments	Fruit size (g)	Fruit size (g)	Fruit size (g)
Telone C-35 (40cc)	26.9 a	25.4 a	26.1 a
MB (40g) pref.beds	27.2 a	24.8 a	26.0 a
Chloropicrin (40g)	26.6 a	25.2 a	25.9 a
Telopic (20cc) VIF	26.5 a	24.8 a	25.6 a
MB (20g) beds VIF	26.6 a	24.3 ab	25.5 a
MB (40g) wh.surf.	**25.6 ab**	**23.0 bc**	**24.3 b**
Dazomet (45-50g)	25.6 ab	21.7 cd	23.6 bc
Solariz. + MS (75cc)	23.9 cd	21.9 cd	22.9 cd
Biofumigation	24.4 bc	21.3 de	22.9 cd
MS (175cc) beds	22.8 de	22.3 cd	22.5 d
Control chem.	22.8 de	19.4 fg	21.1 e
Solarization	21.9 e	20.2 ef	21.0 e
Electromagn. waves	23.2 cde	18.2 g	20.7 e

Table 5. Weed control estimation. Time in weed elimination (hours/ha) on the top of beds and Index*

Treatments	Avitorejo (Moguer)		Tariquejo (Cartaya)		Two locations average	
	hours/ha	Index	hours/ha	Index	hours/ha	Index
Electromagn. waves	17.2 a	470	8.5 a	108	12.8 a	289
Biofumigation	13.6 ab	372	11.5 a	146	12.5 ab	259
Control	10.1 bc	277	9.4 a	119	9.7 bc	198
Solarization	7.8 cd	215	5.8 a	74	6.8 cd	144
Solariz. + MS (75cc)	4.3 de	117	9.1 a	115	6.7 d	116
Telopic (40cc)	4.2 e	115	8.1 a	102	6.1 de	109
Dazomet (50g)	4.2 de	116	7.6 a	97	5.9 ef	106
MB (40g) w. surf.	**3.7 e**	**100**	**7.9 a**	**100**	**5.8 ef**	**100**
MS (175cc) beds	4.3 de	119	6.0 a	76	5.2 ef	97
Chloropicrin (40g)	4.6 de	125	4.3 a	55	4.4 ef	90
MB (20g) beds VIF	4.6 de	125	4.1 a	52	4.3 ef	88
Telopic (20cc) VIF	3.9 e	107	4.5 a	57	4.2 ef	82
MB (40g) beds	3.7 e	102	3.4 a	43	3.6 f	72

*Index = % of Time in weed elimination versus standardized shank-applied MB (67-33), 40 g/m^2

** $P < 0.05$