

## PENGGUNAAN TEPUNG RUMPUT LAUT (*Sargassum* sp.) SEBAGAI SUPLEMEN PAKAN SUMBER MINERAL TERHADAP KINERJA PRODUKSI DOMBA EKOR TIPIS JANTAN LEPAS SAPIH

### INTISARI

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Penelitian ini bertujuan untuk mengkaji komposisi kimia dan kandungan metabolit sekunder tepung rumput laut (*Sargassum* sp.), pencernaan bahan kering dan bahan organik, sintesis protein mikroba, fermentasi rumen secara *in vitro* serta palatabilitas tepung rumput laut (*Sargassum* sp.), tingkat konsumsi dan pencernaan nutrisi, produksi protein mikroba, kinerja produksi dan profil mineral makro dan mikro dalam darah domba ekor tipis jantan lepas sapih yang diberikan tepung rumput laut (*Sargassum* sp.). Materi dan metode penelitian: Tahap I. *Sargassum* sp. dari Gunungkidul Yogyakarta dibersihkan, dikeringkan matahari, oven 55°C dan *freeze dryer* pada -20°C. Variabel penelitian meliputi analisis komposisi nutrisi, mineral makro dan mikro, saponin dan tanin. Tahap II. Evaluasi pencernaan dan fermentasi rumen *in vitro* menggunakan rancangan acak lengkap (RAL) pola faktorial 3x2. Tiga perlakuan pengeringan rumput laut *Sargassum* sp. meliputi S1=matahari, S2=oven dan S3=*freeze dryer*; dua perlakuan P0 = tanpa *Polyethylene glycol* (PEG), P1 = penambahan PEG, serta uji palatabilitas dengan menggunakan 5 ekor domba. Variabel penelitian meliputi : Pencernaan bahan kering (BK) dan bahan organik (BO), pH, sintesis protein mikroba, fermentasi rumen, dan palatabilitas. Tahap III. Mengevaluasi penggunaan tepung rumput laut *Sargassum* sp. pada domba ekor tipis jantan lepas sapih 16 ekor, berumur 5 – 6 bulan BB  $\pm 11,8$  kg selama 3 bulan, menggunakan RAL 4x4 dengan empat perlakuan yaitu T1 = hijauan + konsentrat + 0% mineral dari konsentrat, T2 = Hijauan + konsentrat + mineral booster sapi 0,38% dari konsentrat, T3 = hijauan + konsentrat + *Sargassum* sp.5% dari konsentrat, T4 = hijauan + konsentrat + *Sargassum* sp.10% dari konsentrat. Variabel yang diamati adalah konsumsi dan pencernaan nutrisi, keseimbangan mineral makro dan mikro plasma darah, sintesis protein mikroba, pertambahan bobot badan harian (PBBH), efisiensi penggunaan ransum (EPR), *feed conversion ratio* (FCR), dan *income over feed costs* (IOFC). Hasil penelitian tahap I menunjukkan bahwa *Sargassum* sp. dengan cara pengeringan matahari, oven dan *freeze dryer* tidak berbeda nyata terhadap BK dan protein kasar (PK), namun berbeda nyata ( $P < 0,05$  terhadap kandungan abu, lemak kasar (LK), serat kasar (SK), dan bahan ekstrak tanpa nitrogen (BETN). Kandungan abu tertinggi pengeringan matahari 46,56%, dan terendah pengeringan *freeze dryer* 38,26%. Kandungan LK tertinggi pengeringan oven 0,58%, dan terendah pengeringan *freeze dryer* 0,48%. Kandungan SK tertinggi pengeringan oven 8,76%, dan terendah pengeringan matahari 6,67%. Kandungan BETN tertinggi pengeringan *freeze dryer* 45,78%, dan terendah pengeringan matahari 37,41%. *Sargassum* sp. pengeringan matahari, oven dan *freeze dryer* tidak berbeda nyata terhadap saponin dan berpengaruh nyata ( $P < 0,05$ ) terhadap tanin. Kandungan tanin tertinggi pengeringan *freeze dryer* 1,22% (b/b), dan terendah pengeringan oven 0,77% (b/b). Rumput laut *Sargassum* sp. Pengeringan

matahari, oven 55°C dan *freeze dryer* -20°C berpengaruh nyata ( $P < 0,05$ ) terhadap kalsium (K), magnesium (Mg), natrium (Na), fosfor (P), cobalt (Co), mangan (Mn), *cuprum* (Cu), dan *ferrum* (Fe). Mineral makro tertinggi K pengeringan oven 99,8 mg/kg, dan terendah P pengeringan *freeze dryer* 8,85 mg/kg. Mineral mikro tertinggi Fe pengeringan oven 1457,90 ppm, dan terendah Cu pengeringan matahari 4,26 ppm. Percobaan *in vitro* perlakuan tidak berbeda terhadap produksi gas 72 jam, kinetika produksi gas, pH, VFA, sintesis protein mikroba dan degradasi bahan organik (DBO). Perlakuan yang diperoleh berbeda nyata ( $P < 0,05$ ) terhadap produksi gas CH<sub>4</sub>, NH<sub>3</sub> dan degradasi bahan kering (DBK). Produksi gas CH<sub>4</sub> terendah pengeringan matahari tanpa PEG 4,02%. Produksi NH<sub>3</sub> tertinggi pengeringan matahari PEG 28,11 mg/100 mL dan terendah *freeze dryer* PEG 21,78 mg/100 mL. Degradasi bahan kering tertinggi pengeringan matahari PEG 82,41%, dan terendah pengeringan oven PEG 46,26%. Uji palatabilitas rumput laut *Sargassum* sp. pengeringan matahari, oven 55°C, dan *freeze dryer* -20°C pada domba ekor tipis jantan lepas sapih <25%. Percobaan *in vivo* perlakuan tidak berpengaruh terhadap konsumsi dan pencernaan BK, BO, PK, SK, BETN dan *total digestible nutrient* (TDN). Perlakuan berpengaruh nyata ( $P < 0,05$ ) terhadap konsumsi mineral Ca, Mg, K, Na, Cu, Fe dan zink (Zn). Konsumsi mineral Na tertinggi T1=2866,76 mg/kg, dan terendah K T2=6,41 mg/kg. Konsumsi mineral Fe tertinggi T2=2789,57 mg/kg dan terendah Cu T3=22,06 mg/kg. Mineral plasma darah sebelum perlakuan tidak berbeda terhadap Mg, Na, Cu, Fe, Zn, namun berpengaruh nyata ( $P < 0,05$ ) terhadap Ca dan K. Mineral Ca tertinggi T1= 87,13 mg/kg dan terendah T3 =57,6 mg/kg. Mineral K tertinggi T3 =1013,31 mg/kg dan terendah T1=682,99 mg/kg. Perlakuan berpengaruh nyata ( $P < 0,05$ ) terhadap mineral Mg, Cu, dan Fe dalam plasma darah; namun tidak berpengaruh terhadap Ca, K, Na, Zn. Mineral Mg tertinggi T3=58,94 mg/kg; dan terendah T1=4,78 mg/kg. Mineral Cu tertinggi T3=0,80 mg/kg, dan terendah T4=0,54 mg/kg. Mineral Fe tertinggi T1=436,44 mg/kg dan terendah T4=319,99 mg/kg. Perlakuan tidak berpengaruh terhadap derivat purin, pH, propionat, protein mikroba, PBBH absolut, *feed cost per gain* dan IOFC serta berpengaruh ( $P < 0,05$ ) terhadap asetat, butirrat, VFA total, EPR, dan FCR dan *Relative average daily gain* (ADG). Kandungan asetat tertinggi T1=144,02 mM dan terendah T2=21,39 mM. Kandungan butirrat tertinggi T1= 32,08 mM dan terendah T2=6,81 mM. Kandungan VFA total tertinggi T1=215,52 mM dan terendah T4=102,69 mM. Nilai EPR tertinggi T4=19,64% dan terendah T3=5,77%. Nilai FCR tertinggi T3=6,41 dan terendah T4=5,12. Nilai relatif ADG tertinggi T4=1,27 gram/ekor/hari dan terendah T1=0,95 gram/ekor/hari. Berdasarkan hasil yang diperoleh maka penggunaan tepung rumput laut *Sargassum* sp. 10% dari total konsentrat dengan pengeringan matahari dapat meningkatkan kinerja produksi domba ekor tipis jantan lepas sapih.

Kata kunci: Rumput laut, *Sargassum* sp, Domba ekor tipis, Mineral makro dan mikro, Metode pengeringan

## THE USE OF SEAWEED FLOUR (*Sargassum* sp.) AS MINERAL SOURCE FEED SUPPLEMENTS ON PERFORMANCE OF POST WEANING - MALE THIN TAIL SHEEP

### ABSTRACT

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This study was aimed to study the chemical composition and content of secondary metabolites of seaweed flour (*Sargassum* sp), digestibility of dry matter, and organic matter, microbial protein synthesis, *in vitro* rumen fermentation, and palatability of seaweed flour (*Sargassum* sp.), level of consumption, and nutrient digestibility, microbial protein production, production performance, and macro and micro mineral profiles in the blood of weaned rams fed with seaweed flour (*Sargassum* sp.). Research materials and methods: Phase I. *Sargassum* sp. from Gunungkidul Yogyakarta cleaned, sun-dried, oven 55°C, and freeze dryer at -20°C. Research variables include analysis of the nutrient composition, macro, and micro minerals, saponins, and tannins. Stage II. Evaluation of digestibility and rumen fermentation *in vitro* using a completely randomized design (CRD) with a 3x2 factorial pattern. Three treatments of drying seaweed *Sargassum* sp. include S1=sun, S2=oven, and S3=freeze dryer; two treatments P0 = without *Polyethylene glycol* (PEG), P1 = addition of PEG, and palatability test using 5 sheep. The research variables included: dry matter (DM) and organic matter (OM) digestibility, pH, microbial protein synthesis, rumen fermentation, and palatability. Stage III. Evaluating the use of *Sargassum* sp. seaweed flour. Sixteen weaned thin-tailed rams aged 5 – 6 months BW  $\pm$  11.8 kg for 3 months, using 4x4 CRD with four treatments, namely T1 = forage + concentrate + 0% minerals of concentrate, T2 = Forage + concentrate + mineral booster cow 0.38% of concentrate, T3 = forage + concentrate + *Sargassum* sp.5% of concentrate, T4 = forage + concentrate + *Sargassum* sp.10% of concentrate. The variables observed were nutrient consumption and digestibility, macro and micro mineral balance in blood plasma, microbial protein synthesis, daily body weight gain (DBWG), ration efficiency (RE), feed conversion ratio (FCR), and income over feed costs (IOFC). The results of the first phase of the study showed that *Sargassum* sp. through sun-drying, oven and freeze dryer was not significantly different from DM. and crude protein (CP), but significantly different ( $P < 0.05$  on the content of ash, ether extract (EE), crude fiber (CF), and extract material without nitrogen (EMWN). The highest ash content of sun-drying was 46.56%, and the lowest in freeze dryer drying was 38.26%, with the highest EE content in oven-drying at 0.58%, and the lowest in freeze-drying at 0.48%. The highest CF content in oven-drying at 8.76% and the lowest in sun-drying at 6.67%. The highest EMWN content in freeze dryer drying was 45.78%, and the lowest was 37.41% sun-drying. *Sargassum* sp. sun-drying, oven, and freeze dryer were not significantly different from saponins and had a significant effect ( $P < 0.05$ ) on tannins. The highest tannin content in freeze dryer drying was 1.22% (w/w), and the lowest was 0.77% (w/w) in oven-drying. *Sargassum* sp. seaweed. Sun-drying, oven 55°C, and freeze dryer -20°C significantly ( $P < 0.05$ ) on calcium (K), magnesium (Mg), sodium (Na), phosphorus (P), cobalt (Co), manganese (Mn), cuprum (Cu), and ferrum (Fe). The highest macro mineral K in

oven drying was 99.8 mg/kg, and the lowest P in freeze dryer drying was 8.85 mg/kg. The highest micro mineral Fe in oven-drying was 1457.90 ppm, and the lowest was Cu 4.26 ppm in sun-drying. *In vitro* experiments did not differ in the treatment of gas production for 72 hours, gas production kinetics, pH, VFA, microbial protein synthesis, and organic matter degradation (OMD). The treatments obtained were significantly different ( $P < 0.05$ ) on the production of CH<sub>4</sub> gas, NH<sub>3</sub>, and dry matter degradation (DMD). The lowest production of CH<sub>4</sub> gas from sun-drying without PEG was 4.02%. The highest NH<sub>3</sub> production in sun-drying PEG was 28.11 mg/100 mL and the lowest was freeze dryer PEG 21.78 mg/100 mL. The highest dry matter degradation was PEG sun-drying 82.41%, and the lowest PEG drying was 46.26% oven-drying. The palatability test of *Sargassum* sp. sun-drying, oven 55°C, and freeze dryer -20°C on weaned thin tails <25%. *In vivo* experimental treatment did not affect consumption and digestibility of DM, OM, CP, CF, EMWN, and total digestible nutrients (TDN). The treatment had a significant effect ( $P < 0.05$ ) on the consumption of minerals Ca, Mg, K, Na, Cu, Fe, and zinc (Zn). The highest consumption of Na minerals was T1=2866.76 mg/kg, and the lowest was K T2=6.41 mg/kg. The highest consumption of Fe minerals was T2=2789.57 mg/kg and the lowest was Cu T3=22.06 mg/kg. Blood plasma minerals before treatment did not differ on Mg, Na, Cu, Fe, Zn, but had a significant effect ( $P < 0.05$ ) on Ca and K. The highest Ca mineral was T1 = 87.13 mg/kg and the lowest was T3 = 57, 6 mg/kg. The highest mineral K was T3 = 1013.31 mg/kg and the lowest was T1 = 682.99 mg/kg. The treatment had a significant effect ( $P < 0.05$ ) on the minerals Mg, Cu, and Fe in blood plasma but no effect on Ca, K, Na, Zn. The highest Mg mineral T3=58.94 mg/kg, and the lowest was T1=4.78 mg/kg. The highest Cu mineral is T3=0,80 mg/kg, and the lowest is T4=0,54 mg/kg; the highest Fe mineral was T1=436.44 mg/kg and the lowest was T4=319.99 mg/kg. The treatment did not affect purine derivatives, pH, propionate, microbial protein, absolute daily weight gain, feed cost per gain, and IOFC and had an effect ( $P < 0.05$ ) on acetate, butyrate, total VFA, efficient use of ration, and FCR and relative average daily gain (RADG). The highest acetate content was T1=144.02 mM and the lowest was T2=21.39 mM. The highest butyrate content was T1 = 32.08 mM and the lowest was T2 = 6.81 mM. The highest total VFA content was T1=215.52 mM and the lowest was T4=102.69 mM. The highest efficient use of ration value was T4=19.64% and the lowest was T3=5.77%. The highest FCR value was T3=6.41 and the lowest was T4=5.12. The highest relative value of ADG was T4=1.27 gram/head/day and the lowest was T1=0.95 gram/head/day. Based on the results obtained, the use of *Sargassum* sp. 10% of concentrate with sun-drying can improve the production performance of weaning rams.

**Keywords:** Seaweed, *Sargassum* sp, Thin-tailed sheep, Macro, and micro minerals, Drying method.