

PENGARUH SUPLEMENTASI KOMBINASI MINYAK JAGUNG TERPROTEKSI
DAN NON TERPROTEKSI TERHADAP KARAKTERISTIK FERMENTASI,
PRODUKSI GAS METAN, DAN KECERNAAN
NUTRIEN SECARA *IN VITRO*

INTISARI

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Penelitian ini bertujuan untuk mengetahui pengaruh suplementasi kombinasi minyak jagung dan minyak jagung terproteksi terhadap karakteristik fermentasi rumen, produksi gas metan, keragaman metanogen, profil asam lemak cairan rumen, dan pencernaan nutrisi secara *in vitro*. Proteksi asam lemak menggunakan susu bubuk afkir dan formaldehid. Substrat pakan terdiri dari 60% rumput Gajah dan 40% *pollard*, kemudian disuplementasikan dengan minyak jagung dan minyak jagung terproteksi dengan berbagai level imbalan secara berturut-turut yaitu 0%:0% sebagai kontrol, 5%:0%, 3,75%:1,25%, 2,5%:2,5%, 1,25%:3,75%, dan 0%:5% berdasarkan BK substrat (b/b). Penelitian ini terdiri dari tiga bagian. Penelitian I menggunakan metode *in vitro* produksi gas (Menke dan Steinngas, 1988). Variabel yang diamati yaitu nilai fraksi a, fraksi b, fraksi a+b, fraksi c, pH, total VFA, kadar asam asetat, asam propionat, asam butirrat, rasio asam asetat:asam propionat, kadar NH₃, kadar protein mikrobial, dan aktivitas enzim CMC-ase. Penelitian II dilakukan pengamatan terhadap produksi gas metan, jumlah sel protozoa, profil asam lemak cairan rumen, serta keragaman metanogen yang dianalisis menggunakan metode *terminal restriction fragment length polymorphism*. Enzim restriksi yang digunakan adalah TaqI. Penelitian III yaitu pengamatan terhadap pencernaan nutrisi meliputi pencernaan bahan kering (KcBK), pencernaan bahan organik (KcBO), pencernaan protein kasar (KcPK) dan pencernaan serat kasar (KcSK) inkubasi 48 jam dan 96 jam secara *in vitro* (Tilley dan Terry, 1963). Data yang diperoleh dianalisis menggunakan analisis variansi dengan rancangan acak lengkap pola searah, kemudian perbedaan variabel secara nyata karena perlakuan, dilanjutkan dengan uji *Duncan's New Multiple Range Test*. Hasil penelitian menunjukkan bahwa peningkatan aras suplementasi minyak jagung tanpa proteksi, terutama pada kombinasi 5%:0% dan 3,75%:1,25% secara nyata ($P < 0,05$) menurunkan nilai fraksi b, fraksi a+b, total VFA, asam asetat, rasio asam asetat:propionat, jumlah sel protozoa, KcBK, KcBO, dan KcSK. Selain itu terjadi penurunan produksi gas metan dan perubahan kelimpahan metanogen jenis *Uncultured rumen methanogen 956*. Adanya kenaikan aras suplementasi minyak jagung terproteksi, terutama pada suplementasi lebih dari 1,25% sampai 5% secara nyata ($P < 0,05$) meningkatkan proporsi asam lemak tidak jenuh dan menurunkan proporsi asam lemak jenuh cairan rumen. Kesimpulan dari penelitian ini yaitu kombinasi suplementasi minyak jagung 2,5% dan minyak jagung terproteksi 2,5% merupakan kombinasi yang paling optimal untuk meningkatkan asam lemak tidak jenuh cairan rumen, namun masih relatif dapat menurunkan produksi gas metan tanpa memberikan pengaruh negatif terhadap fermentasi rumen dan pencernaan pakan secara *in vitro*.

Kata kunci : minyak jagung, metan, proteksi asam lemak, profil asam lemak, fermentasi rumen

EFFECT OF COMBINATION OF PROTECTED AND NON PROTECTED CORN OIL ON *IN VITRO* FERMENTATION CHARACTERISTICS, METHANE GAS PRODUCTION, AND NUTRIENT DIGESTIBILITY

ABSTRACT

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This study aimed to determine the effect of supplementation of the combination of corn oil (CO) and protected corn oil (PCO) on the characteristics of rumen fermentation, methane production, methanogen diversity, the fatty acid profile of rumen liquid, and *in vitro* nutrient digestibility. Protection of fatty acids used refined skim milk powder and formaldehyde. Feed substrate consisted of 60% elephant grass and 40% wheat pollard, then supplemented with CO and PCO with various levels of balance : 0%: 0%, as a control, 5% and 0%, 3.75% and 1.25%, 2.5% and 2.5%, 1.25% and 3.75%, 0% and 5% based on DM basis (w/w). This research consisted of three studies. The first study used *in vitro* gas production methods (Menke and Steinngas, 1988). The observed variables were the value of fraction a, fraction b, fraction a+b, fraction c, pH, total VFA, acetic acid, propionic acid, butyric acid, the ratio of acetic acid:propionic acid, NH₃, microbial protein, and carboxymethyl cellulose (CMC-ase) enzyme activity. The second study was the observation of methane gas production, the number of protozoa cells, the profile of rumen fluid fatty acids, and methanogen diversity, which were analyzed using terminal restriction fragment length polymorphism. The restriction enzyme used was TaqI. The third study was the observation of nutrient digestibility using two-stage *in vitro* Tilley and Terry (1963). The parameters were dry matter digestibility (DMD), organic matter digestibility (OMD), crude protein digestibility (CPD), and crude fiber digestibility (CFD) incubated in 48 hours and 96 hours. The data obtained were analyzed using analysis of variance completely random design, if there were differences between means followed by Duncan's New Multiple Range Test. The results showed that increasing of CO levels, especially, in combination 5%:0% and 3.75%:1.25% significantly ($P < 0.05$) reduced fraction b, fraction a+b, total VFA, acetic acid, the ratio of acetic:propionic acid, the number of protozoa cells, DMD, OMD, and CFD. Also, there was a decline in methane gas production and changed in methanogen abundance, *Uncultured rumen methanogen 956*. Increasing levels of PCO, especially, more than 1.25% until 5% significantly ($P < 0.05$) increased the proportion of unsaturated fatty acids and decreased the proportion of saturated rumen fluid fatty acids. The conclusion of this study was the combination of 2.5% corn oil and 2.5% protected corn oil was the most optimal combination to increase unsaturated fatty acids in rumen fluid, but it can relatively reduce methane production without negatively affecting rumen fermentation and *in vitro* nutrient digestibility.

Keywords: corn oil, methane, fatty acid protection, fatty acid profile, rumen fermentation.