

Uses and knowledge of plant species by mongolian herders in the gobi desert and identification of species of interest for planting

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Key words: Mongolia; pasture species; fodder use; human use; planting

Abstract

In Central Asia, many projects propose to establish single-species saxaul (*Haloxylon ammodendron* (C.A. Meyer) Bunge) plantations. An ethnobotanical survey was carried out among herders in Ulaanbadrakh, in the Dornogobi province, and herders in Gurvansaikhan, in the Dundgobi province in the Gobi Desert (Mongolia). The aim of this survey is to verify the interest of saxaul for the local populations, and to identify other woody species of interest for planting. Herders were questioned about the use of plant species from the Gobi grazing lands: livestock feed, human food, and then about plant species non-eaten by livestock and those that could be toxic to them. A total of 75 species and 413 uses related to these species were cited. We retained the species cited by at least 25% of the herders: 8 species of interest were selected, then sorted according to the number of associated positive uses, while focusing on the species cited in Ulaanbadrakh (area of interest in the Dornogobi). Saxaul appears to be the most numerous woody species for the herders and their livestock. Three other woody species of interest have also been identified. These results show that there is a high diversity of plant species used. It would be interesting to investigate the interest of a multi-species plantation for herders and their livestock in future surveys.

Introduction

In Central Asia and Mongolia, many projects propose to establish single-species saxaul (*Haloxylon ammodendron* (C.A. Meyer) Bunge) plantations to combat desertification (Kleine *et al.*, 2009), for the restoration of dryland forests (Meshkov *et al.*, 2009 in Stanturf *et al.*, 2020), as well as for ecological compensation of mining (Lezak, 2019). In the Gobi Desert in Mongolia, the main land-use is semi-nomadic livestock farming with multi-species herds composed of camels, goats, sheep, horses and cows (Walton, 2010). Then, plantation projects should be adapted to this use of the territory and to this extensive livestock farming.

Saxaul forests cover 25.3% of the Mongolian forest area (Suvdantsetseg *et al.*, 2008), and they are the most widespread in the Gobi Desert. Saxauls are adapted to dry and arid climates, primarily due to a deep and wide root system (Suvdantsetseg *et al.*, 2008). Thus, saxauls seems to be adapted to harsh local pedoclimatic conditions, which benefit herders and their herds as it can be used as fodder for livestock (Suvdantsetseg *et al.*, 2008). Other

woody and herbaceous species also compose the rangelands of the Gobi: consider them for planting projects could be interesting for local population, by meeting their need by providing food or fodder for their livestock.

The objective of this study is to determine the right species, i.e. local plant species adapted to the pedoclimatic conditions that also benefit the populations and their activities. The herders are the key actors in guiding the choice of the species for local pastures since they are the primary users of plant species in the Gobi region. We therefore determined the identification of preferred species for planting based on an ethnobotanical survey conducted among herders.

Materials and Methods

The main location of interest was the *Ulaanbadrakh soum* (district), in the Dornogobi *aimag* (province), thus interviews are conducted with herders in this territory to identify local species. Interviews conducted in *Gurvansaikhan soum* (Dundgobi *aimag*) allow comparison of local botanical knowledge between the herders of

the two *soums*. Dornogobi is a mosaic of desert steppes and semi-deserts, with some areas of real desert, and Dundgobi is a steppe desert region, with some semi-desert areas in the south (Chimed-Ochir *et al.*, 2010).

We met 13 herders from *Ulaanbadrakh soum* and 12 herders from *Gurvansaikhan soum*. Herders were asked to freely quote species they know according to the following use categories: (i) source of food for livestock; (ii) source of food in winter for livestock; (iii) source of human food; (iv) not eaten by livestock; (v) may be toxic to livestock. The data collected are supplemented by research pertaining to the Mongolian vernacular name(s) and Latin name with the support of local botanists and the use of “The Virtual Flora of Mongolia” (FloraGREIF, 2010). We used the taxonomic reference from “The Virtual Flora of Mongolia” (FloraGREIF, 2010) and “The Flora of China” (eFloras, 2015).

The analytical work is organized as follows: (i) graphical quantification of the occurrence of species among herders’ citations; (ii) selection of species cited by at least 25% of the herders; (iii) graphical representation of the distribution of uses for the selected species; (iv) ranking of the selected species according to the number of citations from *Ulaanbadrakh* herders (area of interest) and the number of associated positive uses.

Results

Table 1 shows the number of plant species and uses cited by the herders of *Ulaanbadrakh*, *Gurvansaikhan* and the two regions combined. In total, 75 species were cited and we found the Latin names for 50 of them. Vegetation seems different between the two regions: among the 75 cited species, only 12 species are common to both regions.

Table 1: Number of plant species and uses cited by herders, number of common species cited in the two study.

	Number of species cited	Number of uses cited	Number of cited species in common
Ulaanbadrakh	59	234	12
Gurvansaikhan	28	179	
Both regions	75	413	/

Occurrence of species cited by herders

Figure 1 shows the occurrence of species among the citations of the herders in terms of percentage. A percentage of 100% in the two regions means that the species were cited by all 25 herders. From this graph, species of interest are selected. Species whose Latin names have not been found are excluded, as are cultivated species (oats, maize, wheat) that do not occur naturally in the Gobi Desert

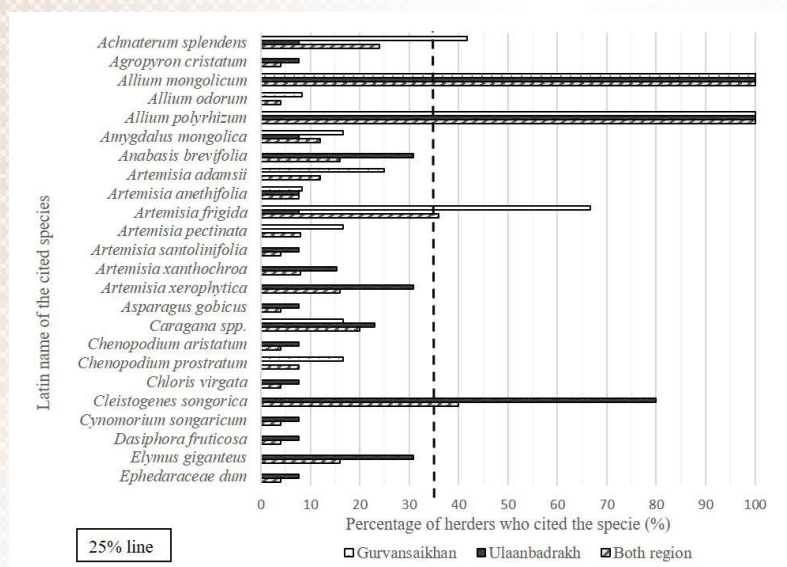


Figure 1: Occurrence of species among the citations of herders in Ulaanbadrakh, Gurvansaikhan and the two soums combined (1)

Uses of selected species

Figure 3 shows the total number of cited uses by species of interest, and the height of sections of each bar on the graph as the importance of each use. Concerning species that can be toxic to livestock: *Allium mongolicum* has been cited as toxic, especially for goats and sometimes for sheep if ingested in too large quantities; sheep

and goats could become intoxicated by eating too much *Allium polyrhizum*. Concerning saxaul, it can be avoided by small livestock (goats and sheeps) because it contains ticks and they usually cannot ingest it because it is often too high off the ground for them. According to another herder, cows do not eat saxaul.

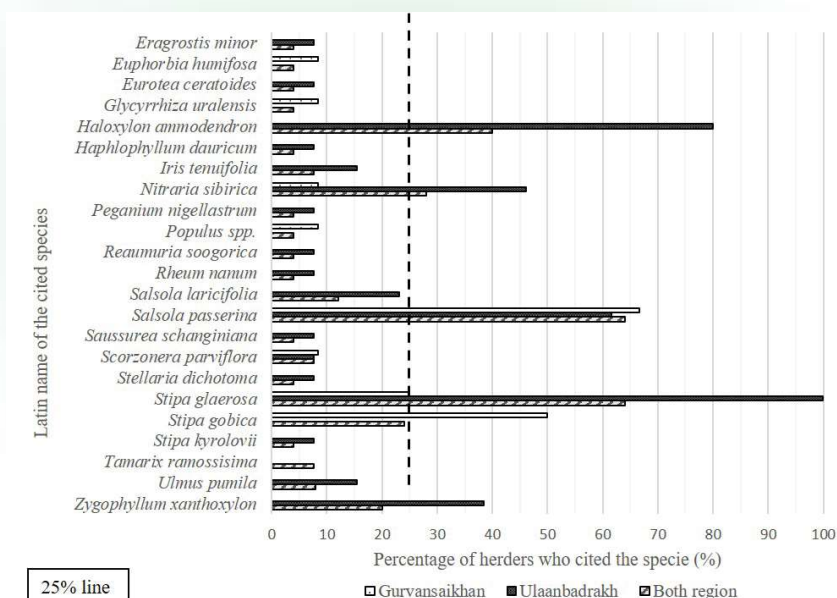


Figure 2: Occurrence of species among the citations of herders in Ulaanbadrakh, Gurvansaikhan and the two soums combined (2)

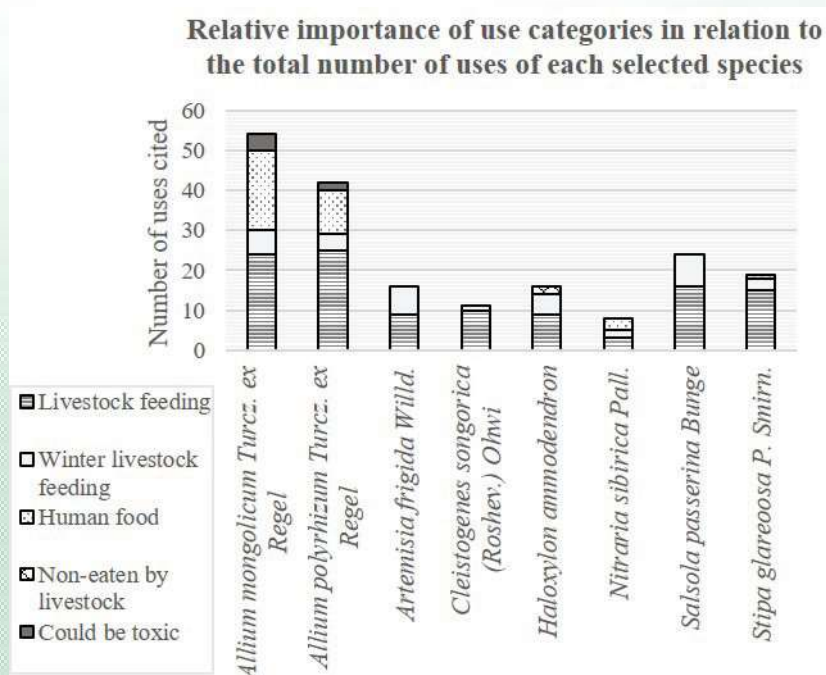


Figure 3: Relative importance of use categories in relation to the total number of uses of each selected species

Ranking of species according to the number of citations from Ulaanbadrakh herders and positive uses

Table 2 summarizes the information related to the 8 species mutually selected among herders at both geographic areas and ranked according to number

of uses and number of herder references.

Table 2: Ranking of species of interest according to the greatest number of positive uses, their respective Mongolian vernacular name(s) and Latin name, and vegetation type. HP: “herbaceous perennial”; W: “woody”.

Mongolian vernacular name(s)	Latin name	Type	Number of positive uses	Number of citations in Ulaanbadrak
<i>Khumuul</i>	<i>Allium mongolicum</i> Turcz. ex Regel	HP	50	13
<i>Taana</i>	<i>Allium polyrhizum</i> Turcz. ex Regel	HP	40	13
<i>Khyalgana</i>	<i>Stipa glareosa</i> P. Smirn.	HP	19	13
<i>Zag</i>	<i>Haloxylon ammodendron</i> (C.A. Meyer) Bunge	W	14	10
<i>Khazaar</i>	<i>Cleistogenes songorica</i> (Roshev.) Ohwi	HP	11	10
<i>(Bor)budargana</i>	<i>Salsola passerina</i> Bunge	W	24	8
<i>Kharmag / Tovstog</i>	<i>Nitraria sibirica</i> Pall.	W	8	6
<i>Agi</i>	<i>Artemisia frigida</i> Willd.	W	16	1

Discussion

The results of the ethnobotanical survey highlight the plurality of plant species used and known by the herders in the study areas. A total of 75 species were cited, corresponding to 413 uses. The diversity of species used by the herders was determined thanks to the local botanical knowledge. This diversity of species and uses suggests the potential benefits that can be brought by multi-species plantations within projects. From the species cited by the herders of *Ulaanbadrakh* and *Gurvansaikhan* soums, a list of 8 species is established, based on their occurrence among citations and the uses and knowledge associated with them. This list includes 4 perennial herbaceous and 4 woody species, and saxaul appears as the first woody species of interest for *Ulaanbadrakh* soum. However, 3 other woody species also appear interesting, in the following order: *Salsola passerina*, *Nitraria sibirica*, and *Artemisia frigida*. According to observations in natural saxaul forests, *Nitraria sibirica* can coexist with saxaul. Planting projects should consider

this diversity by including those other species to benefit local populations and livestock farming.

The present study was a first exploratory survey of species used by herders and livestock in these study regions. This survey presents information on the amount of species diversity and multiple uses of them. Further surveys with herders in these regions along with scientific investigations of these species need to be continued. Methods of production and plantation should also be investigated.

Acknowledgements

We are grateful to all the herders who agreed to answer the survey, to Badrakh Energy and the Mongolian National Federation of Pasture User Groups of herders for all the logistics, support and assistance provided for the fieldwork in the Dornogobi and Dundgobi soums, respectively, and Orano for granting permission to publish our results.

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