FERTILIZER guide
FG 70
Reprinted January 2000

# Irrigated spring-planted small grains—peat and muck soils

*Klamath and Lake counties*

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Soil management practices and fertilizer recommendations for peat and muck soils in Klamath and Lake counties are distinctly different than for mineral soils.

High levels of salts and boron have been a problem on many lower Klamath Lake soils and organic soils in Lake and Harney counties. Surface application of water, by flooding or sprinklers, followed by pumping water out of drain ditches, has reduced salt problems on most fields. However, growers who irrigate by filling drain ditches and letting water "sub" to the surface move the salts back to the soil surface.

## Control of Soil Water

Water control is the most critical management practice affecting the availability of plant nutrients in these soils for stand establishment and successful yields. The following steps are recommended:

1. Establish deep drain ditches to remove winter water.
   - Ditches should be 6+ feet deep and spaced about 1,200 ft apart.
   - Perforated plastic tile drains can supplement surface drain ditches.
2. Pump winter water out about February 1 to allow timely seedbed preparation.
3. Surface irrigation after planting is essential to establish optimum seedbed soil water for uniform stand establishment and availability of fertilizer applied.
   - Spring-applied fertilizers will not benefit that year's crop if seedbed soil moisture is not optimum after planting.
   - A moist surface soil also provides some frost protection during seedling stages.

Sprinkler irrigation is the most expensive irrigation method but provides the best control of soil water. One to 1½ inches of water should reestablish seedbed soil water.

Surface flooding is the second choice after sprinkler irrigation if good drainage is available and fields have been leveled so that water is uniformly distributed. Water runs should be no more than 1,000 feet. Scald may result if water ponds, especially during warm or hot weather.

Filling drain ditches and subbing is the last irrigation choice as optimum soil bed moisture is difficult to establish and salts are moved to the soil surface.

## Soil Properties

Peat and muck soils weigh less per cubic foot than mineral soils and have different nutrient availability. Therefore, the interpretation of soil test values differs between muck and mineral soils.

An average mineral soil weighs about 84 lb per cubic ft ($ft^3$), while lower Klamath Lake muck soils with about 20 percent organic matter weigh about 40–45 lb/$ft^3$. Upper Klamath Lake peat soils with 50–75 percent organic matter might weigh 15–30 lb/$ft^3$.

## Nitrogen (N)

Nitrogen recommendations are based on percent organic matter (OM) and years the field has been in crop production (Table 1).

Nitrate nitrogen soils tests have little value on these soils.

*Table 1.*—N fertilization rates for small grains—Klamath Lake.

| Upper Klamath Lake (probably 50%+ OM) | |
|---|---|
| **Years of crop production** | **N application (lb/a)** |
| 0–6 | 0 |
| 6–12 | 40 |
| over 12 | 80 |
| **Lower Klamath Lake (probably 12–25% OM)** | |
| **Crop** | **N application (lb/a)** |
| Oats | 60 |
| Barley | 60–100 |
| Wheat | 80–120 |

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Band 20–30 lb N/a with the seed at planting where manganese or zinc deficiency is expected or might be a problem. Ammonium sulfate or ammonium phosphate-sulfate (16-20-0) or N, P, K fertilizers containing these materials are recommended for application with the seed.

The remaining nitrogen can be applied as any of the standard materials used in the area, such as anhydrous ammonia, urea, Soln-32, ammonium sulfate, or ammonium nitrate.

Adjust N rates based on yield potential. Yields of 5,500–6,000 lb/a have been produced on Lower Klamath Lake muck soils with 30–40 lb N/a banded at planting if planting dates, stand, soil moisture, and weed control are optimal.

Where yield potential for the variety and soil are higher, each 30–40 lb N/a added should add 1,000 lb grain yield/a.

# Phosphorus (P)

Best results are obtained when P is banded with the seed at planting (Table 2).

Plowing down or discing into the seedbed before planting is better than surface broadcasting at planting.

There is good residual (carryover) value for previous P applications on peat and muck soils if seedbed soil moisture is optimal.

Do not band diammonium phosphorus or urea phosphorus mixtures on Lower Klamath Lake muck soils where the pH is 6.5 or higher.

*Table 2.*—P fertilization rates for small grains.

| If the soil test for P is (ppm) | Apply this amount of phosphate ($P_2O_5$) (lb/a) |
|---|---|
| **Lower Klamath Lake soils (40 lb/ft³)** | |
| 0–20 | 40–60 |
| 20–45 | 30–40 |
| over 45 | 0 |
| **Upper Klamath Lake soils (20–30 lb/ft³)** | |
| 0–30 | 40–60 |
| 30–60 | 30–40 |
| over 60 | 0 |

When broadcasting P, use double the rate recommended above and work the material into the soil prior to seeding.

# Potassium (K)

On peat and muck soils in Klamath County, small grains have responded to K application where the soil test for K was below 300 ppm (Table 3).

*Table 3.*—K fertilization rates for small grains.

| If the soil test for K is (ppm) | Apply this amount of potash ($K_2O$) (lb/a) |
|---|---|
| 0–300 | 60–100 |
| 300–400 | 30–60 |
| over 400 | 0 |

Apply K before seeding and work it into the seedbed. Banding K has reduced yields under some conditions.

# Sulfur (S)

Include 10–l5 lb S/a with the spring-applied fertilizer.

# Micronutrients

Micronutrients can be blended with other fertilizers. Foliar analyses and visual deficiency symptoms are the best ways to identify deficiencies of these nutrients.

## Copper deficiency

Copper deficiency has been widespread, especially on peat soils with more than 50 percent organic matter.

## Manganese deficiency

Manganese deficiency is the major micronutrient deficiency on lower Klamath Lake and is the most difficult micronutrient to correct. Soil pH and organic matter are the two major factors affecting manganese availability. Manganese deficiency has been observed on muck soils with pH of more than 6.5 and on a few fields near the Williamson River with pH or more than 6.0.

Manganese deficiency is not expected where the soil pH is 5.5 or less. Manganese deficiency is more widespread with oats than with barley.

## Zinc deficiency

Zinc deficiency has been observed in a number of locations. Zinc soil test values of 1.0 ppm Zn should indicate adequate Zn.

## Methods of application

- Banding acid-forming N-P fertilizers with the seed at planting followed by good seedbed soil moisture is the best way to supply these micronutrients.
- Spray applications of micronutrients for foliar uptake can be made after spring grain plants are about 6 inches high and visual deficiency symptoms have been identified.

Ammonium sulfate, ammonium phosphate sulfate (16-20-0), and mono-ammonium phosphate (11-48-0) are the best dry materials to band at planting.

## Plant samples for chemical analyses

Ask the OSU Extension Service agent in your county or Experiment Station personnel for specific instructions on collecting plant samples for chemical analyses.

Collect leaf blade material at early tillering (plants generally have six or seven leaves at this growth stage). The following levels generally are associated with deficiency symptoms:

Copper—3.5 ppm or less
Manganese—20 ppm or less
Zinc—15 ppm or less

The following levels generally are associated with good growth and high yields if other management practices are optimal:

Copper—5 ppm or higher
Manganese—25 ppm or higher
Zinc—20 ppm or higher

## Boron toxicity

Boron toxicity can be a problem on lower Klamath muck soils where B soil tests are above l0 ppm and/or where toxicity symptoms have been identified.

## For More Information

*How to Take a Soil Sample ... and Why*, EC 628, by E.H. Gardner (revised 1997). No charge.

*A List of Analytical Laboratories Serving Oregon*, EM 8677, by J. Hart (revised 1997). No charge.

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*Fertilizer and Lime Materials*, FG 52, by J. Hart (reprinted 1997). No charge.

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Published March 1983. Reprinted January 2000.