

## Re-evaluation of DCT seed treatment against the new alpha-Brazil race of bean anthracnose caused by *Colletotrichum lindemuthianum*

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### Introduction

In 1993, a new race, alpha-Brazil, of bean anthracnose was found in several locations where Ontario field trials were conducted (Tu, 1994). The alpha-Brazil race was believed to be introduced into Canada from Michigan in the infected seeds. Subsequently, an assay was made on all currently recommended white and coloured beans and their breeding lines in Ontario. Majority of lines were susceptible and a few were resistant (Tu, 1995). As a result, a re-evaluation of the effectiveness of the commonly used seed treatment compound, DCT (diazinon 6%, captan 18%, thiophanate-methyl 14%) (Edgington and French, 1981; Edgington and MacNeill, 1978) became necessary. DCT, a Ciba-Geigy Canada product, had a permanent registration in Canada in 1981. The diazinon was for control of root maggots, the captan was for control of seed rot and seedling blight, and the thiophanate-methyl was for control of anthracnose.

### Materials and Methods

Along with DCT, three newly designed chemical compounds were chosen from eight in a preliminary test. The three were CTMB, TMZ and Anchor (carbathin and thiram). The abbreviations were : B = benomyl, C = captan, M = metalaxyl, T = thiram, T = thiophanate-methyl in DCT and Z = thiabendazole. The dosages (g a.i./kg of seed) used were: benomyl 1.25, captan, 1.25, carbathin 0.4, metalaxyl 0.5, thiabendazole 0.3 and thiram 1.25, however, only 0.4 g of thiram was used in Anchor.

Each treatment was applied to 200 g of each group of the infected seeds and mixed in a 1 L beaker with a rubber rod. There were four groups of the infected seeds which were categorized on the basis of the size of the disease lesion. They were (a) lesions not visible, (b) minute to 2mm, (c) 2 to 4 mm and (d) 4 to 8 mm. Treated and untreated seeds of each group were planted in 10 cm x 10 cm pots filled with greenhouse soil. Each combination of seed treatments and groups of infected seeds was replicated 10 times with 4 seeds per pot. After sowing, the pots were arranged in randomized blocks in a moist chamber (2m x 6m) set in a greenhouse. Mist was provided by a humidifier and temperature was set at 22 C. One week later, the pots were removed from the mist chamber and placed on a bench in the same greenhouse. The plant stands were counted two weeks after sowing and translated to percent emergence of anthracnose infected seeds. Disease (incidence of plants with anthracnose) was assessed five weeks after sowing. Disease severity was assessed on week six based on a 0-9 scale, of which 0 = no disease symptom, 1 = trace to 10%, 2 = 11 to 20%, ..., and 9 = 81 to 100% diseased area and calculated as disease severity index. The experiment was repeated once.

### Results

The results (Table 1) showed that DCT was effective against the alpha-Brazil race of the anthracnose as it did for other races of *Colletotrichum lindemuthianum*. CTMB was more superior followed by TMZ. The efficacy of DCT and TMZ was about the same. Anchor was slightly weaker than DCT and TMZ.

A combined ANOVA showed that the compounds had no significant effect on germination while the germination was significantly affected by the severity of lesion size on the seed. All four compounds were highly effective ( $P = 0.0001$ ) in controlling all known Ontario races of bean anthracnose when the disease lesion was smaller than 2mm in size but their effectiveness was reduced as the size of the lesion increased ( $P = 0.0001$ ) with the exception of CTMB which appeared to be more penetrative than the other three compounds. Consequently, CTMV offered better control than DCT and TMZ regardless of the lesion size of the anthracnose on the seed.

## References

1. **Tu, J. C. 1994.** Occurrence and characterization of the alpha-Brazil race of bean anthracnose (*Colletotrichum lindemuthianum*) in Ontario. *Can. J. Plant Pathol.* 16: 129-131
2. **Tu, J. C. 1995.** Response of cultivars and breeding lines of *Phaseolus vulgaris* L. to the new alpha-Brazil race of *Colletotrichum lindemuthianum* in southwestern Ontario. *Can. Plant Dis. Surv.* 75: 5-8
3. **Edgington, L. V. and B. French 1981.** Failure of benzimidazol seed treatments to control anthracnose of bean. *Proceeding of the Can. Phytopath. Soc. Western Ontario, Region*, 4 pp
4. **Edgington, L. V. and B. H. MacNeill 1978.** Control of bean anthracnose by seed treatment with systemic fungicides (Abstr.) *Phytopathology News* 12: 235

Table 1. Effect of seed treatment compounds on germination and disease incidence of the anthracnose infected seeds. Data were taken 2 and 5 weeks after sowing for germination and disease incidence, respectively.

Chemical Compound	Emergence (%)								Mean
	Size of lesion on the infected seeds (mm)								
	0	Trace-2	2-4	4-6					
CK	100.0 ± 8.0	84.5 ± 5.0	82.0 ± 8.1	70.0 ± 9.6					84.0
DCT	94.0 ± 3.1	92.0 ± 3.3	90.0 ± 3.3	78.0 ± 6.3					88.5
TMZ	94.0 ± 3.1	90.3 ± 3.3	86.0 ± 6.7	74.0 ± 7.3					86.0
Anchor	92.0 ± 6.0	86.0 ± 6.7	92.0 ± 3.3	74.0 ± 6.0					86.0
CTMB	100.0 ± 0.0	94.0 ± 3.1	90.0 ± 4.5	80.0 ± 5.2					91.0
Mean	96.0	89.2	88.0	75.2					
Chemical Compound	Incidence of plants with lesions (%)								One way ANOVA Linear
	Size of lesion on the infected seeds (mm)								
	0	Trace-2	2-4	4-6					
CK	54.0 ± 9.9a	79.8 ± 5.2a	98.0 ± 2.0a	100.0 ± 0.0a					0.0001
DCT	0.0 ± 0.0b	2.5 ± 2.5b	16.0 ± 7.0c	38.2 ± 3.8c					0.0001
TMZ	2.5 ± 2.5b	2.5 ± 2.5b	16.0 ± 6.0c	23.8 ± 6.2c					0.0009
Anchor	2.0 ± 2.0b	2.5 ± 2.5b	55.0 ± 9.5b	72.0 ± 10.1b					0.0001
LSD <sub>0.05</sub>	13.4	9.0	17.4	16.9					

Abbreviation: CK = control; DCT = diazinon, captan & thiophanate-methyl; TMZ = thiram, metalaxyl & thiabendazole; and CTMB = captan, thiram, metalaxyl and benomyl.