

I. Deciduous Orchard Diseases

Biological and chemical control

1. Crown and root rot; Apple

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This field trial was conducted at the Creston substation of Agriculture Canada in British Columbia. The 21 isolates of Bacillus subtilis and isolate B8 of Enterobacter aerogenes were tested along with chemical fungicide Ridomil and monoammonium phosphate (11:55:0) for control of apple crown and root rot caused by Phytophthora cactorum. One-year-old trees of MM106 rootstock were planted on May 4, 1983 and were budded with MacSpur in August of 1983. Tree spacing was 4 x 0.5 m. Treatments were arranged in a 5 x 5 triple lattice design with 3 replications. Each tree in each treatment was drenched around the base and on the trunk with 2 L of water containing appropriate material. Each plot consisted of seven trees. The first application of chemical and biological material was made at the time of planting and the second one in the fall of 1983. The treatments were then applied biannually in subsequent years in early May and mid-October. Each tree was inoculated in June with approximately 23,000 sporangia/tree each year. The percentage of trees infected by P. cactorum in each treatment was determined on September 18, 1989.

The BACTX and AB8 isolates of B. subtilis, B8 isolate of E. aerogenes, monoammonium phosphate and metalaxyl significantly reduced the disease compared with control. Metalaxyl completely prevented the development of crown rot symptoms on MM106 apple rootstock.

Treatment*	Rate** (ai/tree)	Infection (%)
Metalaxyl	0.5 g	0.0 a
BACTX	1.4 x 10 ¹⁰ CFU	7.5 ab
AB8	0.2 x 10 ¹⁰ CFU	13.7 abc
B8†	1.0 x 10 ¹⁰ CFU	18.4 a-d
MAP	11:55:0 g NPK	18.2 a-d
AB9	1.3 x 10 ¹⁰ CFU	21.6 a-e
BACT2	0.6 x 10 ¹⁰ CFU	23.8 a-e
NZB1	0.5 x 10 ¹⁰ CFU	25.6 a-e
BACT1	0.8 x 10 ¹⁰ CFU	28.4 a-e
EBW6	1.2 x 10 ¹⁰ CFU	28.9 a-e
AB 3	1.1 x 10 ¹⁰ CFU	30.0 a-e
EBW1	0.6 x 10 ¹⁰ CFU	31.8 a-e
AB6	1.4 x 10 ¹⁰ CFU	32.3 a-e
EBW2	1.0 x 10 ¹⁰ CFU	32.8 b-e
BACT9	1.0 x 10 ¹⁰ CFU	34.0 b-e
HB2	0.6 x 10 ¹⁰ CFU	34.0 b-e
AB7	0.1 x 10 ¹⁰ CFU	34.5 b-e
EBW3	0.3 x 10 ¹⁰ CFU	35.2 b-e
BACTK	0.6 x 10 ¹⁰ CFU	37.4 b-e
AB1	1.1 x 10 ¹⁰ CFU	40.3 cde
BACT8	1.4 x 10 ¹⁰ CFU	43.6 cde
EBW4	0.4 x 10 ¹⁰ CFU	46.4 cde
BACT0	0.4 x 10 ¹⁰ CFU	49.1 de
BACT4	0.2 x 10 ¹⁰ CFU	49.2 de
Control		51.5 e

* MAP - Monoammonium phosphate (11:55:0 NPK)

** CFU - Colony forming units

† B8 - Strain of Enterobacter aerogenes