

인삼의 *Pythium*모잘록병에 대한 etridiazole · thiophanate-methyl과
metalaxyl-M · carbendazim의 방제 및 생장에 미치는 효과

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**Evaluation of two fungicides, etridiazole · thiophanate-methyl and
metalaxyl-M · carbendazim, to *Pythium* damping-off on *Panax ginseng***

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Objectives

To register effective fungicides to *Pythium* damping-off of ginseng seedlings, two fungicides, etridiazole·thiophanate-methyl and metalaxyl-M·carbendazim were evaluated for the control effect on ginseng seedling damping-off caused by *Pythium* sp. and for the effect on the growth of ginseng seedlings in a field experiment.

Materials and Methods

A ginseng seedling field was prepared in the experimental field of National Institute of Crop Science at the fall in 2005. Stratified ginseng seeds were sowed on March 15, 2006 and shaded with five layered P.E. shading material. The field was artificially infested with soil inoculum of *Pythium* sp. on April, 2006. Then, the plots were drenched with 3 liters of fungicide suspensions diluted at 1,000X or 500X (for phytotoxicity test) of etridiazole·thiophanate -methyl and 2,000X or 1,000X (for phytotoxicity test) of metalaxyl-M· carbendazim at early May, 2006. There were five replicates with 1.6m² area per replicate. Observation and records of disease incidence were made 2 weeks after application of fungicides up to one month with verifying the pathogen by isolation and observation of causal pathogen under microscopy. The growth of ginseng seedling roots was investigated at early November, 2006. Analyses of variance of all data were performed and the least-significant-difference (LSD, $p=0.05$) test was used for means separation.

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Results and Discussion

Incidence of *Pythium* damping-off was 36.8% in the treatment of pathogen, which is enough to evaluate the effect of fungicides. However, treatment of the fungicides significantly reduced the incidence of damping-off, which were 7.25% of damping-off in the treatment of etridiazole·thiophanate -methyl and 8.99% in that of metalaxyl-M·carbendazim, respectively. The control efficacy was 80.3% for etridiazole·thiophanate-methyl and 75.6% for metalaxyl-M·carbendazim (Table 1). There was no phytotoxicity in any treatment of the fungicides (data not shown). Treatment of the fungicides stimulated the root growth of ginseng seedlings observed by root length, showing no significance by statistical analysis (Table 2).

Table 1. Effect of two fungicides on the control of damping-off in the field artificially infested by *Pythium* sp.

Treatment	Disease incidence (%)						Control efficacy (%)
	1	2	3	4	5	Average*	
Control	32.92	39.09	35.03	39.31	37.65	36.80a	-
Etridiazole · thiophanate-methyl	5.24	8.18	7.41	9.54	5.89	7.25b	80.3
Metalaxyl-M · carbendazim	10.67	8.58	10.91	7.31	7.49	8.99b	75.6

*Means followed by the same letter in the column are not significantly different at $P < 0.05$.

Table 2. Effect of fungicides, etridiazole·thiophanate-methyl and metalaxyl-M·carbendazim, on the growth of 1-year-old ginseng root

Treatment	Dilution	Root length (cm)*	Root weight (g)
Control	-	14.61a**	0.60a
Etridiazole · thiophanate-methyl	1000X	15.69a	0.71a
	500X	14.63a	0.61a
Metalaxyl-M · carbendazim	2000X	16.07a	0.60a
	1000X	15.71a	0.61a

* Length and weight of ginseng root were measured at early November, 2006.

** Means followed by the same letter in the column are not significantly different at $P < 0.05$.