TILLAGE AND SEED INOCULATION EFFECTS ON BEAN AND SOYBEAN ROOT ROT IN TWO SOILS IN MINNESOTA

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Root rot of dry bean and soybean has become an important yield limiting disease problem in Central Minnesota. The increase in root rots, caused by *Fusarium solani* f. sp. *phaseoli* in complex with *Rhizoctonia solani* and *Fusarium oxysporum,* has been attributed to shortening of rotation intervals, the use of susceptible cultivars, and soil compaction. The effects of chisel (CP) and moldboard tillage (MB) and a combined *Bacillus* and *Rhizobium* seed treatment on root rot of dry bean and soybean were evaluated in field experiments planted in a split-split plot design with six replications at Staples and Verndale, MN. Main plots were a comparison of tillage: MB or CP. Subplot treatments were the two crops: dry bean (Montcalm) or soybean (McCall). Sub-subplot was the seed treatment: inoculation of dry bean with a combination of *Bacillus subtilis* MBI600 *and Rhizobium leguminosarum* strain RCR3622 or soybean with a combination *B. subtilis* MBI600 and *Bradyrhizobium japonicum* RCR3407 and an untreated control. The inoculant (MicroBio RhizoGen Corp.) was applied in a peat carrier. At Staples, nitrogen was applied in a split treatment at a rate of 50 Kg/ha at sowing and at 45 days after sowing. No nitrogen was applied at Verndale. Soil penetration resistance was measured from 6 to 24 cm and *Fusarium* colony counts determined at 0-5 and 5-10 cm. Plant growth parameters measured were: stand counts two weeks after sowing; disease severity, and plant height at flowering; and grain yield at maturity. Early spring temperatures were below average and rainfall was excessive, delaying emergence and plant growth at both locations. Emergence of dry beans and soybeans at both Staples and Verndale was unaffected by tillage or treatment. Populations of *F. solani* were not affected by tillage or seed treatment at either location. MB reduced penetration resistance to less than 2000 kPa at both locations. At Staples seed treatment reduced disease severity in dry bean (Fig. 1b) while tillage had no effect. Disease severity in dry beans was affected by the interaction of tillage with seed treatment at Verndale ($P = 0.5$) (Fig 1a). Plant height of dry bean was greater in MB than in CP. Dry bean yield was increased by seed treatment and also by MB (Fig. 2b and 2c). At Verndale plant height of dry bean was affected by the interaction of tillage x treatment with taller plants in MB than CP. Plant height of soybean was greater in MB than CP. Seed treatment reduced disease severity in dry beans at both locations (Fig. 1a and1b) while tillage had no effect. Seed treatment reduced disease severity in soybean at both locations but the reduction was not significant. Dry bean yields (Fig. 2b,c) were low at Staples because of poor early season growing conditions, however yields were increased by MB tillage and seed treatment (Fig. 2b,c). At Verndale, seed treatment increased soybean yields from 2204 Kg/ha to 3022 Kg/ha. Soybean yields were greater in MB than CP at Staples (2,988 vs. 2,835 Kg.ha) although the difference was not significant.

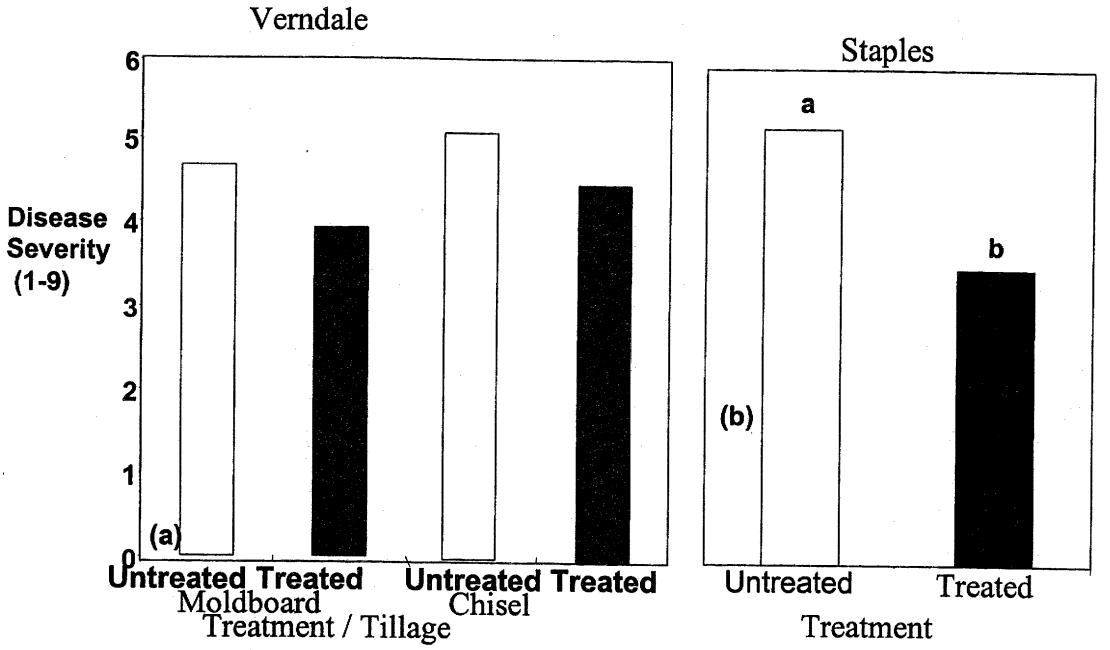

Figure 1a and 1b. Significant factors affecting disease severity in dry bean at Verndale (a) and Staples (b) in 2001.

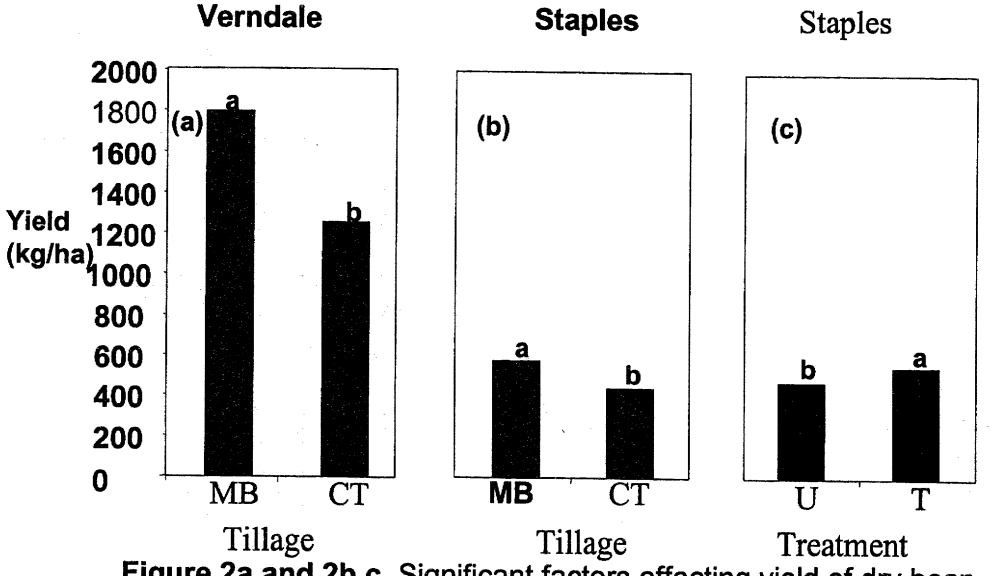

Figure 2a and 2b,c. Significant factors affecting yield of dry bean at Verndale (a) and at Staples (b,c) in 2001.