The objective of this experiment was to determine the effects of 2 levels of dietary starch and the dose at which the effects of Saccharomyces cerevisiae (Yea-Sacc\textsuperscript{1026}, Alltech Inc.; YC) are maximized based on nutrient total tract digestibility (AD), rumen fermentation, microbial protein synthesis, and N utilization of limit-fed dairy heifers. A split plot design with starch level as the whole plot and YC dose as sub-plot was administered in a 4 period (21 d) 4 × 4 Latin square. Eight Holstein heifers (432.49 ± 6.81 kg BW) were allocated to 2 starch treatments (30% starch: HS; 15% starch: LS) and to a sequence of YC doses (0, 10, 30, and 50 g/d). DM (P = 0.98) and NDF (P = 0.28) AD were not different between HS and LS; however, HS decreased ADF and increased hemicellulose AD (48.5 vs 44.9 ± 1.38 and 45.0 vs. 56.4 ± 3.20% respectively). YC dose increased DM AD quadratically (68.6, 68.8, 71.3, and 69.8 ± 0.47%; P < 0.01). NDF, ADF, and hemicellulose AD increased or tended to increase quadratically with increasing YC dose (P = 0.03, 0.06, 0.10 respectively). No significant effects were noted on fecal or urine output. Mean ruminal pH was higher for LS treatment (6.18 vs. 6.05 ± 0.06), and there was a trend (P = 0.09) for YC dose and starch interaction. The highest pH for LS and HS diet were at 0 and 50 g/d respectively. Total volatile fatty acid concentration was not different among YC doses or starch level. Concentrations of propionate, isobutyrate and iso-valerate were higher for HS than LS. Isovalerate was reduced linearly with increasing addition of YC and acetate: propionate responded quadratically to YC addition with 10 g/d having the lowest
value. Estimated microbial N outflow was not different among starch treatments or YC doses. We conclude that starch level did not affect DM AD, but influenced ADF and hemicellulose AD. YC dose had a greater effect on DM, NDF, ADF, and hemicellulose AD when added at 30 g/d. Fermentation parameters were not different among dietary treatments, but rumen pH was higher for LS diets.

Key Words: yeast culture, starch, limit-feeding, dairy heifer