

Impacts of Abundance of some Flora Species on Initiating Formation of Phytobezoars in Sheep on Rangelands of Kordofan, Sudan

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Abstract: Range inventory was conducted in six locations in the western part of North Kordofan State with the objective of studying range attributes in general and density, frequency and composition of some flora species pointed out causing phytobezoars in sheep. The line transect method was used for this purpose. The data was analyzed via analysis of variance and Duncan multiple range tests were applied to detect difference among means of attributes measured. Correlation between *Ipomoea* species and incidence of phytobezoars in sheep diagnosed on the surveyed sites was calculated. The results indicated varied plant species composition, frequency of species and density. Highly stocked sites had high frequency and density of unpalatable species especially *Ipomoea eriocarpus*. High density of *Merrimia emarginata* was recorded on sites heavily stocked and overgrazed. Strong correlation was found between percent incidence of phytobezoars diagnosed in flocks and *M. emarginata* density and frequency. It was concluded that *Merrimia emarginata* could possibly be the cause of the incidence of phytobezoars in sheep concomitant with views perceived by the herders and it was recommended that feeding trials be conducted for confirmation. More studies were also recommended to elucidate possibility of other species in imitating formation of the phytobezoars in sheep and other livestock species in the area.

Keywords: Range inventory, Phytobezoars

INTRODUCTION

Rangelands are those lands on which the native vegetation (climax or natural potential plant community) is predominantly grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing use. Rangelands include natural grassland, savannas, many wetlands, some deserts, tundra, and certain forbs and shrub communities.

The importance of range is to provide human population with reasonable animal production. Rangelands contribution was estimated at 16% of world food production compared to 77% for cropland [1]. Those rangelands are subjected to intensive use due to increasing animal and human population, climate change, and increase in human demands and over economic activities. These factors cause severe rangeland deterioration [2]. In Sudan, 85 % of livestock population is raised on rangelands that are communally used. This pattern of utilization has led to overstocking, overgrazing and eventually change in plant community. This change of plant composition is not only cause of declined rangeland productivity but possible potentially of harmful species. There increasing reports of toxicity, bloat and other nutritional

disorders caused by ingestion of plant species that were not naturally dominant in the area. Recently sheep on natural rangelands in the western part of North Kordofan showed increasing incidence of phytobezoars. Causes of the incidence and mode of formation of the phytobezoars has never been extensively investigated. A preliminary study has revealed that degree of the incidence was considerably high. Sheep owners pointed out that the possible cause for the incidence could be ingestion of certain plant species presumable *Ipomoea spp.* Before trying different plants mentioned as possible cause for this disorder it was necessary to determine the plants species abundance and possible relation between their intake and the incidence of phytobezoars in sheep.

The objective of the study

The overall objective of this study is to assist in solving problems that constrain development of sustainable production patterns on the natural rangelands as main feed source for the huge livestock in the area. Specifically this study is proposed to study the relationship between the plant composition and

incidence of phytobezoars in sheep raised in the areas surveyed.

MATERIALS AND METHODS

The study area

North Kordofan State lies between latitudes 11.5° and 13.75° N and longitudes 27° and 29.5° E. The long term mean annual rainfall ranged from some 200 mm in northeast to about 500 mm in southeast. The maximum temperature (40°C) was recorded in summer and minimum (10°C) was recorded in winter with a monthly average of 35° C. The soil varies from sandy to sandy loam with clay deposits in seasonal streams. Loamy sand soils cover scattered parts in southern area of the locality. The main crops grown here are divided into three groups, cereal crops like millet and sorghum, cash crops like groundnut, watermelon, Roselle and multipurpose crops like cowpea, sweet sorghum ...etc. Crop residues left after harvesting of sorghum and millet are considered low quality roughages, while groundnut, sesame cake and watermelon seeds are considered high quality concentrates. Livestock in the area play an important economical role together with agricultural production with animal population as shown in table 1 (Ministry of Agriculture, Animal Wealth and Irrigation, North Kordofan, 2012). Most of these animals are kept by nomads depending on natural grazing and crop residues [3]. The inhabitants of the city are largely private sector workers, employees, merchants, traders and livestock related services providers.

Range inventory techniques

Vegetation measurements

Range measurements were done to collect data on the following:

- Ground cover: percent Plant, Litter, Bare Soil, Rock and Droplets.
- Species composition
- Plant density (plants/m²)
- Plant frequency
- Canopy cover percentage
- Range production (g/m²)
- Carrying capacity
- Measurement tools used include the following:
 - Measuring tape (100-meter)
 - Loop (3/4" diameter)
 - Recording sheet
 - Pair of scissors
 - Quadrant (1m²)
 - Paper bags
 - Digital camera
 - Sensitive balance

Data on incidence of phytobezoars in sheep

Sample size of 50 heads of sheep was randomly taken from flocks owned by herds in each site surveyed and were diagnosed for phytobezoars by palpation. Percent incidence of phytobezoars of every herd was recorded.

Statistical Analysis

Data of the range attributes on the sites was designed as complete randomized design and analyzed via analysis of variance as described by Steele and Torrie in 1996 [4]. Correlation was developed between the % incidence of phytobezoars and range plants density, frequency and composition.

Range inventory was carried out in six villages within the study area on rangelands where *M. emarginata* was expected to grow naturally. Range inventory included determination of frequency or occurrence and non-occurrence of plants species observed on the rangeland covered by the inventory. Density of species or number of plants of each species observed per unit area (plant species per hectare, *feddan*, square kilometer, square mile) was also determined. Range plants composition as defined by Ali and Suleiman being the percentage of each plant species relative to other plants observed on the studied rangeland and compare, determine dominance, abundance and scarcity of species observed.

Identification and Classification of Plant Vernacularly Named Tabar

Samples of the plant species locally named Tabar were collected and brought to herbarium according to the methods described by Braun *et al.*; in 1991 [5] and Andrews in 1956 [6]. The collected samples were classified on the basis of general plant morphology, flower forms and color as well as seed size shape and color according to Braun *et al.*, [5].

RESULTS OF THE RANGE INVENTORY

The frequencies of the plant species observed on the study sites are presented in Table (4). The plant species that recorded the highest frequencies were *Merrimia emarginata*, *Cenchrus biflorus*, *Dactyloctenium aegyptium*, *Eragrostis tremula*, *Digitaria spp* and *Hibiscus esculentus*. It was observed that among 29 plant species recorded in the rangelands of the study site *Merrimia emarginata* had the highest frequency (22.6 %) or it was observed once in each four observations. Palatable species such as *Blepharis linariifolia*, *Stylothanes flavicans*, *Andropogon gayanus* and *Chlorus gayana* were not among the species observed on rangeland of the sites surveyed. When calculating the density of species, Table (5) it was shown that on average Benu or *Eragrostis tremula* recorded the highest plant population or density in the study area among range plants observed on the selected sites for the study. It had 35581.75 (X100 plants /hectare) plants per *feddan* followed by *Merrimia emarginata* with a population of 22571.75. Other plants that recorded substantial population densities were *Ipomea eriocarpus* *Sesamum alatum*, *Echinocloa colonum*, *Cenchorus biflorus*, *Dactyloctenium aegyptium*, *Zornia glochidiata*, and *Indigofera spp* where their densities (X100plants /hectare) were 5834, 2333, 1167, 400, 243, 170, 267 respectively. Plants that had low densities were *Digitaria spp*, *Vigna sunhum*,

Europhorbia aegyptiaca and their densities (X100plants /feddan) were 5, 2, 1 and 2 respectively. Many unpalatable plants were observed on the sites surveyed such as *Corchorus olitorus*, *Faresti longistigua*, *Solanum dubium*, *Geigeria alutum* and *lantana camara* with densities of 2, 4 5, 8 and 11 (X100 plants /hectare) respectively.

Plant composition, which is the percentage of individual plant species relative to other species that are making the plant community of the area, is presented in Table (4). Plant species that had the highest percentage in the total composition of the area were *Merrimia emarginata* *Dactyloctenium aegyptium* *Eragrostis tremula* *Cenchorus biflorus* *Echinocloa colonum*, *Aristida mutabilis* and *Ipomea eriocarpa*. Plant species with lowest percentage in the total population of the

rangeland were *Ipomea cordofana*, *Sesamum alutum*, and *Europhorbia aegyptiaca*. *Zornia glochidiata* *Alysicarpus oralifolus*, Grasses such as *Andropogon gayanus* and *Ctenium elegans* and herbaceous species like *Stylothanses flavicans* (Natasha) and *Blepharis linariifolia* (beghail) were not found in the area.

Correlation between *Ipomea spp* abundance and Phytobezoars in sheep

Correlation between *Ipomea spp* on sites surveyed and abundance and of the incidence of Phytobezoars in sheep diagnosed in sheep raised on the same sites is presented in table (5). Strong positive correlation was observed between abundance of *Merrimia emarginata* and phytobezoars in sheep in the same area.

Table 1: Frequency (%) of plant species on five rangeland sites in West Kordofan

Botanical name	Vernacular name	1	2	3	4	5	Average
<i>Eragrostis tremula</i>	Benu	7	6	5	9	5	6.4
<i>Merrimia emarginanta</i>	Tabar, liflaif	20	25	21	23	14	22.6
<i>Ipomea eriocarpa</i>	Angarat alwaral	3	1	1	3	7	3
<i>I. cordofana</i>	tabar	4	3	1	3	6	3.4
<i>Cenchrus biflorus</i>	huskaneetkhashin	9	9	13	8	5	8.8
<i>Dactyloctenium aegyptium</i>	Abu asabie	5	8	12	8	10	8.6
<i>Cyprus rotundus</i>	Sieda	1	0	0	2	1	0.8
<i>Abutilon figarianum</i>	Nyada	4	4	1	1	1	2.2
<i>Zornia glochidiata</i>	Lisaig shilini	5	4	5	2	1	3.4
<i>I. sinensis var. blepharocypala</i>	Tabar	6	3	1	1	4	3
<i>Faresti longistigua</i>	Dahayan	0	2	3	1	1	1.4
<i>Euphorbia aegyptiaca</i>	Omlibaina	0	0	1	2	0	0.6
<i>Geigeria alatu^s</i>	Gadgad	0	0	0	1	1	0.4
<i>Solanum dubuim</i>	Gubain	1	0	0	3	3	1
<i>Lantana camara</i>	Raihan	0	0	2	3	5	2

1-Abuzabad 2-Alkhuwei 3- Ennuhud 4 Gheibaish 5-Alkhumas

Table 2: Density (Plant /feddan) of species of five rangeland sites in West Kordofan

Botanical name	Vernacular	1	2	3	4	5	Average
<i>Eragrostis tremula</i>	Benu	56333	43121	23417	19465	35581	35583
<i>Merrimia emarginanta</i>	Tabar,liflaif	74667	69021	84752	53219	22571	60846
<i>Ipomea eriocarpa</i>	Angarat alwaral	5834	4231	6881	3241	5046	5047
<i>I. cordofana</i>	Tabar	23	12	15	17	16	16.75
<i>Cenchrus biflorus</i>	huskaneetkhashin	400	203	401	405	302	352.25
<i>Aristida mutabilis</i>	Gaw	25	16	28	12	21	20.25
<i>Digitaria spp</i>	omaaj	5	4	6	9	6	6
<i>Dactyloctenium aegyptium</i>	Abu asabie	234	217	312	139	234	225.5
<i>Abutilon figarianum</i>	Nyada	23	28	18	15	20	21
<i>Zornia glochidiata</i>	Lisaig shilini	170	198	167	210	187	186.25
<i>Iriethema pentandra</i>	Alrabaa	21	23	9	17	18	17.5
<i>Hibiscus esculentus</i>	Waikat alkhala	12	14	13	12	15	12.75
<i>Tragus spp</i>	Omginaideel	12	7	17	15	13	12.75
<i>Tragas pterocellatum</i>	sharaya	111	152	241	231	189	183.75
<i>Faresti longistigua</i>	dahayan	7	2	5	3	5	4.75
<i>Euphorbia aegyptiaca</i>	Omlibaina	2	3	2	1	3	22.
<i>Geigeria alatum</i>	Gadgad	1	9	7	6	8	5.75
<i>Solanum dubuim</i>	Gubain	2	7	8	5	6	5.5
<i>Lantana camara</i>	Raihan	1	8	9	3	4	5.25

1-Abuzabad 2-Alkhuwei 3- Ennuhud 4- Gheibaish 5-Alkhumas

Table 3: Plant composition (%e) on five sites of rangeland in West Kordofan

Botanical name	Vernacular	1	2	2	4	5	SE+
<i>Eragrostis tremula</i>	Benu	11	7	9	10	8	1.02
<i>Merrimia emarginanta</i>	Tabar, liflaif	23	21	15	16	15	3.5
<i>Ipomea eriocarpa</i>	Angarat alwaral	4	1	1	4	3	1.2
<i>I. cordofana</i>	Tabar	1	.5	.5	.3	.4	.001
<i>Cenchrus biflorus</i>	huskaneetkhashin	13	11	15	12	14	1.5
<i>Commolena imbrebis</i>	Bayaid	1	3	3	3	2	.15
<i>Dactyloctenium aegyptium</i>	Abu asabie	5	5	32	12	7	1.6
<i>Cyprus rotundus</i>	sieda	1	2	0	1	2	.21
<i>Abutilon figarianum</i>	Nyada	1	1	2	1	1	.14
<i>Zornia glochidiata</i>	Lisaig shilini	4	1	2	3	5	.31
<i>Faresti longistigua</i>	dahayan	0	1	1	2	2	.005
<i>Euphorbia aegyptiaca</i>	Omlibaina	0	2	1	0	3	001
<i>Geigeria alatun</i>	Gadgad	0	3	0	0	1	003
<i>Solanum dubuim</i>	Gubain	1	0	2	1	1	012
<i>Lantana camara</i>	Raihan	0	2	2	1	2	03

1-Abuzabad 2-Alkhuwei 3- Ennuhud 4- Gheibaish 5-Alkhumass

Table 4: Correlation between species abundance and % incidence of phytobezoars in sheep at different sites surveyed

Botanical name	Vernacular	1	2	3	4	5	R
<i>Eragrostis tremula</i>	Benu	56333	43121	23417	19465	35581	0.247-
<i>Merrimia emarginanta</i>	Tabar, liflaif	74667	69021	84752	53219	22571	0.785
<i>Ipomea eriocarpa</i>	Angarat alwaral	5834	4231	6881	3241	5046	0.435-
<i>I. cordofana</i>	Tabar	23	12	15	17	16	-0.672
<i>Cenchrus biflorus</i>	huskaneetkhashin	400	203	401	405	302	0.465-
<i>Aristida mutabilis</i>	Gaw	25	16	28	12	21	0.345-
<i>Digitaria spp</i>	Omaaj	5	4	6	9	6	0.247-
<i>Dactyloctenium aegyptium</i>	Abu asabie	234	217	312	139	234	0.785
<i>Abutilon figarianum</i>	Nyada	23	28	18	15	20	0.435
<i>Zornia glochidiata</i>	Lisaig shilini	170	198	167	210	187	0.672
<i>Irienthera pentandra</i>	Alrabaa	21	23	9	17	18	0.465-
<i>Hibiscus esculentus</i>	Waikat alkhalah	12	14	13	12	15	0.345-
<i>Tragus spp</i>	Omginaideel	12	7	17	15	13	0.247-
<i>Tragus pterocellatum</i>	sharaya	111	152	241	231	189	0.785
<i>Faresti longistigua</i>	dahayan	7	2	5	3	5	0.435
<i>Euphorbia aegyptiaca</i>	Omlibaina	2	3	2	1	3	-0.672
<i>Geigeria alatun</i>	Gadgad	1	9	7	6	8	0.465
<i>Solanum dubuim</i>	Gubain	2	7	8	5	6	0.345
<i>Lantana camara</i>	Raihan	1	8	9	3	4	0.247

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