CONTRIBUTIONS TO THE FLORA AND VEGETATION OF KĀGBENI (MUSTĀṄ DISTRICT, CENTRAL NEPĀL)

Gerwin Kasperek

Abstract

Kāgbeni and its irrigated oasis are surrounded by subdesert dwarf scrubland. Pioneer communities on scree, and alluvial shrub formations, grow on some special sites, occupying only very small portions of the total area. Currently, forests with open canopies occur only at greater distances from the village. At higher elevations, several types of matted dwarf shrub thickets can be found. For interpreting the current state of vegetation, strong anthropogenic influences have to be taken into account; particularly, pasture farming has promoted the development of degraded dwarf scrubland.

In the present study, a list of 78 species of vascular plants is presented for Kāgbeni and its immediate surroundings, supplemented with data on the distribution of the species within the entire Mustāṅ District. The data are arrived from own investigations and the geobotanical literature. A phytogeographical analysis shows the prevalence of western over eastern elements. Species with a wide distribution in Eurasia, which constitute one third of the total flora of Kāgbeni, are of great importance as weeds on arable fields and in ruderal places within the irrigated oasis. Their occurrence is closely related to human activity. Presumably, most of these weeds have reached the area under study in connection with agriculture a long time ago. Weeds from the New World, although recorded in other villages of Mustāṅ District, have not been found in Kāgbeni.

The weed vegetation of Kāgbeni is documented by nine vegetation relevés, and is compared to relevés from Jomsom and Mārphā. A floristic gradient from south to north that has been detected by earlier investigations throughout the whole district can be reproduced at the local scale. With regard to the weed flora, the effects of different crops are minimal, compared to effects of altitude and other factors related to altitude.

Introduction

Kāgbeni is situated on the orographically left (i.e. east) side of the Kāli Gaṇḍakī river, about 10 kilometres north-east of Jomsom, the district headquarter of Mustāṅ. Geographically as well as politically, the district is divided into two parts (BYERS, 1985). With regard to administration, Kāgbeni belongs to the southern part of the district, but lies close to the boundary of Lo in the northern part, which for Non-Nepalis is only accessible with special permits.

The Dzoṅ Chu, a tributary of the Kāli Gaṇḍakī draining the Muktināth valley, forms an alluvial cone which is up to 1.5 kilometres wide. Kāgbeni with its surrounding fields is laid out on this cone with favourable soil conditions and a supply of irrigation water. The settlement and the irrigated fields represent an oasis of less than 100 hectares within a desert-like area sparsely covered by vegetation; from the climatic point of view, this area of Nepāl can be considered as

the most arid one. From Kāgbeni to the north, geoecological conditions and cultural peculiarities bear a strong resemblance to the Tibetan Highlands. The monastery at the western margin of the densely built-up village has an altitude of 2820 m; most of the fields are laid out between 2800 and 2900 m. The peaks surrounding Kāgbeni reach heights of about 4000 m; peaks of the Dhaulāgiri and Annapurṇa Himāl exceeding 8000 m are about 25 to 30 kilometres away.

Beside these extreme natural conditions, the availability of topographic and cadastral maps of reliable quality as well as published results from extensive geographical research (POHLE, 1993) make Kāgbeni a rewarding object of botanical investigations. In this report, the vegetation of the area under study will first be described as a framework illustrating the ecological conditions; then, results of floristic research and details of phytosociological investigations of the irrigated oasis will be addressed. The names of flowering plants used in the present study follow KOBA et al. (1994), names of ferns are according to IWATSUKI (1988). For plants not included in these enumerations, names of taxonomic authors have been added.

Vegetation of the village's surroundings

The vegetation of the southern and central parts of Mustāṅ District has been mapped by MIEHE (1982; scale 1:100.000). According to this, the following altitudinal profile can be inferred for the Kāli Gaṇḍakī valley near Kāgbeni.

At the valley bottom of the Kāli Gaṇḍakī vast gravel plains were deposited in the recent past. The width of this alluvial plain varies between 30 and 600 metres near Kāgbeni. The gravel-filled plain is flooded annually and almost lacks vegetation, except for a few higher parts at the margins where "alluvial dwarf shrublands and thickets in the subdesert region" occur. The slopes of the valley from its bottom up to ca. 3800 m, unless they are too steep, are covered by "cushion-shaped subdesert dwarf shrublands", mainly consisting of *Caragana gerardiana* and other thorny shrubs which normally are less than 1 metre high. This plant formation is seen as an expression of a combination of ecological factors: climatic aridity, influence of strong winds, and cattle grazing (MIEHE, 1982; KRIECHBAUM, 2002). The only diversion in these vast areas of subdesert are "alluvial shrubs in the subdesert region", such as *Rosa sericea* and *Lonicera hypoleuca*, along some small streams which run dry for most of the year. There are no forests within sight from the village of Kāgbeni, just subdesert. In this respect, the village's surroundings are clearly different from those of Jomsom a few kilometres to the south, but similar to the adjacent sections of the Kāli Gaṇḍakī valley in northern Mustāṅ.

At the upper elevations above 3800 m, precipitation is relatively high when compared to the valley bottom (see MEURER, 1984). Climbing up on the south and south-east-facing slopes, a narrow zone of "open-stand juniper-elfin-woodland" follows, consisting of *Juniperus indica*. On highly wind-exposed sites, *Juniperus squamata* occurs as well. Up to heights of about 4500 m, all slopes are covered by "matted dwarf shrub thickets" which are rather rich in species, and which vary in relation to precipitation. In the dry type, forming the lower part of these matted thickets and occurring particularly on the orographically left side (eastern side of the valley), *Potentilla fruticosa* var. *ochreata* is reported as a characteristic species. Compared to the subdesert zone, low shrubs, such as *Potentilla fruticosa* var. *rigida*, *Caragana jubata*, and *Rhododendron lepidotum*, form a denser vegetation in the moist type. On the map, the moist

type is shown to be situated regularly above the dry type, or, sometimes, above a distinct zone with intermediate moisture. Occasionally, "espalier shrubs and Cyperaceae-alpine mats occur in the alpine belt" near the upper limit of the matted dwarf shrub thickets. In the zone of intensive frost weathering at elevations above 4500 m, "fragmented Cyperaceae-turf" is very scattered, and above there are only rocks and debris.

According to MIEHE's map, the nearest forests are about 4 to 5 kilometres away from Kāgbeni. To the south, conifer forests grow on north-facing slopes of the Pāṇḍa Kholā valley near Lubrā: a "temperate mixed conifer-forest" with *Pinus wallichiana* and *Cupressus torulosa* can be distinguished from a "xeromorphic conifer-forest" dominated by *Cupressus torulosa* in drier sites. To the north-north-west, this type of "xeromorphic conifer-forest" grows at the mouth of the Lungpa Kholā valley, adjacent to small patches of other conifer-forest types with *Juniperus indica* and *Pinus wallichiana*. Small areas near the upper tree line are covered by deciduous birch forests with *Betula utilis*. All these forest types, located between 3000 and 4200 m, have rather open canopies, indicating that precipitation is a main factor limiting tree growth. While the upper tree line is determined by decreasing temperature, and in some places by strong winds, the lower tree line is seen as a result of arid conditions.

The accounts of other authors vary considerably in terminology. The characteristic subdesert of the study area, e. g., was classified as a steppe formation with three subtypes by DOBREMEZ & JEST (1971). Their "ecological map" at a scale 1:250.000 shows "*Sophora–Oxytropis* steppe" at the lowest parts of the slopes, followed by "*Caragana-Artemisia* steppe" and "*Caragana-Lonicera* steppe" at higher elevations. KRIECHBAUM (2002) described two types of shrub steppe corresponding to MIEHE's subdesert. However, the overall pattern of vegetation types and underlying ecological factors is similar in the treatments mentioned.

Flora

A floristic inventory of the village and the fields has been carried out by the author of the present study during field trips in 1995 and 2000 (KASPEREK, 2002). Further data are derived from a database on the vascular plants which were recorded as wild plants of Mustāṅ District in geobotanical and taxonomic literature or in herbaria (about 2800 entries for more than 900 different taxa, KASPEREK unpubl.). For the following analysis, floristic records for sites remote from villages have been attributed to the next village, respectively. Generally, a more or less three-sided area of about 10 square kilometres between the peaks 3938 (in the west of Kāgbeni), 4127 (in the north-east) and 3966 (in the south-east) is considered as belonging to Kāgbeni (ARBEITSGEMEINSCHAFT FÜR VERGLEICHENDE HOCHGEBIRGSFORSCHUNG, 2001). The frequency and distribution of the species within the entire Mustāṅ District is indicated by the number of records in the database mentioned, and by assignment to lower and/or upper Mustāṅ, respectively. Altitudinal distribution of the species is classified according to DOBREMEZ et al. (1967-2002). The classification of phytogeograpical elements follows KRIECHBAUM (2002), taking HARA et al. (1978-1982) into account, as well. Due to insufficient knowledge of the taxonomic identity and distribution of many taxa, these classifications are of rather preliminary nature.

Tab. 1: Species list of the flora of Kāgbeni (Mustāṅ District, Nepāl). For each of the 78 recorded species of vascular plants, the following data are shown: M-FR = frequency in Mustāṅ District, as number of records in the Flora of Mustāṅ database; M-LU = occurrence in Lower and/or Upper Mustāṅ; N-WE = occurrence in West Nepāl/East Nepāl (according to HARA et al. 1978-82); ALT = altitudinal distribution in the Himālayas (according to DOBREMEZ et al. 1967-2002, modified); ELEM = phytogeographical element (according to KRIECHBAUM 2002; for explanation of abbreviations see Fig. 1).

Taxon	M-FR	M-LU	N-WE	ALT						ELEM
				trop	subtr	temp	subalp	alp	nival	
Abelia triflora	10	Low + Up	W		X	X	X	X		C HIM
Acroglochin persicarioides	9	Low	W			X				HIMAL
Androsace muscoidea	17	Low + Up	W				X	X	X	HIMAL
Androsace tapete	8	Low + Up	W					X	X	TIBET
Arctium lappa	15	Low + Up	W			X	X			EURAS
Artemisia gmelinii	23	Low + Up	W			X	X	X		EURAS
Artemisia roxburghiana	9	Low + Up	W			X	X	X		W HIM
Artemisia sieversiana	19	Low + Up	W			X	X	X		EURAS
Aster indamellus	9	Low + Up	W		X	X	X			HIMAL
Astragalus multiceps	2	Low					X			* W HIM
Avena fatua	7	Low	W			X	X			EURAS
Brassica rapa var. *oleifera*	6	Low								COSMO
Cannabis sativa	14	Low	W E	X	X	X				C AS
Capsella bursa-pastoris	11	Low + Up	W E		X	X	X	X		COSMO
Caragana campanulata	1	Low					X			* ENDEM
Caragana gerardiana	22	Low + Up	W				X	X		C HIM
Caragana sukiensis	5	Low + Up	W				X			* HIMAL
Caragana tragacanthoides var. *himalaica*	1	Low						X	X	* W HIM
Chenopodium album s. l.	7	Low + Up								COSMO
Chenopodium botrys	9	Low						X		EURAS
Cirsium wallichii	4	Low + Up	W E		X	X				HIMAL
Clematis grata	6	Low	W		X	X				HIMAL
Clematis tibetana	7	Low	W		X	X	X			E HIM
Convolvulus arvensis	20	Low + Up	W		X	X	X			COSMO
Cotoneaster sherriffii	1	Low					X			C HIM
Cynodon dactylon	4	Low	W E	X	X	X				COSMO
Descurainia sophia	7	Low + Up	W			X	X	X		EURAS
Elymus thomsonii	1	Low	W			X	X			S TIB
Ephedra gerardiana	14	Low + Up	W E			X	X	X	X	HIMAL
Equisetum debile	4	Low								* SE AS
Eragrostis minor	7	Low + Up					X			EURAS
Geranium nepalense	13	Low	W E		X	X	X			HIMAL
Incarvillea arguta	9	Low	W			X	X			HIMAL
Juncus thomsonii	5	Low + Up	W E			X	X	X		C AS
Juniperus squamata	16	Low + Up	W E				X	X		HIMAL
Lamium amplexicaule	7	Low + Up	W E		X	X	X	X		CIRCPOL
Launaea secunda	4	Low	W		X	X	X			W HIM
Leontopodium nanum	7	Low	W			X	X	X		HIMAL
Lepidium apetalum	7	Low + Up	W			X	X	X		C AS
Lonicera hypoleuca	10	Low + Up	W			X	X	X		C AS
Lonicera obovata	5	Low	W E				X	X		HIMAL

Lonicera rupicola	4	Low + Up	W	E				X	X	X	E HIM
Lotus corniculatus	2	Low + Up	W				X	X			EURAS
Malva verticillata	27	Low + Up	W	E			X	X	X		E AS
Medicago falcata	10	Low			X	X	X	X			* EURAS
Medicago sativa	3	Low					X				---
Melilotus officinalis	10	Low				X	X	X			EURAS
Micromeria biflora var. *hispida*	1	Low	W			X	X	X			HIMAL
Nepeta cataria	1	Low				X	X	X			EURAS
Nepeta leucophylla	7	Low + Up	W				X	X			C HIM
Orobanche aegyptiaca	2	Low	W		X	X	X				IRAN
Oryzopsis gracilis	5	Low						X	X		W HIM
Oxytropis microphylla	9	Low + Up					X	X	X		C AS
Oxytropis williamsii	8	Low + Up	W				X	X			ENDEM
Pennisetum flaccidum	11	Low + Up	W			X	X	X	X		C AS
Poa pratensis	3	Low					X	X	X		CIRCPOL
Primula denticulata	5	Low + Up	W	E		X	X	X	X		HIMAL
Primula glandulifera	3	Low + Up	W						X		* W HIM
Primula tibetica	5	Low + Up						X	X		E HIM
Rosa sericea	24	Low + Up	W	E			X	X	X		E HIM
Rubia manjith	3	Low		E		X	X	X			EURAS
Rumex nepalensis	26	Low + Up	W	E		X	X	X			EURAS
Salsola nepalensis	12	Low + Up	W				X	X	X		W HIM
Salvia nubicola	8	Low	W				X	X			HIMAL
Saxifraga stolitzkae	1	Low	W					X	X		* HIMAL
Setaria viridis	12	Low + Up	W				X	X			EURAS
Sisymbrium brassiciforme	1	Low					X	X			* C AS
Sonchus asper	1	Low				X	X				COSMO
Sonchus oleraceus	5	Low + Up	W			X	X				COSMO
Sonchus wightianus ssp. *wightianus*	9	Low + Up	W	E	X	X	X				E AS
Sophora moorcroftiana var. *nepalensis*	11	Low + Up					X	X			HIMAL
Stipa staintonii	1	Low	W					X	X		ENDEM
Thalictrum foetidum	2	Low	W				X	X			EURAS
Thlaspi arvense	12	Low	W				X	X	X		EURAS
Thymus linearis	13	Low + Up	W				X	X	X		W HIM
Torilis japonica	4	Low		E	X	X	X				* EURAS
Triglochin palustris	2	Low	W				X	X	X		CIRCPOL
Tussilago farfara	14	Low + Up	W			X	X	X			EURAS

So far, a total of 78 species of vascular plants has been recorded in Kāgbeni and its surroundings (Tab. 1; sources are given in Appendix 1, as well as additional distributional data from Mustāṅ District). Some questionable records, or collections which could not be determined to specific level yet, have not been counted, and are not included in the following analysis (see Appendix 2).

- Among those species which are widespread in Mustāṅ District are *Rosa sericea*, *Caragana gerardiana* and *Artemisia gmelinii*, as well as some species which mainly occur in villages, such as *Rumex nepalensis* and *Malva verticillata* s. l.. Eleven species of Kāgbeni's flora have not been recorded in other parts of the district yet, e.g. *Caragana campanulata*, *Cotoneaster sheriffii*, *Sisymbrium brassiciforme*, and *Sonchus asper*.

- With regard to their altitudinal distribution in general, the majority of species are known to occupy the temperate and the subalpine zone, with many of them occurring in the subtropical zone or in the alpine zone, too. Only a few of Kāgbeni's species are distributed in tropical zones as well, such as *Cannabis sativa*, *Cynodon dactylon*, and *Orobanche aegyptiaca*. Among those plants which grow in nivale environments, *Androsace tapete* and *Caragana tragacanthoides* var. *himalaica* have been recorded for the surroundings of Kāgbeni.

- More than 35% of the species are widespread in Eurasia, with 9% being cosmopolitan species and 4% having a circumpolar distribution (Fig. 1). The cosmopolitan weeds which are most common within Mustāṅ District are *Convolvulus arvensis* and *Capsella bursa-pastoris*. Most of the occurring species which are widespread in Eurasia are more or less restricted to the irrigated oasis of Kāgbeni. Almost one half of all species have a more or less restricted Himālayan distribution: about 20% of the species are Sino-Himālayan elements, being distributed throughout the whole Himālayan range. Western Himālayan elements dominate over those with a distribution centred in the Eastern Himālayas. In Kāgbeni, three endemic species restricted to Mustāṅ and immediately neighbouring areas have been recorded: *Caragana campanulata*, *Oxytropis williamsii*, and *Stipa staintonii*.

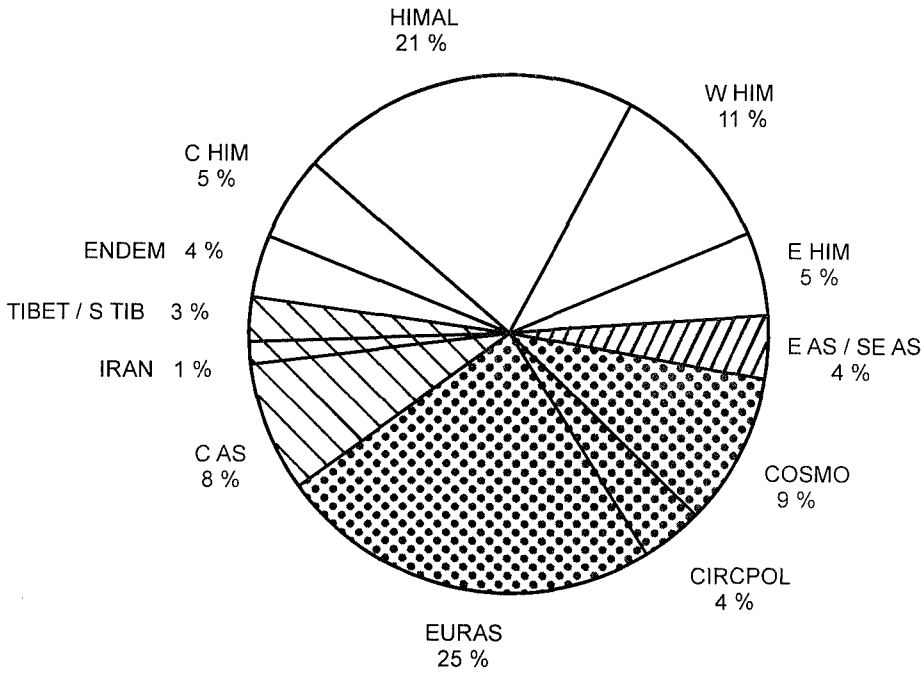

Fig. 1: Spectrum of phytogeographical elements of the flora of Kāgbeni (Mustāṅ District, Nepāl). Abbreviations: COSMO = cosmopolitan; CIRCPOL = circumpolar; EURAS = Eurasian; C AS = central Asian; IRAN = Irano-Turanian; TIBET = Tibetan; S TIB = southern Tibetan; ENDEM = endemic of Mustāṅ and immediately neighbouring areas; C HIM = central Himālayan; HIMAL = Sino-Himālayan; W HIM = western Himālayan; E HIM = eastern Himālayan; E AS / SE AS = eastern Asian and south-eastern Asian.

Tab. 2: Comparison of the spectra of phytogeographical elements of the flora of Kāgbeni (according to the present study), and the flora of Mustāṅ in a wider sense (according to KRIECHBAUM, 2002); for explanation of abbreviations see Fig. 1.

	Flora of Kāgbeni	Flora of Mustāṅ sensu lato
COSMO	**9**	**3**
CIRCPOL	4	4
EURAS	**24**	**8**
C AS	8	7
IRAN	1	2
TIBET / S TIB	3	5
ENDEM	4	6
C HIM	**5**	**11**
HIMAL	21	20
W HIM	11	12
E HIM	**5**	**16**
E AS / SE AS	4	3
Others	0	4

When compared with the flora of Mustāṅ in a wider sense (including parts of Manāṅ and Ḍolpo, KRIECHBAUM, 2002:47), many of the phytogeographical groups show very similar percentages (Tab. 2). On the one hand, clear differences can be detected with regard to cosmopolitan and Eurasian elements, these two groups being much less represented when the wider surroundings are considered. On the other hand, Central Himālayan and Eastern Himālayan elements, which have percentages of more than 10% on a wider scale, are a much less important group in Kāgbeni. Since the flora within the walled oasis has been studied with exceptional high intensity, there might be bias in the available data; but the detected differences also could point the fact that, within Mustāṅ, Kāgbeni is the area which is most similar to arid regions of the Western Himālayas.

When the distribution of the species within Nepāl is considered, the prevalence of western elements over the eastern ones in the flora of Kāgbeni seems even more pronounced; whereas 56 out of 78 species have been recorded in Western Nepāl as well, only 18 are known from Eastern Nepāl (Tab. 1). Kāgbeni, having a longitude of approximately 83 degrees 47 minutes east, is situated in Central Nepāl, according to this phytogeographical division (i.e.: "West" = beyond 83 degrees east, "East" = beyond 86 degrees 30 minutes east; according to HARA et al., 1978-82). So, the proportion of eastern and western elements reflects the village's geographical position rather well.

Weeds from the New World have been recorded in several villages of Mustāṅ District, such as *Conyza canadensis*, *Datura stramonium*, *Drymaria villosa* ssp. *villosa*, *Galinsoga quadriradiata*, and *Galinsoga parviflora* (KASPEREK, 2002). They must have reached the study area only within the last centuries, probably within the 20th century. In Kāgbeni, none of these species has been recorded yet.

Vegetation of arable fields

To this point, the plant communities of arable fields in Mustāṅ District have not been treated in phytosociological studies, the only exception being MAZEK (1991) who investigated weed vegetation in the whole of Nepāl, and reported four relevés from barley fields in southern Mustāṅ (villages of Kālopāni, Ṭukce and Mārphā, below 2700 m). MIEHE (1982), who described and mapped forest and shrub communities as well as alpine meadows extensively, showed only a unit "arable land" in his map without giving further details.

The plant communities of arable fields in Kāgbeni have been documented in the present study by nine vegetation relevés using phytosociological methods (BRAUN-BLANQUET, 1964; cover/abundance scale extended according to BARKMAN et al., 1964). In Jomsom and Mārphā, three additional relevés in arable fields were carried out for comparative study. All relevés were made between September 21st and October 1st, 2000, results are shown in Tab. 3.

For the investigated plots, a mean value of 13 weed taxa was found (minimum 9, maximum 18). Mean cover value amounts to 20%, while the crop plants covered about 60% of the soil surface. In only two out of the 15 investigated fields weed vegetation reached higher cover values than the crop species.

The relevés reveal a set of species which are occurring in almost all fields in this part of the district. This group comprises *Setaria viridis*, *Convolvulus arvensis* and *Malva verticillata* s. l.. The latter species grows mainly along field margins and at ruderal places, but young specimens were found regularly inside the fields as well. Contrary to these widespread taxa, there are others which are restricted to one or two villages; these can be regarded as differential species at the local scale. For Kāgbeni's fields, *Brassica rapa* var. *oleifera*, *Sonchus oleraceus* and *Chenopodium botrys* are characteristic weeds, whereas *Galinsoga parviflora*, *Persicaria nepalensis* and *Digitaria cruciata* are restricted to Mārphā and Jomsom. The floristic gradient from south to north that has been ascertained by investigations throughout the whole district (KASPEREK, 2002) can thus be reproduced even at the local scale.

In the composition of weed flora, the effects of different crops are minimal compared to effects of altitude and other factors related to altitude. With *Lamium amplexicaule* and *Cannabis sativa*, most maize and potato fields show two weeds which are almost completely absent from buckwheat fields. *Chenopodium botrys* seems to favour maize and potato fields only slightly. Other species tend to behave indifferent according to the available data. Relevés from fields with different crops belonging to one village are very similar to each other compared to relevés from fields with the same crop belonging to different villages.

The concept of weed communities of Nepāl depicted by MAZEK (1991) is hardly applicable to the situation in Kāgbeni and the villages nearby, because MAZEK's communities are not precisely documented in vegetation tables. Furthermore, some species are assigned as characteristic to more than one community. Thus, that system is not fully conclusive. Moreover, arable fields in higher altitudes, such as the fields in many parts of Mustāṅ District, have been excluded from MAZEK's study.

Tab. 3: Phytosociological table of weed communities in Kāgbeni, Jomsom and Mārphā (Mustāṅ District Nepāl). Abbreviations: Kag = Kāgbeni, Jom = Jomsom, Mar = Mārphā; Pot. = potatoes, Bw. = buckwheat, M. = maize, B. = beans, P. = pumpkin; p.c. = previous crop; D, d = differential species.

No. of relevé		1	2	5	6	9	3	4	7	8	13	14	15	12	10	11
Village		Kag	Kag	Kag	Kag	Kag	Kag	Kag	Kag	Kag	Jom	Jom	Jom	Mar	Mar	Mar
Date [month/day of year 2000]		9/22	9/22	9/23	9/23	9/29	9/22	9/22	9/23	9/23	10/2	10/2	10/2	10/1	10/1	10/1
Crop(s)		Pot.	Pot.	M.	M.	Bw.	Bw.	Bw.	Bw.	Bw.	M.	M./B./P.	Bw.	Bw.	M.	M.+B.
Area [sqare meters]		30	28	30	40	25	15	20	20	20	25	22	30	25	25	20
Percentage Cover Crop I		60	20	40	40	70	90	95	70	70	40	30	70	70	50	30
Percentage Cover Crop I/III		.	.	.	.	.	.	.	.	.	.	<5/<5	.	.	.	<5
Percentage Cover Weeds		10	40	25	15	10	5	10	15	20	40	20	10	15	10	40
Plant height [meter] Crop I		0,6	0,5	1,3	1,7	0,6	1,1	1,0	0,9	0,8	1,9	1,7	0,9	1,4	1,8	1,6
Plant height [meter] Crop I/III		.	.	.	.	.	.	.	.	.	.	1,3/0,7	.	.	.	1,3
Plant height [meter] Weeds		0,3	0,4	0,4	0,5	0,3	0,3	0,2	0,3	0,3	0,3	0,4	0,4	0,7	0,5	0,5
Species number		10	14	15+3	13+3	9+1	12	11	14	10	18	16+2	10	14	17	16+1
Brassica rapa var. *oleifera*	D1	.	2m	1	1	1	1	1	1	2m	.	.	r	1	.	.
Sonchus oleraceus	D1	.	1	+	+	.	+	.	+	r	.	.	r	.	.	r
Chenopodium botrys	D1	1	2b	r	+	.	.	.	+	+	+	.	.	.	.	.
Galinsoga parviflora	D2	.	.	.	.	.	.	.	.	.	2a	2m	r	2a	2m	2b
Persicaria nepalensis	D2	.	.	.	.	.	.	.	.	.	+	2a		2a	2m	2b
Digitaria cruciata	D2	.	.	.	.	.	.	.	.	.	1	1	.	1	1	2a
Stellaria media	D2	.	.	.	.	.	.	.	.	.	2b	2m	.	.	+	1
Lepyrodiclis holosteoides	D2	.	.	.	.	.	.	.	.	.	.	r	.	1	1	+
Lamium amplexicaule	d1	+	1	+	2m	1	.	.	.	.	.	+	.	.	+	.
Cannabis sativa	d1	.	r	.	r	.	.	.	.	.	.	.	.	.	r	r
Setaria viridis		2m	2a	1	2a	2m	2m	2m	2a	2a	+	1	2a	2m	2m	2m
Convolvulus arvensis		2m	2m	2m	2m	2m	2m	1	2m	1	1	2m	1	+	2m	+
Malva verticillata		1	+	2b	2m	+	+	1	1	1	+	+	+	+	1	+
Acroglochin persicarioides		2a	2m	2a	2m	.	2m	2a	r	2m	1	2m	2m	2m	2a	1°
Chenopodium album agg.		+	2m	1	+	1	.	r	1	+	r	.	1	+	+	+
Artemisia sieversiana		1	2m	1	1	2m	1	2m	2m	2a	1	+	+	.	.	r
Capsella bursa-pastoris		2m	1	2m	.	2a	+	.	.	.	1	1	.	r	+	+
Poacee indet.		.	+	+	.	+	+	r	1	2m	+	.	.	.	.	.
Equisetum ramosissimum s.l.		.	.	1	.	.	2m	.	.	.	.	.	.	1	+	.
Artemisia spec. (non-sievers.)		.	.	.	+	.	1	1	.	.	.	.	.	.	.	.
Cynodon dactylon		+	.	.	.	.	.	.	.	.	r	.	.	.	.	.
Fabacee indet.		.	.	.	.	.	r	.	.	.	.	.	r	.	.	.
Medicago falcata		.	.	.	.	.	.	+	+	.	.	.	.	.	.	.
Tussilago farfara		.	.	.	.	.	.	r	1	.	.	.	.	.	.	.
Artemisia "roxburghiana"		.	.	r	.	.	.	.	.	.	r	.	.	.	.	.
Thlaspi arvense		.	.	.	+	.	.	.	.	.	.	r	.	.	.	.
Rosa sericea, juv.		.	.	.	.	.	.	.	r	.	.	+	.	.	.	.
Eragrostis minor		.	.	.	.	.	.	.	.	.	.	+	.	.	1	.
Equisetum arvense		.	.	.	.	.	.	.	.	.	.	.	.	+	.	2m
Geranium spec.		.	.	.	.	.	.	.	.	.	+	.	.	.	.	+
Fagopyrum spec.	p.c.	.	.	1	r	.	.	.	.	.	.	+	.	.	.	+
Hordeum spec.	p.c.	.	.	r	2m	+	.	.	.	.	.	1	.	.	.	.
Solanum tuberosum	p.c.	.	.	+	r	.	.	.	.	.	.	.	.	.	.	.

Species recorded only once: *Artemisia cf. gmelinii* in relevé no. 2: r / *Galium spec.* in no. 5: r / *Taraxacum spec.* in no. 7: r / *Vicia spec.* in no. 10: + / *Hypecoum leptocarpum* in no. 10: + / *Sigesbeckia orientalis* in 12: r / *Lycopersicon esculentum* in no. 13: r / *Poa annua* in no. 13: 1 / *Veronica polita* in no. 14: +.

The collective of relevés from Mustāṅ District in the present study shows species which, with MAZEK (1991), are regarded as characteristic for the following communities: *Galinsogetum parviflorae* (typical of mid-hill maize fields) and *Polygonetum nepalensis* (occurring in the high hill zone above 2200 m), both communities from summer crop fields, as well as *Lamietum amplexicaulis*, a weed community in winter crops in high altitudes. The species used for constituting the names of the two former communities, *Galinsoga parviflora* and *Persicaria nepalensis*, very often occur together, according to the vegetation table presented here. In two of the relevés, even *Lamium amplexicaule* and further species from MAZEK's *Lamietum amplexicaulis* were detected together with *G. parviflora* and *P. nepalensis*.

Because of the overall similarity of the relevés from Kāgbeni, Jomsom and Mārphā, they might all be assigned to one single association. On a provisional base, this assemblage can be called *Setaria viridis-Convolvulus arvensis*-community. But knowledge is still limited on a regional scale, and the system of MAZEK (1991) can not be transferred to higher altitude areas without major changes. As a consequence, there is need for further phytosociological study of weed vegetation in these remote regions before associations can properly be described.

Conclusions

Flora and vegetation of Kāgbeni and its surroundings are strongly influenced by humans. Many species, particularly weeds of the arable fields, do not grow outside the village's irrigated oasis, which is enclosed by walls. In the subdesert environment outside these walls, there is a lack of natural sites with conditions resembling those of the irrigated fields: fairly good supply of nutrients and water in combination with frequent disturbance. While in other parts of Eurasia, given favourable run-off regimes, river banks occur as natural sites with similar conditions (LOHMEYER & SUKOPP, 1992), river banks in the central part of Mustāṅ District are rather unfavourable to plant growth due to intense flooding during summer monsoon.

Some ruderal species which are restricted to the moist or moderately moist conditions resulting from irrigation have only been recorded from inside the oasis, too. Grazing pressure is high outside the irrigated fields. Thus the subdesert dwarf shrublands, as well as other vegetation types outside the oasis, are in a more or less degraded state. Because of this, it is not possible to prove or disprove whether these ruderal species could grow without the influence of humans in the area under study. In addition to pasture farming, collecting of firewood is an important factor in determining the present vegetation outside the oasis. According to KRIECHBAUM (2002), the main part of the Muktināth valley, a few kilometres east from Kāgbeni, was once covered by forests. Nevertheless, due to its lower altitude and the effects of the wind system, Kāgbeni has a considerably drier climate than Muktināth valley, and there is no evidence for a past forest cover on the slopes surrounding the village.

Many of Kāgbeni's weeds are widespread in Eurasia; in fact, about two out of three weeds species can be found in Central Europe as well. Among the frequently occurring weeds of Kāgbeni, *Acroglochin persicarioides* is the only Himālayan element. Nevertheless, the flora of the study area as a whole has three endemic species, and it is characterized by numerous Himālayan elements, with the Western Himālayan elements prevailing.

In the past, the intensity of floristic research in Kāgbeni and its surroundings has been lower than in some other villages of Mustāṅ District. On the way from Jomsom to Muktināth, the shortcut from Ekleībhaṭṭi uphill has often been preferred in contrast to the route via Kāgbeni – not only by tourists, but also by several expeditions, as their published itineraries show. Given a more thorough investigation in the future, a total species number clearly above 100 can be assumed for the flora of Kāgbeni. It may be supposed that Mustāṅ District harbours some more species not recorded for the flora of Nepāl hitherto, as illustrated by some recent discoveries. Phytogeographical analyses as done in this study are of preliminary nature, since the knowledge of species distribution in Central Asia is still limited. Thus, botanical research in Mustāṅ District as well as in the whole of Nepāl remains an urgent task.

ACKNOWLEDGEMENTS

For their help and support in many ways, I thank W. Haffner and P. Pohle, Giessen. The field trip in the year 2000 would not have been possible without Pen Pa Lama, Pokharā (Nepāl) – many thanks to him, as well as to W. B. Dickoré, Goettingen, for revision of herbarium specimens.

REFERENCES

ARBEITSGEMEINSCHAFT FÜR VERGLEICHENDE HOCHGEBIRGSFORSCHUNG, 2001: Nepal-Mustang, 1:50.000. Munich.

BARKMAN, J.J., DOING, H. & SEGAL, S., 1964: Kritische Bemerkungen und Vorschläge zur quantitativen Vegetationsanalyse. Acta Botanica Neerlandica, 13:374-419.

BRAUN-BLANQUET, J., 1964: Pflanzensoziologie - Grundzüge der Vegetationskunde. 3., neubearb. u. wesentl. vermehrte Aufl., 865 S.. Wien.

BÜRGEL, J., 1999: Dhaulagiri expedition. Quart. Bull. Alp. Gard. Soc., 67:180-189.

BYERS, A., 1985: Resource management in the arid Himalaya: problems and prospective solutions. Contributions to Nepalese Studies, 13(3):107-136.

COLVILLE BARCLAY, Sir, 1973: Plant collecting in the Annapurna Himalaya. Quart. Bull. Alp. Gard. Soc., 41(1):64-73.

DOBREMEZ, J.F., 1970: Biogéographie du Centre Népal. Bull. Ass. Géographes Fr. 379/380:79-90. Paris.

DOBREMEZ, J.F., 1976: Le Népal, Ecologie et Biogéographie. 356 pp. + 1 map. Paris (CNRS).

DOBREMEZ, J.F. & JEST, C., 1971: Carte écologique de la région Annapurna - Dhaulagiri. In: Documents pour la Carte de la Végétation des Alpes, 9:147-190 + 1 map. Grenoble.

DOBREMEZ, J.F., SHAKYA, P.R., CAMARET, S., VIGNY, F. & EYNARD-MACHET, R., 1967-2002: Flora Himalaya Database. http://llsh.univ-savoie.fr/sc/infos.html

GRIERSON, A.J.C., 1964: A revision of the Asters of the Himalayan region. Not. Bot. Gard. Edinburgh,26:67-163, f. 1-11, t. 8-16.

GRUBOV, V.I., 1961: Duae species novae e familia Chenopodiaceae. Not. Syst. Herb. Inst. Bot. Acad. Sci. URSS, xxi:125-129. Leningrad.

HARA, H., 1976: New or noteworthy flowering plants from Eastern Himalaya (17). Journal of Japanese Botany,51:7-11.

HARA, H., STEARN, W.T. & WILLIAMS, L.H.J., 1978-82: An enumeration of the flowering plants of Nepal. [3 volumes, 1978-1982, reprinted in 1 volume 1996.] 600 pp..

IWATSUKI, K., 1988: An enumeration of the pteridophytes of Nepal. In: OHBA, H. & MALLA, S.B. (eds.): The Himalayan plants, Vol. 1: 231-339. Tokyo (University of Tokyo Press).

JALAS, J., 1973: Thymus subsect. Pseudomarginati in the Himalayas and adjoining western mountain ranges, and in Caucasia. Ann. Bot. Fennici, 10:104-122

KASPEREK, G., 2002. Segetal- und Ruderalflora der Dörfer und Bewässerungsfluren im Mustang-Distrikt (Nepal) in Abhängigkeit von Höhenlage und Landnutzung [Kennwort „Segetalflora Mustang"]. 32 pp.. Report to the DFG, Bonn.

KITAMURA, S., 1955: Flowering plants and ferns. In: KIHARA, H. (ed.): Fauna and flora of Nepal Himalaya (Scientific results of the Japanese expeditions to Nepal Himalaya 1952-1953, Vol. 1):73-278. Kyoto.

KITAMURA, S., 1957: Supplements and corrections for "Flowering plants and ferns" in Vol. 1, pp. 73-290. In: KIHARA, H. (ed.): Peoples of Nepal Himalaya (Scientific results of the Japanese expeditions to Nepal Himalaya 1952-1953, Vol. 3):421-425. Kyoto.

KOBA, H., AKIYAMA, S., ENDO, Y. & OHBA, H., 1994: Name list of the flowering plants and gymnosperms of Nepal. 569 pp. (University Museum, University of Tokyo, Material Reports 32). Tokyo (University of Tokyo).

KOIRALA, R.A. & SHRESTHA, R., 1997: Floristic composition of summer habitats and dietary relationships between Tibetan argali, naur and domestic goat in the Damodar Kunda region of Upper Mustang in Nepal. (M.Sc. thesis, Centre for International Environment and Development Studies [Noragric], Agricult. Univ. of Norway).

KOJIMA, S., 1985: An outline of vegetation and environment in central Nepal. In: NAMBA, T. (ed.): Medicinal resources and ethnopharmacology in Sri Lanka and Nepal (Studia Bonorum Materierum Medica No. 1):365-391.

KOJIMA, S., 1990: A geobotanical study of Ephedretum gerardianae in north central Nepal. Phytocoenologia, 19:93-108. Berlin.

KRIECHBAUM, M., 2002: Flora, Vegetation und Landnutzung des Muktinath-Tales (Mustang, Nepal) als Beziehungsmuster von naturräumlicher Ausstattung und menschlicher Gestaltung im Zentral-Himalaya. (Dissertationes Botanicae 369). Berlin.

LOBBICHLER, F., 1961: Lepidoptera der deutschen Nepal-Expedition 1955. Veröff. d. Zoolog. Staatssammlung München, 6:103-137.

LOHMEYER, W. & SUKOPP, H., 1992: Agriophyten in der Vegetation Mitteleuropas. 185 S. (Schriftenreihe für Vegetationskunde, Heft 25). Bonn Bad-Godesberg.

MAJUPURIA, T.C. (ed.), 1984: Nepal - Nature's paradise. Insight into diverse facets of topography, flora and ecology. 476 pp.. Bangkok.

MATSUMURA, T., 1956: Brassicaceae with 10 and 18 chromosomes. In: KIHARA, H. (ed.): Land and crops of Nepal Himalaya (Scientific results of the Japanese expeditions to the Nepal Himalayas 1952-1953, Vol. II): 151-166. Kyoto.

MAZEK, A., 1991: Weed vegetation in Nepal: plantsociological, ethnobotanical and agricultural research. (Ph. D. Thesis submitted to the Agricultural University of Vienna, Austria; 279 pp.).

MEURER, M., 1984: Geoökologische Untersuchungen im Kali-Gandaki-Tal (Nepal): I. Die klimatischen Verhältnisse. Verhandlungen der Gesellschaft für Ökologie, 12:185-196.

MIEHE, G., 1982: Vegetationsgeographische Untersuchungen im Dhaulagiri- und Annapurna-Himalaya. (Dissertationes Botanicae 66, 1+2.) Vaduz.

MIEHE, G., 1990: Langtang Himal: Flora und Vegetation als Klimazeiger und -zeugen im Himalaya. A prodromus of the vegetation ecology of the Himalayas. (Dissertationes Botanicae 158) Berlin.

MIYAMOTO, F. & IKEDA, H., 2003: Japan-Nepal Botanical Expedition to the Upper Mustang, Central Nepal in 2002. Newsletter of Himalayan Botany, 32:1-8.

MIYAMOTO, F., OHBA, H. & SUBEDI, M.N., 2003: Studies on the flora of Mustang, Central Nepal 1. The genus *Juncus* (Juncaceae). Journal of Japanese Botany, 78:152-157.

NOSHIRO, S. & AMANO, M., 2002: Japan-Nepal Botanical Expedition to Upper Mustang in 2001. Newsletter of Himalayan Botany, 29:1-7.

POHLE, P., 1993: Geographical research on the history of the cultural landscape of Southern Mustang. The land use map of Kagbeni as a basis. Ancient Nepal, Journal of the Department of Archaeology, 134:57-81. Kathmandu.

POLUNIN, O. & STAINTON, A., 1984: Flowers of the Himalaya. Drawings by Ann Farrer. 580 pp. + 128 colour plates.

SHRESTHA, K., 1984: Grasses and sedges - their ecology, distribution and economic uses in Manang - Mustang region. Journal of the Natural History Museum (Nepal), 8(1-4):41-54.

SHRESTHA, K., 1990["1987"]: Report on edible wild plants from Pokhara and its northern region. Journal of Natural History Museum, 11(1-4):85-98. Kathmandu (Tribhuvan University).

SYKES, W.R., 1956: 1954 expedition to Nepal. (Part II.) Journal of the Royal Horticultural Society, 81(1):6-14. London.

VASSILCZENKO, I., 1976: Synopsis generis Caragana Lam. specierum in Nepal crescentium. Novitates System. Plant. Vasc., 13:193-201.

VASSILCZENKO, I.T., 1977: Generis Oxytropis DC. species novae in Nepal crescentes. Novitates System. Plant. Vasc., 14:168-178

Appendix 1

For each of the 78 species known to occur in Kāgbeni, distributional data (D) from the whole of Mustāṅ District are given by enumerating all villages where they have been found. Sources (S) are given as literature citations. Data derived from specimens in the local herbarium, housed at the Eco-Museum in Jomsom (the most important collectors being T. Parker and T. Ngawang), are indicated by "Herbarium Jomsom". Sources indicating occurrence in Kāgbeni are underlined. For some species, remarks (R) have been added.

Abelia triflora (Caprifoliaceae)
- D: Lete, Kālopāni, Dhampu, Larjuṅ, Ṭukce, Syāṅ, Jomsom, Lubrā, Kāgbeni, Tiri
- S: KITAMURA 1955: 235; MIEHE 1982 (Vol. 2): 12, 13f., 26, 28, 50, 77, 155; KRIECHBAUM 2002: 107; PARKER (in Herbarium Jomsom)

Acroglochin persicarioides (Chenopodiaceae)
- D: Lete, Choyu, Ṭukce, Kobāṅ, Mārphā, Jomsom, Daṅkardzoṅ, Lubrā, Kāgbeni
- S: KASPEREK 2002: 10f.

Androsace muscoidea (Primulaceae)
- D: Chairo, Ṭukce, Thini, Daṅkardzoṅ, Kāgbeni, Jārkhoṭ, Muktināth, Tiri, Hidden Valley, Dāmodar Kund
- S: KITAMURA 1955: 196, COLVILLE BARCLAY 1973: 70, MIEHE 1982 (Vol. 2): 36, 47, 58, 65, 70, 72, 75, MIEHE 1990: 155, KOIRALA & SHRESTHA 1997: 88, BÜRGEL 1999: 182, 185, KRIECHBAUM 2002:156
- R: Some of these authors recorded *Androsace muscoidea* forma *longiscapa*, while others made no statement with regard to infraspecific ranks.

Androsace tapete (Primulaceae)
- D: Mārphā, Kāgbeni, Lete, Hidden Valley, Muktināth, Tiri
- S: KITAMURA 1955: 196; MIEHE 1982 (Vol. 2): 19, 43, 46, 47, 70, 72, 73, 75; MIEHE 1990: 149

Arctium lappa (Asteraceae)
- D: Mārphā, Jomsom, Kāgbeni, Daṅkardzoṅ, Lubrā, Chusāṅ, Tetāṅ, Tsele, Ḍi, Jārkhoṭ, Khyiṅga, Choṅgor, Yara, Geliṅ
- S: KASPEREK 2002: 10f.; KRIECHBAUM 2002: 115

Artemisia gmelinii (Asteraceae)
- D: Ṭukce, Mārphā, Syāṅ, Jomsom, Thini, Daṅkardzoṅ, Kāgbeni, Muktināth, Tiri, Taṅgya, Gemi
- S: KITAMURA 1955: 246; LOBBICHLER 1961: 127, 128; MIEHE 1982 (Vol. 2): 34, 39, 48, 53, 55, 57, 62, 66, 67, 74-77, 81; KOJIMA 1990: 101, DOBREMEZ & JEST 1971: 178; KASPEREK 2002: 10f.; Herbarium Jomsom

Artemisia roxburghiana (Asteraceae)
- D: Ṭukce, Mārphā, Thini, Jomsom, Tilitso, Daṅkardzoṅ, Lubrā, Kāgbeni, Khyiṅga, Jārkhoṭ, Choṅgor, Tiri, Taṅbe, Tetāṅ, Chusāṅ, Samar, Taṅgya, Gemi, Yara, Lo Montaṅ
- S: DOBREMEZ & JEST 1971: 178; MIEHE 1982 (Vol. 2): 28, 59, 60, 80, 81; POLUNIN & STAINTON 1984: 195; KASPEREK 2002: 10f.; Herbarium Jomsom

Artemisia sieversiana (Asteraceae)
- D: Mārphā, Jomsom, Daṅkardzoṅ, Lubrā, Kāgbeni, Khyiṅga, Jārkhoṭ, Choṅgor, Taṅgya, Taṅbe, Tetāṅ, Chusāṅ, Samar, Gemi, Tsarāṅ, Geliṅ, Yara, Lo Montaṅ
- S: LOBBICHLER 1961: 128; DOBREMEZ & JEST 1971: 178, MIEHE 1982 (Vol. 2): 81; KASPEREK 2002: 10f.

Aster indamellus (Asteraceae)
- D: Ṭukce, Syāṅ, Jomsom, Kāgbeni, Muktināth, Samar, Gemi
- S: LOBBICHLER 1961: 127; GRIERSON 1964: 88; MIEHE 1982 (Vol. 2): 50, 51, 80, 82; KOJIMA 1990: 101

Astragalus multiceps (Fabaceae)
D: Kāgbeni
S: KITAMURA 1955: 162, Herbarium Jomsom
Avena fatua (Poaceae)
D: Kālopāni, Ṭukce, Mārphā, Chairo, Kāgbeṇi, Khyiṅga
S: KITAMURA 1955: 84; MIEHE 1982 (Vol. 2): 28, 36; MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.
Brassica rapa (Brassicaceae)
D: Mārphā, Jomsom, Kāgbeni, Jārkhoṭ, Khyiṅga, Choṅgor, Taṅgya
S: MATSUMURA 1956: 156 [cultivated] , MIEHE 1982 (Vol. 2): 81 [cultivated?], KRIECHBAUM 2002: 132; KASPEREK 2002: 10f.
R: *Brassica rapa* L. var. *oleifera* DC. was recorded as a weed in Mārphā, Jomsom, Kāgbeni, Jārkhoṭ, Khyiṅga, and Choṅgor (Herbarium G.K. 00-132).
Cannabis sativa (Cannabaceae)
D: Choyu, Lete, Kālopāni, Kobāṅ, Ṭukce, Mārphā, Thini, Jomsom, Daṅkardzoṅ , Kāgbeni, Jārkhoṭ
S: LOBBICHLER 1961: 130; MIEHE 1982 (Vol. 1): 103, (Vol. 2): 14, MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.; KRIECHBAUM 2002: 107; Herbarium Jomsom
Capsella bursa-pastoris (Brassicaceae)
D: Lete, Kālopāni, Kobāṅ, Ṭukce, Mārphā, Jomsom, Kāgbeni, Lubrā, Daṅkardzoṅ, Khyiṅga, Jārkhoṭ, Choṅgor, Ḍi, Taṅbe
S: LOBBICHLER 1961: 130; MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.
Caragana campanulata (Fabaceae)
D: Kāgbeni
S: VASSILCZENKO 1976 (original species diagnosis with Kāgbeni as locus typicus)
Caragana gerardiana (Fabaceae)
D: Ṭukce, Mārphā, Jomsom, Chairo, Syāṅ, Thini, Daṅkardzoṅ, Phalak, Kāgbeni, Muktināth, Tiri, Taṅgya
S: DOBREMEZ & JEST 1971: 178 (see also DOBREMEZ 1976:232!); VASSILCZENKO 1976: 195, MIEHE 1982 (Vol. 2): 28, 34, 39f, 50, 57, 62, 66, 67, 74-77, 81; KRIECHBAUM 2002: 144; MIYAMOTO & IKEDA 2003: 2
Caragana sukiensis (Fabaceae)
D: Chairo, Thini, Kāgbeni, Choṅgor, Chusāṅ
S: VASSILCZENKO 1976: 197; MIEHE 1982 (Vol. 2): 34; PARKER (in Herbarium Jomson)
Caragana tragacanthoides var. *himalaica (Fabaceae)*
D: Kāgbeni
S: KITAMURA 1955: 164
Chenopodium album s. l. *(Chenopodiaceae)*
D: Choyu, Lete, Kālopāni, Kobāṅ, Ṭukce, Mārphā, Thini, Jomsom, Kāgbeni, Lubrā, Daṅkardzoṅ, Khyiṅga, Jārkhoṭ, Choṅgor, Muktināth, Dāmodar Kund
S: MIEHE 1982 (Vol. 2): 59; SHRESTHA 1990("1987"): 90; MAZEK 1991: Tab. 1; KOIRALA & SHRESTHA 1997: 88; KASPEREK 2002: 10f.
Chenopodium botrys (Chenopodiaceae)
D: Ṭukce, Mārphā, Jomsom, Kāgbeni, Lubrā, Daṅkardzoṅ, Jārkhoṭ, Choṅgor
S: KOJIMA 1990: 101; KASPEREK 2002: 10f.
R: Having shortly stalked glands and rather narrow perianth segments, the plants examined in Kāgbeni (Herbarium G.K. 00-122) do not match descriptions of *C. nepalense*, a very similar species which is said to be more common than *C. botrys* in Nepāl (compare discussion in KRIECHBAUM 2002:113)
Cirsium wallichii (Asteraceae)
D: Choyu, Lete, Kālopāni, Kobāṅ, Ṭukce, Kāgbeni, Taṅgya, Gemi, Geliṅ, Yara
S: MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.; KRIECHBAUM 2002:119
Clematis grata (Ranunculaceae)
D: Ghāsā, Lete, Kālopāni, Thini, Kāgbeni
S: MIEHE 1982 (Vol. 2): 9, 11, 13, 14; KRIECHBAUM 2002: 159; Herbarium Jomsom

Clematis tibetana (Ranunculaceae)
D: Ṭukce, Syāṅ, Thini, Daṅkardzoṅ, Lubrā, Kāgbeni, Muktināth, Tiri
S: MIEHE 1982 (Vol. 2): 28, 47, 63, 66, 69, 77; BÜRGEL 1999: 181; KASPEREK 2002: 10f.; PARKER (in Herbarium Jomson)

Convolvulus arvensis (Convolvulaceae)
D: Ṭukce, Mārphā, Jomsom, Kāgbeni, Jārkhoṭ, Khyiṅga, Taṅgya, Chusāṅ, Tetāṅ, Tsele, Ḍi, Yara, Samar, Geliṅ, Gemi, Lo Montaṅ
S: KITAMURA 1955: 207, LOBBICHLER 1961: 129, MIEHE 1982 (Vol. 2): 81, KOJIMA 1990: 101, MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.; PARKER (in Herbarium Jomson)

Cotoneaster sherriffii (Rosaceae)
D: Kāgbeni
S: KRIECHBAUM 2002: 162

Cynodon dactylon (Poaceae)
D: Ṭukce, Jomsom, Kāgbeni
S: LOBBICHLER 61: 130, MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.

Descurainia sophia (Brassicaceae)
D: Ṭukce, Mārphā, Kāgbeni, Taṅgya
S: KITAMURA 1955: 139, LOBBICHLER 1961: 129, 131; MIEHE 1982 (Vol. 2): 81; MAZEK 1991: Tab. 1

Elymus thomsonii (Poaceae)
D: Kāgbeni
S: KRIECHBAUM 2002: 187

Ephedra gerardiana (Ephedraceae)
D: Ṭukce, Mārphā, Thini, Jomsom, Phalak, Kāgbeni, Jārkhoṭ, Muktināth, Tiri, Dāmodar Kund
S: DOBREMEZ & JEST 1971: 178; MIEHE 1982 (Vol. 2): 28, 34, 42, 58, 67, 72, 75, 77; KOJIMA 1985: 389; KOJIMA 1990; KOIRALA & SHRESTHA 1997: 89; KRIECHBAUM 2002: 98; MIYAMOTO & IKEDA 2003: 2

Equisetum debile (Equisetaceae)
D: Thini, Ṭukce, Daṅkardzoṅ, Kāgbeni
S: MIEHE 1982 (Vol. 2): 29, 55; KASPEREK 2002: 10f.; PARKER (in Herbarium Jomson)

Eragrostis minor (Poaceae)
D: Choyu, Mārphā, Jomsom, Kāgbeni, Lo Montaṅ
S: KOJIMA 1990: 101, KASPEREK 2002: 10f., KRIECHBAUM 2002: 187

Geranium nepalense (Geraniaceae)
D: Choyu, Lete, Kālopāni, Kobāṅ, Ṭukce, Jomsom, Lubrā, Kāgbeni, Choṅgor, Muktināth
S: KITAMURA 1955: 168; LOBBICHLER 1961: 125, MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.

Incarvillea arguta (Bignoniaceae)
D: Ghāsā, Ṭukce, Thini, Jomsom, Lubrā, Kāgbeni
S: KITAMURA 1955: 225; SYKES 1956: 13, DOBREMEZ & JEST 1971: 178, MIEHE 1982 (Vol. 2): 28, POLUNIN & STAINTON 1984: Pl. 99, KRIECHBAUM 2002: 101

Juncus thomsonii (Juncaceae)
D: Ṭukce, Thini, Kāgbeni, Muktināth, Lo Montaṅ, Thiṅkhar
S: MIEHE 1982 (Vol. 2): 54; Herbarium G.K. 95-269; MIYAMOTO & IKEDA 2003: 5; MIYAMOTO et al. 2003: 156

Juniperus squamata (Cupressaceae)
D: Ṭukce, Mārphā, Syāṅ, Thini, Jomsom, Kāgbeni, Daṅkardzoṅ, Choṅgor, Jārkhoṭ, Muktināth, Tiri, Samar
S: KITAMURA 1955: 82; DOBREMEZ & JEST 1971: 178; MIEHE 1982 (Vol. 2): 31f., 40, 53, 57, 64, 65, 71, 72, 75-77; KRIECHBAUM 2002:98; Herbarium Jomsom

Lamium amplexicaule (Lamiaceae)
D: Lete, Kālopāni, Ṭukce, Mārphā, Jomsom, Daṅkardzoṅ, Kāgbeni, Jārkhoṭ, Khyiṅga, Choṅgor, Ḍi
S: MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.

Launaea secunda (Asteraceae)
D: Lārjuṅ, Ṭukce, Kāgbeni
S: KITAMURA 1955: 261; LOBBICHLER 1961: 131; MIEHE 1982 (Vol. 2): 26; KRIECHBAUM 2002: 123
Leontopodium nanum (Asteraceae)
D: Chairo, Tilitso, Mārphā, Thini, Kāgbeni, Muktināth
S: KITAMURA 1955: 263; MIEHE 1982 (Vol. 2): 36, 43, 61, 72; Herbarium Jomsom
Lepidium apetalum (Brassicaceae)
D: Ṭukce, Jomsom, Kāgbeni, Khyiṅga, Taṅgya, Dāmodar Kund
S: MIEHE 1982 (Vol. 2): 28, 81; KOJIMA 1990: 101, KOIRALA & SHRESTHA 1997: 88, KASPEREK 2002: 10f.
Lonicera hypoleuca (Caprifoliaceae
D: Ṭukce, Syāṅ, Jomsom, Daṅkardzoṅ, Kāgbeni, Muktināth, Tiri, Chusāṅ, Dāmodar Kund
S: KITAMURA 1955: 232; DOBREMEZ & JEST 1971: 178; HARA 1976: 11; MIEHE 1982 (Vol. 2): 34, 62, 66, 67, 68, 75, 80, 81; MAJUPURIA 1984: 125
Lonicera obovata (Caprifoliaceae)
D: Chairo, Phalak, Kāgbeni, Muktināth
S: KITAMURA 1955: 234; MIEHE 1982 (Vol. 2): 36, 71; MIYAMOTO & IKEDA 2003: 2
Lonicera rupicola (Caprifoliaceae)
D: Thini, Kāgbeni, Dāmodar Kund
S: KITAMURA 1955: 234; DOBREMEZ & JEST 1971: 178; COLVILLE BARCLAY 1973: 70, MIEHE 1982 (Vol. 2): 59, KOIRALA & SHRESTHA 1997: 89
Lotus corniculatus (Fabaceae)
D: Chusāṅ, Kāgbeni
S: MIEHE 1982 (Vol. 2): 80; KASPEREK 2002: 10f.
Malva verticillata s. l. *(Malvaceae)*
D: Choyu, Lete, Kobāṅ, Ṭukce, Mārphā, Thini, Jomsom, Lubrā, Kāgbeni, Jārkhoṭ, Khyiṅga, Dzoṅ, Chusāṅ, Tetāṅ, Tsele, Ḍi, Taṅbe, Yara, Samar, Geliṅ, Gemi, Tsaraṅ, Lo Montaṅ
S: MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.; KRIECHBAUM 2002: 148; Herbarium Jomsom
R: A specimen collected in Kāgbeni shows strong resemblance to the western Himalayan species *Malva pamiroalaica* Iljin as depicted by Riedl in Flora Iranica, Cont. No. 120, 1976 (Herbarium G.K. 93-005, bank of Kāli Gaṇḍakī, march 13, 1993). This species has not been recorded in Nepāl before (see KOBA et al. 1994, and C. M. Joshi, pers. comm.). Since the two taxa were not distinguished during my field work, all records should be treated as *Malva verticillata* sensu lato.
Medicago falcata (Fabaceae)
D: Chairo, Mārphā, Jomsom, Daṅkardzoṅ, Lubrā, Kāgbeni, Khyiṅga, Jārkhoṭ, Choṅgor
S: KITAMURA 1955: 166; MIEHE 1982 (Vol. 2): 36; KASPEREK 2002: 10f.
R: No signs of hybridization between *M. falcata* and *M. sativa* could be detected during my field work.
Medicago sativa (Fabaceae)
D: Jomsom, Kāgbeni
S: KITAMURA 1955: 166; KASPEREK 2002: 10f.
Melilotus officinalis (L.) Pall. (Fabaceae)
D: Thini, Mārphā, Jomsom, Daṅkardzoṅ, Lubrā, Kāgbeni, Jārkhoṭ, Choṅgor
S: KASPEREK 2002: 10f.; KRIECHBAUM 2002: 145; PARKER (in Herbarium Jomson)
Micromeria biflora var. *hispida (Lamiaceae)*
D: Kāgbeni
S: KITAMURA 1955: 212
Nepeta cataria (Lamiaceae)
D: Kāgbeni
S: KRIECHBAUM 2002: 141
Nepeta leucophylla (Lamiaceae)
D: Jomsom, Daṅkardzoṅ, Kag Nyiṅba, Kāgbeni, Gemi, Samar, Yara
S: KOJIMA 1990: 101; KASPEREK 2002: 10f., KRIECHBAUM 2002: 142; Herbarium Jomsom

Orobanche aegyptiaca (Orobanchaceae)
D: Jomsom, Kāgbeni
S: KRIECHBAUM 2002: 150; PARKER (in Herbarium Jomson)
Oryzopsis gracilis (Poaceae)
D: Kāgbeni, Jārkhoṭ, Dzoṅ, Khyiṅga, Muktināth
S: MIEHE 1982 (Vol. 2): 67; KRIECHBAUM 2002:188
Oxytropis microphylla (Fabaceae)
D: Ṭukce, Chairo, Syāṅ, Jomsom, Kāgbeni, Muktināth, Tiri
S: KITAMURA 1955: 167; MIEHE 1982 (Vol. 2): 28, 34, 36, 50, 67, 75; PARKER (in Herbarium Jomson)
Oxytropis williamsii (Fabaceae)
D: Dhampu, Lārjuṅ, Daṅkardzoṅ, Ṭukce, Syāṅ, Kāgbeni, Muktināth, Dāmodar Kund
S: VASSILCZENKO 1977: 170; MIEHE 1982 (Vol. 2): 26, 34, 47, 67, 81; POLUNIN & STAINTON 1984: 106; KRIECHBAUM 2002: 146; Herbarium Jomsom
Pennisetum flaccidum (Poaceae)
D: Choyu, Lete, Ṭukce, Mārphā, Jomsom, Syāṅ, Thini, Kāgbeni, Jārkhoṭ, Tiri, Dāmodar Kund, Gemi, Geliṅ, Yara, Lo Montaṅ
S: MIEHE 1982 (Vol. 2): 48, 76, 81; SHRESTHA 1984; KOJIMA 1990: 101; KASPEREK 2002: 10f.; Herbarium Jomsom
Poa pratensis (Poaceae)
D: Ṭukce, Kāgbeni
S: KITAMURA 1955: 85; LOBBICHLER 1961: 131
Primula denticulata (Primulaceae)
D: Chairo, Thini, Kāgbeni, Yara
S: KITAMURA 1955: 199, COLVILLE BARCLAY 1973: 71, MIEHE 1982 (Vol. 2): 36, 61, NOSHIRO & AMANO 2002: 3
Primula glandulifera (Primulaceae)
D: Chairo, Kāgbeni, Hidden Valley
S: KITAMURA 1955: 199; MIEHE 1982 (Vol. 2): 36, 47
Primula tibetica (Primulaceae)
D: Thini, Kāgbeni, Muktināth, Dāmodar Kund
S: KITAMURA 1955: 201; MIEHE 1982 (Vol. 2): 54, 68; BÜRGEL 1999: 181, NOSHIRO & AMANO 2002: 4
Rosa sericea (Rosaceae)
D: Ghāsā, Ṭukce, Syāṅ, Jomsom, Daṅkardzoṅ, Phalak, Lubrā, Kāgbeni, Muktināth, Tiri, Samar, Gemi, Nyamḍok
S: KITAMURA 1955: 157, LOBBICHLER 1961: 131, DOBREMEZ & JEST 1971: 178, COLVILLE BARCLAY 1973: 69f., MIEHE 1982 (Vol. 2): 28, 31, 34, 47, 62, 63, 67, 75, 76, 77, 80, KOJIMA 1990: 98, MIYAMOTO & IKEDA 2003: 2, 4, 6; KASPEREK 2002: 10f. ; Herbarium Jomsom
Rubia manjith (Rubiaceae)
D: Thini, Kāgbeni, Khyiṅga
S: KITAMURA 1955: 231; Herbarium Jomsom; KASPEREK (unpublished observation)
Rumex nepalensis (Polygonaceae)
D: Choyu, Lete, Kālopāni, Kobāṅ, Ṭukce, Mārphā, Thini, Kāgbeni, Jārkhoṭ, Khyiṅga, Taṅgya, Chusāṅ, Tetāṅ, Tsele, Ḍi, Taṅbe, Yara, Samar, Geliṅ, Gemi, Tsaraṅ, Lo Montaṅ
S: KITAMURA 1955: 120, LOBBICHLER 1961: 129, MIEHE 1982 (Vol. 2): 59, 61, 81; MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.
Salsola nepalensis (Chenopodiaceae)
D: Ṭukce, Syāṅ, Thini, Kāgbeni, Muktināth, Tiri, Yara, Taṅgya
S: GRUBOV 1961: 127; LOBBICHLER 1961: 128; DOBREMEZ 1976: 236; MIEHE 1982 (Vol. 2): 34, 48, 54, 62, 67, 74, 76, 81
Salvia nubicola (Lamiaceae)
D: Kālopāni, Kobāṅ, Thini, Daṅkardzoṅ, Lubrā, Kāgbeni, Khyiṅga, Muktināth
S: KASPEREK 2002: 10f.; Herbarium Jomsom

Saxifraga stolitzkae (Saxifragaceae)
D: Kāgbeni
S: KITAMURA 1955: 146
Setaria viridis (Poaceae)
D: Kobāṅ, Mārphā, Jomsom, Lubrā, Daṅkardzoṅ, Kāgbeni, Khyiṅga, Choṅgor, Chusāṅ, Tsele, Ḍi, Gemi
S: MIEHE 1982 (Vol. 2): 82; KASPEREK 2002: 10f.
Sisymbrium brassiciforme (Brassicaceae)
D: Kāgbeni
S: KITAMURA 1957: 421
Sonchus asper (Asteraceae)
D: Kāgbeni
S: KASPEREK 2002: 10f.
Sonchus oleraceus (Asteraceae)
D: Kobāṅ, Ṭukce, Mārphā, Jomsom, Kāgbeni, Chusāṅ, Tetāṅ, Taṅbe
S: KITAMURA 1955: 272; LOBBICHLER 1961: 130; KASPEREK 2002: 10f.
Sonchus wightianus (Asteraceae)
D: Kālopāni, Ṭukce, Mārphā, Kāgbeni, Chusāṅ, Tetāṅ, Tsele
S: KITAMURA 1955: 271; LOBBICHLER 1961: 131; MAZEK 1991: Tab. 1; KASPEREK 2002: 10f.
Sophora moorcroftiana (Fabaceae)
D: Ṭukce, Syāṅ, Jomsom, Kāgbeni, Muktināth, Tiri, Chusāṅ, Tetāṅ
S: KITAMURA 1955: 168, plate XIII; DOBREMEZ 1970: 89; MIEHE 1982 (Vol. 2): 34, 62, 67, 74, 76, 80; Herbarium Jomsom
Stipa staintonii (Poaceae)
D: Kāgbeni
S: KRIECHBAUM 2002: 190
Thalictrum foetidum (Ranunculaceae)
D: Thini, Kāgbeni
S: KITAMURA 1955: 132; Herbarium Jomsom
Thlaspi arvense (Brassicaceae)
D: Lete, Kālopāni, Kobāṅ, Ṭukce, Mārphā, Chim, Jomsom, Kāgbeni, Jārkhoṭ
S: LOBBICHLER 1961: 131, KITAMURA 1955: 140, MAZEK 1991: Tab. 1, MIEHE 1982 (Vol. 2): 35; KASPEREK 2002: 10f., KRIECHBAUM 2002: 134
Thymus linearis (Lamiaceae)
D: Ṭukce, Chairo, Daṅkardzoṅ, Jomsom, Thini, Kāgbeni, Muktināth, Lo Montaṅ
S: KITAMURA 1955: 216; LOBBICHLER 1961: 125; JALAS 1973: 119; MIEHE 1982 (Vol. 2): 28, 34, 56, 58, 72; KOJIMA 1990: 101; Herbarium Jomsom
Torilis japonica (Apiaceae)
D: Lete, Kālopāni, Mārphā, Kāgbeni
S: KITAMURA 1955: 189; KASPEREK 2002: 10f.
Triglochin palustris (Juncaginaceae)
D: Kāgbeni, Jārkhoṭ
S: KITAMURA 1955: 83; DOBREMEZ 1976: 236; KRIECHBAUM 2002:191
Tussilago farfara (Asteraceae)
D: Kobāṅ, Ṭukce, Jomsom, Kāgbeni, Chusāṅ, Tetāṅ, Ḍi, Jārkhoṭ, Khyiṅga, Yara, Geliṅ, Lo Montaṅ
S: KITAMURA 1955: 272; KASPEREK 2002: 10f.

Appendix 2

Some records which are doubtful with regard to taxonomy or to occurrence in the wild, as well as collections from Kāgbeni which could not be determined to specific level yet, are listed below.

Aster spec.

Chenopodium spec.

According to W. B. Dickoré. Goettingen, specimen 95-254 in Herbarium G. K. might belong to a species not described yet.

cf. *Breea arvensis*

Clematis spec.

Fagopyrum esculentum

In a few cases, this species was observed escaping cultivation in Kāgbeni, Jomsom and Mārphā (KASPEREK 2002: 12); on cultivation in Kāgbeni compare POHLE 1993.

Galium spec.

Gentiana cf. *marginata*

Specimen 93-018 in Herbarium G. K., belonging to sect. *Chondrophyllae*, has not been determined yet.

Heracleum spec.

Hordeum vulgare

Presumably, only cultivated (compare POHLE 1993: 64).

Lepidium spec.

Malus pumila

Presumably, only cultivated (compare KITAMURA 1955: 149).

"*Malva rotundifolia* L., Sp. Pl. 688 (1753)"

KITAMURA (1955: 178): Kāgbeni, 2800 m (May 1, 1953); taxon not mentioned for Nepāl in later publications / checklists.

Plantago spec.

Prunus armeniaca

KITAMURA (1955: 153): Highland, west of Kāgbeni, 3500 m (May 12, 1953).

Solanum tuberosum

Presumably, only cultivated (compare POHLE 1993: 64).

Taraxacum spec.

Zea mays

Presumably, only cultivated (compare POHLE 1993: 65).

To cite this document:

KASPEREK, Gerwin ("2001" [published 2004]):
Contributions to the flora and vegetation of Kagbeni (Mustan District, Central Nepal).

In: POHLE, Perdita & HAFFNER, Willibald (editors):
Kagbeni - Contributions to the village's history and geography
(= Giessener Geographische Schriften 77): 61-80.
Gießen (Institut für Geographie).