Effect of varying densities of great brome (bromus diandrus roth.) on the growth and development of wheat (triticum aestivum l.) and great brome

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The physiology and ecology of competition from weeds in crops has not been extensively studied because of the availability of chemicals for selective control. Moreover there is no information available in the literature on the competitive effects of great brome in wheat. Hence the present study was conducted at Badgingarra, in the wheat belt of Western Australia, to investigate the influence of different densities of great brome on the growth and development of wheat and great brome.

Methods

Wheat cv. Gamenya was seeded in plots measuring 60m x 2.1m on 19 June 1981. Great brome seeds were broadcast and incorporated into the soil so as to approximate to densities of 0, 100, 200 and 400 plants m^2. Plant harvests were made at 42, 52, 61 and 71 days after sowing. The plant samples were analyzed for leaf area (lamina only), leaf dry weight, sheath dry weight, tiller number, as well as nitrogen and phosphorus content of both wheat and great brome.

Results and Discussion

The first two plant harvests (viz. 42 and 52 days after cowing) indicated no significant reduction in any of the crop parameters studied. Data from the third harvest (61 days after sowing) showed a significant reduction in leaf dry weight of wheat even at 100 plants m^{-2} of great brome. At its highest density of 400 plants m^{-2} great brome caused 56, 57 and 63 percent reduction in leaf area index (LAI), leaf dry weight and sheath dry weight of wheat respectively.

Final plant harvest (71 days after sowing) magnified the differences. The treatments were found to be significantly different in leaf and sheath dry weights at the 1 percent level of significance. Great brome seemed to be a strong competitor against wheat and reduced its LAI from 2.5 in the control (no great brome) to 1.7 at a density of 100 great brome plants m^2. Further increases in density of great brome to 400 plants m^{-2} reduced the LAI of wheat to 0.81. The same density of great brome caused a 66 percent reduction in leaf dry weight and a 63 percent decrease in sheath dry weight of wheat compared to the control. At the final harvest (71 days after sowing), nitrogen and phosphorus uptake by wheat in the control was 51.5 kg N ha^-I and 11.0 kg P ha I compared to uptake of only 16.6 kg N ha^-I and 3.6 kg P ha^1 by the crop having 400 great brome plants m^2. By this stage, great brome at 400 plants m^2 had taken up 17.3 kg N ha^{-1} and 3.7 kg P ha^1. Data from the third harvest showed that wheat in the control had significantly higher phosphorus content (mg P g^{-1} dry weight) than treatments having 200 and 400 great brome plants m L. This seems to be an indication of reduced root development of wheat in great brome treatments as phosphorus has extremely low mobility in the soil.

The last two harvests showed that great brome caused significant reduction in tiller production of wheat. There was more senescence in wheat at higher densities of great brome. Senescence (dry weight of senesced leaves as percent of total leaf dry weight) of wheat leaves was 21.7 percent in the control against 30.2 percent in wheat with 400 great brome plants m^2.

1. Trenbath, B.R. 1973. Adv. Agron. 26: 177-210.