

## The Effect of Hay Rake Type on Ash Content of First Cutting Alfalfa Hay

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Ash content of alfalfa (*Medicago sativa* L.) hay typically ranges from 6 to 8% dry matter (DM) with ash contents > 8% indicating hay is likely contaminated with soil. It has been theorized that rake-type can impact ash content in hay; however, this has not been tested. The objective of this research was to determine the effect of rake-type on ash content of alfalfa hay. Research was conducted in 2015 in Minnesota (Entic Hapludolls; loamy sand), Pennsylvania (Typic Hapludalfs; silty loam) and Wisconsin (Typic Agriudolls; silty loam) on first cutting alfalfa hay. The experimental design was randomized complete block with 4 replicates. Treatments involved consolidating two swaths of mowed hay with a wheel rake, side-delivery rake, rotary rake or a hay merger. To show changes in ash throughout haymaking, 4 random samples from the standing forage and from the cut swaths were taken in each replicate. Post-raking, 4 samples per replicate were taken from windrows made by each rake type and from bales (Minnesota and Wisconsin) or haylage (Pennsylvania) made from rake windrows. Samples were analyzed for ash content by igniting samples in a furnace at 600°C. Statistical significance was set at  $P \leq 0.05$  and means separations were determined using Tukey HSD and are presented as percent DM. Environmental interaction prevented the combination of rake treatments across locations ( $P < 0.0001$ ); locations were analyzed separately. The mean ash contents of the standing forage were 11.2, 9.8 and 9.4% in Minnesota, Pennsylvania and Wisconsin, respectively. Post-cutting, mean ash contents were 12.8, 10.2 and 9.4% in Minnesota, Pennsylvania and Wisconsin, respectively. Ash content in windrows after raking differed among rakes ( $P = 0.0005$ ) and after baling ( $P = 0.0034$ ) in Minnesota. The merger resulted in the least amount of ash (11.1%) compared to all other treatments that had similar ash contents (13.6 to 15.3%;  $P < 0.0005$ ). Post baling, the merger resulted in less ash (11.4%) compared to the wheel rake (14.6%). Pennsylvania also showed differences in ash contents between rakes ( $P = 0.0003$ ) and post-chopping ( $P = 0.03$ ). The wheel rake resulted in the highest ash content (10.6%) and was different than the side-delivery, merger or rotary rakes (9.5 to 9.9%). After chopping, haylage from the merged windrows had less ash (9.8%) compared to the wheel rake (11.1%). In Wisconsin, the ash content of hay in windrows post-raking (9.0 to 10.3%) and post baling (9.0 to 9.5%) was similar ( $P > 0.29$  and  $P > 0.46$ , respectively) for the 4 hay rakes. Differences in ash content were found between hay rakes at two locations with the wheel rake resulting in the greatest amount of ash while the merger resulted in the least amount of ash. Farmers looking to reduce ash content of hay should consider using a hay merger when combining swaths.