value of the pelt. It is believed that this phenomenon is the result of infection with the Aleutian mink disease virus (AMDV). The objective of this study was to verify AMDV infection in mink with white hair fibers using histopathology and direct viral detection by the polymerase chain reaction (PCR). Seventeen melatonin-implanted black mink with white hair fibers from two ranches were pelted at a commercial plant in late October. Animals were approximately 6 mo old when pelted, and were the progeny of mink from ranches that were repopulated with AMDV-free animals in February. Heart, lung, kidney and liver were subjected to microscopic examinations and lesions suggestive of Aleutian disease (AD) were scored between 0.5 (trace) to 4 (severe). AMDV was detected in the spleen samples of all 17 mink by PCR. Lungs of all animals showed histopathological lesions that are not normally caused by AMDV infection, but all animals had moderate to severe AD lesions in their kidneys, heart, liver and/or brain. AD lesions were detected in all four organs of 82.3% of the mink. The widespread and severe AD lesions indicated that all animals were clinically sick. The findings suggested that AMDV infection was the cause of hair depigmentation, which may be the result of a disruption in the melanin production in hair follicles due to the death or malfunctioning of melanocytes or disruption of the melanin pathway. This phenomenon seems to be controlled by genetic and environmental factors, because only some infected mink develop this defect. Although the presence of white hair fibers is a strong indication of AMDV infection, lack of white hair is not suggestive of AMDV-free animals.

Key words: Aleutian mink disease virus, mink, hair depigmentation, polymerase chain reaction

Effect of moderate maternal diet restriction on the viability and development of mink kits (*Neovison vison*). Lori Balderston*‡ and Kirsti Rouvinen-Watt. Nova Scotia Agricultural College, Truro, NS, Canada.

Large litter size and kit viability are of great economic importance to the mink producer, whereas large body size impairs reproduction in mink breeder females. This study investigated the effects of moderate maternal diet restriction on the viability and development of mink kits. One hundred (100) standard black sister pairs were used with each sister randomly assigned into a CTRL or a moderate diet restriction treatment (MDR), which was fed $\sim$20% less from September to December in order to avoid over-conditioning. Total kit mortality, stillborn mortality and growth of the kits at 1, 21, and 42 d of age were compared between groups. Paired T-test in Minitab and Proc Mixed with repeated measures in SAS were used for the analysis of the mortality and body weight data, respectively. A lung flotation test was used to determine the incidence of stillbirths out of neonatal mortality. The total number of kits born per litter in the CTRL group was 6.4 ± 0.4, while the MDR dams had 7.1 ± 0.3 kits ($P > 0.05$). Percent kit mortality by 1 d, 21 d, and 42 d was 19.4 ± 3.0, 22.9 ± 3.1, and 28.7 ± 3.9 for the CRTL group, and 13.2 ± 2.5, 17.4 ± 2.7, and 18.4 ± 3.1 for the MDR group. There was a trend for higher neonatal (1 d) mortality ($P = 0.102$), and significantly higher cumulative mortality by weaning (42 d) ($P < 0.05$) in the CTRL group. The average total mortality was 2.1 ± 0.3 kits for the CTRL group and 1.6 ± 0.3 kits for the MDR group ($P > 0.05$). There was no difference in the percent stillborn kits per litter (CTRL 11.5 ± 2.4, MDR 9.0 ± 2.2; $P > 0.05$). Also, the percentage of stillborn out of neonatal mortality or total mortality by 42 d did not differ between the groups. At all time points, the MDR group had live litter weights heavier than the CTRL group, day 1: CTRL 58.8 g, MDR 71.9 g (± 3.5; $P < 0.01$), 21 d: CTRL 606.4 g, MDR 786.9 g (± 38.2, $P < 0.01$), and 42 d: CTRL 1629.4 g, MDR 2012.0 g (± 112.5; $P < 0.05$). The average kit weights did not differ between the groups, 1 d: CTRL 13.0 g, MDR 12.0 g (± 0.4; $P = 0.054$), 21 d: CTRL 136.3 g, MDR 135.7 g (± 2.5; $P > 0.05$), and 42 d: CTRL 373.9 g, MDR 362.5 g (± 9.7; $P > 0.05$). In conclusion, moderate maternal diet restriction improved the viability of mink kits and significantly increased litter weights. It is evident that the heavier litter weights throughout the lactation period were due to the decreased kit mortality in the MDR group, while individual kit growth did not differ between the groups.

Key words: Kit mortality, growth, maternal body condition

Alfalfa at three stages of maturity harvested at sunset and sunrise: botanical traits, chemical composition and dry matter digestibility. Mojtaba Yari[1†], Reza Valizadeh[1], Abbas Ali Naserian[1], Gholam Reza Ghorbani[2], Parviz Rezvani Moghaddam[1], Arjan Jonker[3*†], and Peiqiang Yu[3]. [1]Department of Plant Science, Ferdowsi University of Mashhad, Mashhad, Iran; [2]Department of Animal Science, Isfahan University of Technology, Isfahan, Iran; [3]Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK, Canada.

Optimum alfalfa harvesting time is critical to obtain high-quality forages for lactating dairy cows. This experiment was conducted to find the optimum maturity stage and time of the day to harvest alfalfa for high producing dairy cattle in the east of Iran. Experimental hays for dairy cattle diets were harvested from a third cut of a second year alfalfa field (4.2 ha) divided into three plots (1.4 ha) with each plot assigned to one of the following three stages of maturity: early bud (EB), late bud (LB) and early flowering (EF, local commercial harvesting stage). Half of each plot was harvested at sunset (PM) after a sunny day and the other half was

harvested the next morning (AM), in 2010 on June 13/14, 19/20 and 26/27 for EB, LB and EF, respectively. After 4 field days, these hays ($n=6$) were baled in a factorial arrangement. Advancing from EB to EF, the DM content of fresh alfalfa increased ($P<0.01$) and delaying the time of cutting in the day increased its DM content ($P<0.01$). With advancing maturity, leaf content and leaf/stem ratio decreased ($P<0.01$). These traits increased at PM cutting compared with AM cutting ($P<0.01$). Across maturity stages ash and CP content decreased and total carbohydrate (TCHO), NDF, ADF and cellulose content increased ($P<0.05$). These components were similar between alfalfa harvested at sunset and sunrise. Fat content was similar among the maturity stages and between PM and AM harvests ($P<0.05$). Alfalfa harvested at sunset had a higher true potentially degradable protein (PB) and lower buffer soluble protein (BSP) compared with sunrise harvests ($P<0.05$). These protein fractions were similar among three stages of maturity. There was an interaction between stage of maturity and cutting time for dry matter digestibility (DMD) after 24 h and 48 h of in situ incubation ($P<0.05$), which were both highest for alfalfa harvest at EBPM. Our findings confirm, as previously reported, that with advancing maturity ash, CP and leaf contents decrease and NDF, ADF and TCHO contents increase. Alfalfa harvest at sunset had higher DM, leaf and PB contents and lower BSP content. Results from the current study indicate that early bud stage at sunset is the optimum time to harvest alfalfa.

Key words: Alfalfa hay, sunset and sunrise, botanical traits, chemical composition and dry matter digestibility, stage of maturity

Alfalfa at three stages of maturity harvested at sunset and sunrise: effects on dairy cattle performance. Mojtaba Yari[1†], Reza Valizadeh[1], Abbas Ali Naserian[1], Gholam Reza Ghorbani[2], Parviz Rezvani Moghaddam[1], Arjan Jonker[3*†], and Peiqiang Yu[3]. [1]Department of Plant Science, Ferdowsi University of Mashhad, Mashhad; Iran; [2]Department of Animal Science, Isfahan University of Technologhy, Isfahan, Iran; [3]Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK, Canada.

Information is lacking on the optimum time to harvest alfalfa to obtain high-quality forage for dairy cattle. The objective of this study was to determine optimum maturity stage and time of the day to harvest alfalfa in the east of Iran. The third cut of a second-year alfalfa field (4.2 ha) was divided into three plots (1.4 ha) with each plot assigned to one of the following three stages of maturity: early bud (EB), late bud (LB) and early flowering (EF, local commercial harvesting stage). Half of each plot was cut at sunset (PM) after a sunny day and the rest was cut the following morning (AM) in 2010 on June 13, 14, and 19, 20 and 26, 27 for EB, LB and EF, respectively, and hays ($N=6$) baled after 4 d. Eighteen Holstein-Frisian dairy cows (66.3 d in milk and 43 kg milk d^{-1} pretrial) were used in a cyclic changeover design with three 21-d periods in a 3×2 factorial arrangement. Total mixed rations consisted of % DM of 20% experimental alfalfa hays plus 15% barley silage and 65% concentrates delivered twice daily. Organic matter intake of cows consuming EBAM alfalfa hay was higher than those consuming EFAM ($P<0.05$). With advancing maturity stages, net energy intake of cows tended to decrease linearly ($P<0.1$). In vivo total tract DM, OM, CP and NDF digestibility and daily DM, OM and NDF digestible intake were highest in EFPM alfalfa hay and were lowest for LFAM alfalfa hay ($P<0.05$). Cows fed alfalfa harvested at PM had more digestible CP intake per day than AM fed cows ($P<0.05$). With advancing maturity stages, digestible CP intake of cows decreased, while the efficiency of conversion of feed N into milk N of cows increased linearly ($P<0.05$). Feed efficiency, measured as kilograms milk per kilogram DM intake, was higher at EFAM compared with LBAM ($P<0.05$). Alfalfa harvested at sunset tended to increase milk fat yield (kg d^{-1}, $P<0.14$). Daily eating time per kilogram DM intake was shorter for cows fed EB alfalfa hay compared with other hays ($P<0.05$). Alfalfa harvested at early bud had higher nutrient availability, but including this forage in dairy cattle diets containing high concentrate level decreased feed efficiency. Alfalfa harvested at sunset had higher in vivo feed digestibility and increased digestible nutrient intake. Overall, alfalfa harvested at early bud at sunset has higher nutrient availability for dairy cattle.

Key words: Alfalfa hay, stage of maturity, diurnal cutting, dairy cattle performance

Growth and pigmentation in Arctic charr (*Salvelinas alpinus*) fed diets with different lipid sources and astaxanthin. H. Lin*[‡] and D. M. Anderson. Nova Scotia Agricultural college, Truro, NS, Canada.

Pigment, a significant dietary cost in salmonid production, is estimated to be over 10% of the cost of diets. Astaxanthin is the pigment of choice. Fish oil is available in finite quantities, so alternate lipid sources need investigation. Tissue deposition of astaxanthin can be related to the nature of dietary lipid as lipid source in diets influences absorption. This study compared the growth performance, rate and level of flesh pigmentation in Arctic charr (initial weight approximately 50 g) fed diets with different lipids; beef tallow (BT), poultry grease (PG) camelina oil (CO), flax oil (FLO) or fish oil (FO) with synthetic astaxanthin added at 60 mg kg^{-1}. A control diet (CON) containing fish oil was compared with diets containing 65% of the FO replaced with one