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# G79-430 Oat Production in Nebraska (Revised March 1992)

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**G79-430-A (Revised March 1992)**


# Oat Production in Nebraska

**Information is provided for various oat production practices including seed selection, fertilizing, planting, weed control and harvest.**

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Oats were among the first crops grown by pioneers who settled eastern Nebraska. As recently as 1950, Nebraska produced 2.7 million acres of oats. Acreage has declined steadily, however, and in 1990 there were just 300,000 acres. Oats are grown throughout the state, with the majority being in eastern Nebraska where the cool, moist climate provides for the best growth. The feed value of oats also favors its production in northeast Nebraska where swine, dairy cattle, and beef cattle production are heavy. An increase in the pleasure horse population also has renewed interest in oats as a feed. Oats have increased in importance for human nutrition, with about 10 percent of total production processed for human consumption. The United States imports 45 to 65 million bushels of oats annually.

## Oats in the Rotation

Oats are useful as a rotation crop for:

1. their own value as a cash or a feed crop;
2. companion seeding of legumes;
3. providing opportunity for perennial weed control; and
4. to accomplish shifts in crops which would be difficult otherwise.

Plan companion seeding of oats and small-seeded legumes for successful legume establishment. A firmer seedbed is required for legumes than if oats are grown alone. This can be achieved by using a corrugated roller to firm loose soil before planting. Use about three-fourths of the standard oat seeding rate when legumes also are seeded. Sweet clover and red clover may be planted at the best time for planting oats. When alfalfa is seeded with oats, a delay of one or two weeks is desirable because of the greater frost hazard with alfalfa. Oats can be very competitive with a companion-seeded legume. Alfalfa, sweet clover, or red clover establish well with oats if rainfall is adequate, but in dry years the legume stand can be poor. Harvesting the oats for silage will increase the probability of good legume establishment.

Several perennial weed species are increasing in row crop production, among them field bindweed, common milkweed, hemp dogbane, and Canada thistle. Including oats in the cropping sequence allows for mechanical or chemical weed control during the balance of the summer after oat harvest. Frequent sub-surface tillage can be used to reduce perennial weed infestations. Applying herbicides like 2,4-D and Banvel in late summer or early fall for perennial weed control is possible in oat stubble, but more difficult after corn, grain sorghum, or soybeans.

## Seed Selection

Seed selection is usually the first management decision in oat production. Frequent use of certified seed will assure quality and purity. Buying certified oat seed will permit growers to periodically change to new, improved varieties. Refer to *NebGuide G80-487, Spring Small Grains Variety Selection* for information on available oat varieties. Removing weed seed and lightweight and diseased kernels from bin-run oats will encourage faster emerging, stronger oat seedlings.

## Seedbed Preparation

Fields are usually prepared for oat seeding by double tandem disking and harrowing, but oats can be planted no-till into various crop stubbles. Soybean stubble is ideal for no-till planting oats. In grazed or shredded corn stubble, conventional grain drills with individual flexing units will operate successfully if the old row ridge height is moderate. Oat density may be more erratic when planted in last year's row furrows than when planted on top of the ridge. No-till drills with coulters are ideal for use in heavy corn residue. Oats are usually planted before summer annual weeds germinate so no-till fields should be weed-free. If winter annual weeds like field pennycress, horsetail, and several mustard species are present, a preplant application of 2,4-D may be required. The 2,4-D should be applied at least ten days before planting to avoid oat injury.

## Fertilizer Application

Oats will respond to fertilizer. Proper fertilizer management can increase yields and oat quality. With a few exceptions, the fertility research on oats has come from South Dakota or the Nebraska Outstate Testing Program conducted intensively during the 1950s and early 1960s.

Before buying a fertilizer, test the soil. Recommendations here will be from soil samples sent to the University of Nebraska Soil Testing Laboratory, but samples can be sent to any laboratory that reports these values. The three most important soil chemical properties needed are: (1) the soil phosphorus level (Bray and Kurtz #1 or Olsen P); (2) organic matter; and (3) residual nitrate nitrogen level.

There is no reason to apply fertilizer to soils already containing the level of nutrients needed to grow a crop. Additional applications are costly and a hazard to the environment.

Research has shown that an oat response to potassium (potash recommendations in *Table III*), zinc and sulfur is unlikely on most Nebraska soils. Therefore, only nitrogen and phosphorus will be discussed. If soils test low in these nutrients or have low pH, they should be adjusted for other crops in the rotation that would benefit from the particular nutrient.

**Table III. Potassium recommendation for oats.**

| Calibration range | Soil test value | Broadcast application rate |
|---|---|---|
| | ppm | $K_2O$ lbs/acre |
| Very low | 0-39 | 120 |
| Low | 40-74 | 80 |
| Medium | 75-124 | 40 |
| High | >125 | 0 |

**Phosphorus.** The phosphorus table (*Table I*) has two columns for soil test values, one called Bray & Kurtz #1 and the other Olsen P [also known as $Na(HCO_3)$]. Most samples will be on the Bray and Kurtz #1 scale, but on high pH calcareous soils, the Olsen P test is a better indicator of phosphorus needs.

**Table I. Phosphorus recommendations for oats.**

| Calibration range | Soil test value | | Application method | |
|---|---|---|---|---|
| | Bray & Kurtz #1 | Olsen P [$Na(HCO_3)$] | Broadcast | Band |
| | ----------ppm---------- | | ----lbs $P_2O_5$/acre---- | |
| Very Low | 0-5 | 0-3 | 80 | 40 |
| Low | 6-15 | 4-7 | 60 | 30 |
| Medium | 16-25 | 8-14 | 40 | 20 |
| High | >25 | >14 | 0 | 0 |

Band applications are more efficient than broadcast applications, and result in comparable yields with less fertilizer. Recent research with winter wheat has shown that band applications may raise maximum yield levels (*Figure 1*). Broadcast applications should be incorporated. When growing oats as a companion crop with alfalfa, apply phosphorus for two years of alfalfa production with the fertilizer for the oats.

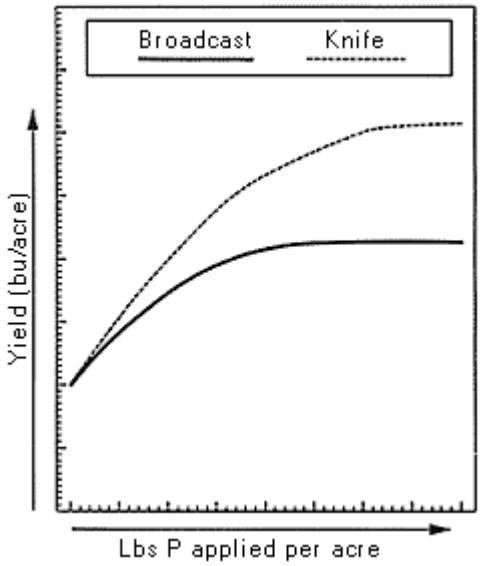


**Figure 1. Theoretical effects of P placement methods on oats yields.**

**Nitrogen**. Nitrogen recommendations are based on yield goal, organic matter and residual nitrate levels. If you have reliable estimates for these three factors, then a sound nitrogen recommendation is possible. As with any crop grown dryland in Nebraska, weather is the final determinant of yield potential. However, you can use your experience to set realistic yield goals. A yield goal approximately 5 percent higher than your five-year average is realistic. Generally, in good years there are enough extra nutrients to enable the crop to achieve that extra yield.

*Table II* has recommendations for three yield goals and three soil organic matter levels. We assume a 40 pound residual nitrogen level. If residual nitrate-nitrogen levels are known, use the chart to adjust on a pound for pound basis. For example, if the soil has 60 pounds residual nitrogen, subtract 20 pounds from the chart values. However, since much oat growth occurs before some of this nitrogen may become available, use only a partial credit.

**Table II. Nitrogen recommendations for oats.**

| **Yield goal** | **Organic matter (%)** | | |
|---|---|---|---|
| | **1** | **2** | **3** |
| bu/acre | ----------lbs N/acre---------- | | |
| 60 | 70 | 50 | 30 |
| 80 | 90 | 70 | 50 |
| 100 | 110 | 90 | 70 |
| Table assumes 40 lbs residual nitrogen | | | |

Excess nitrogen can stimulate oat lodging. Adding extra nitrogen for "insurance" purposes may be more hazardous than with corn. Nitrogen is most beneficial when applied close to planting or before oats begin to tiller. When growing oats as a companion crop with alfalfa, reduce nitrogen rates to minimize oat vegetative growth and lodging and thus benefit alfalfa stand establishment.

For the most effective fertilizer program, take a soil test, set a realistic yield goal and then apply recommended rates at the right time. Apply nitrogen early and apply phosphorus in bands.

## Time of Seeding

Oats respond favorably to early planting. Research has shown that oat seeds germinate at 40°F. In southeastern Nebraska March 20 to April 1 is generally optimum for seeding. Later dates apply northward and westward in the state. Test results showed an average yield loss of about one percent for each day seeding is delayed after April 1 at Lincoln. Comparable dates in northeast and western Nebraska would be April 7 to 10. Newer oat varieties will tolerate seeding delays better than older types.

## Rate and Method of Planting

Nebraska research results have indicated a seeding rate of 64 to 80 lb/A is best for optimum planting dates. Oat yields at a seeding rate of 48 lb/A have been only slightly less than with 80 lb/A. Reasonable variations in seeding rate produce only minor variations in yield. Therefore, oat seeding rate should be reduced to 48 lb/A when used as a companion crop for legumes.

Generally oats are seeded with a grain drill because it requires less seed, insures a more uniform stand, and provides for more uniform soil coverage of the seed. Broadcast end-gate seeders are used extensively in northeast Nebraska for sowing oats on disked corn ground. These seeders may allow earlier planting in some years than if a drill were used. Seed placed properly into a firm, mellow seedbed is essential for good stands.

## Annual Weed Control

Currently registered herbicides control only broadleaf weeds in oats. If oats are underseeded with a legume, Buctril can be used. Alfalfa seedlings should have four trifoliate leaves before herbicides are applied to minimize injury. However, weed seedling size must not exceed that stated on the Buctril label for reasonable weed control. MCPA is also registered for emergency control of certain broadleaf weeds in oats underseeded with alfalfa. Consult the MCPA label for application instructions.

For oats not underseeded with a legume, use *Table IV* as a guide for herbicide selection based on weeds to be controlled. Make herbicide application at the three to four leaf stage. Spring annual weeds are most susceptible when small. The herbicides must be applied uniformly to the plant foliage to be effective and to avoid crop injury.

Oats are tolerant to 2,4-D amine or ester after the soft dough stage. However, by this time weed competition will have already reduced oat yield. Late spraying may improve harvesting conditions.

**Table IV. Weed response to selected herbicides applied to weeds less than 4 inches tall.**

| *Weeds to be controlled* | **2,4-D Amine** | **Buctril** | **Curtail M** | **2,4-D Amine + Buctril** |
|---|---|---|---|---|
| *Commercial product per acre* | *0.5-1 pt* | *1-1.5 pt* | *1.75-2.3 pt* | *0.5-1 pt + 1-1.5 pt* |
| Wild buckwheat | P[a] | E | E | E |
| Kochia | F | F | F | G |
| Erect knotweed | F | E | G | E |

| | | | | |
|---|---|---|---|---|
| Lambsquarters | E | G | E | E |
| Prickly lettuce | E | G | E | E |
| Tansymustard | E | G | F | E |
| Redroot pigweed | E | F | F | G |
| Prostrate pigweed | E | F | F | G |
| Shepherdspurse | E | E | E | E |
| Sunflower | E | E | E | E |
| Russian thistle | F | G | F | G |
| [a]P = poor 0-50%, F = fair 50-75%, G = good 75-90%; E = excellent 90-100% | | | | |

## Oat Plant Development

Temperature and available soil moisture largely determine how fast the oat plant develops. Therefore, days from oat planting to ripened grain for a given variety will differ from year to year. A 10 day delay in oat planting does not result in a 10 day delay in flowering. Research has shown that a three or four day delay in seeding represents approximately a one day delay in maturity. Full heading and grain ripening are closely correlated events, being separated by an average of 24 days. This interval may be lengthened by cool and moist weather during the fruiting period, or shortened by dry and hot weather or disease. Oat varieties for Nebraska classed as early, medium, and late maturity will, on the average, reach ripened grain stage in 85, 90, and 95 days, respectively, after planting.

## Oat Diseases

Oats are subject to many diseases. Among the most destructive are stem rust, leaf rust, barley yellow dwarf, and smut. Stem rust and leaf rust are caused by a fungus. Breeding new oat varieties with tolerance or resistance to the disease organism allows for more profitable oat production. Races of fungi causing stem rust are fairly stable and serious disease infection does not occur frequently in Nebraska. Resistance to leaf rust in oat varieties is not stable and new fungi races frequently develop. The rust diseases generally have not been a limiting factor in oat production in Nebraska. Many commercially grown oat varieties have good resistance to both loose and covered smut. Consult *NebGuide G80-487 Spring Small Grains Variety Selection* for disease reaction ratings of many oat varieties.

## Oats for Forage

Oats underseeded with a legume are best removed for forage to increase the survival potential of the legume. Nebraska research indicates oats should be cut in the early dough stage for maximum forage yield and pounds digestible dry matter per acre. Pounds protein per acre also will be high at that stage.

## Oats for Grain

Oats are harvested with a combine either direct while standing or by the windrow-pickup method. With the windrow method, oats are cut when kernels are in the hard dough stage and most traces of green have disappeared from the grain and straw. This allows a week or more earlier harvest than if oats are left until dead ripe for cutting. Harvest losses of 15 to 20 percent can occur while waiting for direct cutting, resulting from lodging or shattering. Windrowing is also beneficial in fields that are weedy or ripen unevenly. Oats need to be at or below 13.5 percent moisture for safe storage.

***File G430 under: FIELD CROPS***
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