PRODUCTION OF HIGH QUALITY SILAGE FROM SAGO FRONDS

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Sago frond is one of the most abundant by-products from the sago industry. Sago fronds are left on the ground upon harvesting of the sago palm for production of sago flour. Over 500 palms are harvested every day in the district of Mukah, Sarawak to feed the numerous sago mills. From here, it has been approximated that over 26 tons of sago frond is discarded as a rotting biomass. We see the potentials of sago frond to be developed as the alternative material for large-scale production of lactic acid and as a feed material for the livestock industries. Sago frond contains sap that can be extracted from the de-skinned white pith using a roller compressor, akin to sugar cane press. The sap contains 7% free sugars consist mainly of glucose and xylose. Both sugars are ideal substrates - and have been used - for the production of lactic acid utilising lactic acid bacteria (LAB) such as *Lactococcus lactis*. The residual fibre can be used as high-quality animal feed with minimal treatment. However, feed quality and palatability is very much improved through lactate fermentation during ensiling to produce silage. Ensiling process require anaerobic condition to inhibit the growth of moulds and fungi that can spoil the silage while concomitantly allowing the growth of lactic acid bacteria to produce nutrient and increase digestibility of the silage. The ensiling process takes only three weeks, whereby the pH of the silage is reduced to 4.4, a definitive condition that inhibits the growth of mould and fungi. Thus, addition of antibiotic and antifungal which usually entails the usual production of animal feed is unnecessary. This ensures that sago frond silage is much healthier and safer for consumption by the livestock. Silage from sago frond contains 9% carbohydrate and 18% protein, a balanced ratio of carbohydrate and protein highly recommended for growing and lactating stages of goats. Ensiling process of sago frond can be improved by using the LAB cells from the production of lactic acid on sago frond sap to boost the ensiling process. Adding LAB cells will hasten acidification to lower the pH, which will reduce duration of the ensiling process together with augmenting its digestibility. These findings are crucial in maximising the use of sago fronds – either disposed upon daily trimming or perpetual harvesting of matured logs – which proves to be a sustainable source for both the animal feed and lactate industries. With these possibilities, meagre income of the sago farmers can be enhanced, followed by development of new sago plantations which focus on zero wastes to protect our environment.

Silage made from fermented sago fronds

Preliminary testing on palatability of our sago frond silage to mixtures of young and mature goats at the Temudok Training Centre, near Sri Aman, Sarawak