

Cassava pulp is suitable as beef cattle feed and shows less variation in chemical contents among seasons and factories

Cassava (*Manihot esculenta*) is one of Thailand's major crops, with about half of domestic production coming from the northeastern region. Cassava pulp, the major waste produced from starch factories, is considered a nutritious feed for cattle because of its high starch and fiber contents. To promote cassava pulp utilization as cattle feed, variations in chemical composition among seasons and starch factories, energy value, and performance of beef cattle fed with cassava pulp were investigated.

Cassava pulp samples were collected in each season -- the rainy season (mid-May to mid-October), summer (mid-October to mid-February), and winter (mid-February to mid-May) -- from four starch factories in northeastern Thailand. Significant variations in phosphorus and potassium contents were found among factories (Table 1). Constant variation in any of the chemical components was not found among the three seasons. Crude protein content of cassava pulp was close to that of cassava chip. Energy values, obtained from feeding trial using four Thai native cattle fed basal diet or basal diet with cassava pulp at maintenance level, were close to that of dried brewers' grain.

Eighteen yearling Thai native cattle were allocated to one of three dietary treatments and fed ad libitum (i.e., as much as desired) for 5 months in a randomized complete block design. Three dietary treatments using different proportions of cassava pulp (10, 30 and 50% as dry matter) instead of rice straw as a base in a fermented total mixed ration were applied (Table 2). The diets were formulated to contain 10% crude protein and exceed their energy requirement. Metabolized energy content and daily weight gain increased with increasing cassava pulp content (Fig. 1).

These results provide useful information on beef cattle rearing using cassava pulp and contribute in promoting the utilization of waste (cassava pulp) from cassava factories. Cassava pulp should be used as soon as possible or kept under anaerobic condition because of its low aerobic stability. The physical effective fiber content and nutrient requirements must be noted when diets are formulated with a high cassava pulp ratio.

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Table 1. Chemical composition and energy values of cassava pulp, cassava chip and dried brewers' grain

	Cassava pulp		Cassava chip ^s	Dried brewers' grain ^s
	Mean	SD		
DM (%)	18.4	3.9	89.8	91.3
Crude Protein (%DM)	2.2	0.5	2.3	25
Ether extract (%DM)	0.4	0.3	0.5	5.7
Neutral detergent fiber (%DM)	36.0 [†]	5.1	10.1	50.7
Non fibrous carbohydrate (%DM)	59.3 [†]	5.4	10.8	83.3
Hydrocyanic acid (ppm DM)	117	55	-	-
Calcium (%DM)	0.22	0.07	0.1	0.36
Phosphorus (%DM)	0.03 [†]	0.01	0.1	0.47
Potassium (%DM)	0.36 [†]	0.14	0.92	0.04
Magnesium (%DM)	0.09	0.02	0.09	0.23
Total digestible nutrient (%DM)	74.4	0.4	79	70
Metabolized energy (MJ/kgDM)	11.3	0.1	15.3	11.3

DM:dry matter, [†]significant difference among factories (P<0.05), ^{*} interaction between factory and season (P<0.05), ^s Data obtained from Nutrient Requirements of Beef Cattle in Indochinese Peninsula (2010)

Table 2. Feed formula, chemical composition and energy value of fermented total mixed ration containing 10, 30 and 50% of cassava pulp (dry matter basis)

Feed formula (DM basis)	Cassava pulp ratio		
	Low	Medium	High
Cassava pulp	10.0	30.0	50.0
Rice straw	50.0	30.0	10.0
Palm Kernel meal	23.5	23.5	23.5
Soybean meal	5.0	5.0	5.0
Rice bran	10.0	10.0	10.0
Urea	0.5	0.5	0.5
Vitamin & mineral premix	1.0	1.0	1.0
Chemical composition (%DM)			
Crude protein	9.9	9.7	9.7
Ether extract	5.9	5.9	5.9
Neutral detergent fiber	63.2	53.6	45.2
Non fibrous carbohydrate	10.5	22.9	33.7
Metabolized energy (MJ/kgDM)	9.6	11.4	12.4

DM: dry matter

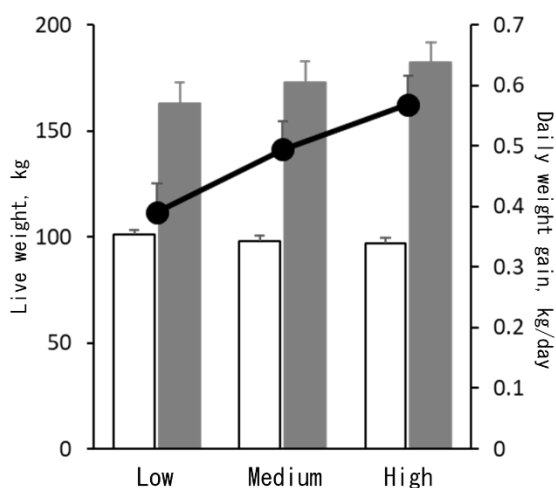


Fig. 1. Initial (□) and final (■) live weight, and daily weight gain (●) of Thai native cattle fed fermented total mixed ration containing 10, 30 and 50% of cassava pulp (dry matter basis; Low, Medium, and High, respectively). Daily weight gain linearly increased with increasing cassava pulp inclusion (P<0.05).