Animal - Science Proceedings 14 (2023) 604–655

Contents lists available at ScienceDirect

Animal - Science Proceedings

journal homepage: www.elsevier.com/locate/anscip

International Symposium on the Nutrition of Herbivores (ISNH 2023) – Poster Presentations

P1
Impact of incubation temperature on the growth and efficacy of white-rot fungi to improve the nutritive value of rice straw

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Keywords
White rot fungi; Rice straw; Ruminant nutrition; Lignin degradation.

The use of white-rot fungi (WRF), such as Ceriporiopsis subvermispora, Lentinula edodes, and *Pleurotus eryngii*, is of great interest to upgrade highly lignified biomass such as rice straw. To date, a great body of evidence is available on the *in vitro* efficacy to degrade lignin by WRF but a number of issues require further elucidation before this potentially biologically and environmentally friendly technology can be applied under practical conditions in the tropics. One of these involves the combination of temperature and duration of the incubation of rice straw with the aforementioned WRF. An incubation temperature of 24 °C is commonly used to study the *in vitro* efficacy of WRF to degrade lignin while ambient temperatures fluctuate between 26–35 °C in South East Asian countries. The efficacy of the lignin degrading enzymes produced by WRF is known to be temperature sensitive. In view of its potential practical relevance of the WRF technology in the tropics, we first investigated the growth of *C. subvermispora, L. edodes* and *P. eryngii* when incubated at six different temperature regimes: continuous at 24, 30, 35 and 40 °C, and three days at 35 and 40 °C with subsequent days at 24 °C to test the impact of temperature on fungi growth (Exp 1). The efficacy to improve the fermentability in buffered rumen fluid of rice straw by the three WRF species was investigated at either 24 or 30 °C incubation for up to 8 weeks (Exp 2). The three fungi grew at incubation temperatures up to 35 °C, but at 40 °C, no growth of any of the fungi species was observed. In Exp 2, there were significant differences in hemicellulose and lignin degradation of rice straw at both temperatures for *C. subvermispora* ($P < 0.001$ and $P = 0.004$, respectively). At 30 °C, *C. subvermispora* degraded 69 and 90% of the hemicellulose and lignin, respectively, which was higher than at 24 °C (55 and 80%, respectively). For *L. edodes*, there were only significant differences in cellulose degradation between 24 and 30 °C, with 12% more degradation at 30 °C ($P = 0.001$). *In vitro* gas production, however, showed no differences between the two incubation temperatures for either of the two fungi. *Pleurotus eryngii* treatment significantly degraded the absolute amount of lignin. However, it did not shown any improvement in terms of *in vitro* gas production. Treatment of rice straw by *L. edodes* and *C. subvermispora*, but not by *P. eryngii*, is robust and temperature changes will not majorly impact their efficacy as long as the temperature remains below 35 °C.

doi: 10.1016/j.anscip.2023.04.096

P2
Nitrate supplementation reduces enteric methane emission, but increases enteric nitrous oxide emission in dairy cows

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Keywords
Nitrate supplementation; Methane; Nitrous oxide; Dairy cows.