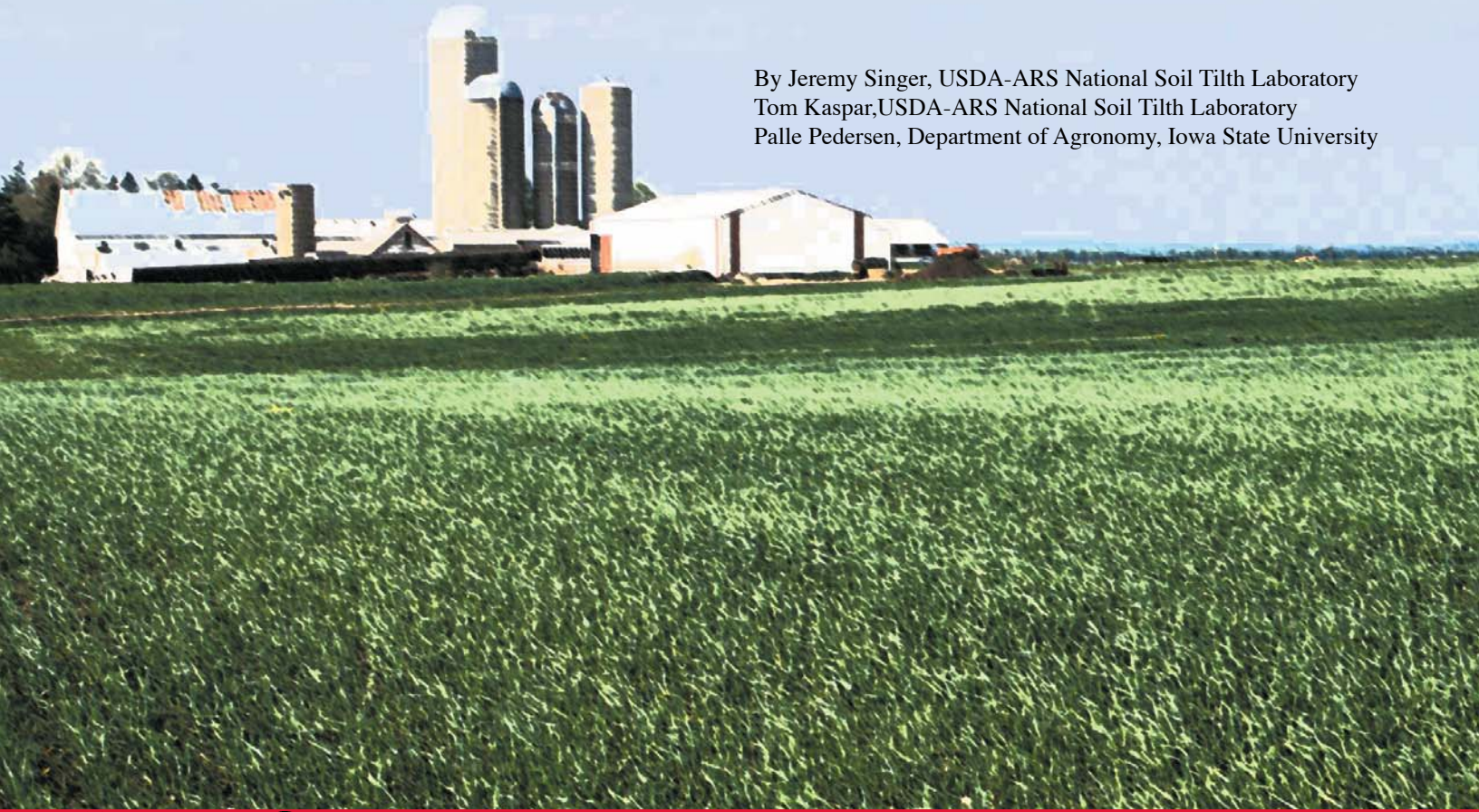
Small Grain Cover Crops for Corn and Soybean



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Cover crops protect the soil and may be used to reduce soil erosion, limit nitrogen leaching, suppress weeds, and increase soil organic matter. Small grain cover crops increase surface cover, anchor corn and soybean residues, increase water infiltration, and reduce both rill and interrill erosion.

A three-year study in Iowa reported that rye cover crops over-seeded into no-tillage soybean reduced interrill erosion by 54 percent and rill erosion by 90 percent compared with no-tillage without cover crops. Oat cover crops reduced interrill and rill erosion by 26 percent and 65 percent, respectively.

Nitrogen remaining in the soil after harvest is a significant source of nitrate contamination for groundwater, wells, streams, and lakes. During the late fall and early spring, small grain cover crops accumulate nitrate that would otherwise leach out and potentially contaminate water supplies. Nitrate accumulated by cover crops is recycled into the soil in plant residues. In Iowa, field studies conducted over three years have shown that rye cover crops reduced nitrate losses by 96 percent while oat cover crops reduced losses by 75 percent. Small grain cover crops can also reduce the number of early season weeds and provide a mulch for continued weed suppression.

Species Selection
Winter-hardy cultivars of rye, wheat, and triticale planted in the fall offer the best erosion protection because they provide fall and winter cover and regrow in the spring. Oat and spring cultivars of wheat, rye, and triticale can be planted in early fall, but will winter kill. A three-year study in Iowa reported fall average oat dry matter production of 410 lb/acre compared to 365 lb/acre for rye. In spring, rye dry matter prior to corn production was 1666 lb/acre. Information for oat, wheat, and triticale cultivar selection can be obtained from Iowa State Extension at the following web site:www.extension.iastate.edu/pubs/cr.htm. Contact your local seed dealer to find out which cultivars of winter and spring rye are available in your area.

Oat
Oats are the primary small grain planted in Iowa. When planted as a grain crop, they are planted in early spring. They will not overwinter in Iowa. If planted in the fall as a cover crop, they winter kill, and will not regrow in spring. If planted in early spring as a cover crop, they need to be killed with tillage, cutting, rolling, or herbicides. In Iowa, seeds of adapted oat cultivars are widely available and the least expensive of all small grains.

Rye
Rye cultivars are available as either spring or winter types. Winter rye is the most winter-hardy of the small grains and usually has excellent winter survival in Iowa. If planted as a fall cover crop, rye will overwinter, regrow vigorously in the spring, and need to be killed with tillage, cutting, rolling, or herbicides. Spring rye cultivars used as cover crops are managed the same as oat. Winter rye seed is available in many locations in Iowa, but usually the cultivar is unnamed or unknown. Spring rye seed, on the other hand, is not readily available in Iowa.

Wheat
For grain production, spring wheat is adapted to the northern third of Iowa and winter wheat to the southern third of Iowa. Spring wheat is the hard red type and winter wheat is hard or soft red. The presence of snow cover dramatically improves winter wheat survival in Iowa. Generally, hard red wheats are more winter-hardy than soft red wheats. Even adapted cultivars of hard red winter wheat will have severely reduced stands because of winter damage in one out of five years. Winter wheat cultivars used as cover crops are managed the same as winter rye and spring wheat cultivars are managed the same as oat. Named cultivars of winter wheat are available in Iowa.

Triticale
Triticale cultivars are crosses between wheat and rye and have both spring and winter types. The winter-hardiness of winter triticale is less than that of rye or hard red winter wheat and about the same as soft red winter wheat. Named cultivars of winter triticale are available in Iowa.

Establishment
Planting small grain cover crops using a no-tillage grain drill or shallow tillage and regular grain drill is recommended. Generally, small grains that overwinter should be planted as soon as possible after harvest but before Oct. 15 (adjust periods 1 week earlier for northern Iowa and 1 week later for southern Iowa).

Small grains that do not overwinter are best planted before mid-September (mid-Iowa) and will still produce reasonable growth in many years. At this time, we have no information on the effect of Hessian fly on small grains grown as cover crops. Normally, winter small grain planting is delayed until after the Hessian fly free date (Sept. 14 at the northern border and Sept. 28 at the southern border) for grain production. Because winter cover is one of the primary goals of cover crops, we recommend planting as early as possible in the fall.
In general, seeding rates for small grain cover crops are roughly the same as seeding rates for grain production. Adapted cultivars of winter rye, winter wheat, and winter triticale should be planted at 1 to 1.5 million seeds/acre with 1.3 million seeds/acre (30 seeds/ft^2 or 17.5 seeds/ft of 7 in rows) being ideal.

Seed size and weight of rye, wheat, and triticale vary considerably from year-to-year and lot-to-lot. The best way to determine seeding rates on a lb/acre basis is to divide 1.3 million seeds/acre by seeds/lb. If this information is not available, rough averages to obtain 1.3 million seeds/acre are 90 lb/acre for wheat or triticale (1.5 bu) and rye (1.6 bu). Seeding rates for winter-hardy small grains should also be increased for later planting dates to obtain adequate soil cover for winter erosion protection.

Planting rates for oats, barley, and other non-winter-hardy small grains should be increased to 1.5 million seeds/acre. Seed size varies considerably, but this would be roughly 120 lb/acre of oat seed (3.75 bu) and 100 lb/acre of barley seed (2.1 bu). Row widths should be 6 to 12 inches with narrower row widths providing better erosion protection. Planting depth should be 0.5 to 1.0 inches. You can, however, plant as deep as 1.5 inches for drier soil conditions but it is generally not recommended. Although fertilization of small grain cover crops would increase their growth, we do not recommend fertilization in the fall except for maintenance applications of P and K for the main season crops.

Shallow incorporation of surface broadcast seed (shallow disking, field cultivation, or cultipacker) is another approach to establishing a cover crop in the fall. Generally, shallow tillage is performed first, the seed is broadcast on the tilled surface, and then very shallow tillage is used to incorporate the seed. Because seeding depth is variable and plant establishment is not as good as drilling, it is recommended that seeding rates increase to 1.5 million seeds/acre for winter-hardy small grains and to 1.7 million seeds/acre for non-winter-hardy small grains.

Aerial or overseeding of small grain cover crops into soybean canopies in mid to late August can be very successful. We have less experience using these techniques to seed small grain cover crops into either grain or silage corn. In general, because of the more open canopy in corn, these techniques do not work as well as they do in soybean. Consequently, we do not recommend overseeding or aerial seeding of small grain cover crops after corn silage or into grain corn.

Spring Management

Management of winter-hardy small grain cover crops in the spring is a compromise between maximizing the benefits of the cover crop and minimizing the yield risk to the following crop. The benefits of the cover crop are maximized by allowing it to grow as long as possible before planting the main crop.

The risks of decreasing the yield of the following crop are minimized by using a cover crop that does not overwinter (such as oat) or by killing the cover crop soon after it begins growth in the spring. To minimize the risk of reducing corn or soybean yield following winter cover crops, it should be killed at least two weeks prior to planting the main crop.

Cover crops can be killed chemically or mechanically, although mechanical methods vary in their effectiveness. If using mechanical control (mowing and chopping), delay control measures until the cover crop has passed the flowering growth stage for best results.

The cover crop should be killed when it starts regrowing in the spring. If the spring is exceptionally dry, the soil profile has not been recharged with water since harvest, or long-range forecasts are predicting dry conditions.

Small grain cover crops can reduce growth and yield of following crops in the same ways that continuous corn reduces corn growth and yield relative to a corn-soybean rotation. Plant chemicals (allelochemicals) released into the soil by their roots or by decomposing residues can inhibit growth of corn and some weed species. Soybean yield decrease following cover crops is associated with soil water use in growing seasons with below normal rainfall or in years when the soil profile does not recharge.

Our experience indicates that it may be beneficial to increase seeding rates for no-tillage corn by 10 percent when preceded by a small grain cover crop. Inclusion of a cover crop in a no-tillage system increases the amount of surface residue, which can interfere with planter operation and seed placement. Additionally, the rotation or allelopathic effect of small grain cover crops can increase seedling mortality and reduce emergence in some instances.

For corn, use a starter (with nitrogen) fertilizer and increase total nitrogen fertilizer rates by 10 percent if less than 150 lb nitrogen/acre. Addition of undecomposed organic matter or crop residues to soil usually results in the tie-up or immobilization of nitrogen by the soil microorganisms that are decomposing the organic matter or residues. Eventually, this nitrogen is released back into the soil.

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