CHEMICAL COMPOSITION OF WEEDS AS POTENTIAL FORAGE IN INTEGRATED FARMING

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ABSTRACT. The purpose of this study is to determine the chemical composition of weeds in an oil palm plantation aged 8 and 10 years with the aim of assessing their potential as forage for beef cattle. Data collection was conducted in a cattle-oil palm integrated farming in FELCRA Batu 3½ Paloh, Johor, in two different years, 2016 and 2018, when the plantation was 6 and 8 years old, respectively. Both samplings (October 2016 and August 2018) were obtained from the same plot Each sampling was from ten randomly picked points using a quadrant size of 0.5 m × 0.5 m. The results showed three dominant weeds growing on oil palm plantations in 2016: *Paspalum conjugatum* (buffalo grass), *Asystasia gangetica* (Asystasia grass) and *Axonopus compressus* (carpet grass). In 2018, there were two dominant weed species found during the sampling process: *Ottochloa nodosa* (slender panic grass or rumput pait in Malay) and *Asystasia gangetica* (Asystasia grass). Determination of chemical composition showed that average crude protein increased from 19.0% at aged 8 years to 21.9% at aged 10 years, while average crude fibre decreased from 24.4% at the aged 8 years to 23.4% at aged 10 years. Naturally, weeds in oil palm plantations showed is a good potential source of forage for beef cattle.

Keywords: oil palm, beef cattle, integrated farming, chemical composition

INTRODUCTION

Weeds can be defined as undesirable plants in an area such as oil palm plantations. Humid and fertile conditions under the trees and in inter-row spaces promote the growth of at least 60 species of grass, commonly considered as weeds (Ayob and Kabul, 2009). Weeds can affect the oil palm crop in many ways such as competition for nutrient and water, reduction in yield and growth retardation (Chung, 2010). However, the presence of weeds in oil palm estates can be useful and has some benefits such as helping to reduce erosion, cooling the surrounding land area, moisturising the soil (Mark, 2013) and as a feed source for livestock (Castelán *et al.,* 2003). Apart from using chemicals, grazing activities by livestock may also be practised to control the growth and spread of weeds.

Paspalum conjugatum (buffalo grass) is a tropical to subtropical perennial grass. According to the Food of Agriculture Organization (2010), palatability of *P. conjugatum* is higher for buffalo than for cattle. It should be grazed young as palatability declines rapidly after flowering (Heuze *et al.,* 2016).

Axonopus compressus (carpet grass) is a robust creeping perennial grass and is ranked as a high quality species (Samarakoon *et al.,* 1990; Senanayake, 1995) with no toxicity reported. In Japan, *A. compressus* was found to be one of the most palatable grasses in comparison with ten other pasture species for grazing cattle (Nada, 1985). Samarakoon *et al.* (1990) also mentioned the ability of *A. compressus* to grow and tolerate heavy grazing while maintaining quality under shade (light transmission less than 50%).

Ottochloa nodosa (slender panic grass or rumput pait in Malay) is a perennial grass, it is moderately palatable but not tolerant of heavy grazing or frequent cutting (Manidool, 2016). *Asystasia gangetica* (Asystasia grass) known as a perennial herb, it has an ability to grow under shade and it has high nutritive value. It is also high palatability and digestibility which make it attractive to graze (Adetula 2004).

There are several types of weeds that have potential as animal feed in the livestock integration system. However, not much research has been conducted to determine the chemical composition of weed. Therefore, the aim of this study is to determine the chemical composition of weeds that may have potential to be used as animal feed in an integrated farm.

MATERIALS AND METHOD

The study was conducted at cattle-oil palm integrated farming in FELCRA Batu 3½ Paloh, Johor. The area of the integration is 16 acres, per acre consisting of 55 palm trees. The distance between trees was 8.8 meters. In 2018, the trees were ten years old and between 3 to 4 meters tall. A total of 40 Brahman and Kedah Kelantan breed cattle were reared in this integrated farm. Cattle were placed in each plot for a duration of three days and rotated from plot to plot to prevent over-grazing. Source of drinking water was from a river, maintained by the Department of Irrigation and Drainage. The cattle were supplied with mineral salts to meet mineral requirements of livestock.

The samplings were collected in October 2016 and August 2018 at Paloh, Kluang, Malaysia (2° 01′ N, 103° 19′ E; elevation 88.1 m). The local climate was hot, humid and tropical with abundant rainfall throughout the year. The monthly maximum and minimum temperatures and relative humidity in October 2016 ranged from 29.2 °C to 25.1 °C, and 73.5% to 94.4% respectively. While in August 2018, monthly maximum and minimum temperatures and relative humidity range from 28.9 °C to 25.3 °C, and 71.3% to 85.3%, respectively.

Both samplings were taken from the same plot. Each sampling were from ten randomly picked points using a quadrant of 0.5 m × 0.5 m. The samples were cut, weighed, and pre-dried in a forced-air drying oven at 60 °C overnight. The dried samples were then ground to pass 1-mm sieves and then forced-air dryed in an oven at 103 ± 2 °C overnight (AOAC, 2000) to determine the dry matter composition. The ground samples were also used to determine the chemical composition of samples. The crude protein (CP) content (*N x 6.25*) was determined after digestion in sulphuric acid by Kjeldahl analysis using a Kjeltec™ analyzer (FOSS, 2003). Crude fibre (CF) was measured after treatment with boiling dilute sulphuric acid and boiling sodium hydroxide solution using a Fibertec™ system (FOSS, 2010). Ether extract (EE) was determined using the Soxtec™ Extraction System (FOSS, 2008). The metabolisable energy (ME) for the ruminant was calculated using Close and Manke equation (1986). pH readings of water samples were taken with a pH meter.

RESULTS AND DISCUSSION

Weeds were sampled twice, in 2016 and 2018. In 2016, three dominant weeds were found: *P. conjugatum*, *A. gangetica* and *A. compressus*. In 2018, two dominant weed species were found: *O. nodosa* and *A. gangetica*.

The chemical compositions of four grass species and one of mix grasses (*P. conjugatum*, *A. gangetica* and *A. compressus*) sampled are presented in Table 1. Proximate

Table 1. Chemical composition of dominant weed in samplings.

Parameter (%)	2016				2018	
	Paspalum conjugatum	*Asystasia gangetica*	*Axonopus compressus*	Mix grasses	*Ottochloa nodosa*	*Asystasia gangetica*
Dry matter	29.7	11.2	31.6	20.3	21.5	11.5
Crude protein	13.4	30.7	13.0	17.6	20.2	23.5
Ether extract	1.2	3.3	2.0	2.2	2.3	2.5
Crude fibre	25.9	19.8	27.4	25.9	23.6	23.1
Total ash	8.8	17.6	7.5	8.6	19.1	15.8
NFE	50.8	28.7	50.1	45.6	34.9	35.2
TDN	62.7	45.4	63.2	64.8	52.3	55.7
ME (MJ/kg)	9.42	6.59	9.52	9.78	7.72	8.28
Calcium	0.26	0.54	0.30	0.45	0.23	0.58
Phosphorus	0.00	0.12	0.14	0.20	ND	ND

Note: NFE: Nitrogen-Free Extract; TDN: Total Digestible Nutrients; ME: Metabolizable Energy; ND: Not done

Table 2. Average of chemical composition of weeds.

Parameter (%)	Year	
	2016	2018
Crude protein	19.0	21.9
Ether extract	2.2	2.4
Crude fibre	24.4	23.4
Total ash	11.3	17.5
TDN	57.1	54.0

analysis found that total digestible nutrients (TDN) of mix grasses was 64.8%, approximately 63% for *A. compressus* and *P. conjugatum* and 45.4% for *A. gangetica*. ME of *A. compressus* and *P. conjugatum* was approximately 9 MJ/kg and *A. gangetica* was 6.5 MJ/kg. However, ME of mix grasses was 9.78MJ/kg. CP of *A. gangetica* was 30.7%, while two other grasses was 13%. Mix grasses contains 17.6% CP. These values are higher than a mature cow's CP requirement which is 7% (Hersom 2017).

Dry matter for *O. nodosa* and *A. gangetica* in year 2018 are 21.5% and 11.5% respectively. Meanwhile, the results of the chemical composition analysis found that TDN and ME of *A. gangetica* were higher than that of *O. nodosa*. TDN value for *O. nodosa* was 52.3% and *A. gangetica* was 55.7%. ME for *O. nodosa* was 7.72MJ/kg and *A. gangetica* was 8.28MJ/kg. CP for *A. gangetica* was higher at 23.5% compared to 20.2% in *O. nodosa*. pH test results found that the herd was drinking river water with pH of 7.07. According to Curran G. (2014), drinking water should be in the pH range of 6.5 to 8.5. If the pH is highly acidic which is less than 5.5, it can cause acidosis and reduced feed intake may occur. However, if the herd were given highly alkaline water with pH value of over 9, it may cause digestive upset and diarrhoea, lower feed conversion efficiency and reduce intake of water and feed.

Grasses that grow in the FELCRA Batu 3½ Paloh oil palm plantation is natural forage, so changes in its composition is strongly influenced by environmental conditions such as soil fertility, water availability and shade from palm canopy (Taufan *et al.,* 2014). The observations from this study indicates that different types of weeds with different proportions were found under oil palm trees of different ages. In year 2016, there are three dominant weeds species were found, that is, *P. conjugatum*, *A. gangetica* and *A. compressus*. In 2018, only two dominant weed species were found, that is, *O. nodosa* and *A. gangetica*. *O. nodosa* was more predominant compared to *A. gangetica* under older palm trees, indicating that *O. nodosa* is more resistant to shade than the grasses found in 2016. The observations of this study are consistent with those reported by Taufan *et al.,* 2014, which found that a 3-year-old oil palm plantation was dominated by *P. conjugatum*, while a 6-year-old oil palm plantation was dominated by *O. nodosa*.

Data on Table 2 shows that the average CP, EE and total ash in the weeds grown in 2018 tend to increase, while CF and TDN tend to decrease. This is consistent with studies conducted by Taufan *et al.* (2014), with the exception of EE. According to Taufan *et al.,* (2014), the increase in CP occurred because of the change of forage and chemical compositions. CP of *O. nodosa* in 2018 was 20.2%, thus higher in comparison to 13.4% in *P. conjugatum* in 2016. According to Kephart and Buxton (1993), stressful growth conditions that limit photosynthate, such as shade, may improve forage quality especially in CP. Thus, due to these factors the CP value was higher in 2018 than in 2016. Additionally, based on a calculation by Taufan *et al.* (2014), a reduction in the capacity per hectare was found from three to six-year-old oil palm plantations. The declining forage production may be related to the aging of the oil palms. Taufan *et al.* (2014) suggested that the carrying capacity could be maintained through grazing by a rotation system at intervals of around sixty days. Meanwhile, Chen and Dahlan (1995) suggested that a rotational grazing system at six to eight weekly intervals is ideal in order to obtain a sustainable carrying capacity.

CONCLUSION

Based on the results of this study, it can be concluded that weeds in oil palm plantations has great potential to be used as a source of forage for beef cattle. The chemical compositions of the weeds analysed in this study contain high nutritional values and could fulfil the livestock requirement if availability is in abundance. Grazing on weeds is the only source of feed for beef cattle in this integrated farm where no concentrate feed or other grasses were planted and fed to livestock. The cost of purchase of livestock feed is high but by using weeds as animal feed, the owner can economise. Further studies should be conducted to obtain the amount of weeds found in farms to ensure that there is sufficient and continuous supply for livestock. Analysis of chemical compositions and dry matter yield on other weeds found in integrated farms should also be carried out.

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