MOISTURE AND WRAPPING AFFECT TEMPERATURE AND HAY QUALITY

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Forage represents a significant portion of the diet for all classes of post-weaned horses and may constitute the entire energy portion of a diet for some horses. Hay is likely the most expensive dietary component of maintaining a horse. Harvesting hay can be complicated by poor drying conditions and rainfall. Hay that is baled prior to adequate drying can result in mold and forage quality losses. These components have not been investigated thoroughly for large baled, cool-season grass hays intended for horses. The objectives of this study were to determine the relationship between moisture at time of baling and the effect of wrapping on bale temperature, forage quality, and mold formation of large round baled cool-season grass hay. Over a two-year period (2008 and 2009), 40 1.2 x 1.5-m round bales were packaged and tied with net wrap. All forage was first-crop, harvested from a pure stand of orchardgrass in full flower. Targeted moisture ranges included low moisture (LM), <170 g/kg; intermediate moisture (IM), 200 to 250 g/kg; and high moisture (HM), 300 to 350 g/kg. In 2008, treatments included LM, IM, HM, and HM wrapped with plastic (HMW). In 2009, plastic wrapping was added to all treatments and included LM, LM wrapped (LMW), IM, IM wrapped (IMW), HM, and HMW. Each treatment was replicated four times in a randomized complete block design. The bales were stored outside on a well-drained sod surface in a row running east and west with bales of each moisture treatment type tightly butted against each other. After baling, each bale was cored, and samples were analyzed for forage nutrient composition. Forage quality indices included crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF), equine digestible energy (DE), calcium (CA) and phosphorus (P). After baling and sampling, three temperature data loggers were placed in each bale at approximately 38, 72 and 114 cm from the top of the bale, and approximately 61 cm from either flat end of the bale. After temperature sensors were placed, selected bales were immediately wrapped six times with one mil plastic wrap. Temperature sensors recorded temperature every hour for 7 (2008) or 10 (2009) weeks. After 7 or 10 weeks, the sensors were removed and six additional cores were taken on each bale to determine forage quality, mold counts and identification of microflora. Heating degree days (HDD) were computed as the summations of the daily increment by which the average internal bale temperature was greater than 30°C. Data were analyzed using PROC MIX in SAS. Forage quality components were maintained for all wrapped treatments and unwrapped treatments <120 g/kg initial moisture. These same treatments resulted in reduced maximum temperatures (<50^{0}C) and less heating degree days (<151). In 2008, ADF and NDF concentrations of higher moisture treatments increased during storage (*P-value* = <0.01), which was expected. Treatments >160 g/kg moisture resulted in >3.4 million cfu of mold, HM treatments resulted in the greatest maximum temperature (>77^{0}C) as well as the greatest accumulation of HDD within bales (>1,103). Less than 500,000 cfu of mold is considered safe for livestock feed. Using this threshold, all wrapped forage and LM in 2009 would be considered safe for livestock feeding. Reducing mold growth and maintaining forage quality was achieved by baling dry hay (< 120 g/kg moisture) and wrapping wet hay (200-350 g/kg moisture).