Selection of forages by timor deer (*cervus timorensis* blainville) in menjangan island, bali

I Ketut Ginantra*, Ida Bagus Made Suaskara1, I Ketut Muksin1

Department of Biology, Faculty of Mathematics and Natural Sciences, Udayana University, Bali-Indonesia

Email: ketutgi@yahoo.com

Abstract. This study was conducted to determine the selection of forages plants by Timor deer (*Cervus timorensis*) on Menjangan Island and its relation to the availability, chemical and physical properties of feed plants. The study was conducted in July-September 2016 in savanna and monsoon forest habitats. The availability of habitat feed plants in the habitat was determined by the quadrat method, and the species of plant eaten by Timor deer was determined through the microhistological analysis of the fecal sample. The food selection index is determine by the Ilev index. Energy contents of forages plants by bomb calorimeter apparatus, crude protein analyzed by Semi-Micro Kjeldahl technique, NDF, ADF and lignin levels refer to the method of Goering and Van Soest. Mineral content of calcium (Ca) and phosphorus (P) by using atomic absorption spectrophotometer. Determination of tannin content with Folin Denish reaction. Physical properties determine are water regain capacity and water solubility. The relationship between availability with the utilization of plants by Timor deer was analyzed with the similarity index. Multiple regression statistic to test the relationship between index selection with nutritional value factor and physical characteristic of plant species. The result showed that Timor deer selected 32 plants species of graminoids, forbs and woody plants. Feeding selection of Timor deer is strongly influenced by the availability of forage plants in habitat. The feeding selection was significantly influenced by three predictor variables i.e. positive nutritional value is crude protein and negative nutritional value were lignin and tannins. Selection of forage plant Timor deer is positively correlated with the physical properties of feed plants.

Keywords: Chemical and physical characteristic of plants, feeding selection, plant availability, Timor deer

1. Introduction
Timor deer (*Cervus timorensis*) is one of the wildlife found in the area of Menjangan Island Bali. This area is part of Bali Barat National Park (BBNP), located on the north western tip of Bali Island. An area of 175 Ha island consists of savanna habitat, monsoon forest and mangrove forest [1]. Different habitat types have consequences for different of vegetation constituents. These phenomena affect the abundance of forages species, productivity and quality. These differences will have implications for the feeding selection of Timor deer, especially in the effort to meet the need for nutrients.

Selection of feed plants in deer in wildlife is a complex behavior and is a consequence of interactions among several factors. Selection of feed species on deer involves several factors, such as
nutritional value (positive nutrient, negative nutrient), allelochemical compound (negative value), physical characteristics of the plant itself, availability in habitat and also the presence of competitors or predators [2], [3], [4].

Several studies of forage selection on Timor deer in the BBNP have been conducted. Ginantra et al. [5], found more than 30 species of plants selected by Timor deer in two habitat units (in the monsoon forest and savanna) in the BBNP. Masy'ud et al. [6] found 12 species of plants eaten by Timor deer in Tanjung Pasir habitat unit of BBNP. These studies were conducted in the park area of Bali, but not in the area of Menjangan Island. Given the area of Menjangan island is a separate habitat for Timor deer, then the selection study, the availability of feed plants the need to be done.

The focus of this study was to determine the feeding selection of Timor deer (C. timorensis) with factors: Availability of botanical composition in the habitat; Nutritional value of feed plants including protein content, energy, minerals of Calcium (Ca) and Phosphor (P), acid detergent fiber (ADF), neutral detergent fiber (NDF), lignin, allelochemistry (Tannin) and physical characteristics of feed plants that include water regain capacity and water solubility.

2. Methods

2.1 Study Area

Field research was conducted for the study of the composition of forage species and the collection of Timor deer feces. Based on the preliminary study, four habitat units were used by Timor deer. Sampling was conducted in four habitat units of Menjangan Island, i.e. S1, S2 and S3 locations for savanna habitat types and location of MF for vegetation type of monsoon forest (Figure 1). Field research was conducted in July-September 2016.

2.2 Analysis of Botanical Composition in the habitat

The botanical composition availability in the habitat was determined by the quadrat method. Size of 0.25 m² plot for grass, herb and 1 m² for shrubs and 25 m² for trees. The number of plots for each habitat unit is ten times. The parameters measured were the ground cover of each plant species. For vegetation of shrubs and tree parts of plants that measured were percent cover of the shoot that count up to 1.2 m height (height level can be accessed by Timor deer) [7]. Botanical composition/forage species in habitat by percent cover [8].

2.3 Analysis of fecal microhistology

The composition of plants species eaten by Timor determined by techniques micro-histological fecal sample (Holechek et al., 1990). Feces collected from five groups of pellets in four habitat units, each done as much as one time in each month. Immediately collected fecal sample was dried (oven 70 °C)
and put into an envelope, then in refrigerant before micro-histological analysis done in the laboratory to avoid decomposition [9].

Epidermal fragment preparations of each plant species available in the habitat are made as reference slides to identify the species of edible plants. Five individual pellets were randomly selected from 5 fecal groups collected in each habitat unit. The fecal sample was destroyed, then immersed in NaClO (6%) for ± 7 minutes. The washed stool part taken for preparing preparations. The number of epidermal fragments of each plant species is calculated from 20 microscope slides at 400x magnification. The epidermal fragment was computed only by indentifiable fragment to reduce the bias between graminoid and nongraminoid. Observations were made at the plant taxonomy laboratory of Udayana University Bali. The botany composition of deer feed was determined based on the percentage of epidermal fragments of each plant on 20 slides.

2.4 Analysis of chemical and physical properties of forage plants

Each plant species in each plot in the field was cut about 5 cm representative of the animal eaten portion for the sample of feed plants [10]. Dry weight (DW) samples was finely milled (a particle size of about 1-2 mm screen) used in proximate analysis: dry matter (DM), gross energy (GE), crude protein (CP), calcium minerals, phosphorus, and tannin content.

Determination of DM is DW sample oven until temperature 105 °C for 2 x 24 hours. GE contents by bomb calorimeter apparatus, CP analyzed by Semi-Micro Kjeldahl technique, NDF, ADF and lignin levels refer to the method of Goering and Van Soest [11]. Mineral content of calcium (Ca) and phosphorus (P) by using Atomic Absorption Spectrophotometer (AAS) [12]. Determination of Tannin (total tannin) with Folin Denish reaction [13]. The analysis was conducted at the Laboratory of Livestock Research Center, Bogor.

Dry weight samples of each finely ground feed species up to 1-2 mm screen size to measure physical properties. Physical properties are water regain capacity (WRC) and water solubility (WS), was determined according to the methods of Suhartati et al. [14]. The analysis were done at laboratories of plant taxonomi, Biology of Udayana University.

2.5 Data Analysis

Selection of forage plants is determined by selection index (Si) "Ivlev" [15].

\[
Si = \frac{(Ui - pi)}{(Ui + pi)}
\]

\(pi = \) composition (%) of species-i in habitat
\(Ui = \) composition (%) species-i in deer diet

The value of Si ranges from -1 to 1, with the category of preferred degree (palatability) is as follows: preferably (0.1 to 1), proportional (0.09 to -0.09), avoidance (- 0.1 to -1).

The relationship between availability with the utilization of plants by Timor deer was analyzed with the similarity index (S), with the formula S = Yi (Yi = minimum value of plant species composition in the habitat (pi) and the composition of plant species eaten (ui)). If S > 50% showed a high similarity score and S≤50% showed a low similarity score [15]. The relationship between index selection with nutritional value factor and physical characteristic of plant species was tested by multiple regression statistics with the stepwise method. Test using the "IBM SPSS 20" software.

3. Results and discussion

3.1 Availability and selection of plant species in habitat

The species of plants available in four habitat units are as many as 39 species, 32 of which are selected by Timor deer. The species of plants selected are quite diverse both from graminoids, forbs and woody plants (Table 1).
In monsoon forest habitats, some plant species are not available, but in Timor deer diet (in fecal analysis). These include *Dactyloctenium aegptium, Digitaria* sp., *Vernonia patula.* This suggests that the species of forages is eaten in other habitats (on savannas) and when in monsoon forest habitat deer remove feces. The distance between one habitat unit and another near enough (savanna S1 unit with monsoon forest, or between monsoon forest with savanna S2 only 1 to 2 km) to allow the deer to move or still be home range of timor deer. Allison [16], states that the home range of deer is generally 2.62 km².

**Table 1.** Composition (%) of plant species selected by timor deer in Menjangan Island, Bali.

| No | Plants Species                | Graminoids | Forbs | Woody | Selection category |
|----|--------------------------------|------------|-------|-------|--------------------|
|    | Botanical composition in deer diet on the habitat unit | S1 | MF | S2 | S3 | Ui | Pi | IS | category |
| 1  | *Dactyloctenium aegptium* | 9.62 | 2.29 | 9.71 | 5.41 | 1.77 | 0.51 | F |
| 2  | *Eragrostis amabilis* | 6.51 | 8.62 | 4.5 | 5.31 | 6.99 | 2.38 | 0.49 | F |
| 3  | *Themeda arguens* | 1.49 | 1.49 | 1.49 | 1.74 | 0.37 | 0.59 | -0.23 | Av |
| 4  | *Heteropogon* sp. | 1.21 | 1.31 | 2.56 | 1.6 | 1.67 | 2.64 | -0.22 | Av |
| 5  | *Digitaria* sp. | 7.11 | 3.23 | 4.39 | 6.41 | 5.29 | 1.78 | 0.50 | F |
| 6  | *Cyperus* sp. | 2.13 | 3.26 | 5.13 | 2.13 | 2.63 | 1.61 | 0.24 | F |
| 7  | *Imperata cylindrica* | 1.26 | 0.32 | 0.86 | 0.22 | 0.32 | 0.86 | -0.46 | Av |
| 8  | *Andopogon aciculatus* | 4.44 | 1.11 | 1.05 | 0.03 | 1.11 | 1.05 | 0.03 | P |
| 9  | *Phragmites* sp. | 8.11 | 7.89 | 9.12 | 9.41 | 8.63 | 13.25 | -0.21 | Av |
|    | *Desmodium heterophylum* | 2.75 | 0.69 | 0.42 | 0.24 | 0.69 | 0.42 | 0.24 | F |
| 1  | *Ammania bascifera* | 3.96 | 0.99 | 0.65 | 0.21 | 0.99 | 0.65 | 0.21 | F |
| 2  | *Vernonia patula* | 11.51 | 1.2 | 8.92 | 5.41 | 5.41 | 5.41 | 5.41 | P |
| 3  | *Euphorbia hirta* | 1.41 | 0.35 | 0.51 | -0.19 | 0.35 | 0.51 | -0.19 | Av |
| 4  | *Cleome viscosa* | 4.21 | 4.01 | 5.29 | 3.38 | 3.45 | -0.01 | 3.38 | P |
| 5  | *Tephrosia punila* | 3.41 | 0.85 | 0.68 | 0.11 | 0.85 | 0.68 | 0.11 | F |
| 6  | *Justicia* sp. | 2.71 | 3.69 | 4.25 | 2.66 | 1.69 | 0.22 | F |
| 7  | *Ocimum* sp. | 4.65 | 6.96 | 4.65 | 4.67 | 5.23 | 6.97 | -0.14 | Av |

**Woodys**

| No | Plants Species                | Graminoids | Forbs | Woody | Selection category |
|----|--------------------------------|------------|-------|-------|--------------------|
|    | Botanical composition in deer diet on the habitat unit | S1 | MF | S2 | S3 | Ui | Pi | IS | category |
| 1  | *Leucaena leucocephala* | 5.62 | 1.41 | 0.81 | 0.27 | 1.41 | 0.81 | 0.27 | F |
| 2  | *Schoutenia ovate* | 10.5 | 8.82 | 5.78 | 6.28 | 4.67 | 0.15 | F |
| 3  | *Grewia koordersiana* | 6.3 | 4.11 | 2.60 | 1.38 | 2.60 | 1.38 | 0.31 | F |
| 4  | *Sclerchera oleosa* | 3.31 | 0.83 | 0.85 | -0.01 | 0.83 | 0.85 | -0.01 | P |
| 5  | *Datura metel* | 5.12 | 6.21 | 2.83 | 1.57 | 2.83 | 1.57 | 0.29 | F |
| 6  | *Phyllanthus emblica* | 3.22 | 2.49 | 1.43 | 2.70 | 1.43 | 2.70 | -0.31 | Av |
| 7  | *Euapatium odoratum* | 13.71 | 14.82 | 12.92 | 13.91 | 13.84 | 10.91 | 0.12 | F |
| 8  | *Lantana camara* | 2.5 | 2.14 | 1.29 | 1.32 | 1.81 | 5.21 | -0.48 | Av |
| 9  | *Spondias* sp. | 2.78 | 7.22 | 3.11 | 3.28 | 3.28 | 3.28 | 0.00 | P |
| 10 | *Cleistanthus laevis* | 4.65 | 6.96 | 4.65 | 4.67 | 5.23 | 6.97 | -0.14 | Av |
The feed botanical composition of Timor deer in Menjangan Island consists of three groups of forbs, graminoids and woody plants. Woody plants show the highest botanical composition, and the lowest is forbs category (Figure 2).

This result is different from the composition of deer Timor feed plants in the park’s main land (BBNP), the simplest botanical composition of woody plants. Meanwhile, on the Menjangan island composition of the highest woody plants compared with graminoids and forbs. The high composition of deer feed on plant groups of woody plants is associated with the low availability of forbs and grasses in Menjangan Island. Lack of botanical composition in forbs group and grasses are compensated by increasing woody plants. This suggests that the availability of habitat feed plants in the habitat determines the botanical composition in Timor deer feed.

![Figure 2. The Botanical Composition of forages by Timor Deer on the Menjangan Island.](image)

Timor Deer can adapt to selective grazing and browsing, depending on the availability of feed in the habitat. Patisellano and Arobaya [17] reported that the composition of Timor deer feed in upland kebang Manokwari more towards grazer because grass is available higher in the habitat. DeGarine-Wichatitsky et al. [18], also found a similarity to the feed botanical composition of Timor deer in New Caledonia, in vegetation savanna higher botanical composition in deer feed is graminoids, whereas in forest vegetation the botanical composition in deer diet is dominated by broad leaf plants.

### 3.2 Relation of availability to plant utilization by Timor deer

In four habitat units observed, Timor deer showed plant species relationships that were eaten with the availability of vegetation in the habitat, both graminoids, forbs and woody plants, with index values above 50%. The category of forbs showed the highest similarity index value of 87.64% compared with woody and grass plants (Figure 3). This shows that the availability of feed plants of forbs election.
category high. This is because the availability of grass in the menjangan island habitat is very limited to meet the needs.

In contrast to the results of the study [5] that the Timor deer in the mainland BBNP area showed similar low value (<50%) in woody plants. In the area of the park's mainland, the availability of grasses and forbs more abundant than in Menjangan Island. As the availability of woody plants increases, while the herbaceous plants and the grasses are low, the Timor deer shows the composition of feed on high woody plants.

![Figure 3](image-url)

**Figure 3.** Similarity of the available plant composition in habitat with plants utilized by timor deer in Menjangan Island

The availability of plants species is one of the factors that influence feeding selection on herbivor in wild habitat, besides other factors like acceptability, plant digestibility and chemical composition of feed type. Nugent [19] suggest that feeding selection reflects the relationship between animals and vegetation in the habitat. Homolka [7] also reported a high similarity index between feed composition and availability food supply which is dominated by grass in red deer (*Cervus elaphus*).

### 3.3 Content of Nutrition and Tannins of feed plants

The nutrient content of feed plants, i.e. dry matter (DM), crude protein (CP), gross energy (GE), minerals (Ca and P) are presented in Table 2. The content of CP species of feed plants in forbs groups and woody plants shows the range of content which is higher than the graminoids group. GE content of plant species of grasses and woody plants show a higher range of energy content than forbs. Mineral content of Ca and P plant species group of forbs and woody plants showed the range of mineral content (Ca and P) is higher than the graminoids group. However, tannin content of woody plants and forbs relatively higher than the grass group.

In general, the tannin content (mainly condensed tannin) of feed plants is mostly at moderate level, i.e. less than 4% [20]. Grass plants of all species of feeds exhibit moderate tannin content. The content of tannins of plant species in forbs is also mostly a moderate level, but there is one species of plant, namely *Anmania bascifera* tannin content is high enough that is 5.46%. several woody plants show high tannin content, including *Schoutenia ovate* (5.86%), *Datura metel* (4.85%), *Eupatorium odoratum* (5.54%), *Spondias sp.* (5.14%), *Cleistanthus laevis* (5.61%), *Albezia lebbeckioides* (8.74%), *Cleistanthus sp.* (14.35%) and *Zyziphus mauritiana* (15.95%). Holechek [21], also reported that woody plants tend to have secondary metabolite content including tannins that are higher than forbs and grasses plant.

The results of nutrient content analysis of feed plants in Menjangan island habitat, showed that the quality of available plant feed varies. Herbaceous plants content of CP and minerals (Ca and P) is higher, grass content is lower, but its GE content is higher than forbs plants. Woody plant content of CP and GE is high and its availability tends to be relatively longer than forbs. The same is also reported by Amiri and Shariff [22], that the content of CP, GE and minerals varies by plant species (dicoty herbes, grasses and woody plants).
Table 2. Chemical content of feed plants

| NO | Plants species               | DM % | water % | CP % | GE Kcal/kg | Ca % | P % | Tanin % |
|----|------------------------------|------|---------|------|------------|------|-----|---------|
|    | Graminoids                   |      |         |      |            |      |     |         |
| 1  | Dactylolocentum aegespium    | 18.02| 81.98   | 13.44| 3735.16    | 1.13 | 0.27| 0.35    |
| 2  | Eragrostis amabilis          | 22.00| 78.00   | 12.50| 4243.35    | 0.42 | 0.31| 0.59    |
| 3  | Temeda arguens               | 33.15| 66.85   | 7.40 | 4142.21    | 0.21 | 0.20| 0.34    |
| 4  | Heteropogon sp.              | 27.62| 72.38   | 7.05 | 3515.32    | 0.03 | 0.14| 2.06    |
| 5  | Digitaria adscendens         | 21.33| 78.67   | 11.19| 4183.34    | 0.56 | 0.27| 0.32    |
| 6  | Cyperus haspan               | 20.84| 79.16   | 9.81 | 4140.84    | 0.79 | 0.21| 0.43    |
| 7  | Imperata cylindrica          | 28.83| 71.17   | 9.43 | 4322.52    | 0.26 | 0.22| 0.25    |
| 8  | Andopogon aciculatus         | 22.17| 77.83   | 9.98 | 4072.42    | 0.75 | 0.30| 0.41    |
| 9  | Phragmites sp.               | 21.88| 78.12   | 8.47 | 4470.38    | 0.36 | 0.26| 0.29    |
|    | Forbs                        |      |         |      |            |      |     |         |
| 1  | Desmodium heterophylum       | 19.63| 80.37   | 21.91| 3936.58    | 1.48 | 0.45| 0.52    |
| 2  | Ammania bascifera            | 22.34| 77.66   | 19.62| 4235.00    | 0.42 | 0.30| 5.46    |
| 3  | Vernonia patula              | 17.08| 82.92   | 13.97| 4235.21    | 1.25 | 0.26| 3.20    |
| 4  | Euphorbia hirta              | 18.89| 81.11   | 22.07| 3585.22    | 1.93 | 0.52| *       |
| 5  | Cleome viscosa               | 18.96| 81.04   | 10.93| 3278.99    | 9.64 | 0.15| 2.33    |
| 6  | Tephrosia pumila             | 24.34| 75.66   | 21.77| 4059.12    | 1.53 | 0.30| 0.73    |
| 7  | Justicia sp.                 | 16.86| 83.14   | 15.32| 3917.81    | 2.48 | 0.09| 2.77    |
|    | Woodys                       |      |         |      |            |      |     |         |
| 1  | Leucaena leocoecephala       | 24.80| 75.20   | 27.65| 4832.55    | 1.21 | 0.27| 2.16    |
| 2  | Schoutenia ovate             | 15.90| 84.10   | 16.44| 4835.47    | 0.59 | 0.23| 5.86    |
| 3  | Grewia koordersiana          | 31.70| 68.30   | 17.34| 4546.49    | 1.33 | 0.27| 0.41    |
| 4  | Schleichera oleosa           | 31.41| 68.59   | 14.78| 4803.21    | 1.11 | 0.20| 1.11    |
| 5  | Datura metel                 | 14.73| 85.27   | 15.96| 5284.13    | 1.54 | 0.18| 4.85    |
| 6  | Phyllanthus emblica          | 31.25| 68.75   | 11.97| 4715.90    | 0.60 | 0.07| 2.75    |
| 7  | Eupatorium odoratum          | 17.71| 82.29   | 24.63| 4459.80    | 2.24 | 0.14| 5.54    |
| 8  | Lantana camara              | 33.26| 66.74   | 16.76| 3779.49    | 1.43 | 0.22| *       |
| 9  | Spondias sp.                 | 27.69| 72.31   | 16.91| 4388.24    | 2.32 | 0.37| 5.14    |
| 10 | Cleistanthas laevis          | 36.62| 63.38   | 9.96 | 5285.70    | 0.98 | 0.12| 5.61    |
| 11 | Acacia leucophlea            | 27.69| 72.31   | 22.79| 5057.89    | 0.75 | 0.11| *       |
| 12 | Albezia lebbeckoides         | 27.72| 72.28   | 11.87| 4539.50    | 1.14 | 0.15| 8.74    |
| 13 | Pasiflora foetida            | 14.77| 85.23   | 12.17| 4286.03    | 2.41 | 0.09| 1.79    |
| 14 | Cleistanthas sp.             | 27.81| 72.19   | 13.88| 4660.03    | 2.72 | 0.12| 14.35   |
| 15 | Zysispus mauritiana          | 34.032| 65.968 | 15.95| 3558.69    | 2.47 | 0.12| 15.95   |

* tannin data is not analyzed
3.4 Content of ADF, NDF, lignin and physical properties of plant species of feed
The ADF content of the forbs and the woody plants is relatively lower than that of the grasses, but the lignin content of the grass plants is relatively lower (Table 3). The results of this study are a logical consequence of lower ADF in forbs compared with other plants as a result of low coarse fiber. Other researchers also found almost the same thing that grass (graminoids) is a group of plants whose cell wall content (ADF and NDF) tend to be higher than dicotyl herbs [22].

Water absorption and water solubility are affected by plant cell wall content (ADF and NDF) and water regain capacity and water solubility (r = -0.094 and r = -0.413) and negative correlation also between NDF content with water regain capacity and water solubility (r = -0.076 and r = -0.294). That is, the higher the cell wall content (ADF and NDF) plants, the water absorption and water solubility is relatively lower (Table 3). The results of this study are especially their water holding capacity, are negatively correlated with ADF and NDF plant contents.

| Table 3. Cell wall content and physical properties of feed plants |
|---------------------------------------------|
| NO | Plants species | NDF % | ADF % | Lignin % | WRC | WS |
|-----|----------------|-------|-------|---------|-----|----|
| Graminoids |
| 1 | Dactylolcenium aegaeptum | 60.80 | 50.93 | 8.80 | 5.76±1.16 | 0.37±0.12 |
| 2 | Ergrophiis amabilis | 75.04 | 54.66 | 4.69±0.72 | 0.40±0.10 |
| 3 | Temeda arguens | 59.30 | 3.60±0.16 | 0.16±0.08 |
| 4 | Heteropogon sp. | 75.46 | 60.56 | 5.44 | 3.41±0.33 | 0.29±0.05 |
| 5 | Digitaria ascendens | 58.98 | 54.00 | 9.25 | 4.76±0.10 | 0.32±0.05 |
| 6 | Cyperus haspan | 56.30 | 4.51±0.20 | 0.31±0.03 |
| 7 | Imperata cylindrica | 50.38 | 3.37±0.25 | 0.25±0.05 |
| 8 | Andopogon aciculatus | 53.50 | 3.19±0.17 | 0.21±0.18 |
| 9 | Phragmites sp. | 57.88 | 3.30±0.22 | 0.21±0.09 |
| Forbs |
| 1 | Desmodium heterophyllum | 44.29 | 40.85 | 15.58 | 6.42±1.16 | 0.46±0.09 |
| 2 | Ammania bascifera | 50.63 | 48.14 | 15.72 | 4.20±0.41 | 0.29±0.04 |
| 3 | Vernonias patula | 52.18 | 46.45 | 30.16 | 3.20±0.08 | 0.27±0.08 |
| 4 | Euphorbia hirta | 41.78 | 3.9±1.19 | 0.44±0.06 |
| 5 | Cleome viscosa | 43.79 | 43.39 | 17.73 | 5.20±0.48 | 0.40±0.02 |
| 6 | Tephras pumila | 43.11 | 3.41±0.79 | 0.34±0.18 |
| 7 | Justicia sp. | 40.81 | 34.93 | 8.93 | 4.22±0.56 | 0.35±0.08 |
| Woody |
| 1 | Leucaena leucocephala | 39.63 | 32.57 | 20.55 | 4.20±0.87 | 0.48±0.06 |
| 2 | Schoutenia ovata | 49.50 | 47.15 | 20.24 | 4.86±0.72 | 0.55±0.06 |
| 3 | Grewia koordersiana | 61.08 | 58.76 | 26.71 | 4.24±0.98 | 0.37±0.07 |
| 4 | Schleichera oleosa | 63.67 | 57.80 | 30.83 | 3.77±0.81 | 0.31±0.04 |
| 5 | Datura metel | 35.22 | 33.03 | 12.39 | 3.38±0.81 | 0.29±0.09 |
| 6 | Phylanthes emblica | 49.20 | 45.33 | 12.39 | 3.40±0.61 | 0.35±0.06 |
| 7 | Eupatorium odoratum | 61.72 | 59.55 | 28.13 | 3.22±1.12 | 0.33±0.06 |
3.5 Selection of forages plants in relation with chemical and physical properties of plants

Timor deer in Menjangan island habitat selects a variety of plants. Not only the species of high-quality nutrients are selected, but also selecting the species with the quality of the intermediates. This indicates that in the selection of feed in addition to nutrient fulfillment in quality, quantity is also important to maximize nutrient intake for their needs. Lopes-Coba et al. [24] state that in herbivore feeding selection it can make decisions to quickly determine the types of feed to optimize its consumption rate (intake) for a trade-off between the quality and quantity of feed availability.

The result of "stepwise" regression correlation test between feeding selection with CP, GE, Ca, P, ADF, NDF, lignin, tannin, WRC, WS species of feed plants, it was found that the feeding selection showed significant regression correlation with three predictor variables. The three variables are crude protein (X₁), lignin content (X₂) and tannin content (X₃). The model of regression of feeding selection with three variables of predictors are as follows:

\[ Y = 0.93 + 0.18X₁ - 0.052X₂ - 0.092X₃ \]

The value coefficient of R determinant (R²) is 0.82, meaning that together the CP content factor, lignin, and tannin have an effect of 82% on the selection of plant species in the habitat, and the rest is due to other factors.

Furthermore, when examined the physiological aspect that selection of feed plants on deer in nature is a complex behavior and is a consequence of interactions among several factors [25]. Selection of feed species on deer involves several factors, such as nutritional value, allelochemical compounds (negative value), physical characteristics of the plant itself, availability in habitat and also the presence of competitors or predators. Similarly, olfactory or animal flavoring organs can be used to determine the chemical or nutrient compounds that are important to their life [26].

4. Conclusions

Feeding selection of Timor deer is strongly influenced by the availability of habitat feed plants (with similarity index> 50%). The feeding selection was significantly influenced by three predictor variables, i.e. positive nutritional value (X₁ = crude protein) and negative nutritional value (lignin = X₂ and X₃ = tannins). The model of regression of feeding selection with three variables of the predictors is \( Y = 0.93 + 0.18X₁ - 0.052X₂ - 0.092X₃ \).

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