EVALUATION OF DIFFERENT TREATMENTS FOR IMPROVING EFFICIENCY OF UTILIZATION OF AGRICULTURAL BY-PRODUCTS IN RUMINANT FEEDING

By

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B.Sc. Agric. Sc., (Animal production), Cairo University, 1999
M.Sc. Agric. Sc., (Animal nutrition), Ain Shams University, 2013

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ABSTRACT

Marwa Atef Sayed Madkour: Evaluation of Different Treatments for Improving Efficiency of Utilization of Agricultural By-Products in Ruminant Feeding. Unpublished Ph.D. Thesis, Department of Animal production, Faculty of Agriculture, Ain Shams University, 2018.

The objective of this study was to select the best method to improve agriculture by-product utilization, as well as in vivo studies to the elected treatments. This study was carried out in 5steps; in the first one, nine different microorganisms were used in bio-upgrading the chemical composition and nutritive values of rice straw. In the second *in vitro* evaluation for effect of inclusion of the bio-upgraded rice straw in ruminant rations using two technique (batch culture and RUSITEC technique). In the third step the nine microorganisms media were used to produce direct fed microbes (DFM). In the fourth step *in vitro* evaluation for effect of supplementing ruminant rations with different DFM using two technique (batch culture and RUSITEC). The fifth step was to evaluate in vivo trials for the best DFM supplementation. Biodegradation of rice straw with different fungal and bacterial microorganisms decreased organic matter (OM), crude fiber (CF), neutral detergent fiber (NDF), acid detergent fiber (ADF) and cellulose content compared to untreated rice straw. However, crude proteins (CP), ash, acid detergent lignin (ADL), hemicellulose and non-fiber carbohydrate (NFC) contents were increased for biological treated rice straw compared to untreated. All rations containing biologically treated rice straw had no significant higher dry matter degradability (DMD) than that of the control ration. A significant increase was observed in OMD and the amount of total gas accumulated per g DM, OM, NDF and ADF for the rations containing biological treated rice straw compared to that containing untreated rice straw. The best fungal biological treatment was *P. ostreatus*, as well as the best bacterial biological treatment was *P. polymexa*. No significant differences in DMD % were observed among the experimental rations. However, a significant increase in OMD% was recorded for the

rations supplemented with different DFM compared to control except *T. viride* and *B. Cerculance* treatments which were not significantly higher than control. *In vitro* total gas production per g DM, OM, NDF and ADF (ml/g) of rations supplemented with direct fed microbes after 24 hours in vitro fermentation were significantly increased with DFM supplementation except for *T. viride* and *B. cerculance* which were not significantly different from the control. The best fungal DFM supplementation response was recorded for *Ph. chrysosprium*, As well as the best bacterial DFM response was noticed for *B. Subtilus*. Utilization *P. chrysosprium*, *B. Subtilus* DFM supplementation recorded higher dDM and dOM % as well as total accumulated gas production. In the *in vivo* experiment, thirty-two Barkey lambs (3 months old, 22.31± 1.57 kg) were randomly assigned into four groups, 8 lambs of each. The first group (control) was given control rations without DFM supplementation, while treated groups (Fungal, Bacterial and Mixed DFM) were fed the control ration plus 2.5 g fungal, bacterial or mixed (1:1) DFM; respectively.Results of chemical composition showed that all biological treated rice straw recorded lower ($P \leq 0.05$) OM, CF, NDF, ADF and cellulose content than untreated rice straw (RSc). The groups fed ration supplemented with DFM (fungal, bacterial and mixed) recorded higher DM, TDN and digestible CP intake than control group. Supplementation of lambs ration with DFM (fungal, bacterial and mixed) did not showed significant ($P > 0.05$) effects on rumen liquor TVFA's and ammonia concentration at 0, 3 and 6 hrs post feeding. While, DFM supplemented rations showed significantly higher rumen liquor pH at 0, 3 and 6 hrs after feeding compared to the control group. Numerically increase was recorded in cellulose activity as unit per ml rumen liquor for groups fed ration supplemented with bacterial and mixed DFM. Direct fed microbial supplementation significantly ($P \leq 0.05$) improved nutrients digestibility as dry matter, organic matter, crude protein, crude fiber, nitrogen free extract, neutral detergent fiber (NDF) and acid detergent fiber (ADF) as well as feeding values as TDN and digestible crude protein. Bacterial or mixed DFM supplementation showed numerically increased ($P > 0.05$) in plasma total protein concentration compared to lambs

fed non-supplemented ration. Albumin, globulin, urea, triglycerides, creatinine ALT and AST, alkaline phosphates activity were not significantly ($P>0.05$) affected by DFM supplementation. Total gain and ADG were significantly increased ($P\leq0.05$) for groups received rations supplemented with DFM compared to control group. Also DFM supplementation significantly ($P\leq0.05$) improved feed conversion as DM, TDN, CP and DCP compared to the control group.

It may be concluded that supplementing lambs ration with fungal, bacterial or mixed DFM improved feed intake, digestibility, average daily gain and feed conversion ratio without any adverse effects on animal health and performance.

Key words: lambs, DFM, feed intake, digestibility, rumen contents activity, growth performance.