

# THE FIRST YEAR RESULTS OF METHYL BROMIDE ALTERNATIVES IN STRAWBERRY, PEPPER AND EGGPLANT IN THE EASTERN MEDITERRANEAN PART OF TURKEY

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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. MB is used for soil fumigation, especially in cut flowers, strawberry and vegetables grown under protected conditions in Turkey. Vegetable cultivation under protected conditions in Turkey reached 44 000 ha and strawberries cover 8600 ha in 1999. The Eastern Mediterranean Region of Turkey is one of the foremost agricultural area and; strawberry and vegetable have been widely cultivated. Soil borne pathogens, weeds, nematodes and insects create problems. MB is extensively used (150 Mt in pepper, eggplant, and strawberry production in the East Mediterranean Region), and the farmers think of no other alternatives.

In the region, a World-Bank-supported-Project was initiated in 2000 to introduce MB alternatives to strawberry, pepper and eggplant producers to meet the Turkey's plan which aims phasing out MB by 2008 although the Montreal Protocol requires MB phase out by 2015. In this paper, the first year results of the demonstrations will be presented.

**Materials and Methods.** Demonstrations were carried out successfully at 9 sites that were 6 pepper plastichouses, a strawberry plastichouse, an open field strawberry and an open field eggplant. Treatments, number of replicates and plot sizes differed due to field size and crop. Combinations of solarization with basamid (400 kg/ha), chicken manure (1 Mt/ha) or *Trichoderma* spp. were applied all fields. Combination of solarization and straw at 500 kg/ha was applied in a pepper plastichouse. Following application of basamid, chicken manure or straw, plots were covered with plastic tarp. In strawberry planting ridges were prepared, before covering. *Trichoderma* spp. was applied firstly at seed beds, then periodically once a month with drip irrigation. Non-treated and/or MB applied checks were set in suitable fields. Demonstrations were started at different dates from 30.06.2000 to 27.07.2000. Solarizations were lasted 4-6 weeks except for strawberries in which continued for 3 and 7 weeks. Usual cultivation processes

were applied during growing season. Demonstrations were assessed periodically for soilborn diseases, nematodes and weeds and yield were recorded.

**Soilborn diseases.** *Fusarium* spp. in pepper, *Fusarium oxysporum* and *Sclerotinia sclerotiorum* in eggplant, and *F. oxysporum* and *Rhizoctonia solani* in strawberry were determined. Disease incidence as overall average for each crop is presented in table 1. In strawberry no diseases were detected in all the treatments tested. However, in pepper, MB application was better than alternatives.

**Nematodes.** Pepper fields were heavily infested with *Meloidogyne* spp. while no plant parasitic nematode was detected in eggplant or strawberry demonstrations. Gall index was assessed using Zeck Scale and overall averages of six pepper plastic houses are 0.10, 0.89, 0.98, 1.92, 2.04, and 5.95 for solarization+trichoderma, solarization+manure, solarization+basamid, MB, solarization+straw, and check, respectively. Effects of treatments on the second term infective larva the nematode are presented in table 2. Combinations of solarization with basamid, manure or *Trichoderma* were the most effective applications. MB and solarization+straw was partially effective. However, it can be said that all treatments effectively controlled nematodes.

**Weeds.** Effects of treatments on weeds were assessed both counting weeds in the field (Table 3) and counting germinated weeds from soil samples (data not shown). Weed flora varied among fields but *Portulaca oleracea*, *Setaria* spp., *Amaranthus* spp., *Solanum* spp., *Echinochloa colona*, *Echinochloa indica* and *Cyperus rotundus* were common. Although some varying results were obtained, solarization+basamid gave the best control among alternatives. There was heavy broomrape infestation in the eggplant field and seen in mid April in non treated checks, which is two weeks earlier than solarized areas. Broomrape control was over 90 % in all treated plots.

**Yield.** Results obtained are presented in table 4. The highest yield obtained from either MB, basamid or manure in different fields. Yield was considerably higher in all alternatives compared to those of non-treated check.

**Conclusions.** All alternatives gave the comparable results with MB. Combinations of solarization with basamid or chicken manure seem effective alternatives. Solarization alone or with *Trichoderma* can be an inexpensive choice. This results and other activities under this project affected farmers. In this growing season (2001-2002), it has been observed that more farmers have applied solarization. Combination with manure had received more attraction among combinations. It is apparent that there is need for further research related to solarization such as duration, humidity, timing, and other alternative combinations etc. as well as demonstrations.

Table 1. Average disease incidences for pepper, eggplant and strawberry in demonstrations in 2000.

CROP	TREATMENTS and DISEASE RATES (%)				MB	CHECK
	Solarization+ Basamid	Solarization+ Manure	Solarization+ Trichoderma	Solarization+ Straw		
Pepper	2.5	7.5	7.5	7.5	0.0	32.5
Eggplant	20.0	37.5	31.2	NA*	NA	57.5
Strawberry	0.0	0.0	NA	NA	0.0	20.0

\*NA: Not applicable

Table 2. Effects of treatments on the nematode population as percentage of nontreated check during growing season

DATE	TREATMENTS and CONTROL RATES (%)*				MB
	Solarization+ Basamid	Solarization+ Trichoderma	Solarization+ Manure	Solarization+ Straw	
03.10.2000	100.0	100.0	100.0	100.0	100.0
19.10.2000	98.8	100.0	100.0	100.0	100.0
07.11.2000	100.0	100.0	100.0	100.0	100.0
28.11.2000	89.9	100.0	80.0	100.0	97.8
19.12.2000	100.0	100.0	100.0	100.0	100.0
09.01.2001	96.3	99.2	79.9	99.3	100.0
30.01.2001	99.7	100.0	100.0	100.0	99.3
20.02.2001	100.0	100.0	100.0	100.0	97.0
13.03.2001	100.0	99.3	99.9	98.1	97.9
03.04.2001	79.7	98.7	96.2	94.3	91.6
25.04.2001	99.5	95.5	99.8	70.9	90.4
16.05.2001	72.9	88.8	94.4	93.2	87.4
06.06.2001	74.6	91.4	95.8	99.6	59.4
23.07.2001	40.8	59.3	84.9	0.0	0.0

\* 100 is complete control and 0 shows no control

Table 3. Effects of treatments on total weed flora

Crop/Field	Treatments and Number of Weeds per m <sup>2</sup>				Check
	Solarization+ Basamid	Solarization+ Manure	Solarization+ Trichoderma*	MB	
Pepper 1	0.8	1.2	17.0	NA**	116.2
Pepper 2	2.8	13.8	40.2	0.2	45.8
Pepper 3	4.0	23.2	13.0	2.0	46.0
Pepper 4	0.2	0.0	0.0	0.0	51.5
Pepper 5	0.5	6.2	23.0	NA	121.8
Eggplant	0.2	7.5	7.5	NA	31.2
Strawberry 1	46.0	57.0	104.5	0.0	NA
Strawberry 2	0.8	1.5	4.5	NA	NA

\* *Trichoderma* was not applied to strawberry fields.

\*\*NA: Not applicable

Table 4. Yield results in 2000-2001 cropping season in demonstration fields.

Crop/Field	Treatments and yield (Mt/ha)				Check
	Solarization+ Basamid	Solarization+ Manure	Solarization+ Trichoderma*	MB	
Pepper 1	89	75	70	NA**	61
Pepper 2	95	96	85	108	48
Pepper 3	81	94	81	88	60
Eggplant	105	112	91	NA	NA
Strawberry 1	44	32	30	50	NA
Strawberry 2	24	25	23	22	NA

\* *Trichoderma* was not applied to strawberry fields.

\*\*NA: Not applicable