

germination and mycelial growth of Alternaria alternata and A. solani causal agent of early blight in Algeria

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## **SUMMARY**

Diseases are still the main cause of reduction of yield in potato crops in Algeria. Diseases are still the main cause of reduction of yield in this crop. After late blight which is the most dommageable, early blight is also a important foliar disease reported to be caused by Alternaria alternata and A.solani causing yield losses in our conditions.

This research was initiated to examine in laboratory conditions the efficacy of two fungicides used in Algeria. The results showed Difenoconazole has a better effectieness than Chlorothalonil in inhibition of mycelial growth and conidial germination of A. solani and Al alternata.. A. solani showed also a best sensitivity than A. alternata to the two tested fungicides

## **1.INTRODUCTION**

Potato (Solanum tuberosum) is traditionally one of the most cultivated crops in Algeria. Among biotic stresses, early blight is an important foliar disease reported to be caused by Alternaria alternata and A. solani causing yield losses under our conditions. The control of these two pathogens can be accomplished through various means: the use of resistant varieties, of appropriate farming techniques such as careful tillage, crop rotation, etc. ..., as well as fungicide application that may directly affect the growth of fungi.





### **Objectifs:** The present research was conducted to evaluate the efficiency of the two fungicides Chlorothalonil and Difenoconazole used in Algeria towards Alternaria solani and A. alternata.

*In-vitro* experiments were conducted on mycelial growth and conidial germination of the early blight causal agents using two fungicides available on the Algerian market.

### **2. MATERIAL AND METHODS**

2.1. Fungicides: the test are realised to evaluate *in vitro* the effectiveness of two fungicides: Difenoconazole (250 g/l of i.a.) and the chlorothalonil (720 g/l of i.a.), on germination conidia and mycelial growth of A. solani and A. alternata, and to compare them with the usually concentrations used in field.

### **2.2. Fungal material**

Isolates of A. solani and A. alternata are obtained from leaves of potatoes showing characteristic symptoms of early blight collected in Algeria



Symptoms of A. alternata Conidia of A. alternata

### 2.3. Fungicides used

Difenoconazole Concentrations of and

# **2.4. Doses used for mycelial growth test**

### 2.5. Doses used for conidia germination test

active substance	Chemical group	Species of fungi	Doses used f	or mycelial est	r mycelial t substance		Chemical group	Species of fungi	Doses used for conidia germin	
195 3	1.10	1000	ppm	μl/l	145	300 01 31	1.750	PT Day of		
Difenoconazole	triazoles	Alternaria	250	1000	125	ALC: NO	10000	LAN MITTE	1000	
1	22321	solani	125	500	10	Private -	2 10 1 K	State Street	150	
1.000 - 0	- 2.17	TOLUT.	62,5	250	00	State -	1011200	and the part of the	Carrier.	
ALL	1.000	Alternaria	31,25	125	6.1	The second second	1000	A 100 10 10 10 10	10000	
ALC: NOT	1. 1. 1. 1. 1. 1.	alternata	15,62	62,5	1	1000	1. 1. 1. 1.	N 2010 Au	6 C C C	
1 180 20	12.47	CO.	7,81	31,25		PEOM AS	100	Contraction of the	ppm	μl/l
1 C 1	a strate	1000	3,90	15,62	-	Difenoconazole	Triazoles	Alternaria solani	0	12
1.2.2.1.1.1.1	28 34 37	de la constance	1,95	7,81		2110110001102010		Alternaria alternata	1.95	7
6.2 Lat. 19	CT COL	1000	0,97	3,90	100	0.000	1000 100		0.48	1
ALC: NOTE: N	200404	THE PLACE	0,48	1,95		1000	A. 74, 81	A DOMESTIC OF	0.122	0
84.804	1220	COT THAT	0,24	0,97		1000	Sec. Sec.		0.030	(
100.20	and the second	1-4400	0,122	0,48		17237 /20	14000	100 100	2215	14
PR PAULO	And Inc.	1-1-700	0,061	0,24	-	Chlorothalanil	ahlaranitrilag	Altarnaria coloni	0	100
1.1.1.1.1.1	A BUCK	100	0,030	0,12			cinor onitri nes	Alternaria alternata	2880	1
		PREF	0	0	÷.	1.100	Ser You have	Alternaria alternata	720	4
Chlorothalonil	chloronitriles	Alternaria	2880	4000	14	1 9 A L	2002.3	The Manual Di	180	
10.1 20.1	1 2 2 1 2 4	solani	1440	2000	-05	10000	D. C. Color	a sea and	45	6
200 FT 2 C 1	100 100		720	1000	12	No. No. of Lot.	NO MOUT	10 1 2 C		
1000	20.85	Alternaria	360	500		224 10 10 10	CHARLES !!	A 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2.46.2	100
2 A 100 10 10	10.00	alternata	180	250		1.00	ALC: NO	1. S	20.00	100
100 A (1)	2 22 14 2	I LAND	90	62 5		1 1 1 1 1 1 1	ATTA AND	A COLORED TO A COL	0.400	1
ALC OUT		1.1.1.1	22.5	31.25		CALCULATION OF	1 1 1 1 1 1 1	A starting of the	100	1C
A DECKY	Constant of the local division of the local	147 - 3	0	0	1 . A.		Contraction of the	A 100 45 10		1
THEY LLT	and the	market	1 mg 10 - 10	0	100	a service	YO NO	STYLE - MI	1.1.1	1
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the second s			the second se	and the second se	10 A 10		and the second se			

chlorothalonil, are calculated from dose used in field treatments as shown in table 2.4. The tests are carried out in Petri dishes for on slides for mycelial growth and germination of conidia

% inhibition of conidia is evaluated by: = Q - Q0.100 100 - Q 0 Inhibition of mycelial growth(CI50).  $I \% = VO-V \times 100$ V0

## **3. RESULTS**



Symptoms of A. solani

**Tests in Petri dishes for Tests on slides for** germination of conidia mycelial growth

Conidia of A. solani

### 3.1. Effectiveness of fungicides on developpment of mycelial growth



**Effect of Chlorothalonil** against A. solani.

**D2 D3** 

									-	→ Alternaria s
00 -	I								-	Alternaria a
90 -									7	
80 -									/	
70 -									/	
60 -								-	/	
50 -										
40 -	•						•			
30 -				-	-	-				
20 -			-							
10 -	•									
0 -			1	1		1	1			٦
	D1	D2	D3	D4 Dose	D5 esen	D6 ppm	D7	D8	D0	
				2000		P.P				

**Effect of Chlorothalonil on** diametral growth of mycelium

> → Alternaria solani - Alternaria alternata

D11 D10 D9 D8 **Effect of Difenoconazole** against A. solani. D12 D13 D14



### **3.2. Effectiveness of fungicides on germination of conidia**

ion	8		Liné	aire (Alternaria	alternata)
nhibit	6 -	+			
s %d'i	4 -				
obits des	2 -				
đ	o	1		1	
	0	0,5	1 Log (CX10)	1,5	2
		107	10.00	-	1
D	oaro	ccion	oury	0 OV	$\pm$ <b>b</b> )

Active ubstance	Isolates	Doses (µl/l)	Log (10xC)	% inhibition	Probits
1	Alternaria	7,81	1,89	92	6,41
100	solani	1,95	1,29	71	5,55
100	-	0,48	0,68	60	5,25
ole	1000	0,12	0,08	38.4	4,69
onazo	Alternaria	7,81	1,89	65	5,39
enoc	anternata	1,95	1,29	41	4,77
Dif	0000	0,48	0,68	34	4,59
	March 174	0,12	0,08	20	4,16
ctive substance	Includes	Deser	LeeC	% inhibition	Duchita





**Effect of Chlorothalonil** against A. alternata

**Percentage inhibition of Chlorothalonil** on diametral growth of mycelium









# **4. CONCLUSION AND DISCUSSION**

The results obtained showed that the two fungicides tested, Difenoconazole and Chlorothalonil had an effect *in vitro* on the mycelial growth and spore germination of both *Alternaria* species. Furthermore, A. solani was more sensitive than A. alternata in regard to the two products, whose IC50 allowed to rank the two fungicides as follows: Difenoconazole>Chlorothalonil. In previous works, Tofoli et al (2003) showed also efficiency of Chlorothalonil against Alternatia and Badoc (2005) obtained efficiency of Azoxystrobin on germination and mycelial growth of *Alternaria alternata*, the causal agent of fruit storage rots While more recent report (MacDonald et al., 2007) showed efficacy in the field of other active ingredients belonging to the same family of strobilurin (azoxystrobin, pyraclostrobin) against Alternaria solani. In vitro results do not always reflect what happens in the field. This study should be complemented by field trials to prove or disprove the effectiveness of these products on the plant, and compare them to new fungicides.

Acknowledgements: This work was financially supported by Syngenta Algeria