

Effect of *Aspergillus niger* and Urea on the Crude Protein and Neutral Detergent Fibre Content of Cocoa-pods in Central Sulawesi, Indonesia

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Indonesia is the world's third largest producer of cocoa (*Theobroma cacao*), much of which is based on small-holder farmers. Cocoa-pods, left in the plantations after the cocoa harvest, harbour the cocoa-pod borer (*Conopomorpha cramerella*) which can reduce subsequent cocoa yields by 20-50%. Anecdotal evidence from Indonesia suggests that cocoa-pods may be a suitable maintenance feed resource for Bali cattle (*Bos sondaicus*) and quality may be improved under various treatments, including fermentation with *Aspergillus niger*. This preliminary study aimed to evaluate the chemical composition of cocoa-pods and the effect of treatment with *Aspergillus niger* and urea on crude protein (CP) and neutral detergent fibre (NDF) content of cocoa-pods over a 21 day period.

Cocoa-pods were collected immediately after harvest in Central Sulawesi. The pods were chopped to 2.5 cm² and divided into 5 treatment groups, with 3 replicates per treatment. The 5 treatments were; immediately dried cocoa-pods (A), fresh cocoa-pods (B), cocoa-pods fermented with 5x10⁶ spores of *Aspergillus niger* per kg of cocoa-pods (C), cocoa-pods with 20 g of urea added per kg cocoa-pods (D) and cocoa-pods fermented with 5x10⁶ spores of *Aspergillus niger* plus 20 g of urea per kg of cocoa-pods (E). All cocoa-pods were placed in fertiliser bags, either alone or in the presence of their treatment additives, with samples collected from each treatment replicate 0, 6, 12 and 21 days later. Collected samples were dried at 60°C and ground to 1 mm, prior to analysis. Replicate samples at each time point were bulked and analysed for dry matter content at 60°C, nitrogen content by the Kjeldahl method and NDF content, in duplicate. Data were analysed by analysis of variance procedures in SAS.

Untreated cocoa-pods had a CP content of 75 g/kg DM and a NDF content of 590 g/kg DM. The fermentation of cocoa-pods with *Aspergillus niger* increased the CP content above that of dried or fresh cocoa-pods, treated similarly (Figure 1a.). Further, *Aspergillus niger* fermentation in the presence of urea resulted in an increase in CP content above that of urea alone (Figure 1a.). Fermentation of cocoa-pods with *Aspergillus niger*, and the addition of urea, both resulted in a decrease in NDF content over time (Figure 1b.).

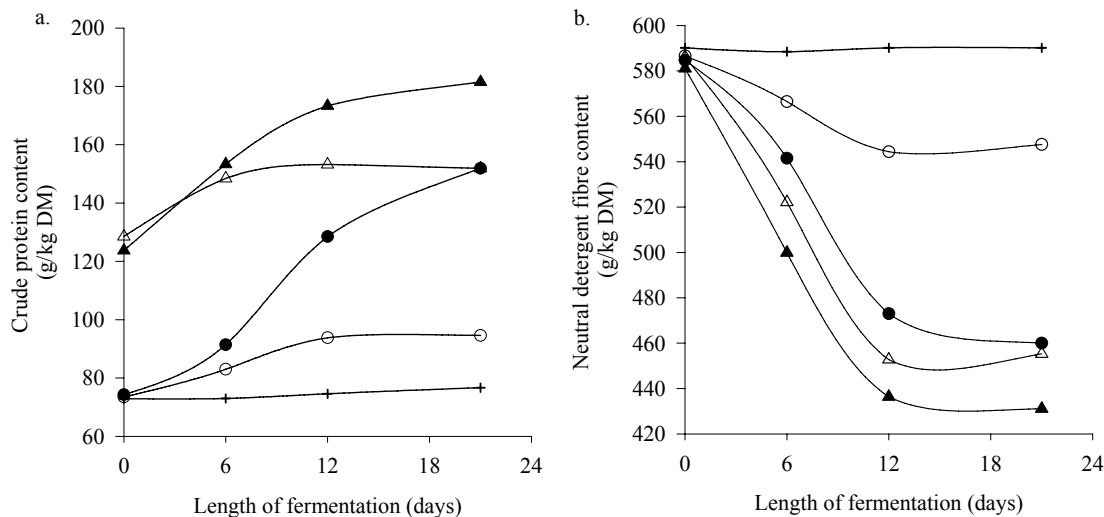


Figure 1. The effect of *Aspergillus niger* and urea treatment (+ A; ○ B; ● C; △ D; ▲ E) on the crude protein content (a.) and neutral detergent fibre content (b.) of cocoa-pods over time

Fermentation of cocoa-pods with *Aspergillus niger*, either alone or in the presence of urea has the potential to increase CP and decrease NDF content of cocoa-pods and provides a novel option for the utilisation of low quality agricultural by-products as a feed resource for Bali cattle in eastern Indonesia.

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