ABSTRACT

AGUS BUDIANSYAH. Application of Cattle Rumen Liquor as Source of Enzymes, Amino Acids, Minerals and Vitamins in Broiler Diets Based on Local Feedstuffs. Under direction of NAHROWI, KOMANG G. WIRAYAWAN, MAGGY T. SUHARTONO and YANTYATI WIDYASTUTI.

The aims of this research were to identify and characterize the enzymes extracted from local and imported cattle rumen liquor, and applications of these enzymes together with mixture of amino acids, minerals and vitamins present in the sediments to improve quality of broiler diets based on local feedstuffs. Combination of filtration and centrifugation of the liquor produced the supernatant as the enzyme source and the sediment used as the source of amino acids, minerals and vitamins. The enzyme activities were evaluated against several local feedstuffs before feeding trial in broiler. Two hundreds Ross strain DOC were randomly assigned to five dietary treatments namely: R1 = Ration added 0% rumen liquor enzyme; R2 = Ration added 1.0% rumen liquor enzyme; R3 = Ration added 1.0% rumen liquor enzyme; and R4 = Ration added 2.0% rumen liquor enzyme.

The chemical composition and quality of the sediment were evaluated. Two hundred and forty Ross strain DOC were randomly assigned to six dietary treatments namely: R1 = Ration containing commercial premix; R2 = Ration containing 0.25% rumen liquor; R3 = Ration containing 0.50% rumen liquor; R4 = Ration containing 0.75% rumen liquor; R5 = Ration containing 1.0% rumen liquor. Data from completely randomized design were subjected to ANOVA and the different among treatments were further analyzed using Duncan's multiple range test. The results showed that optimum precipitation of the enzymes from local and imported cattle were at 60% and 70% of ammonium sulphate, respectively. The enzymes (xylanase, mannanase, and amylase) had optimum temperature in the range of 50 – 60 °C, except for cellulase and phytase from imported cattle which had optimum temperature at 39 °C and protease at 70 °C. The optimum pHs were 6 – 7 except for cellulase at pH 4. The enzymes needed metal ions as activator: Co²⁺ for cellulase; Mn²⁺ and Co²⁺ for xylanase; Cu²⁺, Co²⁺ and Ca²⁺ for mannanase; and Fe²⁺, Zn²⁺, and Cu²⁺ for phytase. The enzymes were able to hydrolyze rice bran, cassava leaf meal, copra meal, palm kernel meal, full fat soybean meal, and the broiler diet based on corn-soya. Feed consumption and protein retention were not different among treatments, while broiler performance, dry matter and organic matter retention, crude fiber digestibility, and metabolizable energy of diets treated enzymes were higher compared to those of control diet. Feed conversion ratio, and energy retention of the broiler fed with R2 (0.5% enzymes) was the best. Sediments of rumen liquor contained higher minerals: Na, K and Fe compare with the commercial diet (premix), but lower in B-vitamins and amino acid. The sediments had pH range from 10.01 – 10.03, the solubility of dry matter was 35.5% up to 39.1%. The sediment from imported cattle had higher specific density, bulk and compacted bulk densities and angle of response compared with those of local cattle. Using sediment from imported cattle rumen liquor in broiler diets at levels of 0.25%, 0.5%, 0.75% and 1.0% could improve broiler performance, and addition at 1.0% showed the best performance and feed conversion ratio. The treatments had no significant effect on carcass weight and morphology of the digestive organs. It is concluded that enzymes from rumen liquor were able to hydrolyze local feedstuffs, and application of 0.5% enzymes and 1.0% the sediment improved the quality of broiler diet composed of local feedstuffs and improves the broiler performances.

Keywords: Extraction, cattle rumen liquor, enzymes, amino acids, vitamins, minerals and broiler.