Harvest Schedule Affects Productivity of High-Quality Alfalfa Varieties Grown Across a Latitude Gradient in Michigan

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Alfalfa growers face a biological dilemma because the nutritive value of forage declines rapidly as the crop matures and increases in yield. To produce high quality alfalfa, growers must sacrifice yield by harvesting no later than late bud stage of maturity with conventional varieties. Lengthening the acceptable harvest window through use of reduced lignin or high-quality varieties may minimize this problem. We investigated yield and forage quality of alfalfa harvested on three harvest schedules at two sites in Michigan: East Lansing (42°42.349'N) in south-central Michigan and Chatham (46°20.702' N) in the Upper Peninsula.

Experimental design was a randomized complete block (n=4) in a split plot arrangement where main plot was three harvest schedules (28, 35, and 42 days) and subplot was alfalfa variety (AFX469, HiGest360, WL354HQ, FSG440HVXRR, HVX Driver, WL341HVXRR) chosen to cover a range of forage quality improvement approaches. Each year, first cut occurred on staggered dates, with the 28-d first cut harvest at the time of late bud, the 35-d first cut a week later, and 42-d a week after that. Subsequent harvests followed the 28/35/42-d schedule except for: 1) plots were cut early if RR/HVX varieties reached 50% bloom, and 2) no plots were cut during the six weeks before expected fall killing frost and final fall harvest was taken on the same day within sites for all harvest schedules each year.

Across harvest schedules, total stand dry matter yields (DMY) over three production years were 62% greater in southern than northern Michigan (41.4 vs. 25.50Mg/ha, respectively, P<0.001). Across sites, total DMY was greater for 35-d and 42-d harvest schedules than for 28-d (34.2, 34.0 vs. 32.11 Mg/ha, respectively, P<0.001). Total DMY was greater for AFX460 and WL354HQ (mean 34.6 Mg/ha) than for HarvXtra and HiGest varieties (mean 32.8 Mg/ha, P<0.001). Response of amylase neutral detergent fiber (aNDF), 48-hour NDF digestibility (NDFD48), lignin, crude protein (CP), and relative forage quality (RFQ) to harvest schedule differed between sites (site x schedule interaction, P<0.05). At the northern Chatham site, RFQ was greatest on the 28-d schedule and did not differ between 35- and 42-d schedules (231 vs. 163, 176, P<0.001). At the southern East Lansing site, nutritive values were best on the 28-d schedule, but less on the 35-d schedule than on 42-d (230 vs 183 vs 209, P<0.001). A potential explanation for this unexpected result was found in mean stage count data which revealed high numbers of vegetative stems under delayed harvest in cuts 3 and 4. Across all sites, schedules and cuttings, alfalfa varieties differed in the quality characteristics aNDF, NDFD48, lignin, CP, and RFQ, but the ranking of varieties differed. In general, the three HarvXtra varieties (mean RFQ 204) exhibited better forage quality than AFX460 (RFQ 184, P<0.001), but at least one of the conventionally bred high-quality varieties was equivalent to at least one of the HarvXtra varieties for all quality constituents. Moreover, the three HarvXtra varieties were not equivalent to each other for NDFD48 (P<0.001). These results show that extended harvest schedules can improve alfalfa yield in both southern and northern Michigan but underscore the reality that side by side variety comparisons are still needed to demonstrate potential yield and quality of alfalfa varieties even when biotechnology traits are present.