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Growing Winter Wheat on Poorly Drained Soil

Theory

Poorly drained soils have low oxygen levels because the air spaces are filled with water throughout the rainy season. Oxygen is required for normal root growth, so root development is restricted when the soils remain flooded. In the absence of oxygen, soil manganese is converted to a particular chemical form, which in large quantities is toxic to wheat seedlings. Seedlings growing on low ridges of poorly drained soil have a better chance to develop normal crown root systems because oxygen supplies are more adequate during the winter months.

In many countries, annual crops grown in areas with heavy rainfall are planted in raised beds or on ridges. Decades ago Willamette Valley farmers plowed their flat, poorly drained fields in "lands" or strips in the same direction each year. These "lands" left permanent parallel ditches 40 to 60 feet apart to drain surface water away from the seedling roots. In areas of the Sacramento Valley where winter drainage is a problem, farmers plant wheat on beds 4 to 5 feet wide on flat fields.

Experimental results

Early experiments in growing winter wheat on poorly drained soils in western Oregon were conducted on the drainage research farm near Lebanon from 1960 through 1964. Bedding disks attached to a diamond tool bar were used to shape beds about 10 feet wide. Use of these 10-foot beds increased wheat yields by 20 to 40 bushels per acre. This required another tillage operation, however, to level the field for the next crop.

Since 1976, 6-inch ditching shovels on 20- to 30-inch spacings have been used to remove water from around the crown of plants. These ditches "melt" down by summer so that normal fall tillage can be used on the following crop. On soils with medium to fair drainage, yields have increased from 8 to 16 bushels per acre over the yield on non-ridged treatments. On the poorly drained soils, where no crop could be produced without ridging, yields have ranged from 30 to 60 bushels per acre.

Current farm experiences

Seven growers in the southern Willamette Valley successfully produced 600 acres of winter wheat on ridges or beds in 1980. Their yields ranged from 48 to 65 bushels per acre on soil that normally could not be used for winter wheat. These yields were comparable to conventionally planted wheat on well-drained soils in that area.

Their planting equipment was modified in a variety of ways. A shovel 6 to 8 inches wide was mounted directly on the drill in front of every third or fourth drill opener or on a tool bar that was pulled ahead of the drill. The point of the shovel was about 2 inches below the bottom of the opening of the drill. The shovel throws dirt out of the furrow, creating a ridge or raised bed into which the drill plants. Shovels can be spaced up to 42 inches apart if enough speed can be maintained. In this case a ground speed of 8½ miles per hour was required. The size and shape of the bed or ridges varies with size of shovel, depth of operation, distance between shovel and drill opener, and tractor speed. One grower used an onion bedder, which made beds 6 inches to 8 inches high. These bedders also worked well in areas where ditching and drainage from the field was a problem. This equipment was considerably higher in cost than the three-point tool bar with four or five shovels, however. In theory a bed of any height will work as long as the water can run off into the furrow. In practice it appears 3 inches from the bottom of the furrow to the top of the crown on the bed should be the minimum. No matter how high the bed, the wheat will die if the water in the field goes over the top of the bed for any length of time. Drainage of water is, therefore, very important.

The normal herbicide and fertilizer applications were made with conventional equipment. Combines could pass over the ridges successfully, but trucks and pickups had difficulty. All seven growers were planning to expand their acreages of wheat planted on beds or ridges in the fall of 1980.

Current recommendations

Prepare a conventional seedbed while the soil is still dry. Avoid excess pulverization. Much of the poorly drained soil is acidic. Application of lime to raise the pH to 5.6 or more is beneficial. There is a significant advantage when 150 pounds of 16-20-0 fertilizer per acre is banded with the seed.

Use 100 to 120 pounds of seed per acre. You can save seed by plugging the drill rows in areas immediately above the furrows. Use the normal calibration to adjust

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the seeding rate. Yamhill is the best variety of wheat for the most poorly drained soil. Stephens will yield equally well on the marginally drained soils if satisfactory beds or ridges have been developed and if the soil has been limed to pH 5.6 or more.

A flexible roller, packer, or harrow that follows the contour of the ridge and is pulled behind the drill will firm the ridges or beds, enhance germination, and reduce the possibility of herbicide injury to wheat seedlings. The beds must have a crown to encourage surface water runoff.

Since most of these poorly drained lands are badly infested with annual ryegrass, fall weed control is imperative. Apply diuron at 1½ to 2 pounds per acre as soon as early rains have settled the surface soil on the ridges. Dichlofop (Hoelon), applied in December or January at the rate of ¾ to 1 pound per acre, will control annual ryegrass and wild oats.

Ridging of poorly drained fields can be effective only if the water collecting in swales and the lowest portions of the fields is drained by temporary ditches or waterways. If excess surface water is allowed to pond over the ridges, this method of planting will fail.

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