

RINGKASAN

ISOLASI BAKTERI DAN JAMUR SELULOLITIK FESES JERAPAH SEBAGAI INOKULUM UNTUK MENINGKATKAN KUALITAS JERAMI PADI DAN PRODUKTIVITAS DOMBA

Penyediaan pakan hijauan memegang peranan penting dan menjadi masalah yang mendasar dalam pengembangan ternak ruminansia. Penggunaan limbah pertanian seperti pucuk tebu, jerami padi, dan jerami jagung sering dijadikan sebagai pakan ternak alternatif oleh peternak untuk mengatasi kekurangan hijauan pakan ternak. Di antara hasil sisa tanaman pangan, jerami padi memegang peranan penting, karena di samping mudah didapat terutama di daerah dataran rendah, jumlahnya melimpah pada saat panen. Namun, sebagai pakan ternak jerami padi memiliki beberapa kekurangan karena kadar proteinnya yang rendah yaitu 3-5% BK, dengan serat kasar yang tinggi mencapai 20 – 41,5 % BK, nilai pencernaan yang rendah, bersifat memakan tempat, serta konsumsi suka rela oleh ternak rendah.

Penggunaan jerami padi sebagai pakan ternak memerlukan pra perlakuan dengan tujuan untuk meningkatkan nilai nutrisinya. Salah satu cara yang bisa dilakukan adalah dengan memanfaatkan bakteri dan jamur selulolitik serta melakukan suplementasi bahan pakan sumber protein untuk meningkatkan sintesis protein mikroba rumen, karena pencernaan pada ruminansia sangat tergantung pada macam dan populasi mikroba rumen.

Penelitian ini bertujuan melakukan isolasi bakteri dan jamur selulolitik dari feses jerapah, kemudian menyeleksi bakteri dan jamur selulolitik hasil isolasi serta memilih isolat bakteri dan jamur selulolitik terbaik untuk diaplikasikan pada fermentasi jerami

padi. Jerami padi hasil fermentasi dengan isolat terbaik diberikan pada ternak domba dan dilihat pengaruhnya terhadap nilai pencernaan pakan dan retensi N, sintesis protein mikroba, profil cairan rumen, fungsi hati dan ginjal, serta performan domba.

Penelitian ini dibagi menjadi 2 tahap. Tahap 1 adalah penelitian pendahuluan yang meliputi (a) isolasi bakteri dan jamur selulolitik, menggunakan feses jerapah dari Taman Safari Pandaan Jawa Timur. Media isolasi yang digunakan untuk isolasi bakteri selulolitik adalah *Carboxyl Methyl Cellulose* (CMC), sedang untuk isolasi jamur selulolitik digunakan media *Carboxyl Methyl Cellulose* (CMC) ditambah kloramfenikol untuk menghambat pertumbuhan bakteri. (b) seleksi terhadap isolat-isolat hasil isolasi, dengan melakukan uji pada fermentasi jerami padi. Jerami padi jenis IR-64 ditambah 3% urea + 3% molasis + 5% suspensi isolat yang akan diuji. 48 kantong jerami padi masing-masing seberat 200gram, digunakan untuk uji isolat. Untuk uji isolat bakteri ada 5 perlakuan dengan 6 ulangan, sehingga ada 30 kantong jerami padi yang dibagi secara acak. Untuk uji isolat jamur, ada 3 perlakuan dan 6 ulangan, sehingga ada 18 kantong jerami yang dibagi secara acak. Selanjutnya jerami padi diperam selama 7 hari, kemudian dilakukan analisis proksimat terhadap kandungan bahan kering, serat kasar, dan protein kasar. Bakteri dan jamur terbaik dipilih berdasarkan kandungan serat kasar terendah dan protein kasar tertinggi.

Penelitian tahap 2 adalah penelitian utama, ada 4 perlakuan dengan 5 kali ulangan, sehingga digunakan 20 ekor domba percobaan yang dibagi secara acak. Keempat perlakuan tersebut berfungsi sebagai variabel bebas, dengan masing-masing perlakuan terdiri dari 5 kali ulangan, sehingga digunakan rancangan percobaan berpola Rancangan Acak Lengkap (4 x 5 ulangan). Keempat perlakuan tersebut

adalah P0 : 60% (jerami padi + 3% urea + 3% molasis + tanpa isolat) + 40% konsentrat, P1 : 60% (jerami padi + 3% urea + 3% molasis + isolat bakteri *Acetobacter liquefaciens*) + 40% konsentrat, P2: 60% (jerami padi + 3% urea + 3% molasis + isolat khamir *Geotrichum sp* + 40% konsentrat, dan P3 : 60% (jerami padi + 3% urea + 3% molasis + isolat dengan isolat *Acetobacter liquefaciens* dan *Geotrichum sp.*) + 40% konsentrat, yang berfungsi sebagai variabel bebas. Masing-masing domba diberi air minum secara *adlibitum*. Variabel yang diamati meliputi : nilai pencernaan pakan, retensi N, sintesis mikroba rumen, profil cairan rumen, fungsi hati dan ginjal, serta performan domba.

Data yang diperoleh pada penelitian ini dianalisis menggunakan metode statistik Analisis Varian (Anava) dan untuk perbedaan rata-rata di antara perlakuan diuji dengan uji jarak berganda *Duncan's (Duncan Multiple Range Test)* (Steel and Torrie, 1995).

Hasil penelitian tahap 1, untuk isolasi didapat 4 isolat bakteri selulolitik yaitu : *Acidophilium facilis*, *Acetobacter liquefaciens*, *Cellulomonas sp*, dan *Acentobacter sp.* serta 2 isolat jamur selulolitik yaitu khamir *Geotrichum sp* dan jamur *Cryptosporium sp.* Untuk seleksi isolat, terpilih isolat terbaik untuk isolat bakteri selulolitik adalah *Acetobacter liquefaciens*, dan untuk isolat jamur selulolitik adalah khamir *Geotrichum sp.*

Hasil penelitian tahap 2, pada domba lokal yang diberi pakan jerami padi yang difermentasi dengan suspensi bakteri *Acetobacter liquefaciens*, khamir *Geotrichum sp.*, serta campuran *Acetobacter liquefaciens* dan *Geotrichum sp.* ternyata dapat meningkatkan ($P < 0,05$), (a) pencernaan serat kasar, protein kasar, bahan organik, NDF,

ADF, ekskresi derivat purine, absorpsi derivat purine, sintesis protein mikroba dan sintesis N mikroba (b) mengoptimalkan profil cairan rumen meliputi pH, peningkatan konsentrasi Amonia, Asam Asetat, asam propionat, asam Butirat, total VFA, jumlah total jamur dan bakteri, serta jumlah jamur dan bakteri selulolitik (c) dapat meningkatkan performan domba meliputi: kenaikan berat badan, berat akhir, konsumsi serat kasar, protein kasar, bahan organik, NDF, serta menurunkan konversi pakan secara nyata ($P < 0,05$), tetapi tidak berpengaruh nyata ($P > 0,05$) pada retensi N, konsumsi ADF, serta pada kadar SGOT, SGPT, Ureum Nitrogen, dan creatinine serum darah domba.

Domba lokal yang diberi pakan jerami padi yang difermentasi dengan campuran bakteri selulolitik *Acetobacter liquefaciens* dan khamir selulolitik *Geotrichum sp.* memberikan hasil yang terbaik, diikuti berturut-turut pemberian suspensi khamir selulolitik *Geotrichum sp.* dan suspensi bakteri selulolitik *Acetobacter liquefaciens*.

Berdasarkan hasil penelitian ini disarankan bahwa Isolat bakteri selulolitik *Acetobacter liquefaciens* dan khamir selulolitik *Geotrichum sp.* dapat digunakan sebagai inokulum untuk meningkatkan kualitas jerami padi, serta dapat dimanfaatkan untuk meningkatkan produktivitas domba. Untuk selanjutnya perlu penelitian lanjutan dengan melakukan cloning dan ekspresi gen penyandi enzim selulase terhadap isolat bakteri selulolitik *Acetobacter liquefaciens* dan khamir selulolitik *Geotrichum sp.* hasil isolasi dari feses jerapah

SUMMARY

ISOLATION OF CELLULOLYTIC BACTERIUM AND CELLULOLYTIC FUNGI FROM GIRAFFE'S FAECES AS AN INOCULUM TO INCREASE THE QUALITY OF RICE STRAW AND SHEEP PRODUCTIVITY

Supplying of forage, play an important role and become the elementary problem in development of ruminant livestock. The use of agriculture waste like sugar cane top, rice straw, and corn straw is often made as alternative livestock feed by breeder to overcome the insufficiency of forage. Among the waste of food crop, rice straw play an important thing, beside it is easy to get especially in lowland area, its abundance amount at the time of harvesting. But, as the feed of livestock, rice straw have some insufficiency as its protein rate is too low (3-5% dry matter), the high crude fibre reach 20 - 41,5 % dry matter, and low digestibility, having the character spacions, and also low volumtary feed intake by livestock.

The use of rice straw as livestock feed need a pretreatment as a mean to improve the nutrition value. One way which can be conducted is by exploiting cellulolytic bacterium and cellulolytic fungi and to conduct the supplementation of substance feed of protein source is well to increase the synthesis protein of rumen microbe, as digestibility of ruminant is very depend on kinds and population of rumen microbe.

The research aimed to conduct the isolation of cellulolytic bacterium and cellulolytic fungi from giraffe's faeces, by selecting the cellulolytic bacteria and cellulolytic fungi, the to identify isolation and chosen the isolate of cellulolytic bacterium and the best cellulolytic fungi to be used on fermentation of rice straw. The rice straw which was of fermentated by the best isolate was given to the sheep and

seen how its influence against the nutrient digestibility, N-balance, purine derivate excretion, purine derivate absorption, synthesis of rumen microbial protein and synthesis of rumen microbial nitrogen, rumen liquid profile, health of liver and kidney, also the sheep performance.

The research was divided into 2 phases. The first, was preliminary research including (a) isolation of cellulolytic bacterium and cellulolytic fungi, taken from the faeces of *giraffe* from Safari Park of Pandaan East Java, (b) selecting the isolates by conducting a test of the rice straw's fermentation. Rice straw of variety IR-64 added with 3% urea + 3% molasses + 5% suspension isolate to be tested. 48 bag of rice straw each as heavy as 200 gram, was used to test the isolate. 30 bag used to test the isolate bacteria were divided into 5 treatment and 6 replications. 18 bags to test the isolate fungi, which were divided into 3 treatments and 6 replications. Then, the rice straw were incubated for 7 days, later, analysed against dry matter, crude fibres, and crude protein. The best fungi and bacteria selected against the lowest crude fibre content and the highest crude protein. Phase 2 of the research was the main research, using 20 local sheep which were divided into 4 treatments with 5 replications. P0 : rice straw + 3% urea + 3% molasses + without isolate, P1 isolate bacterium of *Acetobacter liquefaciens*, P2 isolate yeast of *Geotrichum sp*, and P3 isolate *Acetobacter liquefaciens* and *Geotrichum sp*. The data analysed by the Varians Analysis and for the difference of mean among treatment, tested with the Duncan's Multiple range Test.

The results of the first phase research were (a) for the isolation obtained 4 isolate of cellulolytic bacterium that were : *Acidophilium facilis*, *Acetobacter liquefaciens*, *Cellulomonas Sp*, and *Acenitobacter sp*. Two isolates of cellulolytic

yeast were *Geotrichum sp.* and *Cryptosporium Sp.* (b) The chosen selection for the isolate of bacterium was *Acetobacter liquefaciens*, and for the isolate of yeast was *Geotrichum sp.* The result of the main research was local sheep given feed of rice straw which fermentated by bacterium suspension of *Acetobacter liquefaciens*, yeast of *Geotrichum sp.*, and the mixture of *Acetobacter liquefaciens* and *Geotrichum sp.* were able to improve (a) crude fibre, crude protein, organic matter, NDF, and ADF digestibility, purine derivate excretion, purine derivate absorption, synthesis of rumen microbial protein and synthesis of rumen microbial nitrogen (b) optimalising rumen liquid profile: pH, amonia concentration, acetic acid, propionic acid, butyric acid, the total of VFA, to increase the amount of the fungi and bacteria, the cellulolytic fungi, and cellulolytic bacterium (c) improved the sheep performance : by the average daily gain (ADG), final body weight, consumption the crude fibre, crude protein , organic matter, NDF, and degrading the feed conversion significantly($P < 0,05$), but was not have significant effect on ($P > 0,05$) N-balance, consumption the ADF, the rate of SGOT, SGPT, Ureum Nitogen, and creatinine of serum of sheep blood

Local sheep given feed of rice straw which fermented with the mixture of bacterium of cellulolytic *Acetobacter liquefaciens* and cellulolytic yeast of *Geotrichum sp.* gave the best result, followed successively conferral suspension of yeast of cellulolytic *Geotrichum sp.*, and conferral suspension of bacterium of cellulolytic *Acetobacter liquefaciens*.

Based on the results, it was suggested that the isolate of bacterium cellulolytic *Acetobacter liquefaciens* and yeast of cellulolytic *Geotrichum sp* could be used as an inoculant to increase the quality of rice straw, to increase the productivity of sheep.

Next, it is important to do a research of furthermore by doing a cloning and expression of the enzyme cellulase encoding genes to isolate of bacterium of cellulolytic *Acetobacter Liquefaciens*, and of yeast of cellulolytic *Geotrichum sp.* as the result of isolation from giraffe's faeces.



ABSTRACT

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Keywords : Giraffe's faeces, cellulolytic bacterium and cellulolytic fungi, rice straw, digestibility, rumen liquid profile, function of liver and kidney, sheep Performance