PRELIMINARY RESULTS ON APPLICATION OF AMMONIA AND ORGANIC AMENDMENTS FOR SOIL DISINFESTATION IN NORTHERN ITALY

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Methylisiothiocyamate generators (metham sodium - MS, dazomet - DZ) and soil solarization (SS), applied alone or combined with several soil amendments releasing ammonia (Gamliel and Stapleton, 1993 and 1995; Cebolla *et al*. 1999, Di Primo and Cartia, 1998) have been widely investigated among available alternatives to methyl bromide (MB). This paper shortly describes the results of two experimental trials carried out at Albenga (Liguria – Northern Italy). The trials were carried out under greenhouse conditions in soil artificially infested with *Fusarium oxysporum f. sp. basilici* and *Rhizoctonia solani.* Chicken manure (Agrifumax Casalserugo -Pd- : N organic 2,5 %; C organic 25 % - pellet) and $(NH_4)_2SO_4$ (soil fertiliser 21% of N - granulated) was distributed with soil rototilling. The NH_3 (available formulation 5% of NH_3) was applied by soil drenching with the same equipment employed for MS application. Soil was mulched with polyethylene (PE, 50 µm thick) or gas impermeable (VIF, 35 µm thick) films. During the 1st trial all different combinations among MS, chicken manure, $(NH_4)_2SO_4$ and SS reduced the incidence of *F. basilici* on basil and *R.solani* on bean (table 2). For bean on the 2nd crop, better results were obtained by combining MS (191 g/m^2), chicken manure (50 g/m^2) and SS (14 days) or MS (191 g /m^2), NH_3 (100 g/m^2) and SS (14 days). All treatments had similar efficacy against *Pyrenochaeta lycopersici* on tomato (table 3). During the 2nd , trial the 1st crop of bean (table 5) showed the good efficacy of BM applied at 30 g/m^2 under VIF; similar results were obtained with DZ alone or in combination with chicken manure (1 or 3 kg/m^2). In spite of the low disease pressure, DZ was more effective when combined with 1 kg/m^2 of manure. The total biomass produced by plants grown on soil treated with DZ (50 g/m^2) and manure (3 Kg/m^2) was higher in comparison to the others treatments. On basil, all treatments gave interesting results. However chlorosis and reduced growth were observed on basil and bean grown in the plots treated with chicken manure. In conclusion chicken manure, NH_3, $[NH_4]_2SO_4$ can be effectively combined with chemicals (DZ, MS) and SS for soil disinfestation. In Northern Italy, where SS can be only partially effective, the above described combinations not always improve efficacy of DZ or MS. According to many authors, the application of soil amendments, among witch chicken manure, seem to be an efficient method to improve SS (Gamliel and Stapleton 1993; Gamliel and Stapleton 1995). Other researchers (Cebolla *et al*., 1999) described phytotoxicity. Our results only partially encourage the application of

soil amendments as chicken manure, $(NH_4)_2SO_4$ or NH_3 , due to development of phytotoxicity and to the increased labour required.

Work carried with a contribution of the Italian Ministry for the Environment, Rome.

References

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Table 1 – Experimental trial conditions.

	1st trial	2nd trial
Artificial soil infestation	15/06/98	15/06/98
Treatments	29/06/98	30/06/98
Rototilling	10/08/98	10/08/98
Bean sowing°	24/08/98	20/08/98
Basil sowing°°	24/08/98	20/08/98
Tomato transplant°°°	15/03/99	-

° Bean cv "Canellino" (S.A.I.S. - Cesena) 50 seeds/m^2; °° basil cv "Genovese Gigante" (S.A.I.S. - Cesena) 4 g seeds/m^2; °°° Tomato cv "Marmande marinda" 2 plants/m^2, cv "Cuore di bue" 2 plants/m^2.

Table 2 - Effect of soil treatments against *R.solani* on bean and *F.basilici* on basil (1st trial; basil 1st sowing: control on 14/09/98; 2nd sowing: control on 18/11/99; basil: control on 21/10/98).

Treatment		Bean		Basil
fumigant / dosage (g/m^2) / plastic cover		1st sowing	2nd sowing	
	SS (days)	% infected plants	% infected plants	% infected plants
Control	-	25 b°	34 b	7 b
-/-/PE	28	4 a	10 ab	1 a
MS/191/PE	14	4 a	13 ab	1 a
MS+manure/191+50/PE	14	2 a	3 a	1 a
MS+$(NH_4)_2SO_4$/191+40/PE	14	1 a	10 ab	1 a
MS+NH_3/191+100/PE	14	1 a	4 a	0 a

* Means of the same column followed by the same letter do not statistically differ following Duncan's Multiple Range Test (P =0.05).

Table 4 - Effect of soil treatments against *Pyrenochaeta lycopersici* on tomato (1st trial: control on 25/05/99).

Treatment	SS (days)	cv Cuor di bue		cv Marmande Portomauro	
fumigant / dosage (g/m^2) / plastic cover		% healthy plants	% infected roots	% healthy plants	% infected roots
Control	-	0 b°	44 b	8 b	14 b
-/-/PE	28	93 a	0 a	97 a	0 a
MS/191/PE	14	95 a	1 a	100 a	0 a
MS+manure/191+50/PE	14	95 a	0 a	92 a	1 a
MS+$(NH_4)_2SO_4$/191+40/PE	14	85 a	1 a	90 a	1 a
MS+NH_3/191+100/PE	14	96 a	0 a	93 a	0 a

° see table 2

Table 5 - Effect of soil treatments on the incidence of *R.solani* and on biomass production on bean and on the incidence of *F.basilici* on basil (2nd trial; bean: control on 22/09/98; basil: control on 20/10/98).

Treatment	Bean		Basil
fumigant / dosage (g/m^2) / plastic cover	% infected plants	Biomass (g/plant)	% infected plants
Control	9 bc°	21 b	11 b
BM/30/VIF	0 a	22 ab	1 a
DZ/100/PE	10 c	23 ab	1 a
DZ/50/PE	5 abc	25 ab	1 a
DZ+manure/50+1000/PE	3 abc	28 ab	1 a
DZ+manure/50+3000/PE	1 ab	30 a	2 a

° see table 2