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Research Article

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Botanical Composition of forage by Timor Deer (*Cervus timorensis* Blainville) in A Monsoon Forest and Savanna of West Bali National Park

Ketut Ginantra[1]*, Sentana Putra [2], Wayan Suarna[2] and Wayan Kasa[1]

[1]Department of Biology, Faculty of Mathematic and Natural Science, Udayana University

[2]Department of Nutrition and Tropical Forage Science, Faculty of Husbandry, Udayana University

*Corresponding Author E-mail: ketutgi@yahoo.com

ABSTRACT

The research was conducted at monsoon forest-Prapat Agung and savanna-Brumbun in West Bali National Park (WBNP) to study botanical composition of the forage by timor deer (Cervus timorensis) and relationships availability of forage plants in the habitat unit with the forage plant utilization by deer. Botanical composition in habitats determined from percent ground cover plant species at sampling quadrat. The botanical composition in deer diet estimated by using microhistological techniques of fecal samples.Selection of plant species calculated using i'vlev electivity index. Relationships forage plants availability and utilization of plant species by deer calculated using similarity index. The result study showed that's differences in the availability of plants in two habitat unit (monsoon forest and savanna) effect on botanical composition in timor deer diet. In monsoon forest botanical composition in the diet is dominated by broadleaf plants (forbs and woodys) and in the savanna dominated by graminoids. Based on the selection of plants, some plant are important species for the diet timor deer in the two habitat units both forbs, graminoids and woodys categories. There is a high correlation between the use of plants by the timor deer with the availability of food supply in the habitat. Implication for the management of deer habitat in WBNP focused to suppress the growth of plant species are invasive and potentially cover an area for growth in dicotyledonous herbs and grasses were edible for deer.

Key words: *Timor deer, Monsoon forest, Savanna, Forage availability, Feeding selection.*

INTRODUCTION

Timor deer (Cervus timorensis) is one of Indonesian native tropical deer that has now spread to the outside of Indonesia, such as New Zealand, Australia, Muritinius, and New Caledonia. Timor deer one of the wild life found in the area of West Bali National Park (WBNP). Deer population in the region continues to decline, mainly due to poaching and habitat destruction[7]. One attempttomaintain exsisting timor deer in this area done through hhabitat management guidance[1].

Some studies on the composition of the feed plant Timor deer showed that the proportion of grass and broad leaf plants depend on the availability of the seplants in the habitat[2,13]. Timor deer spread over several habitat units in WBNP. Vegetation type of grazing area timor deer are monsoon forest and savanna. In the monsoon forest the vegetation dominated by deciduous tree and shrubs, and in the savanna vegetation dominated by grass and herbaceous dicots. Differences of this vegetation type have consequences for the feeding selection by timor deer.However, this study has not been documented in detail on the diet of wild timor deer in monsoon forest and savanna of WBNP.

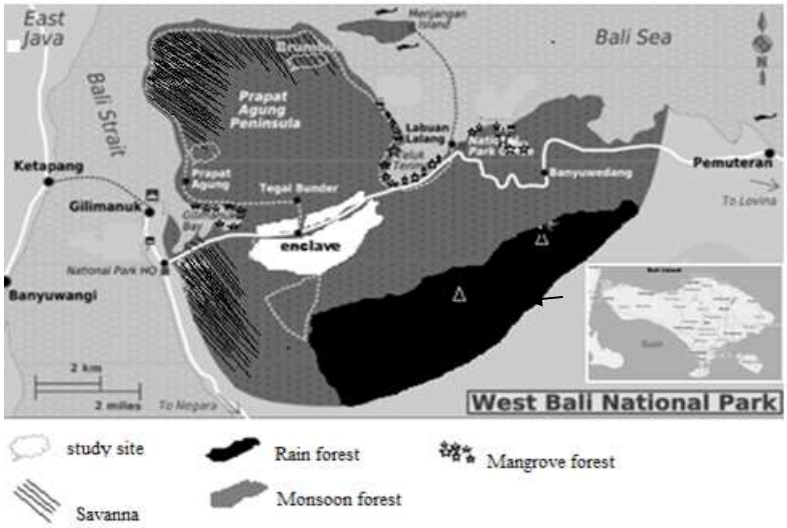
This study focused on two issues, namely how the plant selection of timor deer in two grazing area (monsoon forest-Prapat Agung and savanna Brumbun) and the relationship of plants availability in habitat with the use of plants by timor deer. Two issues are important in development efforts timor deer habitat in WBNP.

MATERIAL AND METHODS

Study Site

The study was conducted in two grazing unit at West Bali National Parks, that's were: monsoon forest-PrapatAgung and savanna-Brumbun (Figure 1) in January-Mart 2013 (rainy season) and July-September 2013 (dry season). The geographyclocated monsoonforest-PrapatAgung at $8^0$08'07.49"-$8^0$08'14.09" S and $114^0$26'45.95" -$114^0$26'50.58" E, an elevation 4.90-15.24 meter above sea level (a.s.l.).The vegetation monsoon forest dominant by deciduous treeand evergreen plant so exist in this forest.Edge part of this forest are open area that's growth graminoids and forbs, mainly in rainy season.The geographyc located of savanna-Brumbun at $08^0$05'53.96"-$08^0$06'21.13" S and 114^0 29'39.83"-114^0 29'58.09" E, an elevation 9.50-90.84 m a.s.l. Vegetation type of this area were savannaacacia (*Acacia leocophloea*) andherbs layer dominanted by grass.An average annual temperature in WBNPof 24-37 ^{0}C and humidity of 30-80%.Average of precipitation in rainy season are 220.17 mm per moon and in dry season are 28.33 mm per moon (data from BMKG region IIIBali, 2013).

Fig.1: Location of study area at West Bali National Park



Analysis of Botanical Composition in Habitat

Botanical composition in habitat determine by quadrat methods. Each quadrat 0.5m x 0.5 m for grass/forbs vegetation, 1 m x 1 m for shrubs and 5 m x 5 m for tree. Ten quadrats in each habitat applicated per moon, up to in each habitat unitused thirty quadrats per season. Percent ground cover each plant species measured in quadrat. For shrubs and tree vegetation, percent cover of shoot that's count up to 1.2 m height (height level can be access by deer).

Botanical composition in habitat determine by formula:

Average cover sp-*i*= $\frac{\text{number cover sp} -\text{i}}{\text{total quadrat}}$, Composition of sp-i (Ai)= $\frac{\text{average cover sp}-\text{i}}{\text{tota cover all sp}}$ x 100%

(Morrison, 2008)

Analysis of Botanical Composition in Deer Diet

Botanical composition in deer diet determine by techniques micro histological feacal sample[5]. In this techniques, indetification of plant species in deer diet based on microscopic recognition of plant epidermic fragments preserved in the feces.

Fecal collections

Fecal samples collected from fivegroup pellet at each habitat unit at 2-week interval between February, Mart and April for rainy season and August, September 2013 for dry season. Fecal sample was collected immediately dried (oven 70 ^{0}C) to avoid further decomposition.Samples on each habitat unit then composite based on season to mikrohistology analysis.

Microhistological analysis

The beginning of this techniques are making reference preparations/slides of plant species availability in habitat. Epidermic fragment each species availability in habitatused as a reference slides to identification plants species in deer diet. Further step are making microhistology slides from fecal sample. Ten individual pelletselected randomized from composite sample fesesin eachhabitat unit-each season as sample. Fecal samples were ground to pass through a1-mm screen, then soaked or decolorized in household liquid bleach (6% NaClO) for ±10menit. The feses were bleached take to making mikrohistology preparations. The preparations are then observed using microscopes at 100-400x magnification. The epidermal fragment that calculated only inditifiable fragment (form and cell structure of epidermic and it's stoma) to avoid bias between graminoids and non graminoids. Microscopic observation sperformedin the laboratory of plant taxonomy Udayana University of Bali.

Botanical composition in deer diet calculate by formula :

$$\text{Density (d)} = \frac{\text{number of fragment sp}-\text{i}}{\text{number slides}},\ \text{Composition of sp-i (Ui)} = \frac{\text{(d) sp }-\text{i}}{\text{Total density all sp}} \text{x } 100\%$$

Data Analysis

Availability of botanical composition of the habitat unit and botanical composition in deer diet were analyzed by means of descriptive statistic. Forage selection were assessed using a ivlev'sindex of electivity (SI) (Krebs, 1989):SI= (Ui-Ai)/(Ui+Ai), where Ai= composition (%) plant species-i in habitat, Ui = composition (%) plant species-i in deer diet. SI values ranging from -1 to +1, where SI values 0.1 to 1isindicate preference, 0.09 to -0.09 isproporsional, and -0.1 to -1 is avoidance.To determine relations between deer diet and forages availability in habitatunit using similarity index (S), where S= Yi (Yi= minimum value of botanical composition species-i in diet and availability in habitat[8].

RESULT AND DISCUSSION

Plants Availability in Habitat

A total of 57 plants species found in two habitat unit (monsoon forest-PrapatAgung and savanna-Brumbun), that include in three category are forbs (herbaceous dicotyl), graminoids (grass) and woodys (trees and shrubs). Different of habitat type showed different dominantion of availability forage plants. In monsoon forest, availability of broadleaf (forbs+woodys) more dominant than graminoids.In savanna, graminoids category more dominant than broadleaf.Season influence composition of plant availability for forbs. Forbs more dominant in rainy season than dry season. Composition of graminoids and woodys species predominant in two season (Table 1). Study indicate that forage plant availability in two habitat unit diverse in two season. A diverse of plant availability in habitat important to available alternative forage resources both quantitatively and qualitatively for deer. Mosser *et al*. suggest that's a variety of forage classes on range provide nutrients throughout the season.

Percent (%) cover reflects the availability of plants biomass inhabitat. Availability of plant forbs category was significantly higher in the rainy season than the dry season in two habitat units. In creasedav ailability off or bsin the rainy season due top lantth is category enter the growth phase when high rainfall and enters a dormant phase when the dry season. This is supported by data on the average rainfall in the rainy season is higher than in the dry season. Memmott *et al*.[10] states that the botanical composition of feed availability in the habitat, particularly dicotyledonous herbs and grasses is strongly in fluenced by rainfall (precipitation). Dicotyledonous herbs and grasses generally entered a period of growth when the high precipitation and entersa dormant phase when the dry season. While there are woody plants that are evergreen all season or seasonal dynamics for the provision of botanical composition for herbivores are not declining rapidly as in herbaceous dicots.

Plant species as such *Eupatorium odoratum* (shrubs) is quite high availability in habitat units. This species become invasive to other plants in the grazing area. Another species also of high availability are *Caesalpinia crista* and *Solanum* sp. (shrubs) in the grazing area. Based on observations of this plant growing quite fast growing and can cover grazing area of timor deer.

Botanical Composition inTimor Deer Diet

Plant species selected

From the analysis of plant epidermal fragments microanatomy in feces identified plant species were eaten by thetimor deer. In units monsoon forest-Prapat Agung found 27species of plants selected by deer timor (9 species offorbs, 10 species of graminoids, 6 species of woody and 2 species not identified) in the rainy seasonand 24 species (4 species offorbs, 9species of graminoids, 10 species of woodys and 1 species not identified) in the dry season. In the unit savanna-Brumbun found 20 species of plants selected by timor deer (6 species offorbs, 12 species of graminoids and 2 species of woodys) in the rainy season and 20 species (3 species offorbs, 9 species of graminoids, 7 species of woodys and 1species not identified) (Table 1).

Selection of forages relate to the availability of plants in habitat and season. Some plant species are important for the timor deer diet in the two habitatunits. It is shown from several plants were preference in two habitat unit, such as *Boerhavia diffusa, Desmodium trifolium, Fleura interupta* and *Justicia* sp. (forbs); *Eriocloa ramosa, Dactyloctenium, Panicum tryperon,*(graminoids) and *Grewia koordersiana, Sida acuta* (woodys). Other speciesselection level is varied in two habitat units.Several species of plants including the preference in monsoon forest but to decrease the level of the selection in the savannaor vice versa. Some examples of such this selection behavior are; *Oplismenus Burmani, Cyperus haspan* and *Lantana camara* is avoidance in the monsoon forest but be preference in savanna. Species such as *Acalypha indica, Vernonia cinerea* and *Fleura interupta* show proportional and preferred in monsoon forest unit, however be decreased levels of the selection in savanna.There are several plants species (categories of woody) are present in the two habitat unit in two seasons, but only selected in the dry season, such as *Acacia auriculiformis, Eupatorium oduratum, Lantana camara, Ziziphus mauritiana, Pluchea indica, Bridelia monoica* and *Sida acuta*.

This study shows that the availability of for agesinthe habitat plays a role infeeding selection the timor deer. Selection behavior canchange depending on the unithabitatandseason. Hanley[3] states that feeding selection of the deer is a problem that is complex, involving multiple factors. These factors are; nutritional value are generally shown on the energy digestible/metabolism and/or nutrients (positive value) or compound alelokimia (negative value); physical characteristics of the plant itself; availability in the habitat; and also the presence of competitors or predators.

Composition on graminoids, forbs and woodys in deer diet

Botanical composition of the diet timor deer (expressed in % dry wight or DW) consists of 3 categories, namely plant forbs, graminoids and woody sintwo habitat unit. Graminoidsa higher botanical composition of the diet timor deerin the savanna is over 76.78% in the rainy season and 56.84% in the dry season. Unlike the botanical composition of the diettimor deer inmonsoon forest, which in the botanical composition of the diet of deer are fairly balanced between forbs, graminoids and woody in the rainy season. However, during the dry season in this habitat unit increased woody composition. This suggests that the availability of for ageinthe habitat effect botanical composition of the diet timor deer.

During the dry season, woodys composition in the diet of deer increased compared to the rainy season. Improved high enough woodys composition occurs in savanna ie from 6.18 to 30.75% (Figure 2 and Figure 3). Timor deer require compliance feed in quantity and quality throughout the season, shortage of fodder grass and forbs category in the dry season is compensated by an increase in dietary composition of woody category.

Timor deer can adapt to these elective grazing and browsing, depending on the availability of forage in the habitat. In savanna, graminoids composition in the deer diet higher than the composition of broad leaf. While, in them on soon for estbroad leaf composition in the diet seem higher. Timor deer show flexibility in the feeding selection, meaning that when habitat availability in the high grass and nutritive value more deer can choose categories of grass and then can switch to the broad leaf for bsorwoody in then extseason. Patisell no and Arobaya (2009) also found that the botanical composition of timor deer diet in the Kebar Upland Manokwari more towards grazers. Based on the classification of grazers, browsers and intermi diet feeder according to the composition of grass and broad leaf in herbivore diet[11,15] timor deer suitedas such “intermediet feeder”.

Fig.2: Botanical composition in timor deer diet in rainy season

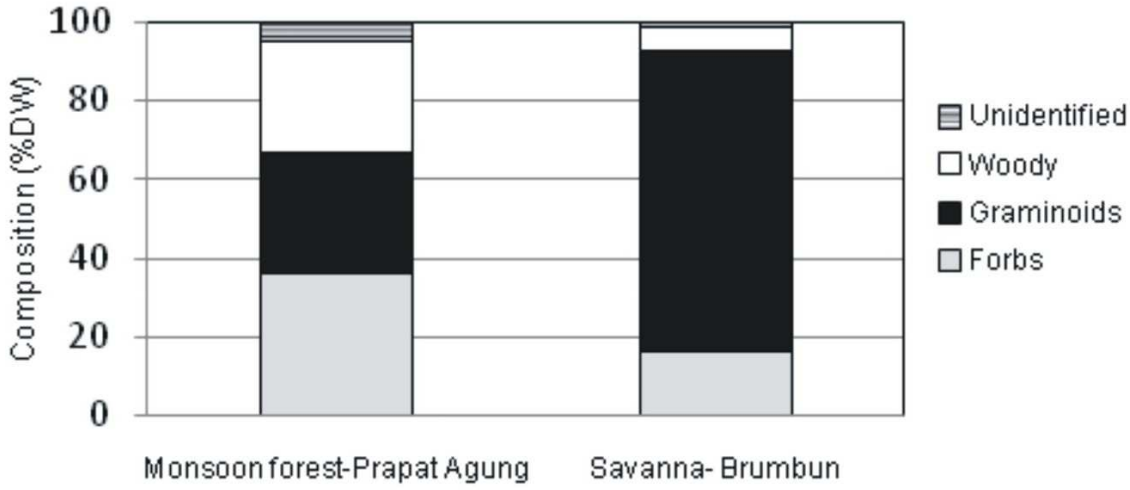
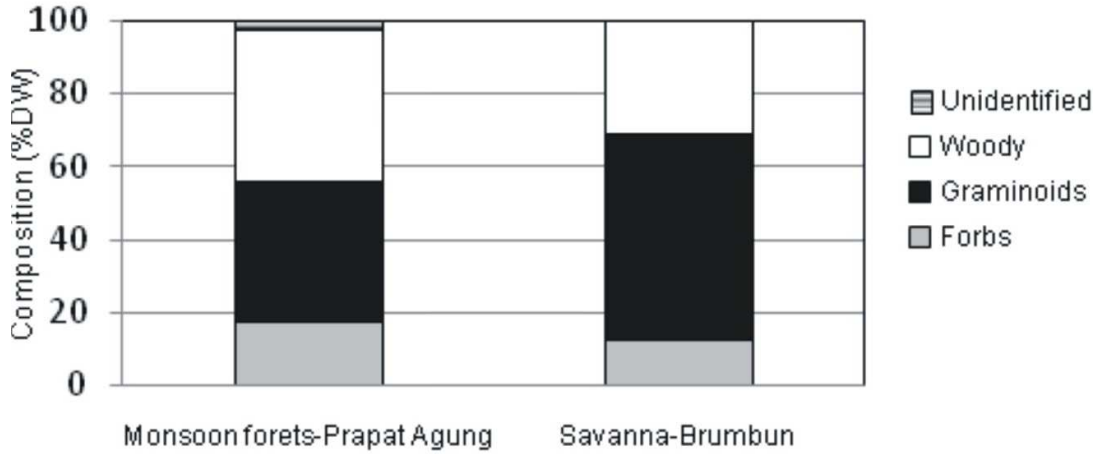


Fig.3: Botanical composition in timor deer diet in dry season

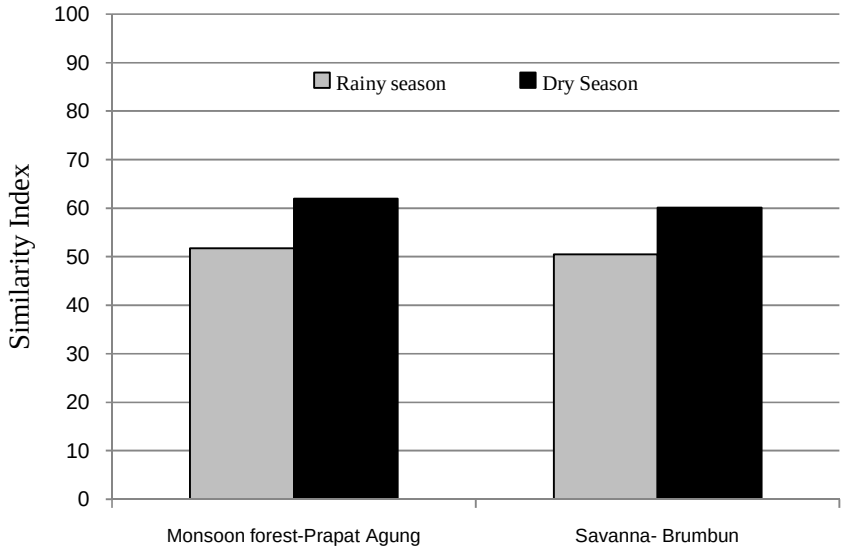


Timor deer showed the shift towards of grazerto browser can be seen in the monsoon forest, which is relatively lower availability of grass, so the botanical composition of the deer diet showed an increase inbroad leaf composition (woodys and forbs). This is consistent with the statement Rollins[14] which state sthati fall categories of plants availablein their habitat, the possibility of deer will eatin appropriate portions. However, if certain categories of plants (eggraminoids) are not available in large numbers in the range area, compared with the diet, it will reflect higher than normal percentage of broadleaf. DeGarine-Wichatitsky *et al*. (2005), also found something similar in botanical composition of diet timor deerin New Caledonia, were high composition of graminoids in forest and high of broadleaf in savanna.

Ralation between forage available and diet composition

In two habitat unit shows that the relationship with the availability of edible plant utilization by the timor deer habitat in the two habitat units is quite high. It is shown from the high index of similarity between the availability of food supply with deer diet composition (similarity index >50%) (Figure 4). On the two habitat unit the relationship between availability and utilization increasedin the dry season. This indicates that when the availability of edible limitedin the habitat timor deer use more effectively. Lopes-Coba *et al*. (2007) stated that in the selection of eatingin the wild herbivores are able to make decisions quickly determine the types of feed to optimize the rate of consumption (intake) and reduces the risk of predators and to get the balance(trade-off) between the quality and quantity of food available.

Fig.4: Similarity of thetimor deer diets composition with forage availability at two habitat unit



Availability of food supply is one of the factors that influence feeding behavior / feeding selection on deer, in addition to other factors such as acceptability, digestibility and chemical composition of food. Feeding selection reflects the relation between the animal and the vegetation in its environment[4].

CONCLUSIONS

Differences inthe availability of plants in two habitat unit (monsoon forest-Prapat Agung and savanna-Brumbun) effect on botanical composition of timor deer diet. In unit monsoon forets botanical composition in the dietis dominated by broadleaf plants (forbs and woody) and in the savanna dominated by graminoids. Based on these lection of plants, some plant species are important for the tim ordeer dietin two habitat units both categories forbs, graminoids and woodys. There is a high correlation between the use of plantsby the timor deer with the availability of food supply in the habitat (similarity index>50%). Implications for the management of deer habitat in West Bali National Park focused to suppress the growth of plant species are invasive and potentially cover an area for growth in dicotyledonous herbs and grasses were edible for deer.

Tabel 1: Forage available, use and selectionindeks by timor deer in two habitat unit West Bali National Park (Ai= composition (%) of plant in habitat; Ui = composition of forage (%) in timordeer diet; SI= Selection Indeks)

No	Plants species	Monsoon Forest - PrapatAgung						Savanna - Brumbun					
		Rainy Season			Dry Season			Rainy Season			Dry Season		
		Ai	Ui	SI	Ai	Ui	SI	Ai	Ui	SI	Ai	Ui	SI
	Total forbs (%)	**26.50**	**35.98**		**12.13**	**15.64**		**23.25**	**16.19**		**13.46**	**12.41**	
1	*Acalyhpaindica*	2.10±0.30	4.86±1.08	0.40	-	-		1.71±0.07	1.69±0.89	-0.01	-	-	
2	*Boerhaviadiffusa*	1.05±0.04	3.26±0.46	0.51	0.30±0.09	-		2.05±0.32	6.98±1.62	0.55	0.22±0.03	1.55±0.20	0.75
3	*Commelinabenghalensis*	2.90±0.04	5.89±1.52	0.34	-	-		-	-		-	-	
4	*Desmodiumtriflorum*	1.20±0.02	4.03±1.16	0.54	-	-		1.10±0.20	2.50±0.76	0.39	-	-	
5	*Synedrellanodiflora*	1.27±0.09	2.44±0.60	0.32	0.82±0.05	2.25±0.11	0.47	-	-		-	-	
6	*Tribulusterrestris*	1.21±0.11	0.83±0.11	-0.19	-	-		1.30±0.21	1.67±0.83	0.12	-	-	
7	*Ipomoea hispida*	1.47±0.10	-		0.46±0.03	5.57±1.30	0.85	-	-		-	-	
8	*Tephrosiapumila*	1.36±0.16	2.51±1.00	0.30	-	-		-	-		-	-	
9	*Vernoniacinerea*	8.49±0.63	8.54±0.98	0.00	-	-		7.99±0.46	1.67±0.83	-0.65	-	-	
10	*Vernoniapatula*	-	-		9.96±0.37	5.57±1.30	-0.28	-	-		5.47±0.11	4.51±1.59	-0.10
11	*Justicia*sp.	-	-		0.59±0.08	2.25±0.11	0.58	-	-		3.30±0.14	6.35±3.01	0.32
12	*Fleurainterupta*	1.73±0.23	3.62±0.78	0.35	-	-		1.52±0.03	1.68±0.06	0.05	-	-	
13	*Alternanterarepens*	-	-		-	-		1.26±0.02	-		2.61±0.12	-	
14	*Euphorbia hirta*	0.62±0.17	-		-	-		0.57±0.18	-		-	-	
15	*Ipomoea pes-tigridis*	1.40±0.27	-		-	-		1.17±0.11	-		-	-	
16	*Phylanthusniruri*	1.09±0.09	-		-	-		0.81±0.05	-		-	-	
17	*Physalis minima*	-	-		-	-		3.25±0.03	-		-	-	
18	*Ocimum* sp.	0.62±0.10	-		-	-		0.47±0.13	-		1.86±0.21	-	
	Total graminoids (%)	**35.26**	**30.86**		**34.84**	**39.35**		**50.19**	**76.78**		**43.68**	**56.84**	
1	*Eriochloaramosa*	2.15±0.17	2.80±0.77	0.13	-	-		2.26±0.12	20.14±1.63	0.80	1.65±0.10	4.80±0.80	0.49
2	*Eriochloasubglabra*	1.96±0.05	6.48±1.27	0.54	-	-		-	-		-	-	
3	*Dactylocteniumaegeptium*	1.27±0.17	3.21±0.91	0.43	0.34±0.03	2.25±0.11	0.74	3.62±0.24	13.19±0.89	0.57	0.95±0.11	3.10±0.41	0.53
4	*Panicumtryperon*	1.05±0.12	5.24±1.02	0.67	2.37±0.09	5.59±1.30	0.40	4.40±0.07	6.69±1.46	0.21	3.38±0.09	9.31±1.22	0.47
5	*Oplismenusburmani*	3.70±0.27	3.21±0.91	-0.07	5.40±0.01	6.79±1.91	0.11	1.69±0.12	8.42±1.03	0.67	-	-	
6	*Eleusineindica*	0.71±0.04	1.61±0.65	0.39	0.65±0.1	5.59±1.30	0.79	-	-		0.97±0.16	1.55±0.20	0.23
7	*Panicumeruciforme*	2.87±0.31	5.00±1.18	0.27	2.71±0.02	-		2.75±0.42	3.35±0.73	0.10	-	-	
8	*Cyperushaspan*	3.18±0.03	0.83±0.11	-0.59	-	-		2.27±0.15	3.37±0.92	0.20	-	-	
9	*Imperatacylindrica*	1.80±0.20	-		1.97±0.06	2.25±0.10	0.07	5.77±0.15	4.20±0.77	-0.16	9.98±0.77	6.06±1.38	-0.24
10	*Themedaarguerns*	-	-		1.75±0.09	2.29±1.70	0.13	2.64±0.30	3.39±1.58	0.12	11.78±0.53	4.51±1.59	-0.45
11	*Heteropogoncontortus*	1.76±0.17	0.83±0.11	-0.36				5.78±0.15	4.77±0.98	-0.10	-	-	
12	*Andopogonaciculatus*	6.53±0.32	1.65±0.89	-0.60	2.76±0.14	2.25±0.10	-0.10	7.72±0.04	5.06±0.96	-0.21	6.99±0.13	7.62±1.18	0.04

13	*Oplismenuscompositus*	-	-		0.91±0.04	-		4.80±0.07	1.69±0.86	-0.48	-	-	
14	*Phragmites*sp.	8.28±0.29	-		6.19±0.63	4.54±1.80	-0.15	5.14±0.22	2.53±0.90	-0.34	4.97±0.01	9.17±0.98	0.30
15	*Eragrostisamabilis*	-	-		6.67±0.01	7.84±1.20	0.08	-	-		1.12±0.2	10.72±0.78	0.81
16	*Cyperus*sp.	-	-		1.58±0.07	-		1.29±0.09	-		1.87±0.11	-	
	Total woodys (%)	**36.11**	**28.37**		**52.74**	**42.72**		**26.67**	**6.18**		**42.88**	**30.75**	
1	*Leucaenaleucocephala*	4.80±0.17	7.85±1.89	0.24	3.22±0.13	5.59±1.30	0.27	-	-		-	-	
2	*Hibiscus sinensis*	1.98±0.15	4.87±0.70	0.42	3.94±0.16	6.79±1.90	0.27	-	-		-	-	
3	*Grewiakoordersiana*	3.67±0.35	7.53±2.00	0.34	2.91±0.15	5.68±1.86	0.32	2.15±0.26	5.06±0.96	0.40	3.86±0.04	4.66±0.61	0.09
4	*Streblusasper*	2.21±0.12	4.08±1.28	0.30	2.31±0.03	3.38±0.16	0.19	-	-		-	-	
5	*Schleicheraoleosa*	1.01±0.19	4.04±0.81	0.60	-	-		-	-		-	-	
6	*Acacia aurculiformis*	1.20±0.25	0.83±0.11	-0.18	-	-		0.65±0.07	-		1.86±0.12	1.55±0.20	-0.09
7	*Malvastrum*sp.	1.59±0.07	-		-	-		2.74±0.17	-		7.30±0.02	-	
8	*Phylanthusemblica*	-	-		-	-		2.81±0.09	1.12±0.49	-0.43	3.72±0.32	1.55±0.20	-0.41
9	*Sidaacuta*	1.29±0.22	-		1.14±0.01	4.48±1.40	0.59	1.12±0.07	-		1.24±0.03	3.10±0.41	0.43
10	*Brideliamonoica*	0.13±0.01	-		5.57±0.05	5.59±1.30	0.00	0.90±0.16	-		3.10±0.17	7.62±1.18	0.42
11	*Eupatorium odoratum*	7.13±0.31	-		8.19±0.09	3.38±0.16	-0.42	4.03±0.14	-		10.22±0.24	9.17±0.98	-0.05
12	*Lantana camara*	2.95±0.17	-		3.42±0.16	2.25±0.11	-0.21	1.23±0.09	-		1.02±0.31	3.10±0.41	0.50
13	*Zyziphusmauritiana*	1.48±0.12	-		3.36±0.15	2.25±0.10	-0.20	-	-		-	-	
14	*Plucheaindica*	2.50±0.08	-		1.61±0.09	3.33±0.10	0.35				-	-	
15	*Azadirachtaindica*	-	-		-	-		1.09±0.13	-		2.61±0.26	-	
16	*Breyniaoblongifolia*	1.09±0.03	-		-	-		-	-		-	-	
17	*Cassia absus*	1.67±0.21	-		4.02±0.01	-		-	-		-	-	
18	*Manilkarakauki*	0.28±0.05	-		-	-		-	-		-	-	
19	*Acacia leucophlea*	1.31±0.04	-		2.18±0.17	-		1.33±0.30	-		4.11±0.36	-	
20	*Solanum*sp.	-	-		-	-		8.06±0.13	-		3.86±0.18	-	
21	*Caesalpinia crista*	1.09±0.23	-		6.92±0.04	-		-	-		-	-	
22	*Abutilon* sp.	-	-		-	-		0.55±0.16	-		-	-	
23	*Flacourtiaindica*	0.76±0.14	-		3.95±0.15	-		-	-		-	-	
	Unidentified (%)		**4.58**			**2.25**						**0.81**	
1	Sp 1		2.39±0.06			-						-	
2	Sp 2		2.19±0.41			2.25±0.10						-	
3	Sp 3		-			-						0.81±0.03	

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REFERENCE

1. Darmodjo, B. Management of West Bali National Park. Hall of West Bali National Park, Cekik (2008)
2. DeGarine-Wichatitsky, Soubeyran, M., Maillard, D. and Duncan, P. The diets of introduced rusa deer (Cervustimorensisrussa) in a native sclerophyll forest and a native rainforest of New Caledonia. *New Zealand Journal of Zool*., **32**: 117-126 (2005)
3. Hanley, T.A. A Nutritional View of Understanding and Complexity in the Problem of Diet Selection by Deer (Cervidae). Oikos, **79**: 209-218. (1997)
4. Homolka, M. Foraging strategy of large herbivore in forest habitat. Folia Zool.**45(2)**: 127-236 (1996)
5. Holechek, J.L. Vavra, M. & Pieper, R.D. Methods for determining the botanical composisition, similarity, and overlap of range herbivore diets. National Reasearch Council/National Academy of Sciences, London (1990)
6. Fraser, M.D. and Gordon, I.J. The diets of goats, red deer, and South American Camelids feeding on three contrasting scottish uplands vegetation communities. *J. Applied Ecology,* **34** : 668-686 (1997)
7. IUCN. Red List of Treatened Species, Version 2011. Available from:http://www.iucnredlist.org (2011)
8. Krebs, J.C. Ecologycalmetodelogy. Harper Collins Publisshers, New York. (1989)
9. Lopez-Coba, E., Sandoval-Castro, C.A. and Montes-Perez, R.C. Intake and Digestibility of Tree Fodders by White Tailed Deer (*Odocoileusvirginianus*yu catanensis). *Journal of Animal and Veterinary Advances*, **6(1)**: 39-41 (2007)
10. Memmott, K.L., Anderson, V.J. and Fugal, F. Seasonal Dynamics Forage Shrubs Nutrients, Rangelands, **33(6)**: 12-16 (2011)
11. Montaque, W.D. & Longhurst, W.M. Browser and grazer: Constraints on feeding ecology imposed bu gut morphology and body size. Proceeding of the IV International Conference on goats, Brazil (1987)
12. Morrison, J.I. Using microhistological techniques to predict botanical composition of horse diets on cool-season grass pasture. (Thesis submitted), College of Agriculture at The University of Kentucky (2008)
13. Pattiselanno, F. and Arobaya, A.Y.S. Grazing habitat of the rusa deer (Cervustimorensis) in the upland Kebar Manokwari. *Jurnal Biodiversities*, **10(3)**: 134-138 (2009)
14. Rollins, D. Nutritional value of deer habitat. Texas Natural Wildlife. Available from:http://agrilife.org/texnatwildlife/ (2011)
15. Shipley, L. Grazers and Browsers: How Digestive Morphology Affects Diet Selection. Available at: www.cnr.uidaho.edu/ (1999)