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Study the possibility of improving nutritional value wheat straw using of termite gut bacteria

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Abstract

This project was conducted to study the prospect of isolation termite gut symbiotic bacteria and test, if they can grow on wheat straw (WS). Termites were (*Microcerotermes diversus*) were collected from nests on the orange trees and their guts contents were extracted and cultured on 9 different culture media of lignin, prepared from water-extracted sawdust and wheat straw. Three superior bacteria capable of growing on all mediums, with higher lignin peroxidase activity, were selected and subjected to molecular identification of 16SrRNA sequencing analysis. The isolates possessed 97, 99 and 97% similarity with *Bacillus licheniformis*, *Ochrobactrum intermedium* and *Microbacterium paludicola*, respectively. Subsequently the optimum temperature and pH for growth of bacterial isolates were determined in nutrient broth medium. The optimum growth was 40°C for *B. licheniformis* but 37°C for *O. intermedium* and *M. paludicola*. All isolates could grow in acidic, alkaline and neutral pH, but their optimum growth occurred in neutral pH of 7.0. In the next stage, effect of isolated bacteria on the production of acid-precipitable polymeric lignin (APPL) and nutritive value of wheat straw were investigated. The APPL was higher ($P<0.05$) in wheat straw incubated with the isolates where the highest APPL was obtained by *B. licheniformis*. Acid detergent lignin (ADL) was decreased ($P<0.05$) in wheat straw treated with the isolated bacteria. Acid detergent fibre (ADF) was also reduced in wheat straw treated by isolated bacteria of *O. intermedium*. The crude protein was increased ($P<0.05$) in wheat straw treated with *M. paludicola*. Inoculation of wheat straw with *B. licheniformis* resulted in a higher ($P<0.05$) *in vitro* gas production and *in vitro* organic matter digestibility when inspected with gas test method. Bacterial treatments enhanced ($P<0.05$) two steps *in vitro* digestibility of DM, OM and ADF in wheat straw. In the last experiment, isolated bacteria were transferred to the rumen liquor, and test their effects on fermentation parameters and *in vitro* digestibility of wheat straws. With incubation substrates, *in vitro* gas parameters, DM and OM digestibility were similar between the treatments. However, ammonia nitrogen concentration significantly increased ($P<0.05$) when isolated bacteria inoculated to the rumen liquors. In general, results of the present study indicated that processing of wheat straw with lignocellulose-degrading bacteria isolated from termite gut had a little effect on the chemical composition, but improved the rumen fermentation parameters and nutrient digestibility. Inoculation of isolated bacteria into ruminal fluid, did not affect the *in vitro* rumen fermentation

parameters and nutrient digestibility, but increased the ammonia nitrogen concentration, that may be a capable potential for further researches.

Keyword: bacteria, lignocellulosics, termite