

In vitro Method to Evaluate the Effect of Steam-Flaking on the Quality of Common Cereal Grains

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Abstract : Whole grains with intact pericarp are largely resistant to digestion by ruminants because entire kernels are not conducive to bacterial attachment. But processing methods makes the starch more accessible to microbes, and increases the rate and extent of starch degradation in the rumen. To estimate the feasibility of applying a steam-flaking as the processing technique of grains for ruminants, cereal grains (maize, wheat, barley and sorghum) were processed by steam-flaking (steam temperature 105°C, heating time, 45 min). And chemical analysis, in vitro gas production, volatile fatty acid concentrations, and energetic values were adopted to evaluate the effects of steam-flaking. In vitro cultivation was conducted for 48h with the rumen fluid collected from steers fed a total mixed ration consisted of 40% hay and 60% concentrates. The results showed that steam-flaking processing had a significant effect on the contents of neutral detergent fiber and acid detergent fiber ($P < 0.01$). The concentration of starch gelatinization degree in all grains was also great improved in steam-flaking grains, as steam-flaking processing disintegrates the crystal structure of cereal starch, which may subsequently facilitate absorption of moisture and swelling. Theoretical maximum gas production after steam-flaking processing showed no great difference. However, compared with intact grains, total gas production at 48 h and the rate of gas production were significantly ($P < 0.01$) increased in all types of grain. Furthermore, there was no effect of steam-flaking processing on total volatile fatty acid, but a decrease in the ratio between acetate and propionate was observed in the current in vitro fermentation. The present study also found that steam-flaking processing increased ($P < 0.05$) organic matter digestibility and energy concentration of the grains. The collective findings of the present study suggest that steam-flaking processing of grains could improve their rumen fermentation and energy utilization by ruminants. In conclusion, the utilization of steam-flaking would be practical to improve the quality of common cereal grains.

Keywords : cereal grains, gas production, in vitro rumen fermentation, steam-flaking processing

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