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| **Title:** *(Use Normal style (Times New Roman 12). Only capitalise the first letter of the first word. No full stop at the end of the title)* |
| Performance of dairy cows offered grass silages produced within either a three- or five-harvest system |
| **Summary:** *(Your summary (Times New Roman 10) must use Body text style and must not be longer than this box)* |
| **Application** Cows offered silage produced within a five-harvest system produced an additional 1.8 kg energy corrected milk (ECM) yield compared to cows offered silage produced within a three-harvest system.  **Introduction** In order to improve grass silage quality, more producers are moving towards multi-harvest silage systems (considered as four or more harvests). However, there is little research evidence to quantify the effects of multi-harvest silage systems on herbage yield or cow performance. Previous work indicated that increasing harvesting frequency from three to four harvests improved silage quality, silage dry matter intake (DMI), milk yield and milk fat plus protein yield (Craig et al., 2023). The current study investigated the effect of offering grass silages produced within either a three- or five-harvest system on cow performance.    **Material and methods** Two treatments, comprising perennial ryegrass silages produced within either a five-harvest (5H) or three-harvest system (3H), were examined. Cutting dates for 5H were 30 April, 1 June, 29 June, 10 August and 7 September 2021, while cutting dates for 3H were 17 May, 28 June, and 23 August 2021. Silages were offered in a 21 wk study involving 34 mid-lactation (av. 147 days in milk) Holstien cows (30 multiparous and 4 primiparous). Within each treatment cows were offered silage from each harvest in consecutive order (harvest 1, followed by harvest 2, etc) for a pre-determined number of days (in proportion to the herbage dry matter (DM) yield for each harvest). Silages were offered *ad lib*, with a single concentrate type offered at a flat rate (mean of 9.5 kg/cow/d) through an out-of-parlour feeding system. Rumen fluid samples were obtained from each cow during the final week when silage from each harvest was offered and analysed for volatile fatty acids (VFA), ammonia and pH. Treatment effects on DMI, milk yield and composition, body weight (BW) and body condition (BCS) were examined. Mean weekly data were analysed using REML, with cow as the experimental unit and week as the repeated measure. Rumen data was weighted according to the amount of time the cows were offered each silage and results analysed using ANOVA (GenStat 21st ed., VSNI Ltd.).  **Results** Total herbage DM yield was 11.2 and 12.6 t/ha for the 5H and 3H systems, respectively. Mean crude protein, metabolizable energy and neutral detergent fiber concentrations of the silages produced were 152 g/kg DM, 11.5 MJ/kg DM and 341 g/kg DM respectively within the 5H treatment, and 131 g/kg DM, 10.9 MJ/kg DM and 413 g/kg DM respectively within the 3H treatment. Silage DMI and total DMI was greater in 5H than 3H (P < 0.001; Table 1). Milk yield, milk fat plus protein yield and ECM were also greater with 5H (P = 0.037, P = 0.010 and P < 0.001 respectively), while milk fat and protein content were unaffected. Treatment had no effect on BW or BCS. All parameters changed over time (P < 0.001), while there were significant Treatment × Week interactions for all parameters (P < 0.05) except milk fat content. Rumen pH was unaffected by treatment, while rumen ammonia concentration was greater (7.9 vs. 6.2 mg/dL; P = 0.009) within the 3H treatment. Concentrations of VFA differed between the two treatments with 3H exhibiting higher acetate (66 vs. 61 mMol/L; P = 0.040) and total butyrate concentrations (17.1 vs 13.7 mMol/L; P < 0.001) compared to 5H.  **Table 1** Effect of silage harvesting frequency on cow performance.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  | P-Values: |  | |  | 5H | 3H |  | SED | Treatment | Week | Interaction | | Silage DMI (kg/d) | 14.1 | 11.7 |  | 0.40 | <0.001 | <0.001 | <0.001 | | Total DMI (kg/d) | 23.4 | 21.1 |  | 0.44 | <0.001 | <0.001 | <0.001 | | Milk yield (kg/d) | 33.5 | 31.9 |  | 1.02 | 0.037 | <0.001 | <0.001 | | Fat (g/kg) | 47.7 | 48.0 |  | 1.14 | 0.851 | <0.001 | 0.619 | | Protein (g/kg) | 35.9 | 35.1 |  | 0.75 | 0.359 | <0.001 | <0.001 | | Fat + protein yield (kg/d) | 2.78 | 2.65 |  | 0.072 | 0.010 | <0.001 | 0.001 | | Energy corrected milk yield (kg/d) | 37.4 | 35.6 |  | 0.94 | 0.007 | <0.001 | <0.001 |   **Conclusion** Increasing harvesting frequency from three to five harvests improved silage nutritive value, but reduced herbage DM yield (t/ha). Silage DMI, milk yield, milk fat plus protein yield and ECM were increased within the five-harvest silage system. The increase in rumen ammonia in 3H may indicate an imbalance between availability of nitrogen and energy for microbial protein synthesis.  **Acknowledgements** This project was funded by Department of Agriculture, Environment and Rural Affairs (DAERA) and AgriSearch (Farmers Levy).  **References**  Craig, A., Gordon, A. and Ferris, C. (2023). Animals, 13(2), 228-241. |