

5-2-2005

## Frost/freeze on alfalfa

Stephen K. Barnhart

Iowa State University, sbarnhar@iastate.edu

Follow this and additional works at: <http://lib.dr.iastate.edu/cropnews>

 Part of the [Agricultural Science Commons](#), [Agriculture Commons](#), and the [Agronomy and Crop Sciences Commons](#)

---

### Recommended Citation

Barnhart, Stephen K., "Frost/freeze on alfalfa" (2005). *Integrated Crop Management News*. 1381.  
<http://lib.dr.iastate.edu/cropnews/1381>

**The Iowa State University Digital Repository provides access to Integrated Crop Management News for historical purposes only. Users are hereby notified that the content may be inaccurate, out of date, incomplete and/or may not meet the needs and requirements of the user. Users should make their own assessment of the information and whether it is suitable for their intended purpose. For current information on integrated crop management from Iowa State University Extension and Outreach, please visit <https://crops.extension.iastate.edu/>.**

---

## Frost/freeze on alfalfa

### **Abstract**

Pinning down precise air and tissue temperatures in a standing alfalfa crop, and then predicting the impact on growth (or death) is not an exact science. The air temperature reported on the weather report or on your local thermometer may not be what the alfalfa crop is experiencing. Topography of the site (cold air "flows" into low-lying areas), wind, and the moderating influence of the warmer soil mass greatly influence the microclimates in the standing alfalfa canopy and from site to site in the field. My descriptions here should be considered subjective, with an appropriate amount of acceptable variability that reflects real-world conditions.

### **Keywords**

Agronomy

### **Disciplines**

Agricultural Science | Agriculture | Agronomy and Crop Sciences

# INTEGRATED CROP MANAGEMENT

## Frost/freeze on alfalfa

Pinning down precise air and tissue temperatures in a standing alfalfa crop, and then predicting the impact on growth (or death) is not an exact science. The air temperature reported on the weather report or on your local thermometer may not be what the alfalfa crop is experiencing. Topography of the site (cold air "flows" into low-lying areas), wind, and the moderating influence of the warmer soil mass greatly influence the microclimates in the standing alfalfa canopy and from site to site in the field. My descriptions here should be considered subjective, with an appropriate amount of acceptable variability that reflects real-world conditions.

### Light frost (27° to 31° F)

Once alfalfa plants have broken spring dormancy, their tolerance of low temperatures is greatly reduced. Leaves on new alfalfa shoots will often be killed at tissue temperature of about 27° to 28° F (or colder). Buds and growing points are somewhat better insulated at 27° to 28° F and will often continue to grow normally. The only evidence of a light frost will be the loss of several sets of trifoliate leaves down the stem that correlates with the chronological time of the frost. Most plants in the field of a low-lying area will exhibit the same general leaf loss pattern. At these light frosts, the top few inches of alfalfa stems may curl--similar in appearance to 2,4-D herbicide epinasty. Alfalfa plants outgrow this.

**Management implications:** Morphological plant development should not be affected by a light frost, and there is no need to change harvest management plans.

### Moderate frost--26°-27° F

Temperatures that freeze the upper few inches of the stem tips cause serious damage to that stem's terminal growing point, as well as the supporting stem tip and associated leaves. The entire stem is not dead. At each leaf position lower on the stem is a dormant bud that can develop into a stem branch. Buds from the crown can also begin to develop new stems with the loss of the terminal buds. The frozen stem tips will dry out, and weather, losing nutritive value. The lower stem and any lower (or shorter) stems may still have their terminal growing points in tact and will continue to grow normally.

**Management implications:** For the next few weeks following the moderate frost, the morphology of the plant will be mixed. The unaffected stems will continue to develop normally and progress through stem maturation, budding, and flower formation as they normally would. The plants that may have only received temperatures in the light frost range (described above), will also progress through the reproductive stages normally. The lower

stem tissue on stems that have lost the terminal growing points will continue to mature (increase in fiber, decrease in feed quality). The new side branches and frost-induced crown shoots will remain vegetative (and higher in feed quality) for a longer period than the associated older stems. Making harvest decisions then must be made on the basis of the feeding quality goals for the crop. Harvest for dairy quality forage should be based on the maturity of the most mature stems. In some cases this may mean the remaining old, maturing stems of frosted shoots that now have new vegetative branches are exhibiting maturity several weeks younger than their stem bases. For high nutritive forage quality, cutting decisions should best be made based on scissors clippings and testing--visual indicators will be giving mixed messages. If using PEAQ (predictive equations of alfalfa quality), try to find areas of the field that were not frosted as you best guide for the quality changes going on in the field as a whole. Using stem maturity and height of new, post-frost stems in the PEAQ assessment will overestimate the quality of the standing forage as a whole. You may see some yield sacrifice from the frost loss.

Physiologically, the moderately frosted plants still have had nearly constant full leaf area and will not have been greatly stressed enough to delay harvest because of frost stress. An exception may be for fields that are recovering from winter injury and have been recovering slowly. These fields would benefit from a week or so delay in harvest, or harvest when the plants reach early- to mid-bloom. Some producers are asking if they should cut alfalfa a week or two earlier than normal, simply because the stem tips have been frozen. This strategy would not only net a yield reduction for the cutting (because of early harvest), but may increase physiological early cutting stress in the plants.

## **Hard frost--25°-26°F or colder**

Cold air that kills alfalfa tissue, deep within the canopy, does lead to important considerations.

Stems present at the time of frost will not produce any additional yield, and plants will attempt to regrow from crown buds.

**Management implications:** If you are to salvage the nutritive value of the severely frozen alfalfa, you need to begin the harvest and curing process soon--before the frozen plant tissue begins to weather, and lose nutritive quality. Physiologically, this is an early harvest and may lead to slower-than-normal regrowth from early cutting stress. This will also set the harvest schedule a week or two earlier for the remainder of the harvests of the year. If you do nothing, new crown shoots (essentially the 2nd growth) will grow up through the frost-killed stems and be at late bud/early flower, ready for harvest 4 to 5 weeks later. The presence of the dead, old stems will add to the dry matter yield of the combined 1st and 2nd crop but will also contribute significant, less desirable fiber.



*An alfalfa plant showing symptoms of frost damage.*

This article originally appeared on pages 67-68 of the IC-494 (8) -- May 2, 2005 issue.

---

**Source URL:**

<http://www.ipm.iastate.edu/ipm/icm//ipm/icm/2005/5-2-2005/alfalfa.html>

**IOWA STATE UNIVERSITY**

**University Extension**