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FACULTY OF ANIMAL SCIENCE
BOGOR AGRICULTURAL UNIVERSITY

isai 4th
International Seminar on Animal Industry 2018

THE FOURTH INTERNATIONAL SEMINAR ON ANIMAL INDUSTRY

"Harmonizing Livestock Industry Development, Animal Welfare, Environmental and Human Health"

August, 28-30 2018
IPB International Convention Center, Bogor-Indonesia

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Crude Nutrient and Mineral Composition of *Asystasia Gangetica (L)* Derived from Different Growing Areas

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Abstract

Asystasia gangetica as a predominant plant species for feeding goat grows widely in various lands in Payakumbuh region. The present study was aimed to determine crude nutrient and mineral composition of the wild plant derived from five different growing areas, i.e. banana and cacao plantations, road sides, idle lands and river banks. The sampling sites were distributed in 3 different subdistricts. Fresh samples which were collected by using a plate meter of 0.5 x 0.5 m^2 were weiighed, chopped, dried and then ground in meal form prior to analysis for dry matter (DM), crude ash, crude protein (CP), crude fiber (CF), acid detergent fiber (ADF), cellulose, and minerals of Ca, P, Mg, Cu, Zn, Mn. Data were subjected to analysis of variance (ANOVA) in completely randomixed design of 5x3 consisting of 5 growing areas and 3 subdistricts as replications. Results showed that *A. gangetica* contained relatively low DM of 9.3-11.9%. Crude ash ranged 16.8-20.9%, CP: 15.5-25.0%, CF: 23.2-28.6 %, ADF: 42.5-46.4%, and cellulose :26.5-29.7%. Macro mineral Ca ranged 18.8-20.5 g, P:11.2-17.4, Mg: 7.5-8.5 g/kg DM. Trace element of Cu ranged 22.0-29.4 mg, Zn:17.4-22.6 mg, Mn: 36.2-41.4 mg/kg DM. *A. gangetica* grown in the banana plantation areas showed the highest crude protein content, while the highest fiber content was found by *A. gangetica* collected from the cocoa plantation. *A. gangetica* grown in river banks tended to have the higher mineral content of Ca, P, Mg, and Cu.

*Keywords***:** *Asystasia gangetica* L, predominant species, crude nutrient, mineral composition

Introduction

A. gangetica (Linn) T. Anderson belongs to the family of Acanthaceae and is commonly known as the Chinese violet. It has green and oval-shaped leaves with rounded base occurring in opposite pairs. This herb grows well and spreads widely in crop plantations, such as rubber, coffee, and palm oil plantations in particular (Ong *et al*., 2008). Although this plant is considered a serious environmental and agricultural weed (Asbur *et al*., 2015), *A. gangetica* is known have high nutritional value for feed, because this plant was not only rich in protein and soft fiber, but also contained favorable amount of minerals (Khalil, 2016; Sobayo *et al*., 2012; Adigun *et al*., 2014).

Goat farming in Payakumbuh region which cover Payakumbuh city and 50 Kota district is distributed mainly in the six sub-districts of Lareh Sago Halaban, Harau, Mungka, Luhak, Payakumbuh Timur and Payakumbuh Barat (Kurnia *et al*., 2015). These regions are dominated by annually small-scale crop estates as potential sources of fodder feed. *A. gangetica* is widely grown in various areas, like plantation areas, river banks, rice fields, idle lands, forest edges, and roadsides. This wild forage which called "akar jalar" or "aka jala" by locals was found to be very palatable and as a predominant species used for feeding goat in Payakumbuh (Khalil, 2016). The present research was aimed to identify the dominance and to determine crude nutrient and mineral composition of *A. gangetica* derived from five different growing areas, i.e. banana and cacao plantations, road sides, idle lands and rive banks.

Materials and Methods

Fresh samples of *A. gangetica* were collected at 5 growing areas, i.e. banana and cacao plantations, road sides, idle lands and river banks. The sampling areas were distributed in 3 different subdistricts of South Payakumbuh, Payakumbuh and Luhak. Samples were collected at 5 sampling points each area by using quadrants plate mater of 0.5 x 0.5 m^2 in size. Plant materials in plate meter were cut about 10 cm above ground level and placed in individual plastic bag. The fresh samples were weighed, separated into species and then weighed for determination of botanical composition.

Samples of *A. gangetica* at each sampling area were chopped and mixed. Representative samples of about 100-150 g were dried in a forced draught oven at 60ºC for 24 hours, weighed again and ground in meal form prior to analysis for dry matter (DM), crude ash, crude protein (CP), crude fiber (CF), acid detergent fiber (ADF), cellulose and minerals (Ca, P, Mg, Zn, Cu, Mn). Data were subjected to analysis of variance using a completely randomized design of 5x3 consisting of of 5 growing areas and 3 subdistricts as replications. Duncan's Multiple Range Test was applied to compare means. Differences were considered significant at $P < 0.05$ (Steel *et al*., 1997).

Results and Discussion

There were in total about 12-16 wild plant species growing together with *A. gangetica*. As shown in Table 1, *A. gangetica* dominated plant colonies which composed of about 90% in banana and cacao plantations, road sites, and idle lands and 76% in river bank. This plant is known as a rapidly growing struggling herb, spreads very quickly as weed which infests crops, such as rubber, coffee, and particularly palm oil plantations (Ong *et al*., 2008). It adapts well to low fertility soils and shaded areas (Ong *et al*., 2008; Samedani *et al*., 2013). *A. gangetica* contained relatively low DM of 9.3-11.6%. The DM content of *A. gangetica* of the present study was comparable with the result of Bindelle *et al*. (2007) who reported that *A. gangetica* contained DM of about 10.5%, but lower than the DM content of 14.6% and 15.0% of those reported by Khalil (2016) and Odhav *et al*. (2007), respectively. This plant is presumably favored by goats because of its soft leaf texture and high-water content.

The nutrient content ranged from 15.4 to 25.0% CP, 23.2 to 28.6% CF, 16.8 to 20.9% crude ash, 42.5 to 46.3% ADF, and 26.5 to 29.7% cellulose in DM. *A.*

gangetica grown in banana plantation showed significantly higher crude protein concentration of about 25.0%, while four other sources showed relatively low variation of about 15-19% CP. Crude fibers were varied among the feed. *A. gangetica* from cacao plantation contained the highest crude fiber of about 28.6% followed by road sides and idle lands of 25.8 and banana plantation of 24.4%, while the lowest fiber was found by *A. gangetica* from river banks of about 23.2% ($P<0.05$). There was no statistically different in crude ash, ADF and cellulose content ($P>0.05$).

There were no significant differences in macro mineral content. Calcium varied from 18.3-20.5 g/kg, followed by P (11.2-17.3 g/kg), and Mg (6.8-8.5 g/kg DM). In term of mean values, *A. gangetica* grown at river banks tend to have the highest macro mineral content presumably due to high mineral sedimentation carried by river water flow. In compare to other dominant forages fed to goat in Payakumbuh region, *A.gangetica* was found as reliable sources of Ca and P with relatively narrow Ca/P ratio. It contained significantly higher Ca of 8.2 g/kg DM than that of grasses (2.1 and 2.2 g/kg DM) and *C. pubescens* (3.5 g/kg DM) (Khalil, 2016). The P mineral content of 11.2-17.3 g/kg DM of *A. gangetica* was found comparable to P content of *C. pusbescens* (12.6 g/kg DM) and cassava leaf (11.4 g/kg DM) (Khalil, 2016).

Table 1. Plant dominance, dry matter and crude nutrient content and mineral composition of *A. gangetica* grown in different areas

Parameter	Growing areas				
	Banana plantations	Cacao plantations	Road sides	Idle lands	River banks
Plant dominance (%)	94.3±5.0	90.2±3.0	89.1±11.3	95.0±3.9	76.2±8.1
DM content (%)	9.3±0.7	10.6±1.2	11.9±0.5	10.1±1.3	11.6±2.7
Crude nutrient (% DM)					
- Crude protein	25.0±3.7^{a}	15.4±3.6^{b}	18.7±4.2^{b}	18.5±3.8^{b}	18.7±1.0^{b}
- Crude ash	20.9±2.4	18.5±2.1	17.0±2.2	17.4±1.4	16.8±4.4
- Crude fiber	24.4±2.8^{b}	28.6±0.8^{a}	25.7±2.2^{ab}	25.8±2.0^{ab}	23.2±2.1^{b}
- ADF	42.5±2.5	46.4±3.7	45.0±3.9	45.2±3.0	45.2±4.7
- Sellulosa	27.4±1.5	29.7±2.7	26.5±3.7	29.0±1.5	29.0±1.6
Macro minerals (g/kg DM):					
- Ca	18.3±0.9	19.0±1.7	18.5±4.7	20.5±3.5	20.3±1.3
- P	14.4±2.8	11.2±3.6	15.6±7.0	12.6±1.2	17.3±3.8
- Mg	7.4±1.6	8.3±0.6	8.5±0.6	6.8±0.4	7.7±1.3
Micro minerals (mg/kg DM)					
- Zn	17.4±2.3^{d}	22.5±3.8^{a}	18.5±2.5^{cd}	22.1±1.5^{a}	19.9±1.8^{bc}
- Cu	29.4±1.6^{a}	27.2±2.4^{a}	22.0±0.7^{b}	24.8±3.3^{ab}	29.1±3.1^{a}
- Mn	40.2±4.1	41.3±3.5	38.1±5.0	37.8±3.1	36.2±1.6

Different superscript in the same line means significantly different ($P < 0.05$)

A. gangetica was found a relatively rich on trace mineral Zn, Cu, and Mn. *A. gangetica* derived from cacao plantation and idle land contained the highest Zn, while the highest Cu concentration of 29 mg/kg DM was found by *A. gangetica* derived

from banana plantation and river banks. There was no significant difference in Mn concentration. Concentration of Zn (17.7-22.5 mg), Cu (22.0- 29.1 mg), and Mn (36.2-41.3 mg/kg DM) were comparable to the previous results reported by Khalil (2016).

Conclusions

A. gangetica was favored by goats presumably because of its availability, palatability and high nutritional values. This plant grown in the banana plantation areas showed the highest CP, while the highest fiber was found by *A. gangetica* collected from the cocoa plantation. *A. gangetica* grown in the river banks tended to have the higher mineral content of Ca, P, Mg, and Cu.

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Selection of irradiated 50 Gy Lamtoro (*Leucaena leucocephala*) Callus on Acid Stress through Tissue Culture

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Abstract

Lamtoro (*Leucaena leucocephala*) cv Tarramba is a good forage that has a high crude protein, insect tolerance and drought resistant but only grow well at pH >5 and have high mimosine content. The aim of this study was to select irradiated 50 Gy Lamtoro callus on acid stress by $AlCl_3$ addition. This study was used a complete randomized design with 6 treatments and 20 replications. The treatments were the addition of $AlCl_3$ with levels of 0 ppm with pH 6.1 (P0), 100 ppm with pH 5.1(P1), 200 ppm with pH 4.1 (P2), 300 ppm with pH 3.55 (P3), 400 ppm with pH 3.45 (P4) and 500 ppm with pH 3.36 (P5). The variables observed were height and width of callus, viability, contamination, texture, pH alteration, media shrinkage, and callus weight. These treatments significantly affected ($P<0.05$) height and width callus, media shrinkage, and weight of callus. The conclusion of this study was that the tolerance level of irradiated 50 Gy Lamtoro callus at 200 ppm with pH 4,1 (P2).

Keywords : *acid stress, Leucaena leucocephala,* callus, tissue culture

Introduction

Legumes have high nutritional value used to complianced protein and fiber needs for livestock. Legume commonly found in Indonesia is lamtoro (*Leucaena leucocephala*) that has a digestibility of 70% (National Academy Press 1977). According Siahaan (1982), that lamtoro has a chemical composition such as dry weight 34.5%, crude protein 21.5%, non-nitrogen extract 49.5%, crude fiber 14.3%, crude fat 6.5%, ash 6.28%, Ca 2.7%, and Phospor 0.17%. Lamtoro grow well in Indonesia, especially in eastern Indonesia. One of lamtoro plants that exist in this area is lamtoro cv. Tarramba. According to Nulik *et al*. (2004), Lamtoro cv. Tarramba are tolerant of insect attacktion and drought, but there is not tolerance to acidic conditions. Indonesia has the potential land with extensive dry soil with acidic condition. Acidic soil characterized by low pH can be caused by a fairly high aluminum content (Prasetyo and Suriadikarta, 2006). Aluminum excess can be toxic to plants grow, therefore lamtoro plants tolerant to low pH conditions can exploit the potential of marginal landscapes in Indonesia especially with acidic conditions. This problem can be solved by applying of plant biotechnology through tissue culture that can select acid-tolerant lamtoro plant. In vitro cultures, genetic diversity can be enhanced by somaclonal diversity. Genetic diversity can be enhanced by various treatments such as the provision of physical mutagen (gamma rays) on embryogenic