

Table 2. Inhibitory effect of fungicides on mycelial growth of *Colletotrichum* spp. on PDA at 27 °C. EC₅₀ and EC₉₀ represent the concentration of fungicides causing mycelial growth inhibition by 50% and 90%, respectively. Values are means of three replicates of three plates

<i>Colletotrichum</i> spp.	Benomyl		Prochloraz manganese		Azoxystrobin		Pyraclostrobin		Tebuconazole		Dithianon	
	EC ₅₀ (µg/mL)	EC ₉₀ (µg/mL)	EC ₅₀ (µg/mL)	EC ₉₀ (µg/mL)	EC ₅₀ (µg/mL)	EC ₉₀ (µg/mL)	EC ₅₀ (µg/mL)	EC ₉₀ (µg/mL)	EC ₅₀ (µg/mL)	EC ₉₀ (µg/mL)	EC ₅₀ (µg/mL)	EC ₉₀ (µg/mL)
<i>C. gloeosporioides</i>												
71501	<0.001	0.083	0.08	1.46	0.42	18.03	1.514	436.5	0.51	23.44	120.2	7,400
71502	<0.001	0.031	0.07	1.30	0.38	13.61	1.193	275.4	0.41	24.54	120.2	7,900
91901	<0.001	0.006	0.08	1.17	0.26	15.67	0.454	131.8	0.68	28.84	60.3	2,800
92205	<0.001	0.005	0.12	1.95	0.35	18.01	0.046	36.3	1.40	40.74	52.5	1,900
92240	<0.001	0.251	0.03	0.50	0.17	9.09	0.006	12.7	0.91	19.05	44.7	1,700
<i>C. acutatum</i>												
92201	17.741	^z	0.07	1.40	0.10	8.57	<0.001	0.8	0.31	12.02	57.5	3,500
92202	0.070	-	0.05	1.09	0.01	3.09	<0.001	0.1	0.17	11.74	34.7	1,000
92206	0.028	-	0.08	1.39	0.01	3.30	<0.001	0.1	0.28	13.80	37.1	1,000
92207	0.001	-	0.05	0.87	0.04	5.96	<0.001	0.1	0.14	11.22	42.7	1,500
92208	0.022	-	0.05	0.99	0.01	4.12	<0.001	0.3	0.12	10.01	70.8	2,200
92209	0.006	-	0.05	1.08	0.01	3.85	<0.001	0.1	0.11	10.47	52.5	1,600

^z>10 mg/mL.

0.025% potato dextrose broth 98-100% 0.325 µg/mL
 (PDB) hole slide glass 60 µm EC₅₀ 0.001 µg/mL EC₉₀ 0.005-
 L 0.025% PDB 0.252 µg/mL *C. acutatum*
 Hole slide glass 가 325 µg/mL 56-81% 0.325 µg/mL 42.5-
 15 25°C 59.7% *C. gloeosporioides* benomyl
 가 1/2 가 *C. acutatum* EC₅₀ 92201
 3 , 100 EC₉₀ 10 mg/mL
 72 4°C (Table 2).
 Prochloraz manganese complex
 , 250 µg/mL 100%
 , 2.5 µg/mL 90% prochloraz
 manganese EC₅₀ 92240
 가 , 92205 가 EC₉₀
 92240 0.50 µg/mL 가 , 92205
 1.95 µg/mL 가 (Table 2).
 Azoxystrobin 100
 µg/mL 100% , 50 µg/mL
 90% *C. acutatum*
 0.5 µg/mL 70.1-92.1%
C. acutatum azoxystrobin
 , EC₅₀ 0.01-0.10 µg/mL *C. gloeosporioides*
 EC₉₀ *C. acutatum*
 Benomyl *C. gloeosporioides* 3.09-8.57 µg/mL 9.09-18.03 *C. gloeosporioides*
 benomyl (325 µg/mL) (Table 2).

결 과

균사생장 억제효과

EC₅₀ EC₉₀
 Benomyl *C. gloeosporioides*
 benomyl (325 µg/mL)

Pyraclostrobin	<i>C. acutatum</i>	pyraclostrobin	79.3-94.5%	<i>C. acutatum</i>
g/mL	1%	(115 μ g/mL)	. 92240	pyraclostrobin 1.15
	1.15 μ g/mL	95%	91.3%	, 71501
	<i>C. gloeosporioides</i>		49.9%	. <i>C.</i>

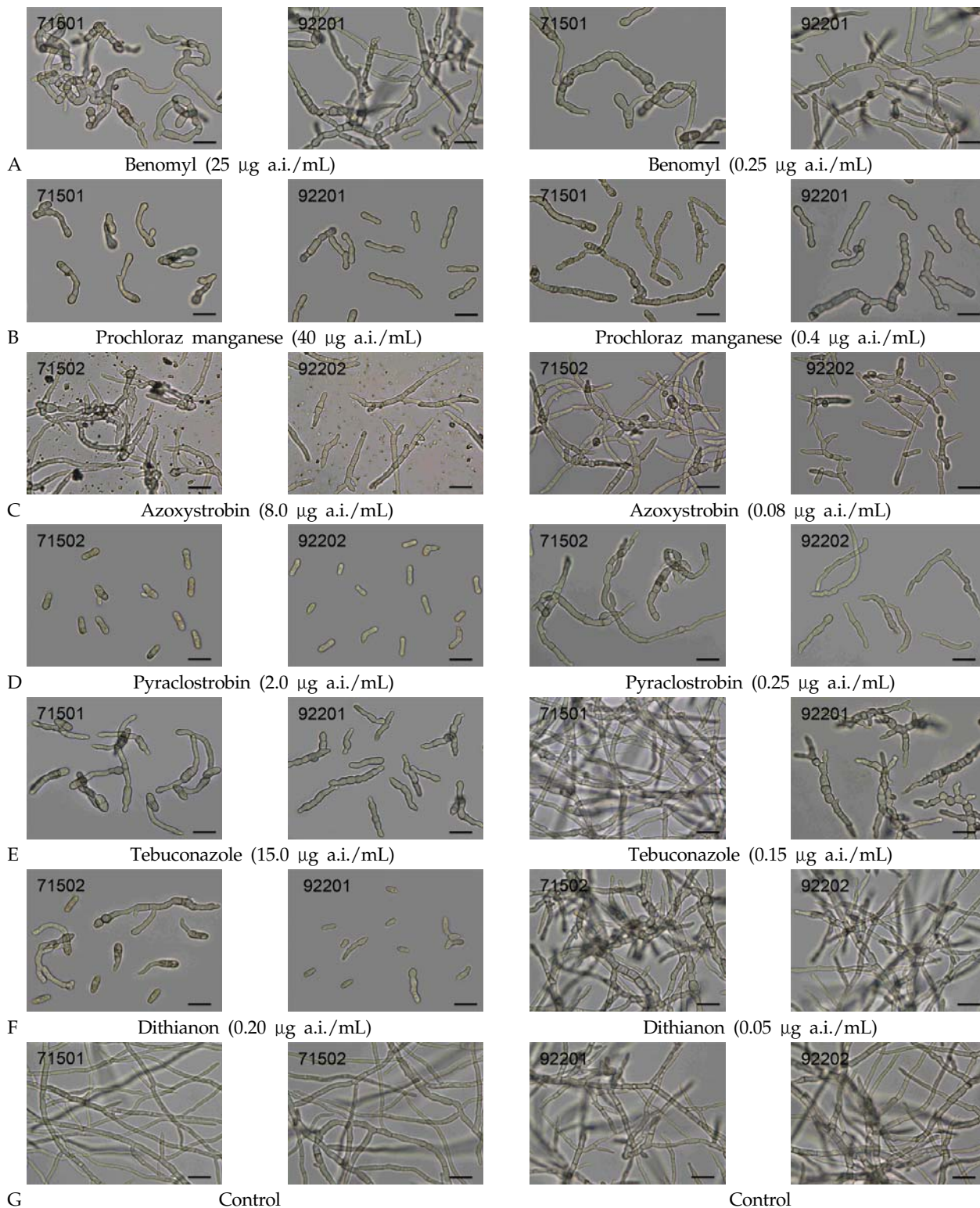


Fig. 1. Effect of fungicides on spore germination, growth of germ tubes or mycelial growth of *Colletotrichum gloeosporioides* (71501, 71502) and *C. acutatum* (92201, 92202). Scale bar: 20 μ m.

acutatum EC₅₀ 0.001 µg/mL
C. gloeosporioides EC₅₀ 가
 71501 71502 1 µg/mL 92240
 0.006 µg/mL . *C. acutatum*
 EC₉₀ 1 µg/mL *C. gloeosporioides*
 (Table 2).
 Tebuconazole (100 µg/mL) 95-100% , 92201, 92206, 92208 92240 100% . *C. acutatum* 1.0 µg/mL 86-90.9%
 47-62% *C. gloeosporioides*
 . *C. acutatum* EC₅₀
 0.01-0.31 µg/mL , *C. gloeosporioides*
 0.41-1.40 µg/mL . EC₉₀ *C. acutatum* *C. gloeosporioides* 가 10-41 µg/mL (Table 2).
 Dithianon dithianon 가 , 430 µg/mL
 67.9-87.5% 43 µg/mL
 33.5-53.1% . EC₅₀ *C. gloeosporioides* 71501 71502 120.2 µg/mL 가 ,
 34.7-70.8 µg/mL . EC₉₀
 1.0-7.9 mg/mL (Table 2).

포자발아 억제 효과

Benomyl 250 µg/mL , 25 0.25 µg/mL
 (Fig. 1. A). *C. gloeosporioides* 0.25 µg/mL 가
C. acutatum 가
 Prochloraz manganese complex 40.0 µg/mL 100%
 (Fig. 1. B). *C. gloeosporioides* , *C. acutatum*
 0.4 µg/mL .
 Azoxystrobin azoxystrobin 8.0 µg/mL
 (Fig. 1. C).
 0.08 µg/mL 가 ,
 azoxystrobin 가
 Pyraclostrobin 2.0 µg/mL
 95% . 50% 6

Table 3. The effective concentration of fungicides (EC₅₀ value) at which 50% of the spores were inhibited from germinating. Values are means of three replicates of more than hundred spores

<i>Colletotrichum</i> spp.	EC ₅₀ (µg/mL)	
	Pyraclostrobin	Dithianon
<i>C. gloeosporioides</i>		
71501	0.071	0.034
71502	0.072	0.033
91901	0.072	0.035
92205	0.070	0.020
92240	0.023	0.019
<i>C. acutatum</i>		
92201	0.069	0.028
92202	0.058	0.027
92206	0.019	0.025
92207	0.063	0.031
92208	0.065	0.024
92209	0.059	0.023

EC₅₀ 가 92240
C. gloeosporioides 0.07 µg/mL,
 92206 *C. acutatum* 0.06 µg/mL
 g/mL (Table 3). 92240 92206
 pyraclostrobin .
 가 0.0-3.5% 0.25 µg/mL
 가 (Fig. 1. D).
 Tebuconazole 150 µg/mL . 0.15 µg/mL
 g/mL *C. gloeosporioides* 가
C. acutatum 92201 가
 (Fig. 1. E).
 Dithianon 가 가
 가 . 0.20 µg/mL
C. gloeosporioides 71501, 71502 91901
 가 75%
 98-100% .
 EC₅₀ 0.019-0.035 µg/mL (Table 3), 가
 (Fig. 1. F).

고 찰

C. gloeosporioides 5 *C. acutatum*
 6 6 in

vitro, *C. gloeosporioides* *C. acutatum* Sharma (2015). *C. gloeosporioides*가 *C. acutatum* benomyl (Bernstein *et al.*, 1995; Freeman *et al.*, 1998; Pers *et al.*, 2004), *C. gloeosporioides* benomyl *C. acutatum* *C. gloeosporioides* benomyl *C. acutatum* pyraclostrobin pyraclostrobin QoI Pyraclostrobin 가 (Turechek *et al.*, 2006), 2.0 µg/mL Dithianon 가 가 Dithianon pyraclostrobin 가 , EC₅₀ . Dithianon 가 가 pyraclostrobin dithianon benomyl, prochloraz manganese, tebuconazole azoxystrobin EC₅₀ , 가 Kenny (2012) , 가 Quinone 가 가 dithianon . (Jeon *et al.*, 2015; Lim *et al.*, 2015; Stević *et al.*, 2017). Dithianon prochloraz manganese 가 5 . Prochloraz manganese *Colletotrichum* 가 (Freeman *et al.*, 1998; Cao *et al.*, 2017), 가 (Freeman, 2008; Than, 2008; Nam *et al.*, 2014; Lim *et al.*, 2015). Azoxystrobin, pyraclostrobin tebuconazole 95%, 80% 95% 가 *C. gloeosporioides*

C. acutatum Sharma (2015). *C. gloeosporioides*가 *C. acutatum* benomyl (Bernstein *et al.*, 1995; Freeman *et al.*, 1998; Pers *et al.*, 2004), *C. gloeosporioides* benomyl *C. acutatum* *C. gloeosporioides* benomyl *C. acutatum* pyraclostrobin Pyraclostrobin 가 (Turechek *et al.*, 2006), 2.0 µg/mL

요 약

C. acutatum 6 *C. gloeosporioides* 5 benomyl, prochloraz manganese complex, azoxystrobin, pyraclostrobin, tebuconazole dithianon *in vitro* , prochloraz manganese가 가 dithianon pyraclostrobin 가 가 . Benomyl, prochloraz manganese complex, azoxystrobin tebuconazole dithianon , prochloraz manganese, azoxystrobin, tebuconazole , pyraclostrobin 가

Note

The authors declare no conflict of interest.

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