FORCED-AIR VS. MICROWAVE OVEN SAMPLE DRYING DOES NOT AFFECT RUMEN STARCH DIGESTIBILITY, ESTIMATED BY *IN SITU* RUMEN TECHNIQUE, FOR TMR, CORN SILAGE, OR HIGH MOISTURE CORN GRAIN

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INTRODUCTION:

Laboratory drying technique is known to affect dry matter results. For example, forced-air oven drying is known to volatilize more than water with fermented silages, thus dry matter results based upon weight lost upon calculations should be corrected for these non-water losses (Watson & Ferguson, 1937). Beyond dry matter measure accuracy, oven drying corn grain samples has also been recognized to reduce rumen starch digestibility relative to undried (Ali et al., 2014). However, the discussion in commercial forage analysis relates to microwave oven versus forced-air oven drying, and to the authors' knowledge no published data exist investigating both forced-air and microwave ovens in relation to starch digestion measures. Thus, the objective here was to determine if commercial laboratory drying techniques impact rumen starch digestibility measures.

MATERIALS AND METHODS:

Commercial dairy total mixed ration (TMR, n=5), corn silage (CS, n=5) and high moisture corn (HMC, n=5) samples were submitted by a commercial dairy nutritionist and further assessed. In general, the *in situ* rumen digestion procedure employed here is that described by Heuer (2014). Samples were split and treated using different drying techniques; undried (UN), forced-air (FA) and microwave (MW) oven. Understanding that each microwave and forced-air ovens are variable instruments, two additional oven intensities (low and medium) were applied. With forced-air and microwave ovens, low and medium intensities were defined as 52C (FAL) and 105C (FAM) or microwave oven power setting equal to 3 (MWL) and 6 (MWM) in a 1500W oven, respectively.

Approximately 200g of subsample were dried by each technique, using a sequential drying technique where samples were dried, weighed, then further dried, then reweighed (and so-on) until weight loss upon further drying was less than 1g, as is done with commercial feed sample processing. Mean minutes to dry were 1200, 380, 24 and 16 for FAL, FAM, MWL and MWM. Dried CS and TMR samples were then ground to pass a 6mm screen (Wiley mill) and HMSC and UN samples were not ground. Processed samples were then weighed, 3g, into Ankom R510 bags, and incubated for 3, 7, and 16h, in triplicate in three ruminally cannulated lactating dairy cows consuming a 60% forage, corn silage based diet. Residue bags were rinsed in a laundry machine for two five-minute rinse cycles and then dried at 50C for 24h. Sample bags with residue were weighed to determine DM disappearance. Residues were composited and starch (% of DM) assessed using the Hall (2008) procedure. Starch digestibility at 3, 7,and 16h (SD3, SD7, and SD16; % of starch) were determined as starch lost during incubation.

Figure 1: *in situ* rumen starch digestibility, % of Starch, for 3, 7, and 16h incubation of undried, unground samples or samples dried using microwave or forced-air ovens and ground to a pass 6 mm screen.

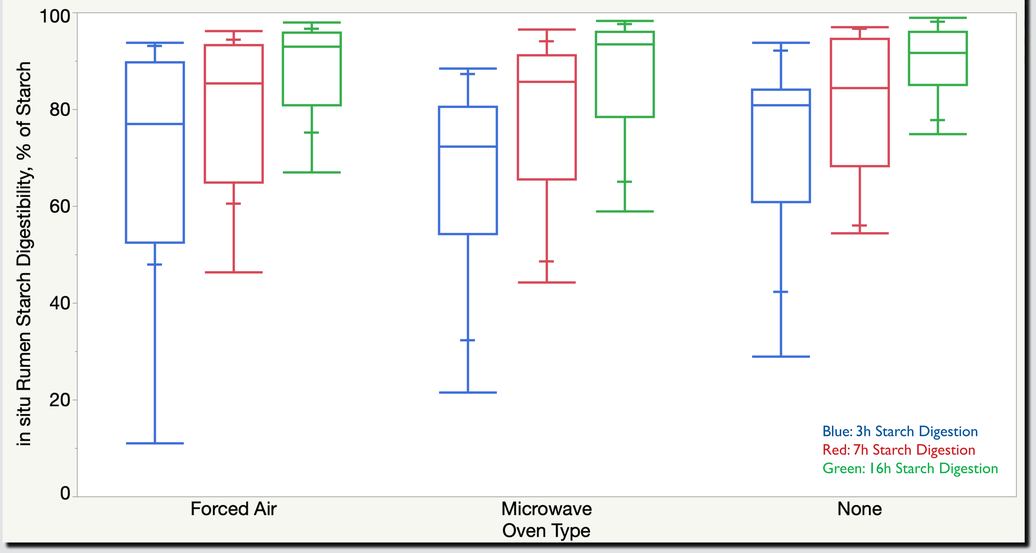
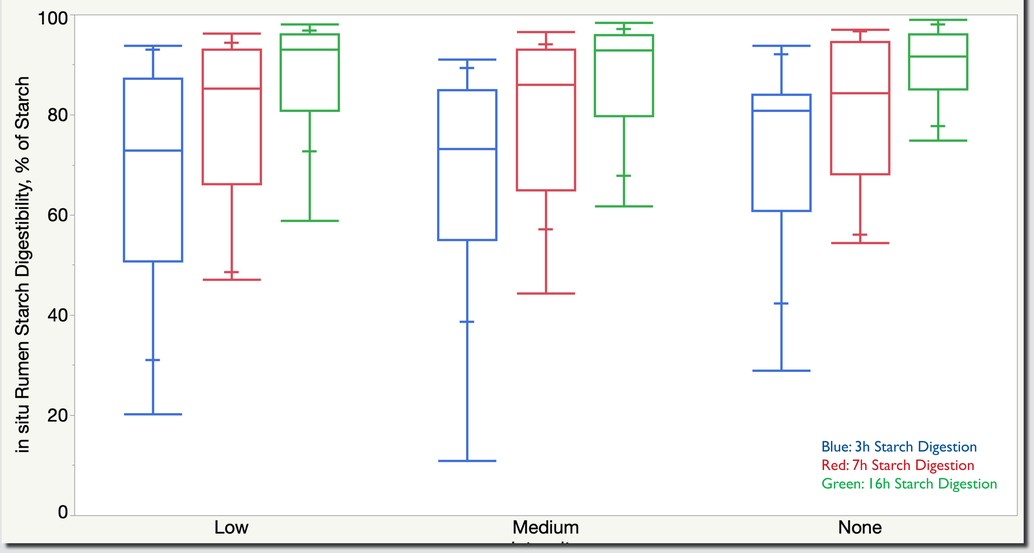


Figure 2: *in situ* rumen starch digestibility, % of Starch, for 3, 7, and 16h incubation of undried, unground samples or samples dried at low and medium intensities, and ground to a pass 6mm screen.



KEYWORDS:

Starch digestion, Corn Silage, Drying technique

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STATISTICAL ANALYSIS:

Starch, SD3, SD7 and SD16 (dependent variables) were related to feed, oven type, and drying intensity. Farm was considered a random effect. All parameters were fit to model using backwards elimination using SAS JMP Pro v11. Effects were considered trends at $P<0.10$ and significant at $P<0.05$.

RESULTS AND DISCUSSION:

Starch and rumen starch digestion (SD3, SD7 and SD16) were not significantly affected by drying technique, but each was related to feed type ($P<0.05$). Starch digestibility means, at 3, 7, and 16h *in situ* rumen incubation, in box plot format and quartiles for each drying treatment are presented in Figure 1. Drying technique tended to affect SD3 ($P = 0.09$), with microwave oven dried samples numerically less in 3h rumen starch digestibility than either forced air or undried samples. Further, oven (forced-air or microwave) drying intensity quartiles, shown in box plot format, are presented in Figure 2. There were no effects due to intensity observed. Our results contrast those published by Ali et al. (2014) in that both forced-air and microwave oven drying did not reduce *in situ* rumen starch digestibility measures. These observations may be due to the low to medium intensity under which samples were dried.

CONCLUSION:

Our observations and results provide one means of evaluating dry matter technique impact on starch digestibility. Our results suggest that forced air versus microwave oven drying does not impact rumen starch digestibility measures for commercial dairy feeds.

REFERENCES:

- Heuer, C.R. 2014. Ensiling and processing of corn silage and high moisture corns and laboratory method comparison of starch digestion in ruminants. M.S. Thesis. University of Wisconsin - Madison.
- Watson, S.J., and W.S. Ferguson. 1937. The chemical composition of silages. J. Agric. Sci. 28:1-42.