Effects of Different Season on Dominant Species and Chemical Composition of Tropical Agricultural Weeds

Bambang Suwignyo[1*], Bambang Suhartanto[1], Briyan Ahmad Suparja[2], Wahyudin[2], and Galih Pawening[2]
[1] Lecturer at Faculty of Animal Science, Universitas Gadjah Mada
[2] Undergraduate student at Faculty of Animal Science, Universitas Gadjah Mada
*Corresponding email: bsuwignyo@ugm.ac.id

ABSTRACT

The study was conducted to determine the dominance level and nutritive composition of weeds during differenrt seasons. Weed sampling was done randomly on agricultural lands located in Pakem, Sleman, Yogyakarta. The method used to determine the level of dominance of weeds was by using line intercept transcect. Plant data collected include height, width, and number of plants with different seasons as treatment. The dominant weeds were then analysed for nutritional quality using proximate analysis methods. The results showed that the level of weed species domination was higher than the legume and forb weeds in different seasons. Weeds that dominate in the dry season include *Digitaria setigera*, *Echinochloa oryzoides*, *Eleusine indica, Portulaca oleracea*, and *Cyperus iria* while in rainy season *Ageratum Conyzoides*, *Cyperus iria*, *Ludwigia octovalvis*, *Echinochloa conola*, and *Echinochloa glabrescens*. Based on the proximate analysis of weeds that emerged in different seasons showed that seasonal differences significantly ($P<0.05$) affect the nutritional content of weed grass and some *forbs*. *Cyperus iria* is one of grass weed that dry matter content during dry season (23.3%) higher than rainy season (13.9%) ($P<0.05$). Weeds of shrubs that contain higher dry matter during the dry season are *Cleome rutidosperm* (13.1%) than during rainy season (10.7%) ($P<0.05\%$). Based on the study, it can be concluded that seasonal differences affected the nutritional content of some weed plants and t on the dominance level of weed species. The grasses weed domination level were higher than the shrubs and the legum in the dry season and the rainy season. Seasonal differences significantly affected the content of dry weed material and some weeds and legumes.

Keywords: Weed dominance, Line intercept transcent, Season, Tropical climate, Weed

INTRODUCTION

Forage feed is the main feed of ruminant livestock. The low availability of forage during dry season is one of regular constraints that affect to livestock productivity. Suwignyo et al. (2016) states that fluctuations in the availability of forage often occur : during the rainy season availability is abundant while the dry season there is the scarcity of forages. In addition to reduced availability, seasonal differences also affect the nutrient content of the plant. Weeds are plants that grow wild and potentially disrupt the staple crops grown on the cultivated land. Growth of weeds in the agricultural land is supported its inherent properties, such as they have a very efficient breeding mechanism through breeding vegetatively and generatively (Utami and Rahadian, 2010). However, weeds that grow in the agricultural land can be used as animal feed. Based on these problems, further research on the diversity and quality of weeds of agricultural land in different seasons is required.

MATERIALS AND METHODS

Time and Place of Study

This study was carried out in dry (August-October 2016) and rainy (December-January 2017) seasons. Data collection took place in the field of research Hargobinangun,

Pakem, Sleman, Yogyakarta Special Region with an altitude of 600 above sea level (asl) with land used for cultivation of rice (±30 days), corn (±30 days), peanuts (±45 days), and empty agricultural land. These selected four agricultural lands have not been treated with weed control.

Materials

Tool. Tools used include field equipments for productivity evaluation included scissors, gauges, ares, digital scales, cameras, grinding machines, 55°C ovens, sample plastics, pencils, raffia ropes, record books and also a set of tools for proximate analysis in the laboratory.

Location: The location of data collection include agricultural land planted with rice, corn, beans, and empty land with dry and rainy season in Pakem, Sleman, Yogyakarta.

Methods

Dominance of weeds. Weed domination test was done by line intercept transect technique. Weed productivity measurements with line intercept transect techniques were conducted according to Moody et al. (1984).

Sampling. Existing weeds on the studied field were sampled as much as 500 grams / weeds to be analyzed for proximate analysis at the Forage Feed Farm laboratory. Not all weeds on the farmland were sampled, as only the most dominant weeds are taken from five groups of grass, shrubs and legumes.

Chemical composition. Collected samples was analyzed by proximate analysis: dry matter (DM), organic matter (OM), ash content, crude fiber (CF), crude protein (CP) (AOAC, 2005), and extract ether (EE) (Kamal, 1994). The data obtained then was used to calculate nitrogen free extract (NFE) the content. Total digestible nutrients (TDN) formulated with equation by Hartadi et al. (2005), grade 2 feed material (fresh forage) for cattle.

Data analysis. The data from the weed proximate analysis were analyzed descriptively and continued by T-test using SPSS 16 software.

RESULTS AND DISCUSSION

Domination Level of Weed

Table 1. Species of weeds that dominate in different seasons

Species	*Summed domination ratio* (%)	
	Dry season	Rainy season
Rumput ceker ayam (*Digitaria setigera*)[1]	5.65	-
Rumput padian (*Echinochloa oryzoides*)[1]	5.39	-
Rumput belulang (*Eleusine indica*)[1]	5.09	4.38
Krokot (*Portulaca oleracea*)[2]	4.01	3.43
Teki jekeng (*Cyperus iria*)[1]	3.90	7.32
Tumbaran (*Fimbristylis miliacea*)[1]	3.89	-
Urang-aring (*Eclipta alba*)[2]	3.83	-
Maman ungu (*Cleome rutidosperma*)[2]	3.36	4.66
Bandotan (*Ageratum conyzoides*)[2]	3.26	5.93
Cacabean (*Ludwigia octovalvis*)[2]	3.17	4.52
Putri malu (*Mimosa pudica*)[3]	0.75	-
Suket tuton (*Echinochloa conola*)[1]	-	4.75
Rumput jajagoan (*Echinochloa crus-galli*)[1]	-	5.04
Jampang (*Echinochloa glabrescens*)[1]	-	4.62
Goman (*Eclipta prostrata*)[2]	-	3.72

Description: 1: grass, 2: shrubs, and 3: legumes. - excluding the dominance of the season.

Based on the data from Table 1, it was found that the seasonal differences had no significant effect (P<0.05) on the summed domination ratio of each weed species. Indah et al. (2012) showed that the summed domination ratio is a quantitative parameter that can be used to express the dominant level of species within a plant community. Based on the results obtained that the summed domination ratio during the highest dry season *Digitaria setigera* 5.65% while the rainy season is Cyperus iria 7.32%.

Chemical Composition

Based on the proximate analysis, chemical composition grass weed value are shown in Table 2.

Table 2. Chemical Composition Grass Weed

No.	Species	Season	Chemical composition						
			DM	OM	CP	CF	EE	NNE	TDN
1	Teki jekeng	Dry	21.39[b]	90.26[b]	7.25[a]	31.14	6.84	44.51	51.82
	(*Cyperus iria*)	Rainy	13.91[a]	85.37[a]	13.07[b]	26.12	6.48	40.81	58.16
2	Rumput belulang	Dry	19.53[b]	88.10[b]	13.02	28.33	7.43	38.82[b]	58.21
	(*Eleusine indica*)	Rainy	15.16[a]	85.04[a]	15.40	29.17	6.02	34.98[a]	58.51
3	Rumput ceker ayam	Dry	17.82	89.72	12.22	23.34	7.37	47.07	60.42
	(*Digitaria setigera*)	Rainy	-	-	-	-	-	-	-
4	Tumbaran	Dry	17.31	80.68	7.70	27.44	6.90	37.94	47.82
	(*Fimbristylis miliacea*)	Rainy	-	-	-	-	-	-	-
5	Rumput padian	Dry	14.16	87.95	9.18	33.62	7.34	38.14	53.61
	(*Echinochloa oryzoides*)	Rainy	-	-	-	-	-	-	-
6	Suket tuton	Dry	-	-	-	-	-	-	-
	(*Echinochloa conola*)	Rainy	13.75	81.69	13.94	27.15	6.33	34.25	56.94
7	Rumput jajagoan	Dry	-	-	-	-	-	-	-
	(*Echinochloa crus-galli*)	Rainy	14.14	87.26	11.61	34.68	7.06	34.18	56.21
8	Jampang	Dry	-	-	-	-	-	-	-
	(*Echinochloa glabrescens*)	Rainy	12.99	87.17	14.62	34.51	4.55	31.90	59.35

Description: [a.b] different superscript on the same line shows real difference. DM: dry ingredients. OM: organic matter. CP: crude protein. CF: crude fiber. EE: rough fat. NFE: nitrogen free extract. TDN: total digestible nutrients.

Dry matter. From the results it can be seen that the dry matter content of weeds that emerged in the seasonal differences was significantly different (P<0.05) due to the effect of season. The contents of dry materials of both weeds were higher during the dry season than during the rainy season. This was in accordance with the opinion of Khan et al. (1999), who showed that that the proportion of nutrient content of dry matter in the dry season will be higher than during the rainy season.

Organic matter. The content of organic matter in weeds that emerged in the two seasons were significantly different (P<0.05). Kartasapoetra (1991) stated that during the dry season the plants had longer time to photosynthesize, hence the higher organic matter content.

Crude protein. The crude protein content of some weed grasses that emerged were significantly different (p<0.05) between the seasons. Williamson and Payne (1993) stated that the environment is very influential on the growth and content of plant nutrients such as crude protein and nitrogen free extract that increase during the rainy season and decreased the content of crude fiber.

Crude fiber. The crude fiber content of grass weeds in the two seasons were not significantly different (P<0.05). Williamson and Payne (1993) stated that the environment has a great influenceby on the growth and content of plant nutrients such as crude protein and nitrogen free extract increase and crude fibre decreases during the rainy season..

Extract ether. The fatty acid content of grass weed and seasonal weeds was not significanty affected (P<0.05) by seasonal differences. Hartadi et al (2005) showed that pangola grass (*Digitaria decumbens*) had a crude fat content of 3.3%. Based on the crude fat of feed plants and compared with weeds listed in Table 2 there are several weeds that are similar in crude fat content, namely *Cyperus iria*. *Digitaria setigera*. *Echinochloa oryzoides*. *Eleusine indica*. *Fimbristylis miliacea*. *Echinochloa conola*. *Echinochloa crus-galli* and *Echinochloa glabrescens*.

Nitrogen Free Extract. The content of nitrogen free extract ingredients in some weed grasses that emerged in different seasons had significant differences (P<0.05) against seasonal differences. Based on the results obtained that the extract materials without nitrogen both weeds are higher during the dry season.

Total digestible nutrient. Total digestible nutrient (TDN) in weeds sampled between the two seasons were not significantly different. Butterworth et al. (1991). *Digitaria decumbens* has a TDN content of 59%.

Chemical composition analysis of shrubs and legumes weed are shown in Table 3.

Table 3. Chemical composition shrubs and legume weed

No.	Species	Season	Chemical composition						
			DM	OM	CP	CF	EE	NFE	TDN
Shrubs									
1	Bandotan (*Ageratum conyzoides*)[1]	Dry	13.33[a]	86.77	21.96[b]	19.70[a]	11.14[b]	33.56	79.18[b]
		Rainy	15.52[b]	86.11	15.01[a]	27.42[b]	9.00[a]	34.80	60.66[a]
2	Maman ungu (*Cleome rutidosperma*)[1]	Dry	13.15[b]	86.58	22.48	19.00[b]	9.45[a]	33.65	79.46
		Rainy	10.79[a]	85.26	25.14	16.13[a]	10.30[b]	33.02	80.70
3	Cacabean (*Ludwigia octovalvis*)[1]	Dry	16.94[b]	89.99[b]	12.95[a]	28.35[b]	12.95[a]	38.01[b]	39.44
		Rainy	9.15[a]	84.09[a]	11.42[b]	15.87[a]	13.87[b]	43.38[a]	42.42
4	Krokot (*Portulaca oleracea*)[1]	Dry	7.53[a]	75.77[b]	12.11[a]	23.11[b]	5.09[a]	35.54[b]	52.31[b]
		Rainy	18.76[b]	67.20[a]	18.24[b]	15.52[a]	7.81[b]	27.51[a]	48.18[a]
5	Urang-aring (*Eclipta alba*)[1]	Dry	13.87	82.17	17.17	13.83	6.19	45.50	63.38
		Rainy	-	-	-	-	-	-	-
6	Goman (*Eclipta prostrata*)[1]	Dry	-	-	-	-	-	-	-
		Rainy	11.59	80.03	17.05	17.64	7.73	37.60	61.00
Legumes									
7	Putri malu (*Mimosa pudica*)[2]	Dry	30.91	92.67	18.22	22.63	8.55	42.48	69.78
		Rainy	-	-	-	-	-	-	-

Description: [a,b] different superscript on the same line shows real difference. DM: dry ingredients. OM: organic matter. CP: crude protein. CF: crude fiber. EE: rough fat. NFE: nitrogen free extract. TDN: total digestible nutrients.

Dry matter. The content of dry matter of shrubs and legume weeds that appears in different seasons were significantly different (P<0.05) between the two seasons.. Similar to grasses Khan et al. (1999), stated that the proportion of dry matter in the dry season will be higher than during the rainy season.

Organic matter. The content of organic matter in some weeds that appears on different seasons has a significant difference (P<0.05) to the effect of seasonal differences.

Crude protein. Seasonal differences had significant (p<0.05) effect on the crude protein content of weeds. Williamson and Payne (1993) stated that the nutrient content of plants such as crude protein and nitrogen free extract increased during the rainy season and decreased the content of crude fiber.

Crude fiber. Crude fiber content of some weeds that emerged in different seasons had significant differences (P<0.05) on the effect of seasonal differences. It was obvious that during the dry season the plants accumulated more crude fibre in the form of cellulose and lignin than during the wet season

Extract ether. Extract ether content of some weeds that occur in different seasons has a significant difference (P<0.05) on the influence of seasonal differences. Dwidjoseputro (1980) states that the amount of fat in plants (except seeds) is never a lot.

Nitrogen Free Extract. The content of nitrogen free extract in some weeds had no a significant difference due to to the seasonal differences. However, some differences were observed for weeds like Cacabean and Krokot. There could be species differences among the legume weeds.

Total digestible nutrient. Total digestible nutrients in some weeds that occur in different seasons have significant differences (P<0.05) on the influence of seasonal differences. Susetyo (1969) states that *Centrosema pubescens* has a total digestible nutrients content of 60.7% and *Gliricida sepium*. Senani et al (1997) states that the total content of digestible nutrients *Gliricida sepium* by 60.2%.

CONCLUSIONS

Based on the research finding, it can be concluded that the weed grasses domination level in the dry season and the rainy season were higher compared with shrubs and legumes. Seasonal differences significantly affected the content of dry matter,of some weeds and legumes.

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