



## **TIMING OF NITROGEN FERTILIZER FOR OREGON PASTURES**

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Every year producers wait for spring forage growth on their pastures; every year wishing the grass would come earlier than it usually does. What can be done to stimulate earlier growth? How can we use our resources more efficiently? These were two of the questions that come from the reality that in parts of Oregon, pasture forage for grazing livestock is lacking early in the growing season. And, livestock producers must provide more costly harvested forages as supplemental feed during this time.

To increase forage production, fertilizer is traditionally applied in the spring. The application of fertilizer at the traditional time, which is the middle part of the spring growing season increases the already accelerated growth rate and does not help with the early lack of feed.

Fertilizer is one of the major annual costs in maintaining the productivity of an established pasture. The time of the year and the time during the growing season that fertilizer is applied can make a difference in the amount of growth that occurs.

Nitrogen is usually the nutrient that limits total production. What we mean by this is rapid plant growth that normally occurs during the growing season depletes the nitrogen in the soil. When the nitrogen runs out, plant growth slows down or stops. Phosphorus, potassium and other nutrients are important also and soil tests should be used to make sure these nutrients are sufficient for plant growth. The soil reserve or availability of nitrogen, however, is an important factor in determining yield of dry matter.

Research during the 1980's in Great Britain showed that there is an advantage to an early nitrogen application in a pasture. Forage researchers there developed a method called T-SUM 200 to determine the date of that first application to a pasture. The fertilizer was put on when pasture plants start to grow in mid- to late winter. A supply of nitrogen early in the growing cycle of a plant can stimulate more pounds of feed during the first part of the grazing season. It can also be beneficial if an intensive grazing system is used, due to the more frequent, but controlled "harvest" of grass or clover plants by livestock.

Subsequent research using T-SUM 200 was conducted in western Canada as well as here in Oregon from 1996 to 2000. The results of the research work are discussed later in this article.

### **WHAT IS T-SUM 200?**

T-SUM 200 is an accumulation of HEAT UNITS starting from January 1, until a total of 200 heat units are reached. The first application of nitrogen should be applied on or soon after the date that 200 heat units are accumulated.

### **WHAT IS A HEAT UNIT?**

A heat unit is the average (AVG) of the high and low temperature for the day, in degrees centigrade. The formula for calculating a heat unit is:

$$\frac{\text{Maximum degrees C} + \text{minimum degrees C}}{2}$$

For example, if the high for January 1 is 8.3 degrees centigrade and the low was 2.8

degrees centigrade, the number of heat units for that day is 5.6 (8.3 + 2.8 divided by 2 = 5.6). NOTE: If the temperature is less than 0 degrees centigrade (or 32 F), then use 0 in the formula.

**HOW DO YOU ACCUMULATE HEAT UNITS?**

The T-SUM 200 method adds (sums) up daily heat units starting on January 1 of any particular year (Sum). An example of this is:

| <u>Date</u> | <u>Max</u> | <u>Min</u> | <u>Avg</u> | <u>Sum</u> |
|-------------|------------|------------|------------|------------|
| Jan 1       | 11.11      | 1.67       | 6.39       | 6.4        |
| Jan 2       | 11.11      | 1.67       | 6.39       | 12.8       |
| ...         | ...        | ...        | ...        | ...        |
| Jan 16      | 3.89       | -1.11      | 1.95       | 123.9      |
| Jan 17      | 4.44       | 1.11       | 2.78       | 126.7      |
| ...         | ...        | ...        | ...        | ...        |
| Jan 26      | 10.0       | 3.89       | 6.94       | 178.6      |
| Jan 27      | 5.56       | -0.56      | 2.50       | 181.1      |
| ...         | ...        | ...        | ...        | ...        |
| Jan 31      | 7.78       | -1.67      | 3.06       | 193.1      |
| Feb 1       | 8.89       | 5.00       | 6.94       | 200.0      |

When the total reaches 200, research shows that plants start to put on growth. Nitrogen should be made available at that time or soon after.

Temperature data for calculating T-SUM 200 are available from weather collecting stations in your area, airports or by accessing the Oregon Climate Service website

[http://www.ocs.orst.edu/forecasts\\_us.shtml](http://www.ocs.orst.edu/forecasts_us.shtml)

Producers can also collect their own data by recording the high and low temperatures until 200 heat units occur. If you collect your temperature data in degrees Fahrenheit, use the formula below to convert °F to °C:

**(Degrees F - 32) X 0.556 = Degrees C**  
 For example, (40°F -32) x .556 = 4.4° C

Computer programs are available on the Internet to help you calculate degree growing days: <http://ippc2.orst.edu/OR/>

click on “full-featured calculator”  
 Select model or calculator: “none”  
 Select “Check here for °C”  
 Enter lower threshold as “0”  
 Select “simple average/growing dds”  
 Select starting and ending dates  
 Select location: “Roseburg Or nws”  
 Click here to run the model: “Calc”

Alternatively, you can choose the timing for early nitrogen application based on past history. The 30-yr average for T-sum 200 in Roseburg is February 9. This year we are ahead of schedule for degree growing days and T-sum came earlier (Feb 1) than usual.

**HOW DOES T-SUM 200 WORK?**

Researchers use January 1 as the starting date each year for the accumulation of heat units. It isn't some magical date, after which plant growth starts, but just happened to be a convenient and easy starting point. It is based on the assumption that cool or cold winter temperatures in December or January have caused plant growth to slow down or cease. Approximately 200 heat units after January 1 signals the plant to initiate growth.

**WHY APPLY NITROGEN EARLY?**

Most fertilizer applications tend to go on pastures anywhere from March to May depending upon the location in the state. However in many cases, a significant amount of potential plant growth has been lost. A late application of nitrogen just increases the already explosive amount of forage growth that occurs from the middle to the end of the spring growing season. An application of nitrogen at the T-SUM 200 date helps to spread out the total amount of forage produced over a longer period.

The benefits of early nitrogen applications in Oregon are documented by Oregon State University pasture research work. Research trials in 1995-96 in western Oregon (John Rogers, John Hart and Gene

Pirelli) showed the benefits of early nitrogen application on pasture. The equivalent of 60 pounds of nitrogen/acre was applied soon after the T-SUM 200 date to four sites in western Oregon.

Clipping data showed increases in forage growth of T-Sum plots compared to controls of no nitrogen. Also by mid-April, most of the plant growth, which resulted from the February nitrogen application, had been harvested. A second application of nitrogen was made to maintain plant growth through the rest of the growing season.

In 1999-2000, experiments across Oregon were conducted to determine whether nitrogen applied early in the growing season (T-sum 200), would be retained and utilized for early season forage production (late winter, early spring or mid-spring, depending upon the location). Research sites were Baker County, Lake County, Coos County, **Douglas County**, Tillamook County and Benton County. Early applications of nitrogen are also vulnerable to loss from leaching. Another aspect of this statewide study was to monitor nitrogen uptake by the forage.

For some central and eastern Oregon locations, we found similar results to those of western Oregon. In sites where nitrogen was limiting, early application of nitrogen provided early feed as compared to no nitrogen plots. In most locations, nitrogen was efficiently taken up into the forage without substantial loss of fertilizer. A couple of sites however, showed limited success with this method. The major difference between east side and west side locations was the date at which T-SUM 200 arrived. Also the quality of the pasture makes a difference in the size of the yield response from early nitrogen.

## CAUTIONS

The most important caution about using the T-SUM 200 method is that it will not fit

every ranch or farm. To minimize loss of nitrogen, fertilizer should not be applied to very wet soils, especially ones with some standing water. And, use caution on sandy soils due to the potential for nitrogen loss early in the growing season. Additionally, producers should not turn livestock out onto pastures until the soils are firm as this can cause long term damage from hoof action on softened ground. Use lighter weight animals (sheep or stocker cattle) for early grazing opportunities. Heavier, mature cows need to have some type of controlled, short-duration grazing to prevent damage.

## SUMMARY

To get the most benefit from T-SUM 200 applied nitrogen, follow these steps:

1. Identify a pasture that would work for early grazing.
2. Make sure there are sufficient animal units to use the feed produced.
3. Apply nitrogen at 200 heat units.
4. Move livestock in when sufficient forage is available. Be sure to pay attention to the grazing impact in order to avoid damage to pastures with soft soil.

The method will pay the greatest benefits to western Oregon pastures, but can also be beneficial in reducing wintering feed costs for livestock operations in many parts of the state.

Guidelines for local fertilization rates are available in OSU Fertilizer Guides (FG 63 at <http://eesc.orst.edu/agcomwebfile/edmat/>) or from an agronomist in your area.

Intensive grazing systems may require more nitrogen during the growing season than the guide recommends. A good rule to follow is "utilize what you fertilize."