FUNGICIDE EFFICACY FOR BEAN WHITE MOLD UNDER DIFFERENT PLANT POPULATIONS AND ROW SPACINGS

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Western Nebraska bean growers plant Great Northern dry beans (Phaseolus vulgaris) in row spacings of 56 and 76 cm and in a range of plant populations of 120,000 to 200,000 plants/ha. Variety architecture ranges from bush to viny. White mold disease, caused by Sclerotinia sclerotiorum (Lib.) d By., is reported to be less severe at 76 cm compared to 51 cm and 25 cm row spacings (3) and less severe in bush than in viny varieties (1,3). Changes in plant population levels may affect canopy density and white mold severity but varieties differ in how top growth changes with different population levels (2). Thus, any changes in row spacing, plant population, or variety may be related to potential changes in white mold severity.

A three-year study at the University of Nebraska Panhandle Center was designed to examine the response of Great Northern beans to changes in row spacing and plant population. Three bean varieties Spinel, Beryl, and Sapphire were used to represent bush, semivine, and vine plant types, respectively. Row spacings were 16, 36, 56, and 76 cm, and populations were 100,000, 200,000, 300,000, and 400,000 plants/ha. The experimental design was a three factor randomized complete block with main factors of row spacing, population, and variety. The main plots were split into sub-plots with and without benomyl fungicide to protect the measured parameters of seed size and yield from the effect of severe white mold and to study the efficacy of the fungicide for control of white mold across the test range of row spacings and plant populations. Benomyl was applied three times at 10 day intervals at a rate of 1.12 kg ai/ha at approximately 400 kPc beginning when blossoms were present on 80% of the plants of the earliest blooming variety. The plots were sprinkler irrigated with well water as needed for optimum growth of the crop but avoiding excess soil moisture. Percent white mold severity was calculated from the proportion of affected main stems and/or branches prior to harvest.

Benomyl fungicide significantly (P = .05) reduced white mold severity across all varieties, row spacings, and plant populations. Among varieties, Sapphire consistently was highest and Beryl lowest in white mold severity in both fungicide treated and nontreated plots. In nontreated plots, white mold severity ranged from 27 to 45 percent compared to less than 10 percent in fungicide treated plots. White mold severity in nontreated plots increased by 15% in Spinel and by 5% in Beryl and Sapphire as plant populations increased from 100,000 to 400,000 plants/ha. There was no significant change in white mold severity across populations or row spacings in fungicide treated plots. White mold severity decreased by about 5% in all three varieties as row spacing increased from 16 to 76 cm.

Seed size was about 6% greater in fungicide treated plots across plant populations and row spacings. Seed size increased by 3% in both fungicide treated and nontreated plots as row spacing increased from 16 to 76 cm and as plant populations decreased from 400,000 to 100,000 plants/ha.

Seed yields were 33 and 38 quintal/ha for nontreated and fungicide treated plots, respectively. Seed yield decreased by 2.5 quintal/ha in nontreated plots as plant populations increased from 100,000 to 400,000 plants/ha, but decreased less than 1 quintal/ha in fungicide treated plots. Fungicide treatments had little effect on seed yield with changes in row spacings.

Percent severity of white mold varied among replications. The mean white mold severity combined over years, plant populations, row spacings, and varieties was 20 and 56%, respectively, for blocks 1-2 and 3-4. However, benomyl fungicide treatments reduced disease severity to less than 10% across all row spacings and plant populations. In fungicide treated plots the variation in white mold severity was no greater than 2% across the tested row spacings and plant populations. However, in nontreated plots in heavily diseased blocks white mold severity decreased by 10% from 16 to 76 cm row spacings and from 400,000 to 100,000 plants/ha. Relative to that, seed yield increased by 2.2 quintals/ha in severe white mold plots and decreased by 1.2 quintals/ha in fungicide treated plots through row spacings from 16 to 76 cm. Similarly, seed size increased by 10% where fungicide treatments controlled white mold, however, in row spacings from 16 to 76 cm seed size increased by 3 and 5%, respectively, where white mold was controlled or not controlled.

Application of benomyl fungicide minimized the effects of white mold on seed size and yield under the conditions of this study. The fungicide also minimized white mold severity across the range of row spacings and plant populations used in this study.

Literature Cited

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