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The 23rd International Grassland Congress (Sustainable use of Grassland Resources for Forage Production, Biodiversity and Environmental Protection) took place in New Delhi, India from November 20 through November 24, 2015.

Proceedings Editors: M. M. Roy, D. R. Malaviya, V. K. Yadav, Tejveer Singh, R. P. Sah, D. Vijay, and A. Radhakrishna

Published by Range Management Society of India

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**Feed intake and diet selection by sheep on rangeland at two phenological stages in North Kordofan State, Sudan**Mohammed Fatur<sup>1\*</sup>, B. Fadlalla<sup>2</sup>, A. K. Gaiballa<sup>2</sup><sup>1</sup>College of animal production, University of Bahri, Khartoum, Sudan<sup>2</sup>Sudan University of Science and Technology, Khartoum, Sudan\*Corresponding author e-mail: [fatour3@hotmail.com](mailto:fatour3@hotmail.com)**Keywords:** Bite-count, Relative preference index**Introduction**

North Kordofan is a leading State of Sudan in animal and range resources. Animal production is traditional and extensive, depending on natural rangeland. Sheep rank first in importance amounting to about 12.9 million heads. This study was conducted at El Demokeya Forest Reserve, North Kordofan State, Sudan at two range sites, protected and open. The objectives were to determinate feed intake and assess the plant species selected by sheep and development of preference indices for use in managing the rangeland.

**Materials and Methods**

Seven healthy, rams with average body weight  $31.6 \pm 1.12$  Kg were used in this study. The loop method was adopted for measuring vegetation botanical composition. Voluntary feed intake was assessed using the product of the weight of faeces collected over a specific period of time and *invitro* digestibility (Tilly and Terry, 1963) of a simulated diet of plants selected by sheep. Diet botanical composition was estimated using the bite-count technique. Relative preference indices (RPI) were calculated according to (Rosier *et al.*, 1975). Plant species were ranked into preferred, desirable, undesirable, unconsumed and toxic plants. Some common grasses, forbs and browse species were analyzed according to standard procedures. Neutral Detergent Fibre, Acid Detergent Fibre and Acid Detergent lignin were determined according to Van Soest *et al.*, (1991). *Data were analysed* using T-test.

**Results and Discussion**

Plants in the closed and open sites formed 81.9% and 87.5% respectively. Plant density was 261,0 and 182.0 plants/m<sup>2</sup> in the two sites respectively ( $P < 0.05$ ). *Zaleya pentandra* had highest frequency in the closed range while *Fimbristyls dichotoma* dominated the open range, (85.0 and 85.2%, respectively). Plants with highest crude fiber were *Aristida mutabilis*, *Cenchrus biflorus* and *Ipomoea blepharosepala* (33.1%, 32.9% and 33.7%, respectively). Plants with highest CP% were *Echinochloa colonum*, *Ipomoea blepharosepala* and *Zaleya pentandra* (13.4%, 18.7% and 14.7% respectively).

Chemical composition of the diets selected is shown in table 1. Sheep selected a diet of similar CP% at both phenological stages in both sites. A superior diet with respect to CP% was selected at the two phonological stages in closed site compared with open site ( $P < 0.01$ ). The mean CP% of the diet selected at flowering (8.8%) and at seed set (7.0%) stage in closed rangeland was greater than that of herbage biomass (6.8 and 5.7%). Also diet CP% in open rangeland at flowering (4.7%) and seed set (4.0%) was higher than that of herbage biomass (3.5% and 3.2% respectively).

Voluntary intake of dry matter (DMI) by grazing sheep at flowering stage in the closed and open sites is shown in table 2. DMI was significantly different between the two sites being  $90.1 \pm 9.750$  and  $100.6 \pm 7.23$  g DM / WKg<sup>0.75</sup> respectively ( $P < 0.01$ ). This is in agreement with the value of 90 g DM/ WKg<sup>0.75</sup> reported by Kearn (1982) for grazing sheep.

**Table 1:** Chemical composition of the diets of sheep in protected and open sites

| Parameter (%)                  | Flowering Stage | Seed set stage  | Sig. |
|--------------------------------|-----------------|-----------------|------|
| Closed site                    |                 |                 |      |
| Crude protein                  | $8.8 \pm 1.01$  | $7.0 \pm 0.23$  | NS   |
| Neutral Detergent Fibre (NDF). | $54.9 \pm 0.86$ | $60.9 \pm 1.22$ | **   |
| Acid Detergent Fibre (ADF).    | $38.6 \pm 0.74$ | $45.1 \pm 0.66$ | ***  |
| Acid Detergent lignin (ADL).   | $7.2 \pm 0.42$  | $9.9 \pm 0.20$  | **   |
| Open site                      |                 |                 |      |

|                                |             |             |    |
|--------------------------------|-------------|-------------|----|
| Crude protein                  | 4.7 ± 0.85  | 4.0 ± 0.76  | NS |
| Neutral Detergent Fibre (NDF). | 54.8 ± 0.78 | 60.4 ± 1.65 | ** |
| Acid Detergent Fibre (ADF).    | 38.8 ± 0.45 | 44.8 ± 1.22 | ** |
| Acid Detergent lignin (ADL).   | 7.2 ± 0.22  | 9.7 ± 0.31  | ** |

\*\*Significant at 0.01 level, \*\*\*Significant at 0.001 level, NS= not significant

**Table 2:** Mean voluntary dry matter intake (DMI) by grazing sheep at flowering stage

| Parameter                   | Closed rangeland | Open rangeland    |
|-----------------------------|------------------|-------------------|
| Mean DMI                    |                  |                   |
| g/ day :                    | 1199.5 ± 128.3   | 1339.5 ± 100.2 ** |
| g DM / w <sup>0.75</sup> Kg | 90.1 ± 9.75      | 100.6 ± 7.23 **   |
| Kg / 100 Kg BW              | 3.8 ± 0.42       | 4.2 ± 0.32 *      |

Botanical composition, RPI and plant classification of the diets of sheep on the two sites at flowering stage for herbaceous species are shown in table 3.

**Table 3:** Botanical composition, RPI and plant classification of the diets of sheep at flowering stage

| Species                          | Closed range site |      |               | Open range site |      |               |
|----------------------------------|-------------------|------|---------------|-----------------|------|---------------|
|                                  | % in Diet         | RPI  | Plant Class** | % in Diet       | RPI  | Plant Class** |
| <i>Ipomoea blepharosepala</i>    | 19.23             | 21.3 | PP            | 00.37           | 0.4  | UP            |
| <i>Cenchrus biflorus</i>         | 14.14             | 23.3 | PP            | 42.01           | 02.9 | PP            |
| <i>Zaleya pentandra</i>          | 13.00             | 0.7  | DP            | 05.14           | 0.9  | DP            |
| <i>Fimbristyls dichotoma</i>     | 07.34             | 0.6  | DP            | 06.39           | 0.2  | UP            |
| <i>Aristida mutabilis</i>        | 05.94             | 0.8  | DP            | 04.41           | 1.1  | PP            |
| <i>Tephrosia spp</i>             | 05.29             | 8.8  | PP            | 02.26           | 3.8  | PP            |
| <i>Corchorus olitorius</i>       | 05.04             | 5.6  | PP            | 00.11           | --   | --            |
| <i>Sesamum alatum</i>            | 04.47             | 7.5  | PP            | 00.76           | 0.8  | DP            |
| <i>Acacia senegal</i>            | 04.14             | --   | --            | 02.56           | --   | --            |
| <i>Echinochloa colonum</i>       | 04.06             | 0.2  | UP            | 12.80           | 1.4  | PP            |
| <i>Tribulus terrestris</i>       | 03.22             | 3.6  | PP            | 00.08           | --   | --            |
| <i>Gyndropsis gynandra</i>       | 02.55             | 1.6  | PP            | --              | --   | --            |
| <i>Chloris prieurii</i>          | 02.33             | --   | PP            | 01.21           | 0.6  | DP            |
| <i>Eragrostis tremula</i>        | 01.88             | 3.1  | PP            | 10.40           | 0.9  | DP            |
| <i>Justica kotschyi</i>          | 01.76             | 5.9  | PP            | --              | --   | --            |
| <i>Heliotropium supinum</i>      | 01.29             | --   | PP            | --              | --   | --            |
| <i>Acanthus spp.</i>             | 00.93             | 1.6  | PP            | 00.12           | --   | --            |
| <i>Dactyloctenium aegypticum</i> | 00.71             | 0.3  | UP            | 03.42           | 5.7  | PP            |
| <i>Ceratotheca sesamoides</i>    | 00.70             | 1.2  | PP            | 00.01           | --   | --            |
| <i>Chrozophora brocchiana</i>    | 00.45             | 0.8  | DP            | 00.67           | 1.1  | PP            |
| <i>Citrullus lanatus</i>         | 00.42             | --   | --            | --              | --   | --            |
| <i>Elytrophorus spicatus</i>     | 00.29             | 1.0  | DP            | 00.15           | --   | --            |
| <i>Monsonia senegalensis</i>     | 00.28             | --   | --            | --              | --   | --            |
| <i>Polycarpea corymbosa</i>      | 00.17             | 0.3  | UP            | --              | --   | --            |
| <i>Acacia tortilis</i>           | 00.15             | --   | --            | --              | --   | --            |
| <i>Calotropis procera</i>        | 00.07             | --   | --            | 00.22           | --   | --            |
| <i>Geigeria alata</i>            | 00.04             | 0.01 | UP            | --              | --   | --            |
| <i>Solanum dubium</i>            | 00.04             | 0.07 | UP            | --              | --   | --            |
| <i>Abutilon spp.</i>             | 00.02             | --   | --            | 01.00           | --   | PP            |
| <i>Balanites aegyptiaca</i>      | 00.02             | --   | --            | --              | --   | --            |
| <i>Ocimum basilicum</i>          | 00.01             | --   | --            | --              | --   | --            |
| <i>Indigofera spp.</i>           | --                | --   | --            | 04.21           | --   | PP            |
| <i>Zornia glochidiata</i>        | --                | --   | --            | 00.52           | 1.7  | PP            |
| <i>Cadaba farinose</i>           | --                | --   | --            | 00.52           | --   | --            |
| <i>Polygala erioptera</i>        | --                | --   | --            | 00.29           | 0.2  | UP            |

|                             |        |    |    |       |     |    |
|-----------------------------|--------|----|----|-------|-----|----|
| <i>Euphoebia aegyptiaca</i> | --     | -- | -- | 00.24 | 0.8 | DP |
| <i>Crotalaria spp.</i>      | --     | -- | -- | 00.12 | --  | -- |
| <i>Commelinia kotschyi</i>  | --     | -- | -- | 00.01 | --  | -- |
| Total                       | 100.00 |    |    | 100.0 |     |    |

\* Relative preference index (RPI) % = Species in Diet% ÷ Species botanical composition%

\*\* Plant classification: PP = Preferred Plant (RPI > 1.0); DP = Desirable Plant (RPI = approximately 1.0); UP = Undesirable Plant (RPI < 0.5)

At closed rangeland site sheep diet composition contained 19.4% grasses 67.7% forbs and 12.9% browse. While in open rangeland site grasses, forbs and browse were 22.2%, 66.7% and 11.1% respectively. The diet selected by sheep at the seed set stage in closed rangeland site comprised *Aristida mutabilis* (22.3%) and *Tephrosia spp.* (12.8%), while in open range site it encompassed *Eragrostis tremula* (68%) and *Aristida mutabilis* (21.9%). Plant classes in the diet of sheep in closed rangeland site contained 14.8% grasses, 77.8% forbs and 7.4% browse. In open rangeland the proportions of grasses, forbs and browse were 33.3%, 55.6% and 11.1% respectively. These results agreed with Fadlalla (1985), who reported that the diet of sheep contained about 90% of forbs and shrubs forbs being about 62%. This type of rangeland (study area) is suitable for sheep which selectively graze on forbs.

### Conclusion

Botanical composition of the grazing animals' diets is essential for reseeding on deteriorated rangelands, in predicting the outcome of overgrazing, in identifying key species on which to base management and in determining the suitability of exotic animals for particular range types.

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### Acknowledgement

Our thanks and gratitude is due to Sudan University of Science and Technology, and to the staff of El Obeid Research Station for their fruitful help.