An Ecological Approach to Weed Management:

Crop Competitiveness

by Randy Anderson

SCIENCE

Randy Anderson is a USDA-ARS scientist at Brookings, SD, formerly at Akron, CO.

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With ecologically based management, emphasis is placed on 1) lowering weed community density, and 2) increasing crop competitiveness with weeds. Diversifying rotations with crops of different life cycles is one tactic for lowering weed community density, whereas any production practice that helps crops access resources earlier than weeds improves a crop's competitiveness. With the ecological approach, herbicides supplement other agronomic practices, rather than serve as the sole tactic for weed control.

Crop interaction with weeds varies with crop, weed species, and environmental conditions, but consistently, any plant, whether a crop or a weed, that captures resources first gains a competitive advantage over neighboring plants.[1] For example, some varieties of winter wheat are more tolerant of downy brome interference.[2] Tolerant varieties are usually taller and intercept more solar radiation; less light within the crop canopy reduces downy brome growth.

A second example is planting winter wheat at higher seeding rates with narrower row spacing, which leads to earlier canopy closure. This strategy improves winter wheat's competitiveness with cheat (*Bromus secalinus*) by 10 to 25% compared to standard practices, reducing yield loss as well as cheat seed production.[3] Another strategy favorable for crops is fertilizer placement. Scientists found that placing N fertilizer in a band below the crop seed reduced jointed goatgrass biomass in winter wheat by 15 to 20% because the winter wheat can then access N earlier than jointed goatgrass.[4]

Summer annual weed density in corn differed among varieties of the previous winter wheat crop.

Production practices can be devised that help the crop capture resources such as nutrients or solar radiation before weeds. To improve competitiveness of winter wheat, corn, sunflower, and proso millet, we evaluated agronomic practices such as nitrogen fertilizer placement, narrow row spacing, higher plant densities, or delayed planting, either alone or in combinations, to determine their impact on weed growth and crop yields.

Strengthen the Wheat Canopy

At Akron, CO, a series of agronomic systems was evaluated to determine if seed production of weedy winter annual grasses could be reduced, comprised of various practices such as higher seeding rates, tall varieties, and banding N fertilizer with the seed.[5] *(Editors' Note: High rates of N with or near the seed may be damaging, even for wheat. Also, sim-*

Photo by Matt Hagny.

It's a fierce struggle between individual plants, and a high-stakes game for the competitors. Here, a patch of henbit established before the wheat, and got the upper hand.

[1] A.M. Mortimer, 1984, Population ecology and weed science, in *Perspective on plant population ecology,* ed. R. Dirzo & J. Sarukhan, Sinauer Assoc. (Sunderland, MS).

[2] Challaiah, O.C. Burnside, G.A. Wicks & V.A. Johnson, 1986, Competition between winter wheat (*Triticum aestivum*) cultivars and downy brome (*Bromus tectorum*), *Weed Sci.* 34: 689-693.

[3] J.A. Koscelny, T.F. Peeper, J.B. Solie & S.G. Solomon, Jr., 1991, Seeding date, seeding rate, and row spacing affect wheat (*Triticum aestivum*) and cheat (*Bromus secalinus*), *Weed Technol.* 5: 707-712.

[4] A.O. Mesbah & S.D. Miller, 1999, Fertilizer placement affects jointed goatgrass (*Aegilops cylindrica*) competition in winter wheat (*Triticum aestivum*), *Weed Technol.* 13: 374-377.

[5] R.L. Anderson, 1997, Cultural systems can reduce reproductive potential of winter annual grasses, *Weed Technol.* 11: 608-613.