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# Effect of Plant Canopy Tunnels on White Mold Disease Severity & Yield in Dry Edible Beans (Phaseolus vulgaris L.)

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In 1980, we observed that some dry bean cultivars, when viewed from above, produced a sprawly, dense and intertwined canopy that tended to "hug" the soil surface. In contrast, other cultivars, while producing an equally dense and intertwined canopy, formed a distinct "tunnel" or open "tube" over the soil surface. This observation led to the hypothesis that the 'tunnel effect' may, in part, contribute to disease avoidance by i) allowing better air movement within the canopy (thus improving foliage and soil surface drying) and ii) preventing the foliage and developing pods from coming in contact with moist debris on the soil surface (thus reducing infection sites). An experiment, utilizing artificially produced tunnels was conducted to assess the contribution of the tunnel effect to disease avoidance and seed yield.

The tunnels were fabricated from 5cm x 10cm welded fencing cut into either 2.9m x 96cm or 2.9m x 66cm rectangle sections. Rectangles were placed with the long axis parallel to the furrow and the short axis arched between adjacent rows. The 2.9 m x 96cm section naturally resulted in a larger tunnel than the 2.9 m x 66 cm section. The trellis, 38cm high, was constructed in the row. The treatments were placed in a commercial planting of Great Northern 'Valley', and the experimental design was a latin square. Severe White mold disease was promoted by excess irrigation and by locating the plot near windbreaks.

The data showed the trellis and large tunnel treatments to have nearly a three fold yield advantage over the control (no wire support) while the small trellis exhibited a two fold yield advantage over the control (Table 1). In addition, the severity of white mold increased as the degree of support decreased (from the trellis to the non-supported control). As one would expect, the increase in yield was accompanied by a significant decrease in white mold severity ($r = -.77$ $P<.01$). A non-conventional use of analysis of covariance allowed us to investigate the association between artificial support and yield. Results of this analysis suggest that the tunnel effect may contribute to an increase in yield, even after removal of the negative effects of white mold on yield. Whether the yield increase results from improved light interception, due to mechanical support, or the reduction in the number and extent to which pods are directly affected by white mold needs further investigation.

The results provide evidence that the tunnel effect may contribute to disease avoidance. Furthermore, a breeding strategy emphasizing the development of improved architectural avoidance mechanisms may be more advantageous than one emphasizing the utilization of physiologic resistance.

Table 1. The effect of artificial support on yield and white mold severity in dry beans.

| Type of support | yield (grams) | White mold severity (%) |
|---|---|---|
| Trellis | 276.3 a[1] | 31.0 a |
| large tunnel | 273.5 a | 46.3 b |
| small tunnel | 226.7 b | 55.6 c |
| control (no support) | 99.1 c | 77.5 d |
| C.V. = | 21.1 | 17.7 |
| Mean = | 218.7 | 52.7 |

[1]Figures followed by the same letter were not significantly different at the 5% level of probability.

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## Timing of Application of Fungicides for Control of Bean Rust

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A spray trial was designed to evaluate Bravo 500 (chlorothalonil) Top Cop w/sulfur and Dithane M-22 (maneb) applied at different dates to control a natural epidemic of rust on a susceptible, dry edible bean cultivar. Plots were located at the University of Nebraska-North Platte Station. Soil type was a Cozad-silt loam with a pH of 7.8. Treatment plots consisted of three 20 ft. rows, 30 in. apart. One spreader row was planted between treatment plots to insure adequate rust inoculum distribution. Spreader rows were planted May 26, and treatment rows were planted June 7. Treatments were arranged in a randomized block design with four replications. Plots were mechanically weeded. Irrigation was applied as needed with an overhead sprinkler system. The growing season experienced below normal temperatures, above normal precipitation, and higher than normal humidity. A Solo backpack sprayer was used to apply the fungicides in 40 gal/A water. Visual rust readings were recorded Sept 3. Fifteen ft. of the center row of each plot were harvested for yield during the first week in Oct.

Rust infection was fairly severe due to wet, cool weather in August. Significantly higher yields over the control and the greatest reduction in disease were found with the early-repeat applications of Bravo 500 and