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DS26

# Harvesting Small Grain Crops for Silage [1]

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Growing and harvesting wheat, oats, or rye for forage in the fall and winter can be quite beneficial to your dairy operation. Potential benefits include:

1. The production of a high-quality fiber for lactating cow diets, which is often difficult to produce in Florida due to our sometimes uncooperative environment,
2. The efficient use of tillable land such that it doesn't lie dormant for several months of the year,
3. A second opportunity to grow a successful forage if spring plantings were less than successful due to inclement weather or equipment breakdown.

While small grains can be harvested for the grain itself, it is often more desirable to harvest the whole plant for silage. The removal of the small grain plants as silage rather than grain allows

1. More dry matter to be harvested per acre and
2. A earlier harvest so that the summer crop such as corn or sorghum silage can be planted sooner in the spring.

If enough land can be planted to corn in order to produce enough corn silage to last all year long, then by all means do so, because corn silage is higher in energy than small grains, and secondly, moisture for corn plant development is usually not limiting in the summer as it can often be in the winter. Lack of rainfall in the winter will quickly reduce small grain development.

In order for small grain silage to be an attractive crop for lactating dairy cows, timely harvests at the right maturity are of utmost importance, even more so than with corn and sorghum crops. The time frame for optimum harvest of small grains is short so be prepared to move quickly. They mature rapidly especially during dry, warm days.

There are typically three stages of identifiable plant maturities at which small grains are harvested - boot, milk, and dough stages. The boot stage is the time when the head is enclosed by the sheath of the uppermost leaf. The milk stage is when the grain head releases a white liquidy substance when opened. The grain head continues to lay down carbohydrates so that its consistency becomes more dough-like thus the label "dough stage".

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The chemical composition and dry weight of the plant is changing rapidly as it matures. Table 1 indicates the

crude protein content, Table 2 the digestibility measurements, and Table 3 the dry matter yields of three small grain species (wheat, oats, and rye) at the boot, milk, and dough stages of maturity. (Triticale, a cross between wheat and rye, has not been bred for silage yet, only for grain production.) As the plant matures from the boot stage to the dough stage, quality (crude protein and digestible dry matter) decreases while yield increases. The net yield of crude protein and digestible dry matter shown in Table 4 combines the data from Tables 1, 2, and 3 into the "bottom line." While total yield of digestible nutrients are greatest when plants are harvested at the dough stage of maturity (Table 4), the quality has been reduced to the point where animal performance will be less than desired. Cows eating small grain silage harvested at the dough stage of maturity will eat less total feed and produce less milk than cows fed small grain silage harvested at the milk or boot stage of maturity. The primary reason for this reduced performance is the accumulation of indigestible lignin in the stem of the plant. With more indigestible fiber being consumed and taking up room in the digestive tract, the animal is forced to eat less feed which results in less milk.

Because of the importance of quality fiber for lactating cows, oat and wheat silages should be harvested in the milk to soft dough stage even though the yields per acre of crude protein and digestible dry matter are lower at this stage of maturity. They remain in this optimum stage of maturity only 3 to 6 days so timely harvests are critical. Harvest rye earlier than wheat or oats, preferably in the boot stage. Rye becomes much too fibrous at the milk stage which decreases its energy content. Water content of the plants often are too high at this maturity to direct cut into the silo; therefore some wilting must take place to bring the water content down to about 60 to 65%.

Differences among the three plant species certainly exist. From a purely nutritional standpoint, wheat silage has the most TDN, followed by oats, followed by rye. However other factors besides nutrition are important in selecting the best small grain for your area. Wheat varieties developed for Florida conditions have little resistance to Hessian flies. This pest can destroy a field of wheat quickly if infested. Little can be done to successfully curb the flies, therefore wheat is a riskier crop than oats and rye. A Hessian fly-resistant variety should be available by 1991. Oats are the least tolerant of frost so freezing temperatures are always a risk to oat growers. That leaves rye. While rye yields the least dry matter due to the need for earlier harvests than wheat and oats, it has two major advantages over the other small grains. First, it is the most frost tolerant, and second, it grows well on droughty, sandy soils.

## Summary

1. Small grain silages can be fed to dairy animals, resulting in successful animal production.
2. Harvest wheat and oats by the early dough stage and rye at the boot stage of maturity. Dry matter yields will be less than that at full maturity, but quality will be much superior.
3. Wheat has higher nutritive value than oats and rye, but is susceptible to Hessian fly damage.
4. Oats are the least tolerant of frost.
5. Rye may yield the least dry matter per acre, but is most tolerant of frost and grows well on dry, sandy soils.

**Table 1.**

**Table 1**. Crude protein concentration of three small grain species at three maturity stages.

| Small grain | Maturity Stage | | |
|---|---|---|---|
| | Boot | Milk | Dough |
| | % dry wt. | | |
| Wheat[1] | 22.8 | 15.7 | 11.9 |
| Oats[1] | 20.5 | 14.6 | 11.5 |
| Rye[2] | 13.1 | 8.8 | 7.2 |

[1] University of Minnesota[2] Virginia Polytechnic Institute. After ensiling.

**Table 2.**

**Table 2**. In vitro digestible dry matter coefficients of three small grain species at three maturity stages.

| Small grain | Maturity Stage | | |
|---|---|---|---|
| | Boot | Milk | Dough |
| | % dry wt. | | |
| Wheat[1] | 76.2 | 63.3 | 58.8 |
| Oats[1] | 77.6 | 61.5 | 56.8 |
| Rye[2] | 66.0 | 56.0 | 54.0 |

[1] University of Minnesota[2] Virginia Polytechnic Institute. After ensiling.

**Table 3.**

| **Table 3**. Dry matter yields of three small grain species at three maturity stages. | | | |
|---|---|---|---|
| Small grain | Maturity Stage | | |
| | Boot | Milk | Dough |
| | tons dry matter/acre | | |
| Wheat[1] | 1.46 | 2.73 | 3.78 |
| Oats[1] | 1.57 | 3.01 | 4.10 |
| Rye[2] | 1.80 | 3.50 | 3.80 |
| [1] University of Minnesota[2] Virginia Polytechnic Institute. After ensiling. | | | |

**Table 4.**

| **Table 4**. Yield of crude protein and digestable dry matter of three small grain species at three maturity stages. | | | |
|---|---|---|---|
| Small grain | Maturity Stage | | |
| | Boot | Milk | Dough |
| | tons dry matter/acre | | |
| Crude protein yield | | | |
| Wheat[1] | 0.33 | 0.43 | 0.45 |
| Oats[1] | 0.32 | 0.44 | 0.47 |
| Rye[2] | 0.24 | 0.31 | 0.27 |
| Digestable dry matter yield | | | |
| Wheat[1] | 1.12 | 1.72 | 2.22 |
| Oats[1] | 1.23 | 1.86 | 2.34 |
| Rye[2] | 1.19 | 1.96 | 2.05 |
| [1] University of Minnesota[2] Virginia Polytechnic Institute. After ensiling. | | | |