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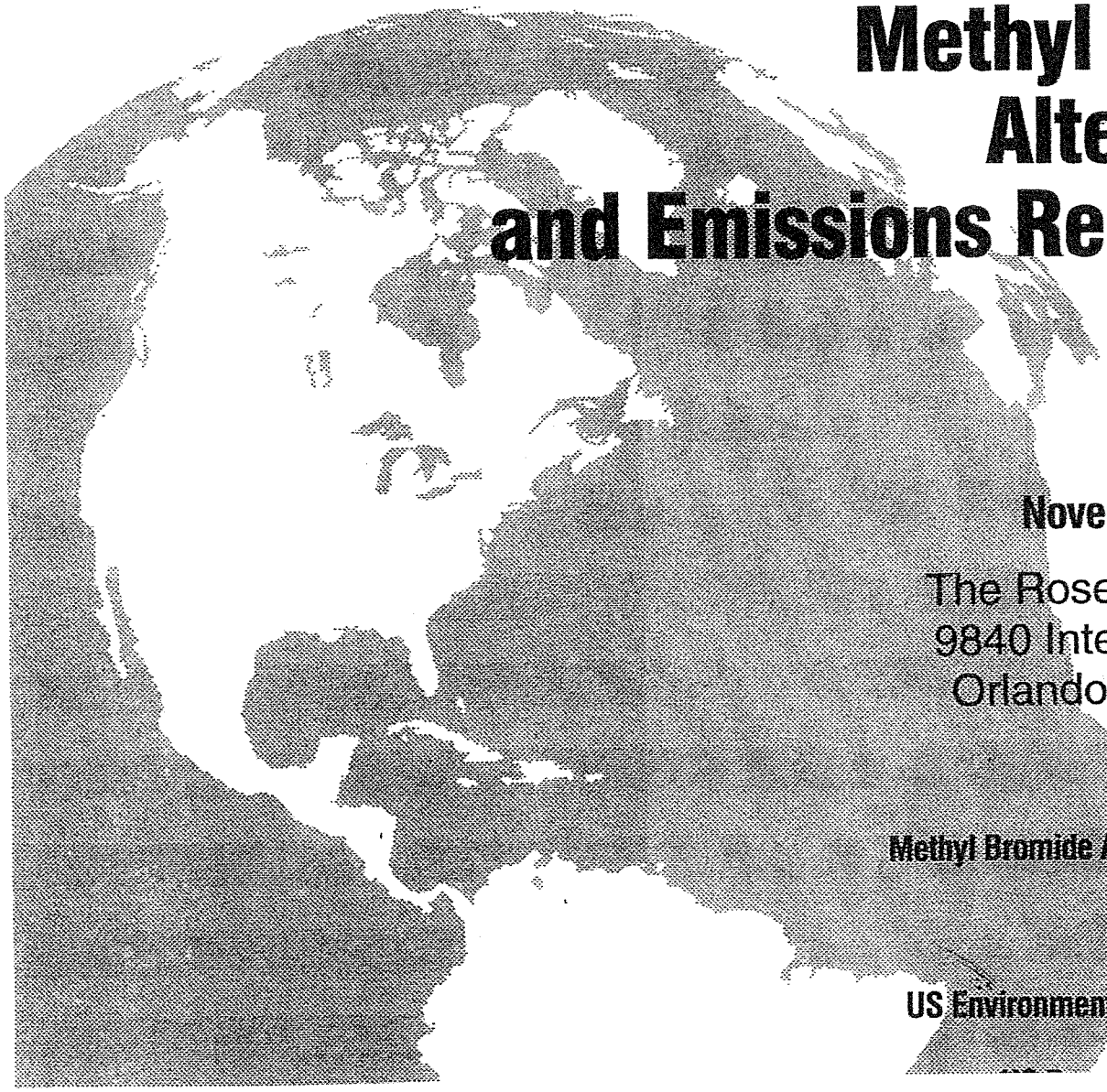

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Crop Protection Coalition,
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THE SECOND YEAR RESULTS OF METHYL BROMIDE ALTERNATIVES IN THE EASTERN MEDITERRANEAN

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Introduction. Turkey is one of the most methyl bromide (MB) consuming countries. MB consumption has increased from 643 Mt in 1990 to 1319 Mt in 1998. A World-Bank-supported-Project was initiated in 2000 to introduce MB alternatives to strawberry, pepper and eggplant producers in the Eastern Mediterranean Region of Turkey which is one of the foremost agricultural areas and; strawberry and vegetable have been widely cultivated.

In the first year, which results of the project were presented in the previous conference, all alternatives gave the comparable results with MB. In this paper, the second year results of the demonstrations will be presented.

Materials and Methods. Demonstrations were carried out successfully at 6 sites that were 2 pepper plastichouses, an eggplant strawberry plastichouse, and three strawberry fields. Treatments, number of replicates and plot sizes differed due to field size and crop. Combinations of solarization with basamid (300, 400 or 500 kg/ha), fresh cow manure (30-40 Mt/ha) were applied. Following application of basamid or manure, plots were covered with plastic tarp. In strawberry planting ridges were prepared, before covering. *Trichoderma* spp. was applied at seed beds, and then seedlings were transplanted to plots. Non-treated and/or MB applied checks were set in suitable fields. Demonstrations were started at different dates from 27.06.2001 to 27.07.2001. Solarizations were lasted 4-6 weeks in strawberry fields, 10 weeks in pepper and 8 weeks in eggplant plastichouses. Usual cultivation processes were applied during growing season. Demonstrations were assessed periodically for soilborn diseases, nematodes and weeds and yield were obtained. Soil temperatures in some demonstrations were recorded.

Soilborn diseases. *Fusarium* spp.in pepper, *Fusarium oxysporum* and *Sclerotinia sclerotiorum* in eggplant, and *F. oxysporum* and *Rhizoctonia solani* and *Macrophomina phaseolina* in strawberry were determined. Disease incidence as overall average for each crop is presented in table 1. All treatments controlled diseases in varying rates; but, solarization+basamid400 and and solarization+basamid500 gave the similar control with MB.

Nematodes. Pepper fields were heavily infested with *Meloidogyne incognita* while eggplant fields were slightly infested with *M. incognita* and *Meloidogyne javanica*. The effect of treatments on *Meloidogyne* juveniles in both crops was over 90 % at the end of the cropping season, June 2002 (Table 2and 3). Galling index also showed the same results. There was no statistical difference among treatments except non-treated-check, which had 5 scale value for galling in pepper and 2.3 in eggplant.

In both crops, pepper and eggplant, alternatives of MB gave the similar control as MB on nematodes during cropping season.

Weeds. Effects of treatments on weeds were assessed both counting weeds in the field (data not shown) and counting germinated weeds from soil samples (Table 4). Weed number in pots among treatments were significantly different. Weed flora varied among fields but *Portulaca oleracea, Seteria* spp., *Amaranthus* spp., *Echinochloa colona, Conyza Canadensis, Eluicina indica* and *Cyperus rotundus* were common. Except pepper2 which had a high weed pressure due to unsuitable conditions of the plastichouse, all treatments gave effective control. In strawberry fields, even solarization alone was comparable with MB. It might be due to ridge application. However, the best results were obtained from MB and Solarization+basamid 500.

Yield. In all crops, yield was higher in all treatments comparing to non treated check (Table 5). In eggplant, yield obtained from alternative treatments was very similar yield of MB applied plots. Yield at highest rate of basamid and solarization combination also was not different from MB application in pepper.

Temperature. Temperature at 10 and 20 cm soil depth in solarized area was 5-10 ^{0}C higher than non-solarized area. In 20 cm soil depth, temperature under tarp reached 40-45 ^{0}C while it was generally over 45 ^{0}C at top 5 and 10 cm soil depth. In strawberry2 field at top 10 cm, the minimum temperature under tarp was higher than maximum temperature in open area. For 5 and 30 cm soil depth, temperature increase was similar to 10 and 20 cm. Fresh manure caused temperature increase up to 5 ^{0}C comparing to solarization alone, especially top 10 cm. In manure applied area temperature exceeded 50 ^{0}C at 10 cm and reached 44 ^{0}C at 30 cm soil depth in a ridge-solarization-applied-field.

Conclusions. All alternatives gave the comparable results with MB as it was previous year. Combinations of solarization with basamid or fresh cow manure, which is available more than chicken manure, seem effective alternatives. Solarization alone or with *Trichoderma* can be an inexpensive choice. These results and other activities under this project affected farmers and many small strawberry farmers applied solarization on ridges.

Table 1. Average disease incidences for pepper, eggplant and strawberry in demonstrations in 2001

CROP	TREATMENTS and DISEASE RATES (%)						
	Solarization+ Basamid 300	Solarization+ Basamid 400	Solarization+ Basamid 500	Solarization+ Trichoderma	Solarization +Manure	MB	CHECK
Pepper	12.5	5.0	5.0	20.0	NA*	5.0	38.7
Eggplant	21.3	16.3	16.0	21.5	16.6	15.0	25.0
Strawberry 1	11.2	5.0	NA	NA	11.2	5.0	18.7
Strawberry 2	10.0	7.5	NA	12.5**	NA	NA	25.0

* NA: Not applicable ; ** Trichoderma was not applied

Table 2. Effects of treatments on the *Meloidogyne incognita* in pepper in 2001-2002 growing season

Treatment	Effect on juveniles			Galling index**
	Initial* population	Final* population	Effect (%)	
Solarization+Basamid 300	752	4	99,5	0,68±0,19 a
Solarization+Basamid 400	968	20	98,2	1,04±0,15 a
Solarization+Basamid 500	984	0	100	0,96±0,20 a
Solarization+ Trichoderma	828	4	99,6	0,80±0,18 a
MB	1040	65	94,6	0,50±0,31 a
CHECK	890	1040	-	4,91±0,50 b

*Per 100 g soil

**Means of five replicates at each rate in a column with the same latter do not differ significantly, according to Duncan's test (P>0.05).

Table 3. Effects of treatments on the *Meloidogyne incognita* and *M. javanica* in eggplant in 2001-2002 growing season

Treatment	Effect on juveniles			Galling index**
	Initial* population	Final* population	Effect (%)	
Solarization+Basamid 300	200	32	99	0,10 ± 0,06 a
Solarization+Basamid 400	400	0	100	0,00 ± 0,00 a
Solarization+Basamid 500	200	0	100	0,05 ± 0,05 a
Solarization+ Trichoderma	200	4	99,5	0,15 ± 0,15 a
MB	120	88	96	0,05 ± 0,05 a
Solarization+Manure	160	4	99,8	0,00 ± 0,00 a
CHECK	40	740	-	2,30 ± 0,47 b

*Per 100 g soil

**Means of five replicates at each rate in a column with the same latter do not differ significantly, according to Duncan's test (P>0.05).

Table 4. Effects of treatments on total weed flora

Treatments	Locations, Number of Weeds per pot and LSD Grouping				
	Pepper 1	Pepper 2	Eggplant	Strawberry 1	Strawberry 2
Solarization+Basamid 300	2.5 b*	19.2 a	3.4 bc	2.5 b	0.0 c
Solarization+Basamid 400	2.4 b	6.2 cd	1.6 bc	2.0 b	1.2 ab
Solarization+Basamid 500	1.2 bc	3.0 de	1.2 bc	NA*	0.6 bc
Solarization	2.4 b	11.4 bc	1.8 bc	2.2 b	0.2 c
MB	0.4 c	1.0 e	0.4 c	0.6 b	0.2 c
Solarization+Manure	NA**	15.0 ab	4.0 ab	1.0 b	NA*
CHECK	4.8 a	8.6 c	6.6 a	15.6 a	1.8 a
LSD	2.07	2.06	2.05	2.06	1.02

*Means of five replicates at each rate in a column with the same latter do not differ significantly, according to LSD test (P>0.05).

** NA, Not applicable

Table 5. Yield results in 2001-2002 cropping season in demonstration fields

	Treatments and Yield (Mt/ha)						
Crop/Field	Solarization+ Basamid 300	Solarization+ Basamid 400	Solarization + Basamid 500	Solarization+ Trichoderma	Solarization +Manure	MB	CHECK
Pepper	59	63	78	39	NA*	80	23
Eggplant	112	112	113	112	109	115	94
Strawberry 1	36	37	NA	NA	36	51	20
Strawberry 2	42	49	NA	38**	NA	NA	NA

* NA, Not applicable

** Trichoderma was not applied