Swath Width and Conditioning in Forage Production

by Ronald T. Schuler, University of Wisconsin-Madison

Rapid drying of the mowed forage crop is very important to ensure a successful harvest resulting in a high quality forage crop. The mower-conditioner is the machine that provides the crop conditions for this rapid drying. Two of the most important adjustments on the mower conditioner are the swath width and conditioning intensity. Recently, much discussion has focused on wide swaths. Some suggestions have been made to abandon the conditioning system for producing alfalfa silage. Some conditions exist where this may be true.

Conditioning systems must be adjusted so effective crop conditioning occurs and losses do not become excessive. The system must crack the stems which are the slow-drying crop component, and must do little or no conditioning of the leaves. Two conditioning systems found on mower-conditioners are rolls and impellers.

For machines with conditioning rolls, the roll spacing should be adjusted to ensure the crop stems are cracked; therefore, the spacing should be slightly less than the stem diameter. If the spacing is too small, leaves will be separated from the stems, leading to excessive leaf and quality loss. If the roll spacing is too large, the stems will not be conditioned and will dry more slowly. Correct spacing can be determined by observing the crop stems which should have three to four breaks per stem after the crop is discharged from the machine.

For machines with impeller conditioners, the impeller blades abrade the stems to condition the crop. The intensity of the conditioning for this system is controlled by adjusting the position of a shield or deflector located immediately above the impeller. Lowering the deflector creates greater interaction of the crop with the impeller blades, causing a higher degree of conditioning but increasing the risk of excessive losses. Raising the deflector reduces the conditioning intensity and the risk of excessive loss. The mowed crop stems should be checked for abrasions after being discharged from the machine for proper conditioning.

The swath width has always been known to be important to the drying rate of forage placed in a swath. The forage serves as a solar collector where the solar energy is the driving force for drying the crop. A wider swath has a larger area exposed to the sun resulting in more energy being collected and a faster drying rate. The number of studies evaluating the interaction between conditioning and swath width has been limited.

At the University of Wisconsin-Madison, Herzmann (2005) studied the impact of crop conditioning and swath width on the drying rate of alfalfa. A mower-conditioner with a disk mower having a cutting width of 135 inches and a roll conditioner were used. The study conditioning treatments were conditioning and no conditioning. The swath width treatments were 33, 65 and 100% of the cutting width. This provided six treatments for study.

Since this mower conditioner was not capable of producing a swath having a width equal to the cutting width (100%), a tedder was used to distribute the crop to the full cutting width immediately after mowing. The roll clearance was increased to two inches to create the non conditioned treatment with the same mower-conditioner.

Second cutting alfalfa was used in the study and the mowing was done at 11:00 am for each study. Forage samples from the swaths were taken at mowing, 2:00 pm and 5:00 pm on the day of mowing and for the two days following mowing. The swaths were raked on the third day. Three studies with these treatments were completed. Herzmann (2005) calculated a drying constant for each treatment to evaluate the differences in drying rates among the treatments.

For the six treatments, the conditioned treatment with full width swath (100%) always had the fastest drying rate and the lowest moisture content throughout the three days. At 5:00 pm on the cutting date, the moisture content was down to 57% which could have been harvested for alfalfa silage. The unconditioned treatment with the narrowest swath (33%) had the slowest drying rate and the highest moisture content throughout the three days. At 5:00 pm on the cutting date the moisture content was about 69.5%, too wet for alfalfa silage in most storage systems. Both were the expected results.

The unconditioned medium swath (65%) had similar moisture to the conditioned narrow swath (33%) throughout the three days. In addition the unconditioned wide swath (100%) was similar to the conditioned medium swath (65%). At each swath width (33, 65 and 100%) the conditioned swath had a faster drying rate throughout the three days. Herzmann (2005) reported the difference among the treatments became larger as the drying progressed over the three days.

In an earlier study completed in the laboratory, Priepke and Bruhn (1970) evaluated several mechanical and chemical treatments to increase the drying rate of alfalfa in a controlled environment (temperature and relative humidity). They continuously weighed the alfalfa during the drying process. The mechanically conditioned alfalfa dried faster throughout the experiment from the time of cutting to the equilibrium moisture content, which was dependent on the temperature and relative humidity.

If a forage producer is going to abandon the conditioning system on their mower conditioner, the swath width should be about twice as wide in order to expect the same drying rate. For many of the mower-conditioners on the North American market, this will be very difficult to achieve. The maximum swath widths on these machines are from 28-87% of the cutting widths. An opportunity to double swath width may exist for machines below 40%.

A producer in southern Wisconsin increased the swath width by removing the belt conveyors delivering the crop to the conditioning rolls. The cut forage drops on the ground immediately behind the cutterbar. The resultant swath width was nearly equal to the cutting width.

As the swaths become wider, the risk of driving on the swath becomes greater. Driving on the wide swaths should be avoided because the drying rate is reduced and the risk for contaminationof the forage increases. Another risk with wide swaths exists in low yielding crops when the rakes or mergers may not pick up the crop effectively and completely.

In closing, a machine operator, attempting to increase the forage drying rate in the field, should adjust the swath width to the maximum and adjust the conditioning systems to ensure effective conditioning. The operator should not abandon the conditioning systems unless the swath width can be doubled without receiving wheel traffic. High quality forage will result from taking steps to ensure rapid drying of the forage in the swath.