

## **Field comparison of mancozeb efficacy with other protectant fungicides for the control of tomato late blight**

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## AIMS

Protectant fungicides play a "key role" in the late blight control strategy either used alone and as partner in mixture with systemic or transgener fungicides. The Integrated Production Guideline used in Italy for the control of late blight, includes a.i.s that are effective against the pathogen and with no dangerous toxicological risk sentences in the commercial label such as R62, R63, R40. At the end of 2010, mancozeb will probably have the risk sentence R63 (toxic for reproduction) in its commercial formulations. Therefore there will be the need to replace mancozeb with other less toxic protectant formulations. The following field trials carried out over the years 2008-2009 aimed to compare the efficacy of mancozeb with other protectant fungicides, authorized in Italy on tomato crop, for the control of *Phytophthora infestans* (Hort.) de Bary, the causal agent of tomato late blight.

## MATERIALS AND METHODS

Materials and methods of the field trials and features of the formulations tested are summarized in **Tables 1 & 2**. Times of the applications and fungicide dosages are indicated in the result tables. Fungicides were applied at weekly interval and respecting their safety period. Disease incidence and severity on the tomato canopy were assessed on the central part of the plots, calculating the percentage of infected leaf area on 200 leaves per plot. The percentage of infected fruits was assessed observing 300 fruit/plot.

Tab. 1: Field trial methods

Year	2008		2009	
	Trial 1	Trial 2	Trial 1	Trial 2
Year	2008	2009	2009	2009
Locality	Saliceto (Parla)	Saliceto (Parla)	Saliceto (Parla)	Saliceto (Parla)
Variety	Parla	Parla	Parla	Parla
Transplanting date	12/8	11/8	12/8	11/8
Experimental Design	Complete randomized Block design (4 replicates)			
Plot size (sqm)	24,4	22,8	24,4	22,8
Spray equipment	Knapsack boom sprayer ECHO GWS 150 G			

Tab. 2: Fungicide formulations tested and dosages

Commercial name	Form	Formulation	Safety period (days)	Active ingredient	A.i. in the formulated product (% g/l)
Anticcol	Resin	WP	7	propineb	75
Dolan WG	Resin	WG	21	diflufenican	56
Dodine L	Solcan	SC	7	dodine	215
Mancozeb DG	Careggi	WG	7	mancozeb	75
Poliram DF	Resin	DF	7	metiram	21,2

## RESULTS

**Trial 1 (2008)** - Disease occurred in the first week of October and epidemics developed rapidly affecting nearly 70% of fruits and 98% of foliage at the end of the trial. All the formulations significantly controlled the disease compared with the unsprayed check both on foliage and fruits. Even though all the tested dithiocarbamates proved to effectively control the disease, propineb gave the best results. On the contrary, diflufenican and dodine failed to satisfactorily control the disease (**Table 3**).

**Trial 2 (2009)** - Disease occurred on foliage at the end of September and developed rapidly on the unsprayed check. Propineb (Anticcol), mancozeb (Pencozeb) and metiram (Poliram) gave the best results in controlling the disease. Agon, diflufenican (Dolan) and dodine (Dodine) proved to be less effective (**Table 4**).

Table 3: Results of trial 1 (2008)

Treatment a.i. & formulation dose (g or ml/ha)	% of infected leaf area					% of infected fruits
	19 October (74 + 8)	22 October (76 + 9)	29 October (78 + 8)	31 October (78 + 14)	29 October (78 + 8)	
1 unsprayed check	91,0 a	92,0 a	92,1 a	98,2 a	98,2 a	
2 propineb (200g)	3,8 a	3,9 a	3,8 a	16,2 b	6,4 a	
3 diflufenican (150g)	19,9 b	42,9 b	56,8 b	71,3 b	15,7 b	
4 dodine (200g)	46,8 b	51,0 b	69,4 b	82,9 b	36,2 b	
5 mancozeb (200g)	19,2 a	12,3 ab	36,9 a	39,3 a	1,9 a	
6 metiram (200g)	16,4 a	16,3 a	35,4 a	49,8 a	2,4 a	

Treatments with the same letter are not statistically different for  $p \leq 0,05$  (Test LSD)

Time of chemical applications: 12 Sept. (T1), 12 Sept. (T2), 22 Sept. (T3), 1 Oct. (T4), 9 Oct. (T5), 17 Oct. (T6)

Table 4: Results of trial 2 (2009)

Treatment a.i. & formulation dose (g or ml/ha)	% of infected leaf area					% of infected fruits
	9 October (74 + 7)	13 October (75 + 9)	21 October (76 + 8)	28 October (78 + 10)	28 October (76 + 13)	
1 unsprayed check	23,3 a	56,9 a	97,9 a	100 a	100 a	
2 propineb (200g)	0,8 a	6,2 a	3,2 a	15,6 a	1,3 a	
3 diflufenican (150g)	6,9 b	14,9 b	46,3 b	80,8 b	42,8 b	
4 dodine (200g)	3,8 ab	11,8 b	44,4 b	85,4 b	72,2 b	
5 mancozeb (200g)	1,8 ab	1,3 ab	7,4 a	24,0 ab	8,9 ab	
6 metiram (200g)	2,8 ab	3,4 a	6,2 a	19,4 a	11,2 a	

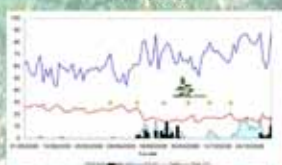
Treatments with the same letter are not statistically different for  $p \leq 0,05$  (Test LSD)

Time of chemical applications: 22 September (T1), 30 September (T2), 9 October (T3), 17 October (T4)

## CONCLUSIONS

Over two years, all the tested dithiocarbamates effectively controlled the disease both on leaves and fruits. However, propineb (Anticcol) gave the best results, probably due to the fact that it has been rarely used on tomato crop. Diflufenican and dodine gave unsatisfactory results. Therefore, due to the new evidence of mancozeb's toxicological property, the results of the trials showed that other dithiocarbamates may be used effectively and alternatively to mancozeb.

Metras (2008)



Metras (2009)

