How to Reduce Traffic Effects in Alfalfa

by Dwain Meyer, North Dakota State University

Wheel traffic has significant effects on alfalfa productivity. Research by Dan Undersander and others at the University of Wisconsin suggested alfalfa forage yield is reduced 20-25% by traffic five days after harvest, with greater reduction when traffic occurred at a later date. Effects were evaluated over the past four years in conjunction with alfalfa performance testing at Fargo, ND. The 2004, 2005, and 2006 performance tests had half the replicates treated with a single pass of a medium-size tractor with duals five days after harvest or equivalent to baling the hay five days after cutting. There were eight varieties in the 2004 and 2006 seedings, and 12 varieties in the 2005 seeding.

First harvest was taken at the late vegetative to very early-bud stage, when the height reached 26”-28”; no traffic occurred on this harvest. Harvests were taken at the mid to late-bud stage of the non-traffic treatment for the second harvest, about 10-80% bloom (depending on plant height) in the third harvest, and whenever regrowth reached about three inches or a killing frost occurred during the fall.

Seasonal forage yield averaged across the varieties included in each test as impacted by traffic is shown in Table 1. Forage yield was decreased by a three-year average of 9.0 and 5.1% for the 2004 and 2005 seedings, respectively. The greatest reduction occurred in 2005 (11.7%) and the least in 2008 (average 3.7%), which affected the three-year average. Obviously, North Dakota has not experienced as great of a reduction in forage yield from traffic as Wisconsin.

Table 1. *Traffic effects on alfalfa production at Fargo, ND.*

Production Year	No Traffic	Traffic	Significance	% Decrease
	----------Tons/ac----------			
	2004 Seeding, 8 Varieties			
1st, 2005	8.54	7.54	*	11.7
2nd, 2006	5.87	5.47	NS	6.8
3rd, 2007	7.65	7.06	NS	9.2
Mean	7.35	6.69		9.0
	2005 Seeding, 12 Varieties			
1st, 2006	6.00	5.62	10%	6.3
2nd, 2007	7.00	6.51	*	7.0
3rd, 2008	8.17	7.96	*	2.6
Mean	7.06	6.70		5.1
	2006 Seedings, 8 Varieties			
1st, 2007	6.58	6.16	*	6.4
2nd, 2008	7.65	7.29	10%	4.7
3rd, 2009				

The reason for the difference between states is not completely clear; however, 2006 and 2008 (the two years with the least traffic effects) both had water-stress during the second and third harvests. Dry soils may reduce traffic effects, or soil texture (a high clay soil with 6-7% organic matter at Fargo) may play a role. Fargo clay soils are shrink-swell soils (smectite types) or types that expand and contract during water uptake or drying out. These soils have most of the soil compaction removed over the winter, which may not be the case for many soil types.

The effects on yield are overstated because the entire plot had a single pass with the tractor tire (Table 1). Alfalfa cut with a 12’ windrower would only have ~25% of the area trafficked if raking was not done. However, any raking, tedding, windrow combining, windrow inversion, bale stacking or removal increase the percentage of the field trafficked during each harvest. In addition, baling, raking, or removal of bales five days after cutting or later would increase effects because regrowth initiates and is more advanced prior to traffic.

Trafficked and non-trafficked treatments were harvested the same day. Traffic damage is primarily crushing of regrowth shoots and crown buds that have initiated. Traffic, therefore, causes a delay in maturity due to the plant initiating new shoots to replace those damaged. Most producers have seen the delayed maturity in wheel tracks of balers or other equipment randomly going across a field. Forage yields may have been greater in the trafficked treatment if maturity at harvest was the same, at least assuming the delayed harvest did not prevent an additional cutting for the year.

Alfalfa varieties may vary in their tolerance to traffic (Table 2). Experiments conducted in Iowa, Nebraska, Wisconsin, and New York tested the traffic tolerance of seven elite varieties from varying companies over a three-year period. Forage yield of AmeriStand 403T, the highest yielding variety with traffic, was 16% greater than the least traffic-tolerant variety. AmeriStand 403T is known to have a deeper set crown than many varieties, which may be associated with its improved traffic tolerance since the soil may protect the deep-set crown buds. However, crown depth would not protect new shoots that are crushed with traffic.

Table 2. *Traffic-tested alfalfa at 4 locations, 3-year averages.*

Cultivar	Brand	Tons/ac
AmeriStand 403T	America’s Alfalfa	5.45
Rebound 4.2	Croplan Genetics	5.24
FQ 315	Mycogen/Cargill	5.05
GH 757	Golden Harvest	4.96
DK 140	DeKalb/Monsanto	4.83
Magnum V	Dairyland Seed	4.73
54Q53	Pioneer	4.63

Results did not show any significant differences in traffic tolerance among the varieties included. Only once in 24 experiments/year/harvest observations was the traffic treatment by variety interaction significant. AmeriStand 403T was included as a traffic-tolerant variety in each experiment, but it was very similar to the mean of all varieties. The lack of differential response by varieties to traffic at Fargo is likely associated with the lower level of loss due to traffic and may again be associated with the smectite soils found in the Red River Valley of the North, like those in the research done at Fargo.

Several things can be done to decrease traffic effects in production. First, minimize the number of trips over the field to those needed to efficiently harvest the alfalfa. Second, traffic two days after harvest causes less damage than five days and traffic five days causes

less loss than ten days after harvest due to the amount and size of new shoots. Therefore, harvesting alfalfa as haylage results in less traffic damage than harvesting as dry hay. Third, align tires where possible to track in the same area. A second traffic pass on the alfalfa stand causes less damage than the first since shoot crushing occurred in the first pass and less occurs in the second. Fourth, remove bales from the field as soon after baling as possible. Fifth, keep traffic (including snowmobiles) off alfalfa fields when snow is melting. Compaction of the snow may form an ice sheet, which may increase winter injury or kill. Sixth, never drive over an alfalfa field when the alfalfa plant is frozen in the fall. This could also increase winter injury or kill.