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Selection of forage plant by Muntjac Deer (*Muntiacus muntjak* Zimmermann) in Bali Barat national park

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Abstract

Was conducted study on the selection of forage plants by muntjac deer (*Muntiacus muntjak*) in Bali Barat National Park (BBNP) in January-September 2014. The study was conducted in four habitat units, namely Cekik unit, Prapat Ahung unit, Segara Rupek and Brumbun Unit. Determination of the habitat used was based on signs of feeding activity, and the presence of traces of feces. Botanical composition / type of forage in the habitat is determined by the quadrat method. The composition of plants eaten by muntjak deer was determined by the utilization techniques. Botanical composition in habitat and muntjak deer diet were analyzed descriptively. Selection of food plants is calculated using ivlev's electivity index. The results showed that deer use a type of savanna and monsoon forest for feeding activity. The botanical composition of the forage dominated by herbaceous dicots (forbs), next is the woody plants (woodys) and grasses (graminoids). Muntjac deer classified as browser type or concentrate selectors. Found 33 plant species were selected by deer during the rainy season and 25 species of plants in the dry season dominated by plant species broadleaf / browses (dicotyledonous herbaceous, shrubs and trees). There are 17 species of plants eaten throughout the season. Species of forbs plants showed a high selection index (preference) in two seasons. Some of them are *Commelina benghalensis*, *Boerhavia diffusa*, *Desmodium triflorum* and *Synedrella nodiflora*.

Keywords: Muntjak deer (*Muntiacus muntjak*), feeding selection, forage plants.

Introduction

Muntjac or barking deer (*Muntiacus muntjak* Zimmermann) is one of four tropical deer native in Indonesia, three others are timor deer (*Cervus timorensis*), bawean deer (*Axis kuhli*) and sambar deer (*Cervus unicolor*) (Santoso, 2011). Populations of this animals in the wild has declined. Thus, internationally muntjak deer has been included in the red list on category of least concern / LC (IUCN, 2011). Muntjak deer is one of wildlife is found in Bali Barat National Park (BBNP). One attempt to maintain the survival of muntjac deer in the area is done through management coaching habitat (Darmodjo, 2008).

Understanding of the availability and forage plant selection by the muntjac deer is very important for

habitat management efforts. Feeding selection on muntjac deer in nature (wildlife) is a complex problem, because it involves a variety of factors, both factors related to the nature of each type of plant feed (*physical, chemical and biological*), the availability of forage, disturbance factors or predators presence, social behavior, learning behavior and also a result of the evolutionary process (Hanley, 1997; Moser *et al.*, 2006).

This study focused on habitat types that are used for feeding activity and how the selection of forage plants by muntjac deer on the availability of food plants in two seasons. Two issues are important in deer habitat management efforts in BBNP.

Materials and Methods

The study was conducted in 4 habitat unit on BBNP was Cekik unit, Prapat Agung, Segara Rupek and Brumbun (Figure 1). In January-March 2014 (rainy season) and in July-September 2014 (dry season). Determining habitat use based on signs of feeding activity, and the presence of traces of faeces. Botanical composition of forage in the habitat is determined by

quadrat methods (Grimaud *et al.*, 2008). Size quadrat (plot) are 0.5 m x 0.5 m for grass, herbs and 1 m x 1 m for bushes / shrubs, and 5 m x 5 m for trees. Total plot for each habitat unit is ten times. Parameters measured area is cover each plant species. The composition of plants eaten by deer is determined by utilization (utilization techniques), the percentage of each plants species of bite marks on each sample plot (Holechek *et al.*, 1990). Identification of plant species refers to Backer (1974).

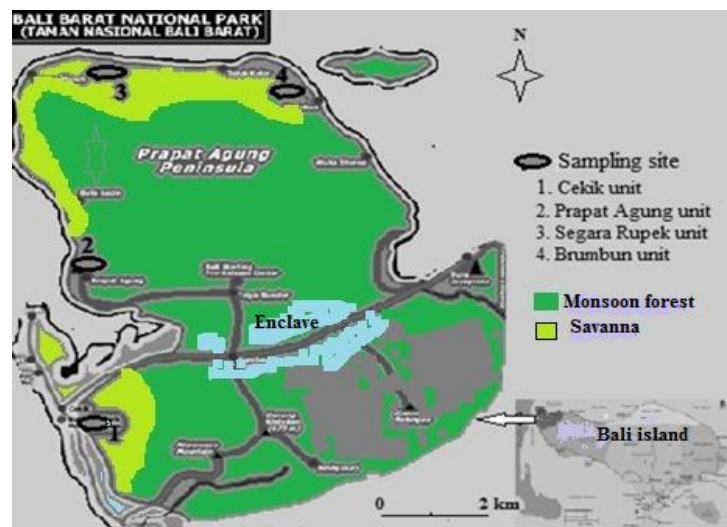


Figure 1. Location of study area at Bali Barat National Park

Botanical composition in the habitat and in deer diets were analyzed descriptively. Selection of food plants is calculated using an Ilev's electivity index (SI) (Krebs, 1989): $Si = (Ui - Ai) / (Ui + Ai)$, where Ai = proportion of species- i in the habitat, Ui = proportion species- i in the muntjak deer diet. The values range from -1 up to 1, with a preference level categories are as follows: strong preferred (0.5 to 1), preferably (0.1 to 0.49), proportional (0.09 to -0.09), less favored (-0.1 to -0.49) and avoided (-0.5 to -1).

Results and Discussion

Habitat and feeding activity

Muntjac deer (*Muntiacus muntjak*) do the feeding activity in savanna habitat type (unit Cekik, Brumbun and Segara Rupek) and monsoon forest (Prapat Agung unit). The dominant tree layer in the savanna habitat type which are *Phyllanthus emblica*, *Acacia leucophloea*, *Schleichera oleosa* and the shrub layer is dominated by *Lantana camara* and *Eupatorium odoratum*. A layer of undergrowth dominated by grasses such as *Imperata cylindrica*, *Panicum eruciforme* and *Phragmites* sp., as well as herbaceous

dicotyledonous including *Commelina benghalensis*, *Synedrella nodiflora*, *Vernonia cinerea*, a layer of grasses and herbaceous dicots in habitat units is varies when the rainy season.

Prapat Agung habitat unit is the monsoon forest with an open edge of the forest, grass and herbaceous plants (forbs). The dominant shrub vegetation is *Eupatorium odoratum*, the dominant tree species of which are *Leucaena leucocephala*, *Grewia koordersiana*, *Syzphus mauritiana*. A layer of grass in grazing unit is dominated by species such as *Andropogon aciculatus*, *Phragmites* sp. and herbaceous dicots such as *Vernonia cinerea*, a layer of grasses and herbaceous dicots in this unit varies during the rainy season.

Muntjac deer generally eat activity a solitary, but sometimes grouped in small amounts (2-3 individu). Muntjac deer feeding the plant claimed under (herbaceous dicots and grasses), especially the young buds and also takes part lower buds of woody plants (trees or shrubs). To find a feed dicotyledonous herbaceous plants that grow in the shade of a bush, deer often go into the bush to get food (Figure 2).



Figure 2. Muntjak deer are actively eating at Brumbun habitat unit (A) and Cekik habitat unit (B and C)

Forage plant selection

Found 33 plant species were selected by muntjac deer during the rainy season and 25 species of plants in the dry season. 17 species of edible plants throughout the season (Table 1). Based on the botanical composition, the dominant plants that select by muntjac deer are group of forbs, compared to grasses (graminoids) and woody plants (Figure 3). An increase in the composition of woody plants in the dry season, it is an attempt to compensate for the declining availability of food plants herbaceous dicot (forbs) in the dry season. Similar results were found by Ilyas and Khan (2003) in the conservation area in Binsar India, that the composition of the plants feed on muntjac deer (Indian muntjac) is dominated by a group of broadleaf plant (browses: herbaceous dicots and young leaves of woody plants) than the grass. Ginantra *et al.* (2014), finding different things on eating habits on the timor deer (*Cervus timorensis*) in BBNP, that the composition of its forage plants are intermediate between grasses and broadleaf plants.

Based on the botanical composition of the forage, muntjac deer grouped into browser type or concentrate selectors. Simpley (1999) states that the structure of animal anatomy and physiology clearly affect food choices. Characteristics of food plants, in turn, is one of the main strengths that make up the r feeding selection behavior on herbivores. Characteristics of the mouth and digestive system in muntjac deer is more adapted to the type of herbaceous dicots (forbs) which has the characteristics of cell walls are thinner and the cell contents are more compounds digestible and compounds rapidly fermented such as sugars, proteins, and lipids compared with the species of grass (graminoids). Ginantra *et al.* (2015), found that the group of herbaceous plants (forbs) in BBNP indicate a higher protein content than grasses. The physical properties (water regain capacity and water solubility forbs plant group was also better than the graminoids. The physical properties are correlated negatively with fiber ADF and NDF (characteristic of cell walls).

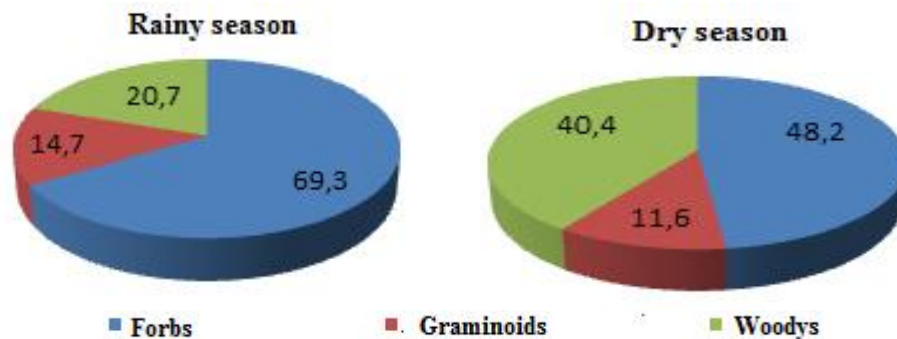


Figure 3. Botanical composition (%) of feed on muntjac deer in BBNP

The species are selected by muntjac deer majority of broadleaf plants group (forbs and woodys). The species that show strong selection index in two

seasons (category selection is preferred) majority of the group of dicotyledonous herbaceous plants (forbs) (Table 1).

Table 1. Selection of forage plants by muntjac deer in BBNP

(Ai= proportion of plants availability in habitat;

Ui= proportion of forage plants in muntjac deer diet; Si= Selection index and Sc = Selection category)

Or – proportion of forage plants in mangjac deer diet, SI – Selection index and Sc – Selection category)									
Rainy Season						Dry season			
No	Plants Species	Ai	Ui	Si	Sc	Ai	Ui	Si	Sc
Forbs									
1	<i>Acalypha indica</i>	0.015	0.073	0.66	strong preferred				
2	<i>Boerhavia diffusa</i>	0.012	0.083	0.75	strong preferred	0.004	0.039	0.81	strong preferred
3	<i>Commelina benghalensis</i>	0.013	0.086	0.74	strong preferred	0.004	0.067	0.89	strong preferred
4	<i>Desmodium triflorum</i>	0,012	0,051	0,62	strong preferred	0.012	0.078	0.73	strong preferred
5	<i>Fleura interupta</i>	0.011	0,056	0,67	strong preferred				
6	<i>Synedrella nodiflora</i>	0.008	0,032	0,60	strong preferred	0.006	0.036	0.71	strong preferred
7	<i>Tephrosia pumila</i>	0.005	0,001	0,33	preferably strong				
8	<i>Vernonia cinerea</i>	0,066	0,198	0,50	strong preferred				
9	<i>Vernonia patula</i>				preferably strong	0.049	0.096	0.32	preferably strong
10	<i>Borreria laevis</i>	0.004	0,010	0,43	strong preferred	0.004	0.029	0.76	strong preferred
11	<i>Tribulus terrestris</i>	0.010	0,051	0,67	strong preferred				
12	<i>Alternantera repens</i>	0.003				0.007	0.024	0.55	strong preferred
13	<i>Elephantopus scaber</i>	0.002				0.011	0.035	0.52	strong preferred
14	<i>Euphorbia hirta</i>	0.008	0.028	0.56	strong preferred	0.006			
15	<i>Ipomoea pes-tigridis</i>	0.008	0.016	0.33	preferably strong				
16	<i>Ipomoea hispida</i>	0.008				0.008	0.038	0.65	strong preferred
17	<i>Phylanthus niruri</i>	0.005							
18	<i>Physalis minima</i>	0.008							
19	<i>Tridax procumbens</i>	0.002	0.002	0.00	proportional	0.001			
20	<i>Leucas zeylanica</i>					0.001			
21	<i>Desmodium heterophyllum</i>					0.003			
22	<i>Justicia</i> sp.					0.013	0.040	0.51	strong preferred
23	<i>Ocimum</i> sp.	0.003	0.007	0.40	preferably strong	0.003			
Graminoids									
1	<i>Andopogon aciculatus</i>	0.055				0.025			
2	<i>Axonopus compresus</i>	0.004	0.006	0.20	preferably strong	0.011	0.038	0.55	strong preferred
3	<i>Chloris barbata</i>	0.004				0.005			
4	<i>Cynodon dactylon</i>	0.006	0.009	0.20	preferably strong	0.012	0.035	0.49	preferably strong
5	<i>Cyperus haspan</i>	0.020	0.024	0.09	proportional	0.002			
6	<i>Dactyloctenium aegyptium</i>	0.028	0.030	0.03	proportional strong	0.008	0.028	0.56	strong preferred

7	<i>Digitaria adscendens</i>	0.007				0.010			
8	<i>Eleusine indica</i>	0.008				0.028			
9	<i>Eriochloa ramosa</i>	0.018	0.020	0.05	proportional	0.008	0.011	0.16	preferably
10	<i>Eriochloa subglabra</i>	0.011	0.024	0.37	preferably	0.003			
	<i>Heteropogon</i>								
11	<i>contortus</i>	0.030							
12	<i>Oplismenus burmani</i>	0.022				0.019			
	<i>Oplismenus</i>								
13	<i>compositus</i>	0.042				0.006			
14	<i>Phragmites</i> sp.	0.059				0.053			
15	<i>Imperata cylindrica</i>	0.029				0.038			
16	<i>Panicum eruciforme</i>	0.048	0.030	-0.23	less favored	0.024			
17	<i>Panicum tryperon</i>	0.017				0.014			
18	<i>Themeda arguens</i>	0.016				0.041			
19	<i>Eragrostis amabilis</i>					0.048			
20	<i>Cyperus</i> sp.	0.003				0.016			
21	<i>Kyllinga monicepala</i>	0.003	0.004	0.14	preferably	0.002	0.004	0.33	preferably
	Woodys								
1	<i>Acacia auriculiformis</i>	0.007				0.008			
2	<i>Grewia koordersiana</i>	0.027	0.028	0.02		0.024	0.046	0.31	preferably
3	<i>Hibiscus sinensis</i>	0.008				0.013	0.021	0.24	preferably
	<i>Leucaena</i>				preferably	0.012	0.031	0.44	preferably
4	<i>leococephala</i>	0.013	0.026	0.33					
5	<i>Malvastrum</i> sp.	0.015	0.019	0.12	preferably	0.015			
6	<i>Phyllanthus emblica</i>	0.035				0.019	0.006	-0.52	avoided
7	<i>Schleichera oleosa</i>	0.012				0.007			
					preferably	0.011	0.069	0.73	strong preferred
8	<i>Streblus asper</i>	0.008	0.020	0.43					
9	<i>Azadirachta indica</i>	0.003				0.007			
10	<i>Breynia oblongifolia</i>	0.003				0.002			
11	<i>Cassia absus</i>	0.007				0.027			
12	<i>Crotalaria refusa</i>	0.004				0.002			
13	<i>Eupatorium odoratum</i>	0.065	0.053	-0.10	avoided	0.159	0.091	-0.27	avoided
14	<i>Lantana camara</i>	0.046	0.030	-0.21	avoided	0.062	0.042	-0.19	avoided
15	<i>Manilkara kauki</i>	0.002							
16	<i>Momosa pudica</i>	0.004				0.004			
17	<i>Acacia leocophloea</i>	0.010				0.023			
18	<i>Pluchea indica</i>	0.004	0.005	0.11	preferably	0.008	0.023	0.48	preferably
19	<i>Pongamia pinnata</i>	0.013				0.002			
					preferably				strong preferred
20	<i>Gliricidia sepium</i>	0.005	0.013	0.44		0.013	0.071	0.69	
21	<i>Solanum</i> sp.	0.023				0.005			
22	<i>Zysipus mauritiana</i>	0.028				0.017			
23	<i>Caesalpinia crista</i>	0.003				0.009			
24	<i>Borrassus flabelifer</i>	0.004				0.003			
25	<i>Bridelia monoica</i>	0.004	0.004	0.00	proportional	0.022			
26	<i>Abutilon</i> sp.	0.002				0.002	0.004	0.33	preferably
27	<i>Flacourtia indica</i>	0.004	0.003	-0.14	avoided	0.018			
28	<i>Calotropis gigantea</i>	0.003							
29	<i>Sida rhombifolia</i>	0.005	0.006	0.09	proportional				
30	<i>Leucas zeylanica</i>					0.001			

From the Table 1, it can be seen that some plants showed changes in the level of preference when the dry season (Preferably to strong preferred; proportional to preferably), which are *Borreria laevis*, *Axonopus compresus*, *Dactyloctenium aegyptium*,

Eriochloa ramosa, and *Streblus asper*. This was done because of a decline in the availability of food plants favored by muntjac deer when the dry season. Figure 4 is a few plants that preferably / strong preferred by muntjac deer in BBNP.



Commelina benghalensis



Desmodium triflorum



Boerhavia diffusa



Tribulus terrestris



Streblus asper



Justicia sp.



Axonopus compresus



Synedrella nodiflora

Figure 4. Some species that's strong preferred and preferably by muntjac deer in BBNP.

Conclusion

Muntjac deer (*Muntiacus muntjak*) activity feeding on habitat savanna and monsoon forest types. Botanical composition of forage dominated by herbaceous dicots (forbs), which is a type of browser or concentrate selector. Found 33 plant species were selected by deer during the rainy season and 25 species in the dry season. 17 plant species were selected throughout the season. Most of the preferred species of herbaceous dicotyledonous group (frobs).

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References

- Backer, C.A. 1973. Atlas of 220 Weeds of Sudar Cane Fields in Java. Publisher by Pasuruan Indonesia.
- Darmodjo, B. 2008. Management of West Bali National Park. Hall of West Bali National Park, Cekik.
- Ginantra, K., Suarna, I.W., Kasa, I. W. and Ismail, D. 2015. Feeding selection by Timor deer (*Cervus timorensis* Blainville) in relation to chemical and physical properties of the forage plants at Bali Barat National Park. Int. J. Adv. Res. Biol.Sci. 2(6): (2015): 55–65.
- Ginantra, K., Putra, S., Suarna, W. and Kasa, W. 2014. Botanical Composition of forage by Timor Deer (*Cervus timorensis* Blainville) in A Monsoon Forest and Savanna of West Bali National Park. Int. J. Pure App. Biosci. 2 (5): 205-213 (2014).
- Grimaud, P., Sauzier, J., Bheekhee, R. and Thomas, P. 2008. Nutritive value of tropical pastures in Mauritius Trop. Anim Health Prod (2006) 38: 159–167.
- Hanley, TA. 1997. A Nutritional View of Understanding and Complexity in the Problem of Diet Selection by Deer (Cervidae). Oikos 79:209-218, Copenhagen.
- Holechek, J.L., Vavra, M. and Pieper, R.D. 1990. Methods for Determining the Botanical Composition, Similarity, and Overlap of Range Herbivore Diets. National Reasearch Council/National Academy of Sciences, London.
- IUCN. Red List of Treatedened Species, Version 2011. Available from:<http://www.iucnredlist.org>
- Ilyas, O. and Khan, J.A. 2003. Food Habit of Barking Deer (*Muntiacus muntjak*) and Goral (*Naemorhedus goral*) in Binsar Wildlife Sanctuary, India. Mammalia Vol. 67 Issue 4:521-531.
- Krebs, J.C. 1989. Ecologycal Metodelogy. Harper Collins Publissers, New York.
- Moser, B., Schu¨tz, M. and Hindenlang, K.E. 2006. Importance of alternative food resources for browsing by roe deer on deciduous trees: The role of food availability and species quality. Forest Ecology and Management (226): 248–255. Available from: www.sceincedirect.com.
- Santoso, S.I. 2011. Rusa Timorensis (*Cervus timorensis*); From Animal Conservation into Towards Raising Livestock. Publisher Graha Ilmu
- Shipley, L. A. 1999. Grazers and Browsers: How Digestive Morphology Affects Diet Selection. Available at: www.cnr.uidaho.edu.

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