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Altitudinal distribution of apomixis in the high-alpine flora of the Ladakh, NW Himalaya

Bachelor thesis

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Annotation

Apomixis is a specific way of asexual plant reproduction by seeds. Conversion from sexual reproduction to apomixis is enabled by many different factors. These include molecular changes in DNA, changes on chromosomes, or affinity to certain taxonomical lineages. Even ecological conditions, as stressful high altitude or latitude environment, are thought to be factors capable of turning sexuality into apomixis. To test this hypothesis, we collected seeds of angiosperms from Indian part of Himalayas, in Ladakh. The seeds were analysed by FCSS where ratio of genome sizes of endosperm / embryo revealed type of reproduction system. Our data indicated 9 apomictic species from 232 totally measured species. These were *Biebersteinia odora, Potentilla gelida, P. pamirica, P. sericea, P. sojakii, P. venusta, Poa attenuata, Ranunculus membranaceus* and *Stipa splendens*. Most of the apomicts are known from previous studies or they have closely related apomictic species. Just *Biebersteinia odora* has no known related apomicts because of missing data about reproduction systems in this family. This results showed rather no affinity of apomictic species to high elevations; apomixis is more likely bound in taxonomically related groups. Our measurement provide extensive dataset to establish relative ratio of size of endosperm / embryo for individual families; this dataset may serve as valuable comparative material in following studies dealing with FCSS.

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Introduction

Plants can reproduce by several different ways – sexually, asexually by vegetative reproduction, or even asexually by apomixis. Earlier, the term apomixis was used in connection with all possible ways of asexual reproduction of plants. Some authors such as Gustafsson (1946) and Stebbins (1941) call apomixis not just agamospermy, but even vegetative clonal reproduction, i.e. new individual is created from buds, bulblets, a sprout or a root or just by dividing a tuft. This type of asexual reproduction is far from recent definition of apomixis which includes only agamospermy. Agamospermy is a sort of asexual reproduction by seeds (Asker and Jerling 1992) and the following text will be focused on this type of apomixis.

Agamospermy is very variable mechanism of a plant asexual reproduction. There is a type of agamospermy which needs no gametophyte and is able to create a sporophytic embryo from sporophyte ovular tissue. There are also types which need fertilisation of the gametophytic embryo-sac to create a viable embryo. Former type establishing embryo directly from somatic tissue, predominantly from nucellus, is named **sporophytic agamospermy** (or adventitious embryony) (described by Strasburger 1878, on an example of *Citrus*). This example of apomixis starts its development of embryo as a sexually reproducing plant – with forming a normal sexual gametophytic embryo and endosperm. Simultaneously, in the nucellus, one or many adventitious embryos is developing from which one or more embryos penetrate the embryo-sac. Further these embryos are maturing with the sexual embryo together or the sexual embryo is suppress and just the sporophytic embryo remains. It is obvious that this type of apomixis is facultative. We can find in one population both apomictic and sexually-created embryos, and in fact, we can find both embryos in only one seed. Sporophytic agamospermy is not very common type of apomixis and mostly appears in tropical trees (Richards 1997).

All other apomixis modifications originate from a plant gametophyte which mostly have somatic number of chromosomes. This type is called **gametophytic apomixis** and is divided into two main groups. The somatic number of chromosomes in the first group is caused by complete blocking of meiosis; apospory (or mitotic diplospory) belongs to this group. The second group, called meiotic diplospory, gains the specific chromosome number by failure in the meiosis. Nevertheless, the origin of all these gametophytic types is as complicated as the sporophytic agamospermy (Richards 1997).

The **aposporous** plant, for example, creates an embryo-sac directly from nucellus and this embryo-sac undergoes no meiosis. But in single ovule can develops a normal reduced sexual embryo-sac beside the apomictic; if fertilization happens in the sexual embryo-sac, both apomictic and sexually embryos can remain in the ovule. The result of two different embryos in one seed is an analogy of the sporophytic type of apomixis. However, obligate apomicts can exist also in apospory – these are individuals which have suppressed sexual functions because of hybridity, triploidy or some other genetic defects (Richards 1997).

When apospory is compared with **diplospory**, the main difference might be found in the origin of a gametophyte. While a gametophyte of an aposporous individual has its origin in nucellus tissue, in a diplosporous plant the gametophyte arises from an archesporium. Next development is comparable with the aposporic one (Richards 1997).

There is also one specific and curious example of paternal apomixis where the embryo arises from unreduced pollen. This reproduction type was described only in *Cupressus dupreziana* by Pichot et al. (2001).

On the development of a viable seed does not participate only an embryo, inseparable part of the process is also endosperm. Development of endosperm in each type of apomixis is different and in each type can arise differently.

The sexual seed has diploid embryo (created from mother haploid egg cell and haploid sperm cell) and triploid endosperm (originated from two haploid polar nuclei and the second haploid sperm cell) (Chiarugai 1927; Horandl et al. 2008) but the apomictic seed has usually different ratio of ploidy of embryo and endosperm (Koltunow and Grossniklaus 2003). As usually, there are some exceptions, for example the sporophytic agamospermy has always the "normal" ratio 2:3 because its diploid unreduced embryo and triploid sexual endosperm.

However, the apospory can reach different ratios 2:5, 2:4 and other (Koltunow and Grossniklaus 2003). The first ratio is given by the diploid unreduced egg cell and fusion of an unreduced tetraploid polar nuclei and a haploid sperm cell of the same species; this form of sexual development of endosperm in apomictic seed is named **pseudogamy** (Stenseth and Kirkendall 1985). There can occur different modifications like fertilisation of endosperm by diploid sperm cell (creating ratio 2:6) or involving both sperm cells in creation of endosperm (leading to ratio 2:6 or 2:8). The possible ratios can be modified by different ploidy level of maternal and paternal plans. Finally, we can observe a case of an embryo-sac with only one polar nucleus leading to the same ploidy level ratio as in sexual plants (2:3) (Savidan 2007).

Nevertheless, in apospory may occur apomicts which need no fertilisation of endosperm to create a viable seed; this mechanism, called **autonomy**, produces the second aforementioned ratio 2:4 (Koltunow and Grossniklaus 2003).

Diplospory has the same mechanism of autonomy and pseudogamy as it occurs in aposporic plants but the autonomy dominates here. In addition there may happen some abnormalities like endoduplication of polar nuclei with a result of 2:8 ratio (Richards 1997).

How the plants avoid fertilisation of egg cell? Easily, in most cases, they create the embryo just before flowers open. This mechanism is functional in autonomy and also in pseudogamy where the pollination of polar nuclei happens right after the plant comes into flower and the embryo can finish its development. Other mechanisms are somehow connected with pollen – some species do not produce pollen at all, some species do not allow pollen to reach an embryo-sac and fertilise it (Richards 1997).

Development of female gametophyte and male gametophyte must not depend on each other. Male gametophyte develops independently and might be or might not be influenced by the mechanisms influencing development of female gametophyte. However, we can see certain trends like that the autonomous apomicts are often sterile because they do not need any pollen to fertilize the polar nuclei (Richards 1997). Pseudogamous apomicts depend on fertilization of polar nuclei therefore the plants need to produce viable pollen (Rutishauer 1967). The pollen, however, might be reduced as well as unreduced (Nogler 1984). There have been observed even pseudogamous plants with male sterility which are depend upon pollen of other species (Asker and Jerling 1992).

One of the first theories suggested that the origin of apomixis is caused by hybridisation itself (Ernst 1918). This theory is based on the fact that all of the apomictic species are hybrids and that disfunction of meiosis is mainly caused by hybridisation. However, this theory is causeless and most of studies suggest that hybridisation as such is not the main cause of apomixis but it could be a predisposition of it (Gustafsson 1947). In fact, apomicts can arise by hybridisation of related species. In such case could be the hybrid apomictic (or sterile) because of unpairable chromosomes unless the hybrid creates an unreduced gamete and subsequently an allopolyploid. In next generation, this change can provide two sets of homologous chromosomes to make a reduced nuclei. Polyploid hybrids which make reduced gametophyte can give rise to the triploid plant, which will be usually sterile, sometimes apomictic or even sexual (Richards 1997). The polyploid hybrids will sometimes produce unreduced gametophyte, creating polyploids (Harlan & de Wet 1975) and / or an apomictic offspring (as in *Tripsacum* agamic complex described by Leblanc et al. 1995).

Most of authors were concentrated on other ways how the apomixis can arise, the hybridisation is not enough explainable to them. For example Powers (1945) says that specific genes are responsible for the asexual development of seeds and for the right function of agamospermy, the cooperation of all these genes is necessary. When having this hypothesis about the "apomixis-genes", two different theories how to look at the apomixis origin arose. Asker (1980) claims that agamospermy arise from sexuality, however, Nogler (1984) sees the origin of agamospermy independent, arising alongside the sexuality.

Another theory proposed by Nogler (1984) shows the possibility of connection of dominant gene for apomixis (A^-) with its lethality in recessive position (A^-/A^-). The lethality might be expressed only in reduced gametophyte where is not the A^- gene present in heterozygous combination with a^+ gene (a gene necessary for sexual life cycle), in unreduced gametophyte with heterozygous combination A^-/a^+ does not occur this threat (Nogler 1984). The unreduced gametophyte may develop when the meiosis fails or is uncompleted – this attribute causes in most cases also polyploidisation which may favour the gametophyte in survival. The polyploids are protected from new mutations which may accumulate during the time just by having other mutation-less copies of the same gene (Maynard Smith 1978).

With expansion of molecular methods, many hypotheses were introduced. The simple Mendelian inheritance were demonstrated by genetic analyses (Asker and Jerling 1992), on the other hand, large gene complex with complicated regulation was revealed by molecular and cytogenetic analyses. Probably, synthesis of these two hypotheses is behind the complex process of apomictic seed development; apomixis should be regulated by a few genetically independent loci, however, inheritance of regulation of genes within these loci is more complex (Barcaccia and Albertini 2013; Koltunow and Grossniklaus 2003).

Besides heredity, research of regulation of apomixis have markedly advanced too. Nevertheless, not all processes are clear, there is still some space for investigation. One theory says that apomixis is regulated by special genes occurring just in apomicts, not in sexual reproducing plants, coding proteins with specific function (e.g. Laspina et al. 2008; Leblanc et al. 1997; Rodrigues et al. 2003). Another researches suggest that apomixis is controlled by the same genes as sexuality, but the genes are expressed and distributed in different space and time during development (Bicknell and Koltunow 2004; Carman 1997). The regulation of gene expression might be mediated by epigenetic mechanisms (methylation) (Pillot et al. 2010a; Pillot et al. 2010b), or by small regulatory RNAs which can regulate gene expression through post-transcriptional gene silencing, translational inhibition or modification of heterochromatin (Ron et al. 2010).

The origin of agamospermy might be supported by some preadaptation and many authors have given examples of this. The first preadaptation were already mentioned above – polyploidisation and hybridisation. The other preadaptation are more macroscopic, related to species ecology and morphology. Richards (1997) found that most of the aposporic and diplosporic apomicts are growing in temperate zone, have just one seed per fruit, are often herbaceous (except some apomicts from Rosaceae family, e.g. *Crataegus* or *Sorbus*) and perennial. These characteristics, however, are not universal. Apomicts with sporophytic agamospermy seem to be rather tropical and woody and with many seeds in a fruit (Richards 1997).

Investigation of ecology of apomicts did not cease by concluding that they grow mostly in temperate or tropical zones. Stebbins (1950) came out with a theory which says that apomicts are more frequent in higher latitudes and altitudes. This theory is based on a fact that polyploidy and frequency of perennial clonal herbs increases along these gradients. There are some explanations why the frequency of apomicts should increase upwards and polarwards: 1) in habitat with cold and dry summers, there is lack of pollinators which are necessary for some plants to reproduce by sexual way; this point, however, does not explain pseudogamy in such conditions; 2) adaptations obtained by hybridisation work well enough to live and reproduce in cold conditions of mountains or arctic, moreover there is no need to improve the adaptations in such open and homogenous areas, so it is profitable to keep this abilities. By apomixis is possible to keep all these gene combination because there is no recombination during meiosis; 3) establishing of apomicts can be also stimulated by glacial periods. During these periods related species came in contact, reaching the hybridisation and afterwards polyploidisation, which may stand behind origin of an apomictic plants (Carman 1997; Lynch 1984). Nowadays, the "glacial-period apomicts" are in glacial refugia in mountains and in the north; and 4) species in discussed areas have mainly disjunct populations, therefore, according to the Baker´s law (Baker 1948; Baker 1955; the law formulated by Stebbins 1957), the autonomic or self-compatible species are more capable of colonising these areas. However, the key reason why apomictic plants grow in such condition might be easily that the families in which apomicts occur (75 % of apomicts belong to Asteraceae, Rosaceae and Poaceae; Richards 1997) have its main distribution in areas in high altitude and latitude. Then, all the factors mentioned above could help species with specific preadaptation inherent with its family to become apomictic.

However, there are some contraindications to this theory. Firstly, apomicts are investigated mostly in temperate and boreal zones, in tropics and subtropics are just poorly

studied, so the theory is based on an incomplete dataset (Richards 1997). Secondly, there are some pollinators in the habitats (Lefebvre et al. 2014; Williams et al. 2015), therefore the argument pointing out the lack of pollinators is deficient.

To the arguments from Stebbins (1950) can be joined one more prediction which can support affinity of apomicts to high and cold areas. By apomixis is spared energy which would be used for energetically expensive process of meiosis (Richards 1997). First way how to save energy is avoiding "cost of meiosis". Definition of this phenomenon says that the asexual plant is able to produce twice as many seeds as sexual relatives by escaping the meiosis (Archetti 2010). However, Archetti adds that sexual plants must have some counterbalances which favour the sexual plants against the asexual ones. For example, a loss of complementation (or loss of recombination) would disadvantage asexual plants by decrease of variability in offspring (Archetti 2010). Therefore, this type of saving energy is compensated by other advantages of sexual plants. The second way of sparing energy is creating no pollen, however, this is not universal, pseudogamous plants generally create pollen to fertilise their endosperm and also to participate in fertilisation of embryo-sacs of sexual relatives (Horandl 2006).

Horandl et al. (2011) tried to verify the theory of higher frequency of apomicts in mountains. She tried to analyse 14 species from 7 families, characteristic for the subnival to the nival zone of the European Alps. There were chosen species dependent on insect pollinators to find out whether there is some effect of pollinator limitation (Horandl et al. 2011). From these species, just *Potentilla crantzii* (an apomictic plant described earlier by Smith 1963) was apomictic, other species showed seeds originated by sexual way. This result shows that apomixis should be rather rare in high elevations. However, there are more extreme areas where the relation between apomixis and high elevation can be studied. Himalayas provide extensive high-elevation environment which might be less favourable for insect pollinators than wet European mountains and therefore more favourable for formation of apomixis due to ecological factors mentioned above.

There are many ways how to study the apomixis. The first, the easiest and the quickest is to try to find an embryo in an ovary before flowering (Herr 1971, 1992). Many species protect themselves from fertilisation by establishing an embryo before blooming, as mentioned above (Richards 1997). But not all species have this ability, then is important to know whether the plants are pseudogamous or with autonomous endosperm. If it concerns autonomy, the most common procedure is putting flowers into bags to protect them from pollen, and the second possibility is removing stigmas or anthers or both to be sure that no pollen can

participate in seed development (Richards 1997). This method, unfortunately, cannot be applied on pseudogamy because of the need of pollen to fertilise an endosperm.

Neither of this methods are strong enough to detect whether any plant is apomictic or not. Both methods have some limits, each of them can reveal just some of the types of apomixis and require long observation or delicate preparation. Most of the apomixis types can be revealed by cytological methods which are based on chromosomes counting, genome sizes measuring or other genetic characteristics detecting. In this field, cytometry became very popular in last few decades (see for example: Carloni et al. 2014; Dobes et al. 2013; Horandl et al. 2011).

By the cytometry is measured a content of DNA in particular nuclei, and also count of nuclei is registered. These two parameters are displayed by the cytometer as a histogram. In case of investigation of plant reproduction systems, nuclei of seeds are analysed (Matzk et al. 2000). In distinguishing an apomictic seed from a sexual one, there is no need to know the absolute genome sizes of the nuclei, there is just essential to know the ratio of ploidy level of embryo and endosperm nuclei (Matzk 2007) as reviewed by Krahulcova and Rotreklova (2010).

In this bachelor thesis, I focus on the testing hypothesis about higher frequency of apomicts in extreme conditions, specifically in a dry part of Himalayas, in Ladakh. The main method of research is cytometry, specifically flow cytometry seed screening (FCSS). The main goals of the thesis are 1) to screen utmost amount of seeds of Ladakh species to find out whether they are sexual or apomictic, 2) in apomictic species determine the way of reproduction, and 3) make a general summary of percentage of endosperm in seeds for individual families which might be useful methodical tool in cytometry.

Methods

Locality

The study was conducted in Ladakh, Jammu and Kashmir, India. From geographical sight, Ladakh belongs to the western part of Tibetan plateau (Fig. 1).

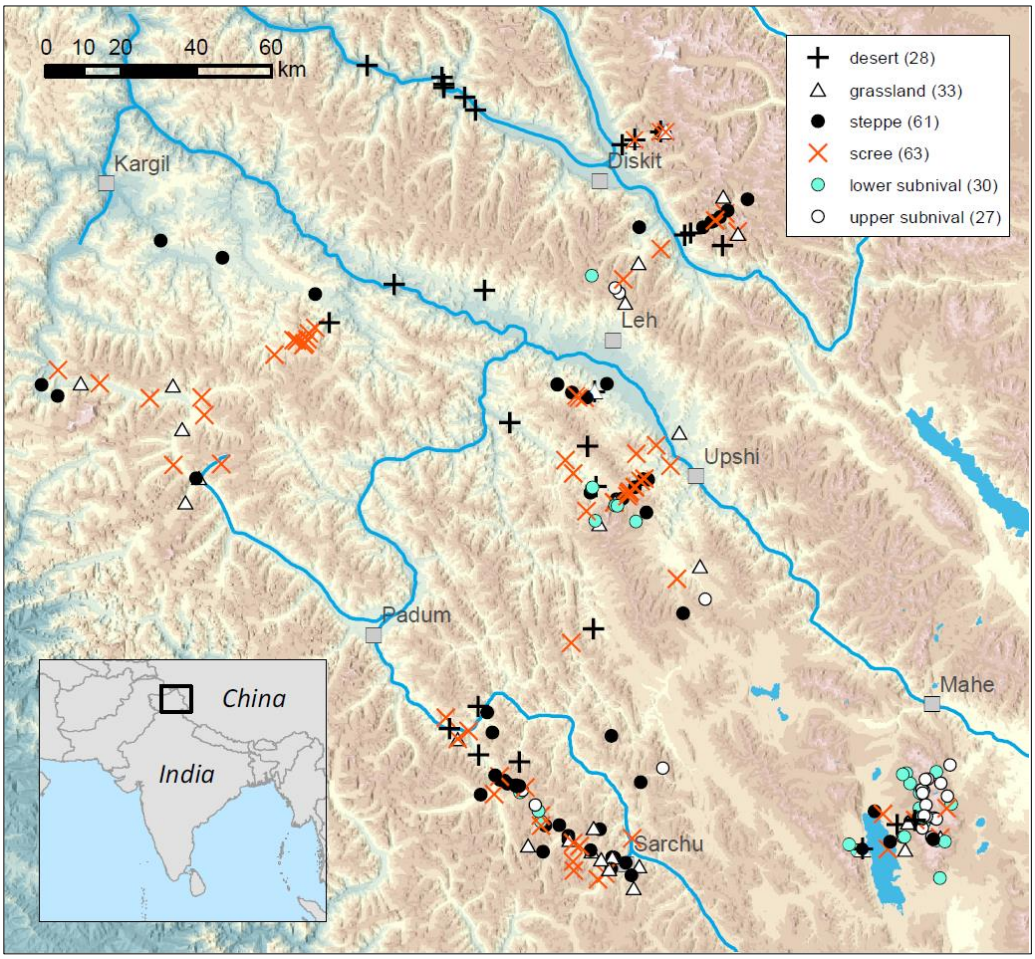

Fig. 1: Map of localities in Ladakh. In lower left side is Ladakh in a black square situated in the north of India.

Climate data obtained from this area show that it is arid part of Himalayas with a precipitation about 100 mm per year (Miehe 2001). Moreover, in the lower and middle parts of the area, the precipitation are lower than evaporation, therefore these elevations are covered by desert and semi-desert, while above 5000 m a. s. l. cold alpine steppes are found. Higher, above 5300 m a. s. l., precipitations increase – there we can found zone of alpine grasslands which can descend along rivers' banks where the ground is watery. In the highest elevations subnival vegetation is situated (Klimes and Dolezal 2010).

Samples collection

Samples were collected during two seasons. The first collection lasted from August to September 2013, the second in the same period in year 2014. During the field work mature seeds were collected from angiosperms which produce seeds in the time of field work. To reveal possible variability in reproduction systems, one to five individuals per species and population were collected, always seeds from one individual put to a separate bag. We had also seeds collected in 2009, however, seeds from all individuals per population were stored in a bag, so we cannot distinguished seeds from different individuals.

The seeds were stored in paper bags, allowing air to flow into the bag drying the seeds. Vouchers have been dried well and deposited in herbarium of Institute of Botany, Academy of Science of the Czech Republic, Třeboň.

Cytometry

The relative fluorescence intensity of nuclei from the embryo and endosperm were analysed by Partec PA II cytometer (Partec GmbH., Münster, Germany). Three samples per population were measured, one sample matches one individual. One to ten seeds were prepared in one sample, depending on how big and how variable in genome size they were (Table 1 - Supplement). If the seeds were too small to be detected on cytometer with enough strong signal, five or even ten seeds per sample were used. If the seeds were big enough to be detected, three seeds were used. In case there were not enough seeds from an individual to make sample from three seeds, two or just one seed was analysed.

In few measured samples, certain variation in ploidy or reproduction type arose between seeds of one species in a population, therefore just one seed per sample was analysed for such species (it was case of *Stipa splendens* and *Biebersteinia odora*). Both species show extremely high variability in reproduction systems and ploidy between seeds, therefore we added a standard with well-known genome size (*Bellis perennis*, 2C = 3.62 pg, calibrated against *Pisum sativum* 'Ctirad', 2C = 9.09; Doležel 1998) to the samples. This step should reveal polyploidisation in the seeds. For the same purpose, during the second fieldwork we collected also leaf samples of the individuals of *Biebersteinia odora* from which were collected seeds. These leaf samples were stored in silica-gel and finally measured by cytometer with a standard (*Bellis perennis*) using the same protocol which was used for the seeds measurement.

The seed samples were prepared by two different protocols: the first one-step protocol is described by Matzk et al. (2000). Samples are chopped by razor blade in 1 ml of seed buffer (firstly described by Matzk et al. 2001, we used slightly modified version according to Krahulcova and Suda 2006) [5mM $MgCl_2.6H_2O$, 85mM NaCl, 0.1M Tris (Trisma-Base), 0.1% (v/v) Triton X-100]. The buffer with chopped seeds is filtrated through 42 μm mesh, then is added DAPI (4′-6-diamidino-2-phenylindole) in final concentration 4 μl/ml. Samples were run on the flow cytometer after several minutes of staining; 5000 particles were recorded.

The second protocol uses the simplified two step protocol following Doležel et al. (2007). Seeds are chopped in 400 μl of Otto I buffer [0.1M citric acid monohydrate, 0.5% (v/v) Tween 20], the solution is filtered through 42 μm mesh, then is added Otto II buffer [0.4M Na_2HPO_4 .$12H_2O$] with DAPI (4 μl/ml) and ß-mercaptoethanol (2 μl/ml). Samples were run on the flow cytometer after several minutes of fixation in Otto I buffer and several minutes of staining in Otto II; in case of insufficient quality of the result, different fixation / staining times were tested (e.g., fixation time reduced to less than 1 min). 5000 particles were recorded.

Data analysis

Final analysis of histograms was performed by FlowJo 10 software (FlowJo, LLC, Ashland, Oregon).

To distinguish the true peaks of embryo / endosperm in histograms from the background noise, we developed simple method comparing count of nuclei of a lower peak in a histogram with count of nuclei between both peaks of embryo and endosperm (Fig. 2). A gate of the peak and a gate of a signal noise between peaks had the same width to be comparable. If ratio *peak / background noise between peaks* is 1.2 or higher, the peak is considered relevant. The undetectable peak might have two reasons. First, the measurement have too much background noise and have to be excluded from other analyses. Second, the measurement have minimum background noise, however, very reduced (undetectable) endosperm is an attribute of the measured species. These analysis have to be excluded from analysis of reproduction systems.

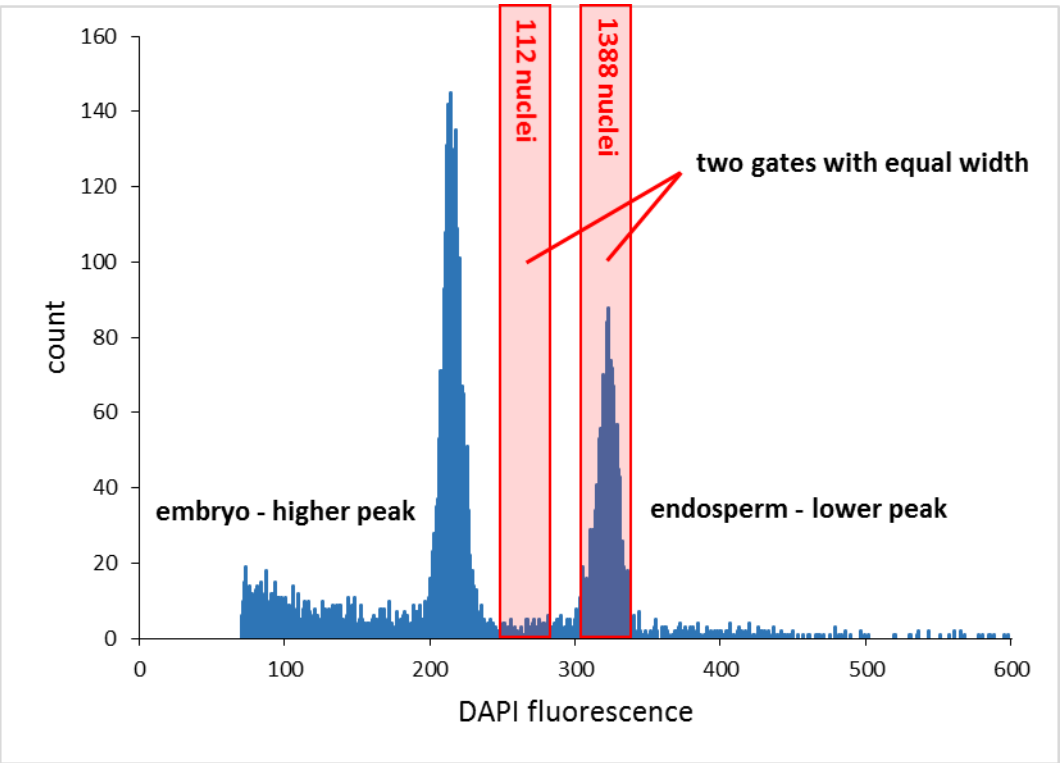

Fig. 2: A histogram of *Stipa subsessiflora* (3 seeds in a sample were measured). Two gates with equal width are shown. In the gates, count of nuclei of lower peak is measured in histogram, as well as count of nuclei between two peaks.

The relative endosperm/embryo ratio was calculated from arithmetic mean of embryo and endosperm peaks. In case when the first peak of endosperm was not visible / low due to high endopolylpoidy of endospermic nuclei, there was a mean of the second peak of endosperm divided twice and the result was used in the calculation of the ratio. According to the ratio a reproduction system of a sample was inferred following Matzk (2007) (Table 1).

Table 1: The table shows ratios of endosperm/embryo of different reproduction systems. Because of variability between seeds and measurement error, 10% deviation from the ideal value is permitted.

	genome size (C - values) endosperm / embryo	**ratio**
sexuality	3C / 2C	1.5 ± 10%
autonomous apomixis	4C / 2C	2 ± 10%
pseudogamous apomixis	5C / 2C OR 6C / 2C	2.5 - 3 ± 10%

Four different formulas to detect a specific apomictic reproduction system were used in case of apomictic species *Biebersteinia odora* (Table 2). The formulas considered sexuality, apomixis with autonomous endosperm and pseudogamous apomixis. The formulas serve to count relative genome size of individual gametes participating in seed formation. The formulas show a probable type of reproduction system if the calculated genome sizes of maternal and paternal gametes are equal or the genome size of paternal gamete participating on apomictic endosperm is half of the maternal genome size (reduced sperm cell). Also multiples of genome sizes are possible, these would indicate polyploidisation in a population. In case of pseudogamy, the formulas can detect whether in endosperm fertilization participate one 1n sperm cell, or whether two 1n or one 2n sperm cells were involved (the two last cases cannot be distinguished by these method).

Table 2: Formulas used for determination of specific reproduction system for *Biebersteinia odora*. In the calculations were used arithmetic means of peaks of embryos and endosperms.

	genome size of maternal gamete	**genome size of paternal gamete**
sexual	2 * embryo - endosperm	endosperm - embryo
autonomy	embryo OR endosperm / 2	×
pseudogamy (1 x sperm cell)	Embryo	endosperm - 2 * embryo
pseudogamy (2 x sperm cell)	Embryo	(endosperm - 2 * embryo) / 2

Because we obtained big amount of data, we prepared a summary of a relative size of embryo and endosperm in seeds. It was determined using counts of nuclei of embryo and endosperm peaks. Percentage of endosperm in a seed was expressed as the ratio of count of nuclei of the endosperm peak to the sum of both peaks. An average of percentage of endosperm in a seed was counted for each family. This output should reveal which families have more nuclei in embryo tissue in comparison to endosperm and vice versa. Also identifying of families without detectable endosperm (or embryo) would be indispensable from methodological point of view. This summary should serve as a tool for following studies dealing with FCSS.

Results

From 925 measured samples, 860 histograms were clearly readable. The illegible histograms were caused by immature seeds, mildewed seeds, parasited seeds, or by secondary metabolites in the seeds. From the 860 histograms, 245 were not clearly interpretable because of no detectable endosperm or embryo, or because of background noise. (Table 1 - Supplement).

Together, 232 species were measured. 48 species had no clearly legible signals, 172 species showed sexual way of seeds formation, 49 species had no detectable endosperm, therefore we cannot say whether the species are sexual or apomictic, and 9 species were clearly apomictic (Table 2 - Supplement). Five out of nine apomictic species belong to the genus *Potentilla* (namely *Potentilla gelida*, *Potentilla pamirica*, *Potentilla sericea*, *Potentilla sojakii*, *Potentilla venusta*). Other apomictic species were *Biebersteinia odora*, *Poa attenuata*, *Ranunculus membranaceus*, and *Stipa* (*Achnatherum*) *splendens*.

All apomictic species of genus *Potentilla* showed pseudogamous development of seeds. The ratio of endosperm/embryo was established as 6/2 which means fertilisation of central cell by an unreduced sperm cell or by two reduced sperm cells (Fig. 3). The species *Ranunculus membranaceus* created seeds in the same way – the ratio was 6/2 which indicate pseudogamy with one or two sperm cells involved in creation of endosperm (Fig. 4).

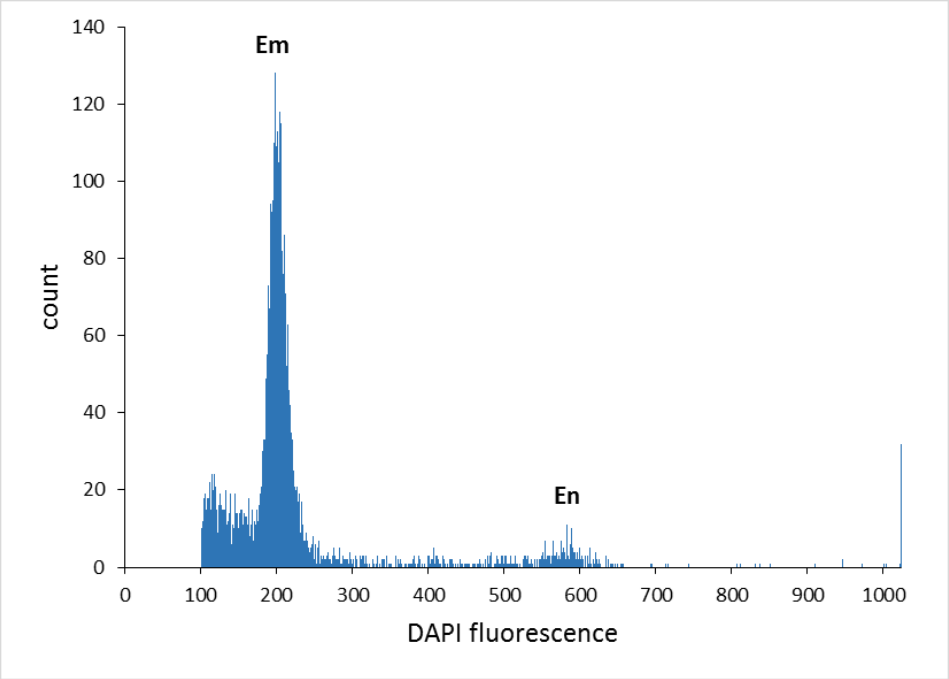

Fig. 3: FCSS histogram of pseudogamous *Potentilla sericea*. Em = embryo nuclei, En = endosperm nuclei, with a ratio 2.91.

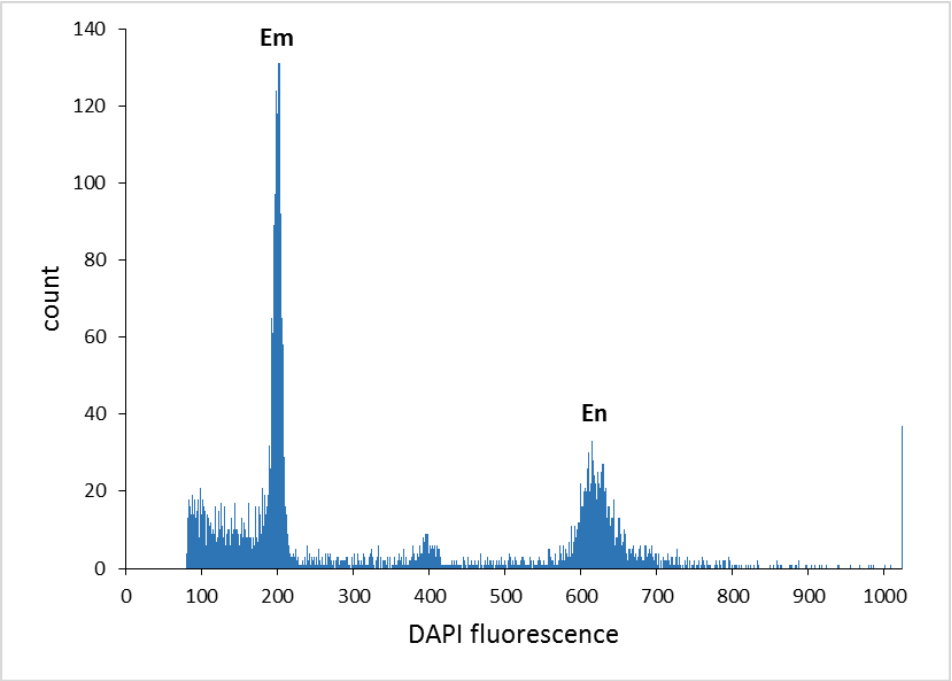

Fig. 4: FCSS histogram of pseudogamous *Ranunculus membranaceus*. Em = embryo nuclei, En = endosperm nuclei, with a ratio 3.09. The small peak between embryo and endosperm comprises nuclei of embryo in G2-phase of cell cycle.

Apomictic *Poa attenuata* have slightly different mode of reproduction. The species was also pseudogamic, however, the ratio 5/2 reveal that the central nucleus was fertilised by a reduced sperm cell (Fig. 5).

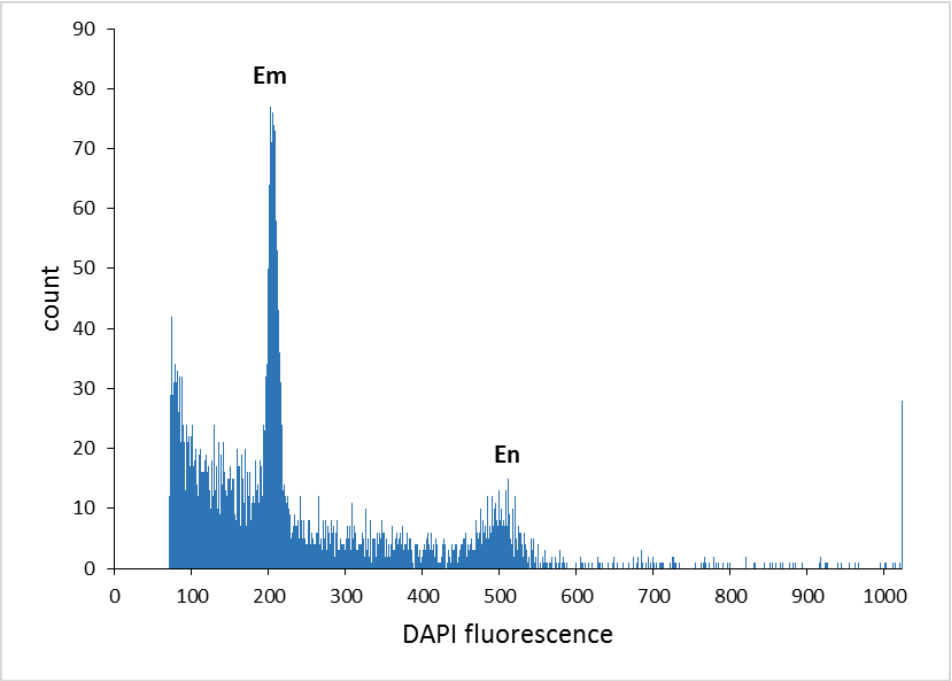

Fig. 5: FCSS histogram of pseudogamous *Poa attenuata*. Em = embryo nuclei, En = endosperm nuclei, with a ratio 2.43.

Seeds of *Biebersteinia odora* reveal that this species is also pseudogamous, however, the way of fertilisation vary between single seeds (Table 3 - Supplement). Because of this variability a standard was added to the samples and during the second fieldwork leaf samples were collected of the species to establish genome size of mother plants. This step revealed uniform genome size of mother plants (average ratio of mother plant to standard was 2.7), however, the ratio of embryo to standard vary from c. 2.7 to c. 5.6 (Table 3 - Supplement).

In the seeds, there were observed endosperm/embryo ratio 5/2, indicating fertilisation of central cell by one reduced sperm cell (Fig. 6). The ratio 6/2 was also present (Fig. 7). The ratio 6/4 detected once indicates unreduced apomictic embryo-sac fertilised by both sperm cells – first in central cell, second in egg cell (Fig. 8). Among the samples of *Biebersteinia odora* were also seeds with obscure ratios which do not match none of common types of apomictic reproducing systems (types or reproduction systems are showed in Fig. 9).

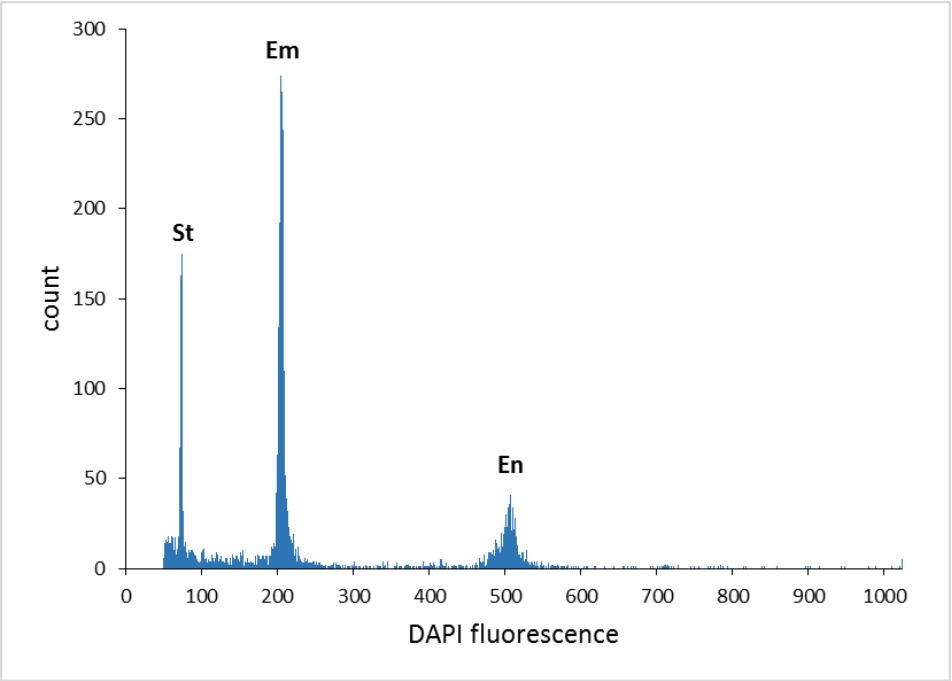

Fig. 6: FCSS histogram of pseudogamous *Biebersteinia odora*. St = standard nuclei, Em = embryo nuclei, En = endosperm nuclei, with a ratio 2.46.

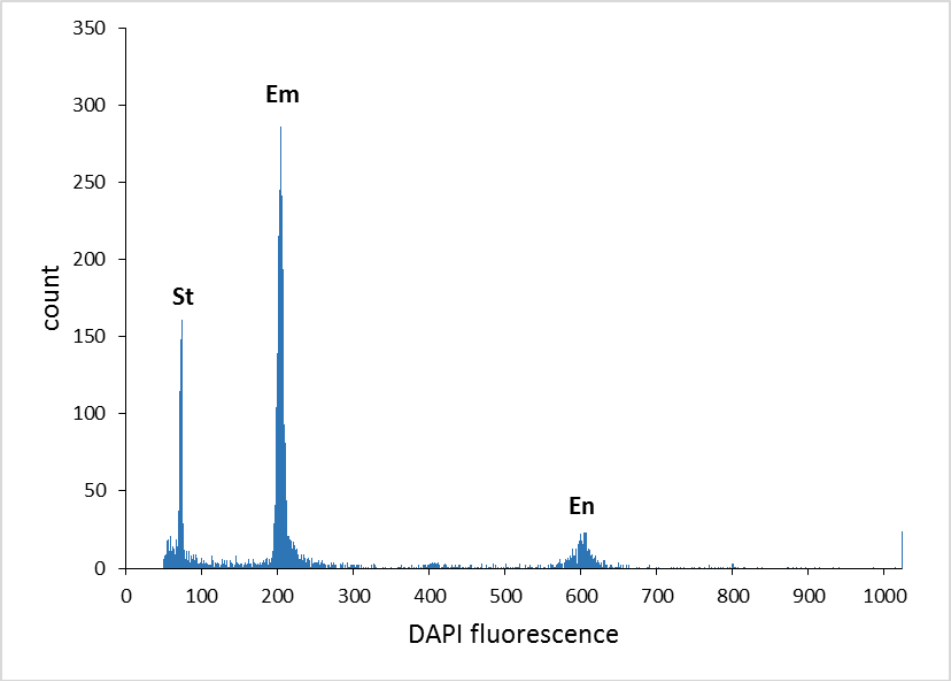

Fig. 7: FCSS histogram of pseudogamous *Biebersteinia odora*. St = standard nuclei, Em = embryo nuclei, En = endosperm nuclei, with a ratio 2.96.

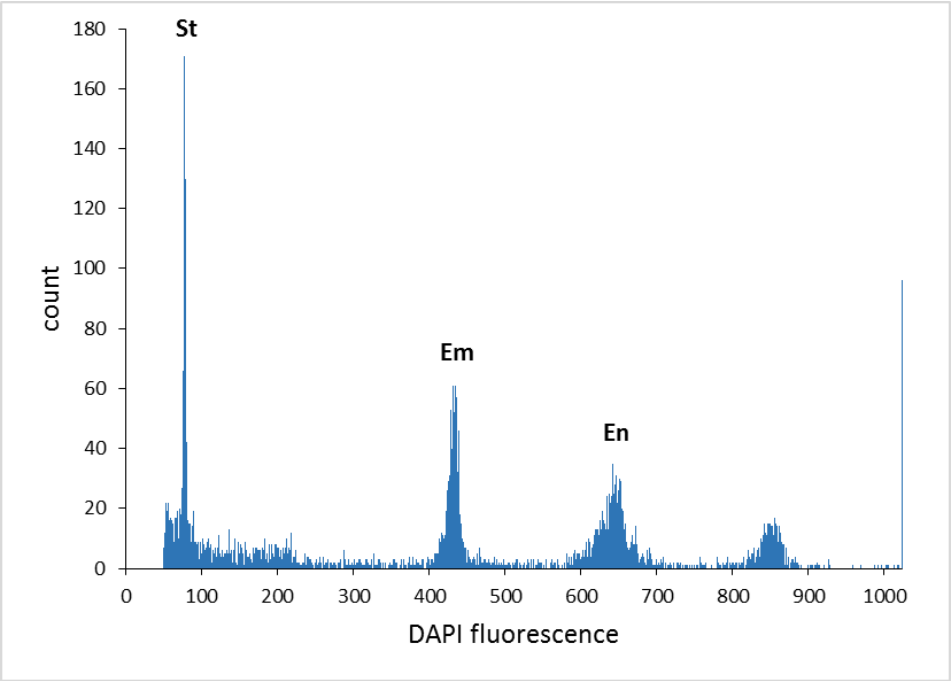

Fig. 8: FCSS histogram of *Biebersteinia odora* with sexual-like fertilisation of unreduced embryo-sac. St = standard nuclei, Em = embryo nuclei, En = endosperm nuclei, with a ratio 1.49. The fourth peak comprises nuclei of embryo in G2-phase of cell cycle.

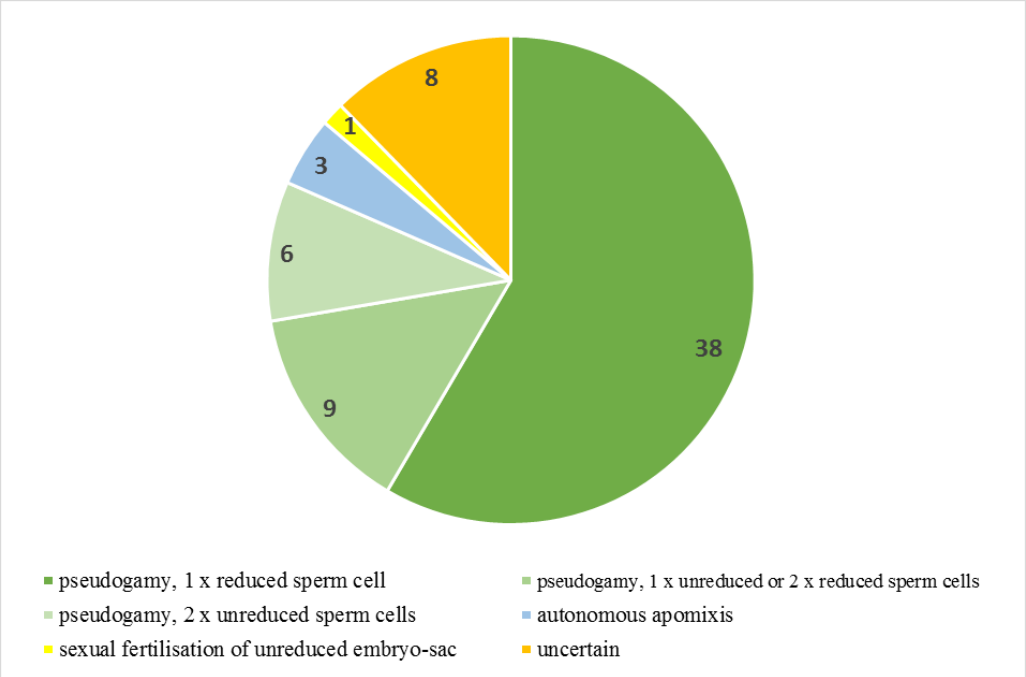

Fig. 9: A graph showing types of reproduction systems occurring in samples of *Biebersteinia odora*. Pseudogamuos systems are green, autonomous apomixis is blue, sexual-like fertilisation is yellow, uncertain results are orange. The numbers in the graph show counts of seeds with particular reproduction system.

The last observed apomictic species is *Stipa splendens*. In the species, more reproduction types were found as well as in *Biebersteinia odora*. At the beginning, we measured three seeds per sample and the histogram revealed apomictic reproduction system and high diversity in ploidy between seeds which was expressed by two peaks of embryos and just one peak of endosperm. The second peak of endosperm (corresponding to the second peak of embryo) was not visible or the endosperm off all samples had the same ploidy level (Fig. 10). Than we measured one seed per sample usually with added standard (*Bellis perennis*). All these one-seed samples seemed to be apomictic. There were observed endosperm/embryo ratios of autonomy (Fig. 11) and pseudogamy apomixis, moreover, the peaks ratio of pseudogamy vary between 5/2 and 6/2 (Fig. 12 and 13). The variability between particular seeds might be caused by involving one or two sperm cells in endosperm, or there were producers of reduced and unreduced pollen in the population. Moreover, the standard reveal variability between ploidy of embryos (Table 3), this phenomenon could influence the endosperm/embryo ratio.

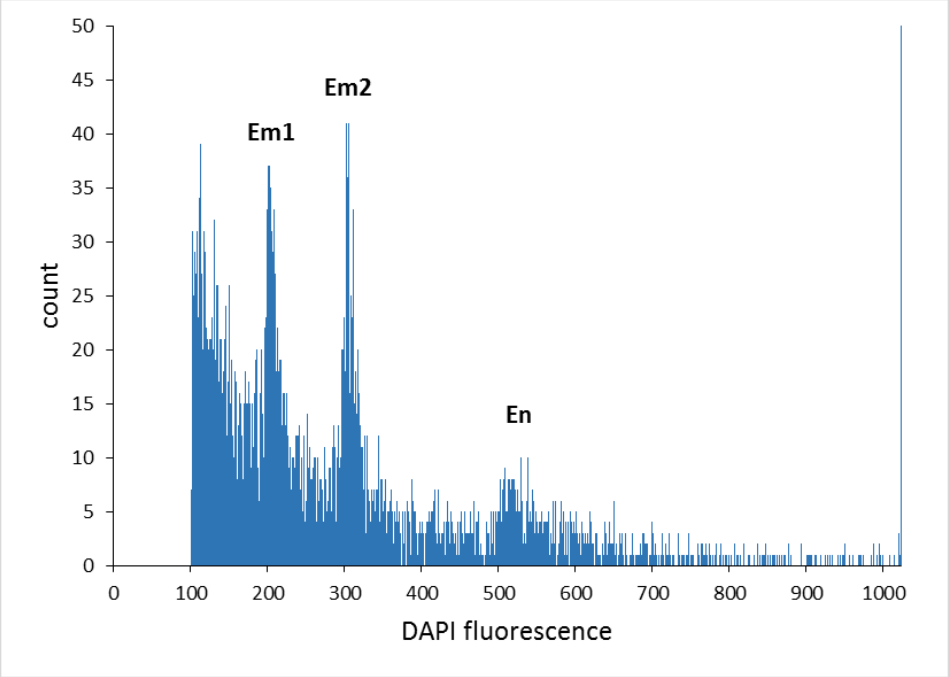

Fig. 10: FCSS histogram of *Stipa splendens*, three seeds were measured. The first peak represents 2x embryo (Em1), the second peak represents 3x embryo (Em2) and the third peak comes from pseudogamous endosperm (En). Ratio of the two embryos is 1.48, ratio of En/Em1 = 2.48.

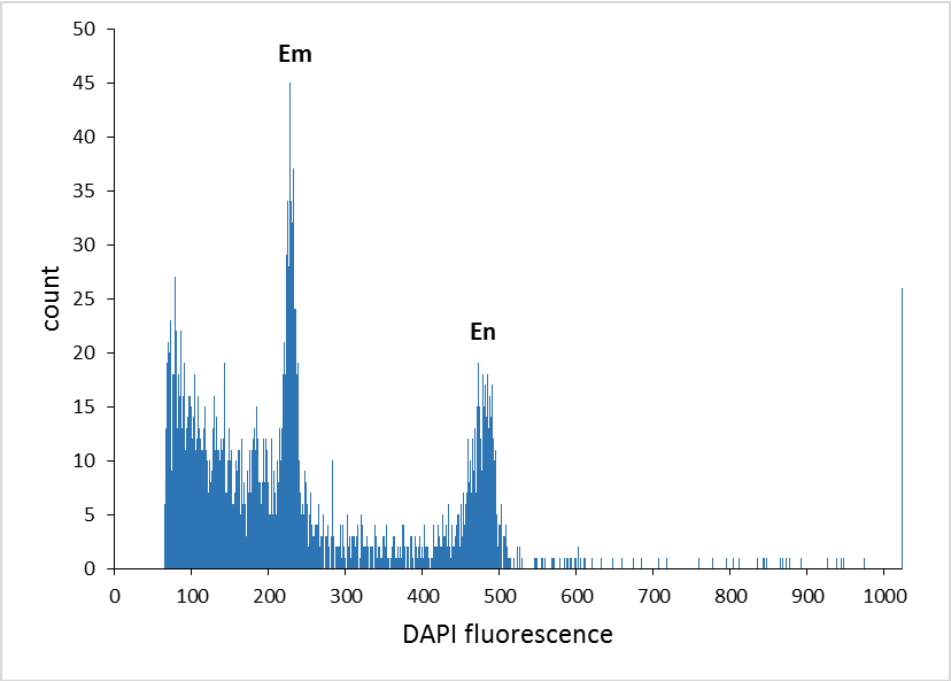

Fig. 11: FCSS histogram of *Stipa splendens*, one seed without standard was measured. Peaks of embryo (Em) and endosperm (En) are in ratio 2.11.

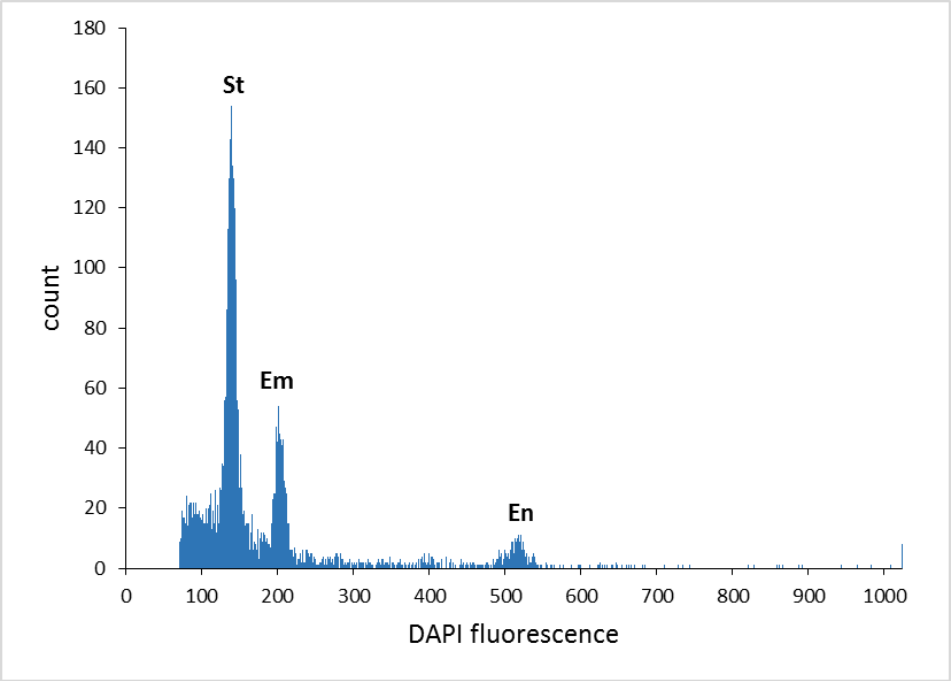

Fig. 12: FCSS histogram of *Stipa splendens*, one seed with a standard (St – *Bellis perennis*) was measured. Peaks of embryo (Em) and endosperm (En) are in ratio 2.54.

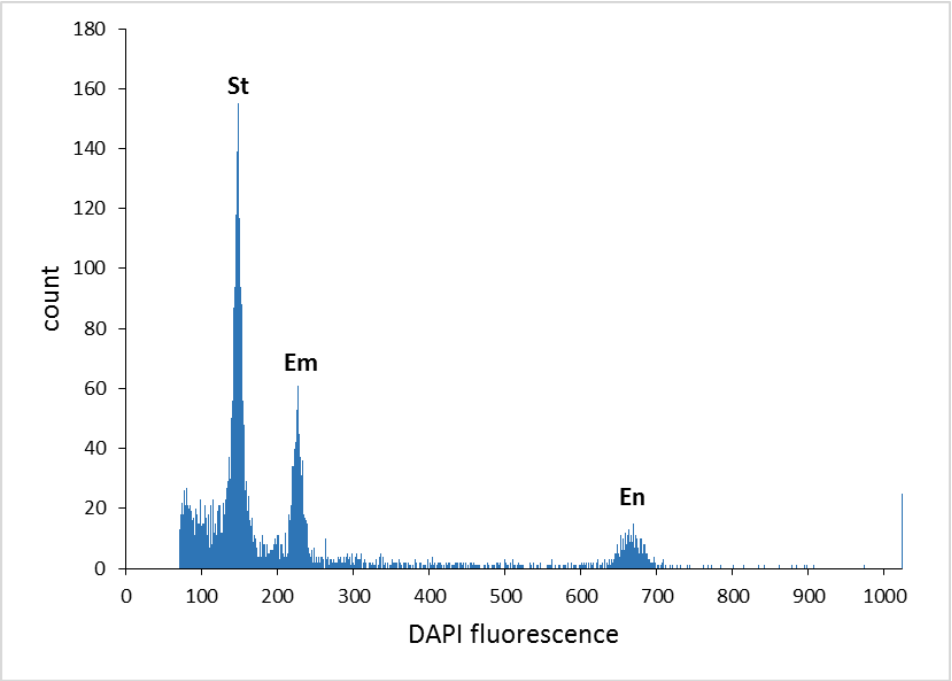

Fig. 13: FCSS histogram of *Stipa splendens*, one seed with a standard (St – *Bellis perennis*) was measured. Peaks of embryo (Em) and endosperm (En) are in ratio 2.95.

Table 3: Results of measuring of *Stipa splendens*. Information about locality is in first column, then information about number of seeds in samples and about used protocol is written (O – two-step protocol using Otto buffers, M – one step protocol using seed buffer). Ratio of embryo to standard (eventually fist embryo to second embryo) is in the next columns (bright-blue – lower genome size, bright-red – higher genome size, grey – 3x embryo). Ratios of endosperm to embryo are noted and finally way of reproduction is described (green – pseudogamy, blue – autonomy).

	locality	year	number of seeds in a sample	used protocol	embryo/standard	embryo 1/embryo 2	endosperm/embryo	endosperm 2/embryo	way of reproduction
Stipa splendens	K266	2014	3	O	×	1.48	2.48		pseudogamy, one reduced sperm cell
Stipa splendens	K266	2014	3	M	×		2.46	2.96	pseudogamy, one reduced sperm cell/one unreduced sperm cell or two reduced sperm cells
Stipa splendens	K266	2014	1	M	1.14		2.17		autonomy
Stipa splendens	K266	2014	1	M	1.18		2.52		pseudogamy, one reduced sperm cell
Stipa splendens	K266	2014	1	M	1.54		2.95		pseudogamy, one unreduced sperm cell or two reduced sperm cells
Stipa splendens	K266	2014	1	M	1.46		2.54		pseudogamy, one reduced sperm cell
Stipa splendens	K266	2014	1	M	1.12		2.60		pseudogamy, one reduced sperm cell
Stipa splendens	K266	2014	1	M	×		2.49		pseudogamy, one reduced sperm cell
Stipa splendens	K266	2014	1	M	×		2.11		autonomy

All measured samples provide us big dataset to calculate ratio of endosperm nuclei count to embryo nuclei count. The results for families were registered in Table 4 with minimal and maximal values occurring in the families. Complete data about individual species and families are attached in Supplements – Table 4.

Table 4: Percentage of endosperm in seeds were calculated for each family. The calculation is based on count of nuclei of embryo and endosperm. Minimal and maximal values are showed.

family	average of family	min. of family	max. of family		family	average of family	min. of family	max. of family
Alliaceae	**50.98**	18.63	84.52		Juncaceae	**33.92**	23.79	43.81
Amaranthaceae	×	×	×		Lamiaceae	**15.98**	5.31	65.30
Apiaceae	**77.14**	46.59	92.14		Morinaceae	**71.86**	71.86	71.86
Apocynaceae	**41.63**	34.91	52.46		Onagraceae	×	×	×
Asteraceae	**15.01**	4.36	42.88		Orobanchaceae	**41.91**	20.18	59.26
Balsamiaceae	**7.89**	2.55	13.22		Papaveraceae	**95.06**	92.44	97.68
Biebersteiniaceae	**23.75**	2.70	47.53		Plantaginaceae	**46.41**	17.99	85.94
Boraginaceae	**10.43**	5.54	21.19		Plumbaginaceae	×	×	×
Brassicaceae	**15.07**	1.86	65.20		Poaceae	**37.59**	10.03	70.28
Capparaceae	**21.43**	18.65	25.63		Polygonaceae	**39.23**	12.25	72.95
Caprifoliaceae	**80.47**	68.74	87.41		Primulaceae	**69.81**	61.25	78.10
Caryophyllaceae	**9.78**	2.17	24.63		Ranunculaceae	**67.82**	7.11	97.54
Crassulaceae	**87.54**	87.54	87.54		Rhamnaceae	**32.34**	31.47	33.21
Cuscutaceae	**23.08**	23.08	23.08		Rosaceae	**7.89**	0.50	24.92
Cyperaceae	**49.58**	32.78	71.85		Rubiaceae	**40.87**	23.29	58.31
Euphorbiaceae	**60.21**	44.99	68.03		Salicaceae	×	×	×
Fabaceae	**7.93**	1.28	14.63		Saxifragaceae	**77.09**	65.66	87.80
Fumariaceae	**64.45**	36.59	87.46		Scrophulariaceae	**42.09**	11.71	59.19
Gentianaceae	**80.77**	73.44	86.49		Solanaceae	**42.94**	40.83	45.52
Geraniaceae	×	×	×		Tamaricaceae	×	×	×
Grossulariaceae	**85.27**	84.54	85.99		Urticaceae	**48.82**	34.22	71.22
Chenopodiaceae	**3.17**	2.05	4.65		Valerianaceae	**9.50**	8.04	11.67
Iridaceae	**82.96**	82.96	82.96					

Discussion

In our sampling just 9 apomictic species were discovered from total 232 measured species. Among the apomicts belong five species of the genus *Potentilla*, specifically *Potentilla gelida*, *Potentilla pamirica*, *Potentilla sericea*, *Potentilla sojakii* and *Potentilla venusta*, other apomictic species were *Biebersteinia odora*, *Poa attenuata*, *Ranunculus membranaceus*, and *Stipa splendens*.

Potentilla spp.

In the genus *Potentilla* was described many well-known apomictic species, in c. 20 *Potentilla* species were discovered elements of apomixis (Dobes et al. 2015). However, study of apomixis in this genus has its limits. The first is caused by nearly undetectable endosperm tissue (Corner, 1976; Martin, 1945), sometimes the endosperm is missing completely (Kalkman, 2004). Also in our samples 20 from 39 samples were without detectable endosperm tissue (Table 1 - Supplements).

The second obstacle can arose by deviation from standard eight nuclei in embryo-sac, there was for example observed a five-nucleate embryo-sac (Eriksen and Fredrikson 2000). In such obscure embryo-sac might be easy developed just one polar nucleus which would make different ploidy of endosperm. The case of only one polar nucleus involved in endosperm was observed by Dobes et al. (2015) in *Potentilla indica*, where histograms from flow cytometer showed regular sexuality, however, an AFLP analysis of progeny revealed an apomictic origin of seeds.

Because of these limitations of cytometric method, there should be more profitable to use also traditional methods beside the cytometry. Microdissections of ovules or the AFLP method mentioned above should give us more proper information about reproduction systems of *Potentilla* spp.

In our dataset, one sample of *P. gelida* showed an apomictic seed with endosperm/embryo ratio 2.64 which mean that the central cell was fertilised by one reduced sperm cell. However, all other seeds show ratio closer 3 which indicates fertilisation of endosperm by one unreduced sperm cell or two reduced sperm cells. Because majority of seeds show ratio 6/2, there is also possibility that the first mentioned sample with lower ratio was fertilised in the same way – it means two reduced sperm cells (or one unreduced sperm cell) were involved in endosperm. In this case, the pollen would come from a plant with smaller genome size, consequently the sperm cells would have also smaller genome size and the ratio

would be closer to the 5/2. This alternate is known in *Sorbus* spp. (P. Koutecký, personal communication).

Four from five *Potentilla* species from Ladakh, which showed apomictic reproduction, had ratio of endosperm/embryo close 3. This result suggests pseudogamy with fertilisation of central cell by one unreduced sperm cell, or by two reduced sperm cells. The second possible way is more probable because from former studies results that pollen of *Potentilla* is almost exclusively reduced (Müntzing, 1928; Rutishauser, 1943; Asker, 1970b, 1985). Moreover, this type of endosperm fertilisation was a few times observed in Rosaceae (Talent and Dickinson 2007a, b). In this regard, the apomictic *Potentilla* species might 1) involve two sperm cells in endosperm formation, 2) be exceptions creating unreduced pollen, or 3) have the pollen (used to endosperm fertilisation) from another related species with twice as big genome size as the studied species, which would be a case well describer by Asker and Jerling (1992). An embryological study or pollen study of the locality might shed light on the problem.

According to the theory of broader distribution of apomicts in extreme mountain conditions, these species should have none or less apomictic relatives in lower elevations compared to mountains. We have measured 9 species of *Potentilla*, 5 of them were apomictic. Complex summary of reproduction systems of *Potentilla* was presented by Dobes et al. (2015). They studied 22 series of the genus *Potentilla*, for 14 series was confirmed apomixis, in 10 out of this 14 series sexuality co-occurred. The apomictic series becomes exclusively from phylogenetically young core *Potentilla*. Authors of the study also compare numbers of sexual and apomictic species for individual continents and the result shows always equally representation of both reproduction systems.

In Dobes et al. (2015) were studied also two of *Potentilla* spp. which occurred also in our sampling. *P. venusta* revealed origin of parthenogenetic embryo in all examined seeds, which means twice, and in *P. multifida* was discovered 18 apomictic embryo-sacs and seven parthenogenetic embryos. Unfortunately, all used material came from botanical gardens, from Germany and from Vancouver, Canada, so we cannot compare our samples with data collected in nature.

In a study from Western Himalayas by Rani et al. (2012), where abnormality in meiosis were investigated, was found ten from fourteen studied species able to perform an abnormal meiosis. Among the studied species was *Potentilla gelida* (a species involved in our samples) which showed meiotic abnormality in one from two studied localities. Abnormality occur in population in 3500 m a. s. l., the second studied population was situated in 3100 m a. s. l. Another study from Indian Himalayas (Jeelani et al. 2012) studied *Potentilla sericea* which

showed polyploidy, however, no meiotic abnormalities occurred. There are no studies concerning any aspects of cytology and even nearly no aspects of phylogeny of species *P. bifurca*, *P. evestita*, *P. pamirica*, *P. sojakii* or *P. turczaninowiana*. Just *P. bifurca* was involved in a phylogenetic study which placed the species outside core *Potentilla* (Eriksson et al. 1998). This result should predict that *P. bifurca* would not be able to reproduce by apomixis, which was confirmed by our outcome.

Poaceae

The family Poaceae is also known for apomictic species. Moreover, the family Poaceae with Rosaceae and Asteraceae make 75 % of all known apomictic plants (Richards 1997). In our data set, 15 species of Poaceae occur, from which is one apomictic species of the genus *Poa* (namely *Poa attenuata*) and one species of the genus *Stipa* (*Stipa splendens*).

Poa attenuata have the ratio of endosperm/embryo determined as 5/2. The ratio says that in the endosperm was involved just one reduced sperm cell. As was mentioned, genus *Poa* is well-known apomict and it is largely studied. In a study by Kelley et al. (2009), there were summarised data of reproduction systems from 34 species of *Poa*, in 20 of these species evolved apomixis. Majority of the species are facultative apomicts, in some cases, however, was not observed sexuality yet. Most of the apomicts were pseudogamous, however, there were observed also three *Poa* spp. showing autonomous endosperm. In the study was also tested *Poa attenuata* (collected on the north side of Ťan-Šan, in 1200 m a. s. l.) and our outcome confirms their result which show pseudogamous apomixis with endosperm/embryo ratio 5/2.

The case of *Stipa splendens* is more unique. There is no reported apomixis in *Stipa* (Chapman 1990), however, our samples showed more different types of apomictic reproduction systems and also different ploidy of embryos. We discovered two types of pseudogamous apomixis, the first with endosperm/embryo ratio 5/2 and the second with ratio 6/2. The ratio 5/2 is probably caused by involving one reduced sperm cell in an endosperm. As mentioned in the Results part, the ratio 6/2 can be explained by involving two sperm cells in endosperm, or there was a producer of unreduced pollen in the population. There is no evidence that in Poaceae fertilisation of central cell by two sperm cells can occur, however, Talent and Dickinson (2007) suggest the same way of endosperm fertilisation in *Paspalum* (Poaceae). Although apomixis in *Stipa* was not documented yet, more types of apomixis in one species of Poaceae family were described. Kelley et al. (2009) documented both

pseudogamous ratios in *Poa nemoralis* with the ratio 6/2 explained by an unreduced sperm cell.

Our data revealed also two samples of *Stipa splendens* with autonomous endosperm (peaks ratios were 2.1 and 2.17). A case of presence of both autonomous and pseudogamous endosperms in one species was described in *Poa nervosa* (Kelley et al. 2009); however, this co-existence of two different types of apomixis is very rare.

Our measurement revealed two different genome sizes of embryos, and moreover, a 3x embryo was discovered (Table 3). This embryo arose probably by sexual-like fertilisation of unreduced embryo-sac by reduced pollen. Comparison of mother plant genome size would confirm this theory.

Ranunculus membranaceus

In the genus *Ranunculus* is well documented and largely studied *Ranunculus auricomus* complex (Nogler 1984a). It is one of the first described apomictic species. *Ranunculus auricomus* is facultative apomictic species. All diploid individuals are sexual without any exceptions (Nogler 1984a; Horandl 2008), however, hexaploid individuals are pseudogamous, and tetraploids can perform pseudogamous apomixis and also sexuality (Horandl and Greilhuber 2002).

The *Ranunculus auricomus* complex has wide distribution from arctic zone to Mediterranean region, from Europe to western Siberia, in Greenland and Alaska (Jalas and Suominen 1989). The complex inhabited very different localities from natural forest to wetlands, meadows and disturbed areas (Horandl et al. 2009). Its distribution reaches also to European Alps and Carpathians (Horandl 2008).

All individuals collected from one population in Ladakh show pseudogamous apomixis with ratio 6/2 which should originate by involving two sperm cells in endosperm. This type of endosperm fertilisation was in *Ranunculus auricomus* many times suggested (Nogler 1984b; Horandl et al. 2008; Talent and Dickinson 2007).

Phylogeny of the genus *Ranunculus* was performed by Horandl et al. (2005) and Paun et al. (2005). The studies revealed that the *Ranunculus auricomus* complex is not monophyletic. However, Horandl et al. (2005) show in the study that *R. membranaceus* is with high bootstrap/PP support sister to the clade containing species of *R. auricomus* complex. The affinity to the apomictic complex should be an explanation of presence of apomixis in the species.

Because there it has been proved that in the genus *Ranunculus* does exist just polyploid apomictic species, it might be very interesting to know ploidy level of *R. membranaceus*. Also comparing ploidy level with reproduction systems in other localities of *R. membranaceus* should be useful and should extend our knowledge about apomictic *Ranunculus* spp.

Biebersteinia odora

The genus *Biebersteinia* contains 5 species distributed from Greek mountains to central Asia (Knuth 1912; Muellner 2011; The Plant List 2013). *Biebersteinia odora* is a species bounded to high mountains of Asia, namely western Himalaya, Pamir, Karakoram, Alatau, Tien Shan and Altai (Muellner et al. 2007). The genus *Biebersteinia* is the only genus belonging to family Biebersteiniaceae, order Sapindales (Muellner et al. 2007; Yamamoto et al. 2014). Biology and ecology of *Biebersteinia odora* is poorly studied, while its European relatives *B. multifida* and *B. orphanidis* are under investigation because of high content of secondary metabolites (e. g. Fakir et al. 2011; Javidnia et al. 2010; Monsef-Esfahani et al. 2013; Nabavi et al. 2010).

Biebersteinia odora was the last apomictic species revealed in Ladakh. The seeds were collected in three different localities, from two of them were collected also samples of leaves to determine genome size of mother plants. The results show stable ratio of mother plant genome size to standard (2.7 – 3), however, the ratio of embryo to standard vary (Table 3 - Supplement). In the first population (the population without knowledge of mother plant genome size), differences between genome sizes of embryos were highest. Seeds with ratio of embryo to standard between 2.7 and 3 were classified as 2x with the same genome size as the mother plants. If the ratio have double value (5.5 to 5.7), the embryo was determined as 4x. This doubled ploidy occurred in two cases. Considering that both seeds probably came from 2x mother plant, they had to get through polyploidisation by chromosome doubling (Asker and Jerling 1992). Both of them showed autonomous apomixis, however, the ratio 4/2 could arise by another way. Degradation of one of the central cell nuclei would provide conditions to creation 4/2 ratio; this phenomenon was observed by Nogler (1984b). In such case, the central cell would be just 2x, and then, fertilisation of one 2x or two 1xsperm cell would create ratio 4/2

The ratios between 2x and 4x (ratio to standard was 3.4 – 4) also occur in *Biebersteinia odora*. It could could be explained by 3x-near mother plant. Nevertheless, these 3x-near embryos originated on one mother plant together with seeds containing 2x or even 4x embryos,

therefore the mother plant would be probably 2x. Fertilisation of egg cell by reduced sperm cell is the only explanation of origin of 3x embryo on 2x mother plant. However, the endosperm/embryo ratio do not indicate sexual way of reproduction. Therefore, probable explanation is fertilisation of unreduced egg cell by 1x sperm cell (creating 3x embryo) and simultaneously fertilisation of unreduced central nucleus by two unreduced sperm cells (this way of fertilisation by two pollen grains was observed on *Sorbus* spp. – P. Koutecký, personal communication).

In the two populations for which we have information about mother plant genome size, there were observed mainly embryos with the same genome size as mother plants (ratio to standard was 2.7 – 3). One embryo was 4x (ratio to standard 5.57); it originated by fertilisation of unreduced embryo-sac by unreduced sperm cells. Origin of such seeds is well-known and quite rare phenomenon. Sexual double fertilisation of unreduced embryo-sac was firstly described by Rutishauer (1948), who named the newly created embryo as "BIII hybrids" (the same phenomenon was called "U-hybrids" by Asker 1977). The embryos are usually formed as 2n+n hybrids and, rarely, as 2n+2n hybrids (Harlan and Dewet 1975).

One 3x embryo also occurred in our dataset (ratio to standard 4.23); it probably originated via fertilisation by three sperm cells as described above.

Between measured seed occurred cases which cannot be explained by any of used formulas although the seeds were 2x. Involvement of one or two 3x sperm cells in endosperm is the most probable explanation. None of the measured mother plants was 3x, all of them had similar genome size, however, 3x embryos were founded in two from three populations, and therefore we can suppose existence of 3x plants in populations.

Unresolved analyses

Also some unresolved cases occurred in our analyses. These had ratio different from determined limits of endosperm/embryo, or showed apomictic ratio of peaks combined with sexuality or unclear reproduction systems.

The case of lower ratio than 1.35 (which is lower limit of sexuality, see Table 1) occurred in one of two samples of *Bistorta affinis*. An analysis of this sample was visibly full of background noise. Although the peaks were clearly obvious, the analysis was influenced by the background noise and the signal was garbled. Because the ratio was near the lower limit of sexual seed ratio, and because the second measured sample showed sexuality, the sample might be also sexual.

Different cases are samples with ratio between upper limit of sexual ratio (1.65) and lower limit of autonomous ratio (1.8) which showed one sample of *Carex borii*, two samples of *Carex nivalis* from different populations, three samples of *Carex sp.* (from locality K313), one sample of *Carex stenocarpa*, one sample of *Comarum salesovianum*, one sample of *Conioselinum vaginatum* and finally one sample of *Thalictrum alpinum*.

Analyses of *Carex borii* (Fig. 14) were full of background noise, moreover, the other two analyses of the species could not be analysed at all because of the background noise. However, the peaks ratio was much more nearer to ratio of sexuality. *Carex stenocarpa* showed endosperm/embryo ratio near to ratio of sexuality, moreover, the second measured sample of this species was definitely sexual. Therefore, sexuality of both of the samples is most probable.

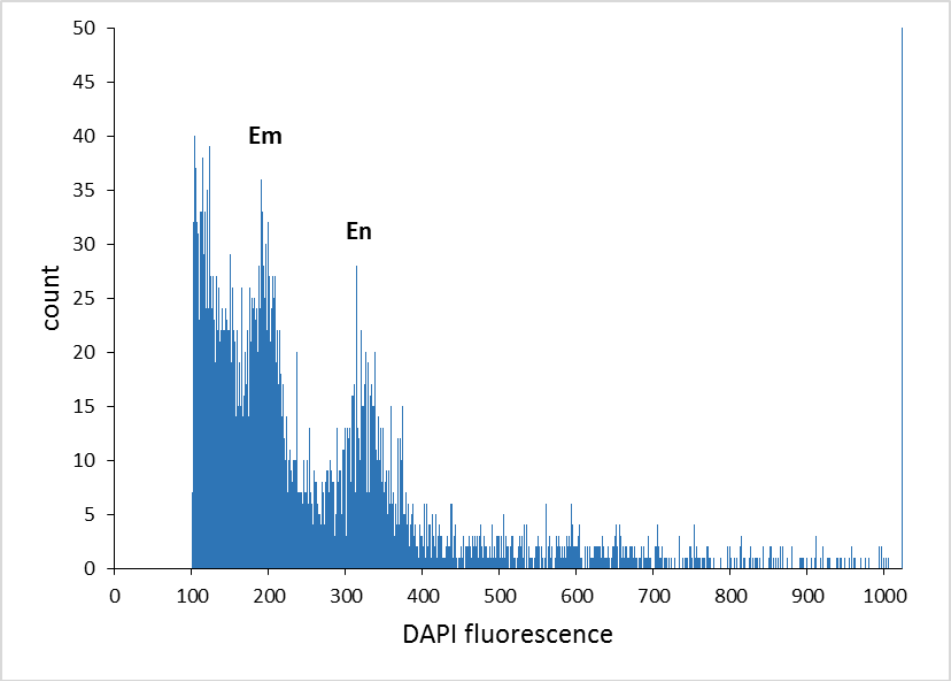

Fig. 14: FCSS histogram of *Carex borii* with a peaks ratio 1.68 (near the ratio of sexuality). Em = embryo nuclei, En = endosperm nuclei.

Other unresolved species of *Carex* had the peak ratios higher and more unclear. In the case of *Carex nivalis*, from four analyses two were unresolved, one showing sexuality and one showing even autonomous apomixis (Fig. 15). However, in all analyses occurred strong background noise and there is certain possibility that the second peak is caused by polyploidisation in embryo. Then, the endosperm peak would not be visible at all. In family Cyperaceae were not described any apomictic species yet, just “vegetative apomixis” or

pseudo-vivpary is known (Gordon-Gray et al. 2009), however, this type of vegetative reproduction is far from agamospermy. Therefore we cannot uniquely determine the reproductive system of this species. A similar situation arose in *Carex sp.* where three unresolved analyses and one autonomous apomixis occurred. All histograms were, however, stigmatise by strong background noise too.

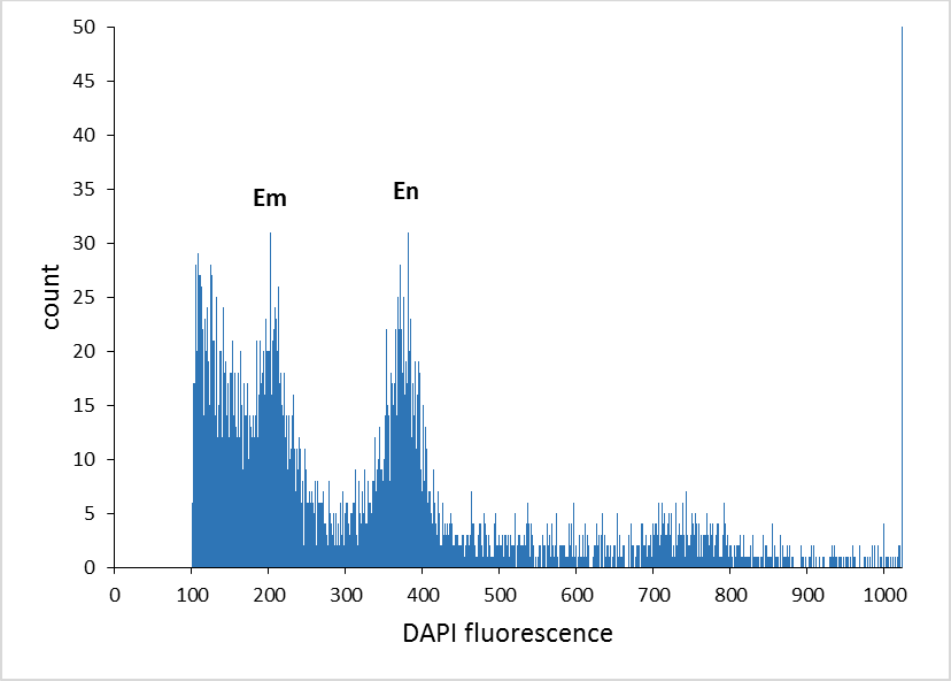

Fig. 15: FCSS histogram of *Carex nivalis* with a peaks ratio 1.86 (showing autonomous apomixis or endopolyploidy of embryo). Em = embryo nuclei, En = endosperm (or also embryo) nuclei.

The analysis of *Comarum salesovianum* was clearer than the analyses of *Carex* spp. However, the peaks show ratio 1.79 which is not enough high to consider the sample as apomictic. Because the other four samples were clearly sexual, this sample was probably also sexual with some shift in ploidy of endosperm. The same problem happened in a sample of *Conioselinum vaginatum* where one unresolved analysis (with peaks ratio 1.68) and three analyses showing sexuality were observed.

The last case of an unresolved analysis occurred in *Thalictrum alpinum* (with peaks ratio 1.77). Two analyses were performed, however, the first was unavailable because of strong background noise, and the second had less background noise but still enough to garble the signal. Because only one analysis of relative species (*Thalictrum foetidum*) was performed, *Thalictrum alpinum* would be probably sexual as well as *Thalictrum foetidum*.

Apomixis in high elevations

To sum up the previous section and draw a conclusion from our results, five genera from four families showed apomixis in our measurement. Most representatives were found in the genus *Potentilla*. Five from nine *Potentilla* spp. in our dataset revealed apomixis. In three of these species was apomixis (or predisposition for apomixis) already known, in one species was not tested. Contrary, *P. multifida*, which is known as an apomictic species, showed sexuality in our measurement.

In genera *Poa* and *Ranunculus*, there are also well-known apomicts. Though *Stipa splendens* have no apomictic relatives in genus, it belongs to family Poaceae which is known for apomixis. *Biebersteinia odora* is the only known apomict in its family, but it is just consequence of missing data within Biebersteiniaceae from this branch of science.

Unfortunately, most of the apomictic species from Ladakh were not tested for apomixis yet, so we cannot compare reproduction systems within species in different altitudinal conditions. Nevertheless, we know that some of the known apomictic species grown in lower elevations or in cultivation in botanical garden. In contrast, apomictic *P. multifida* was collected in botanical garden while samples of sexual *P. multifida* came from Ladakh.

All these facts are showing that apomixis is bound to specific genera and families, which indicates that apomixis is dependent on taxonomical relationships and higher elevation have no little impact on its establishment. This result is supported by very low number of apomictic species which arose from our sampling. If the apomixis were more frequent in higher elevation, the number of apomictic plant should be much higher. Moreover, independence of reproduction system on altitude was demonstrated by the fact that *P. multifida* from our sampling was sexual, despite of the result from former study which reveal apomixis in the species (Dobes et al. 2015).

Percentage of endosperm in seeds

Table 4 (Supplement) shows percentage of endosperm in all measured species and average for families. The percentage within individual species is quite uniform, however, results for families show big dispersion between values. Nevertheless, whether the endosperm is below or above 50% is mostly consistent. This summary of endosperm percentage in seeds across families could be a useful tool for those who will be concerned with seed screening by flow cytometry.

Conclusion

Data obtained from samples collected in Ladakh revealed nine apomictic species from total 232 collected species. Autonomous apomixis was observed in *Biebersteinia odora* and *Stipa splendens*; data show autonomy in *Carex nivalis* and *Carex sp.* (from locality 313), however, this result might by garbled and therefore unconfirmed. Pseudogamous apomixis was more widespread; it appears in *Biebersteinia odora*, *Poa attenuata*, *Stipa splendens*, *Ranunculus membranaceus* and all apomictic *Potentilla* spp.

Among the nine apomictic species, three species were already described as apomictic (*Potentilla gelida*, *P. venusta*, *Poa attenuata*). Most of the apomictic species were not investigated through apomixis yet, therefore we cannot say whether there is some diversity between reproduction systems in different geographical conditions within the species. Nevertheless, in genera *Potentilla*, *Poa* and *Ranunculus* are well-known apomicts. Just *Stipa splendendens* and *Biebersteinia odora* have no related apomicts, in *Stipa* spp. apomixis was not documented, in *Biebersteinia* spp. was not investigated at all. Nevertheless, *Stipa* spp. belong to family Poaceae which is well-known for apomixis.

With these results, we can say that apomicts from Ladakh mostly occur in genera with already known apomictic species, which can lead to negation of the theory higher incidence of apomicts in high mountains and can reflect only tendency to apomixis within individual taxonomical lineages.

Results of ratio of endosperm nuclei in seeds showed that 6 from 45 families have undetectable endosperm. In the other families appear certain trends which show whether the endosperm is rather smaller or bigger than embryo.

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Supplements

Table 1

Summary of all measured samples. In each row is family of the species; name of species; locality number of seeds collection; year of collection; number of seeds used per sample; protocol used for measuring (O – two step protocol using Otto buffers, M – one step protocol using seed buffer); ratio of endosperm/embryo; type of reproduction; count of nuclei of embryo; count of nuclei of endosperm; percentage of endosperm nuclei occurred in a sample; average of percentage of endosperm nuclei for species and family; minimal and maximal value of percentage of endosperm nuclei occurring in the family. Blue rows indicate samples with only one detectable tissue; red rows indicate samples unmeasurable because of background noise. Yellow signals sexual reproduction (sex), green signals apomictic reproduction (pseudogam / autonom), orange signals uncertain reproduction system (?).

family	species	locality	year	count of seeds in a sample	used protocol	endosperm/embryo	reproduction systém	nuclei count of embryo	nuclei count of endosperm	% of endosperm	average of species	average of family	min. of family	max. of family
Alliaceae	*Allium przewalskianum*	45	2013	3	M	1.42	sex	2616	599	18.63	24.17	50.98	18.63	84.52
Alliaceae	*Allium przewalskianum*	45	2013	3	M	1.42	sex	2440	968	28.40				
Alliaceae	*Allium przewalskianum*	45	2013	4	M	1.43	sex	2550	872	25.48				
Alliaceae	*Allium stoliczkae*	18	2013	3	O	1.51	sex	560	1403	71.47	77.78			
Alliaceae	*Allium stoliczkae*	18	2013	3	O	1.48	sex	500	2731	84.52				
Alliaceae	*Allium stoliczkae*	18	2013	4	O	1.52	sex	646	2205	77.34				
Amaranthaceae	*Salsola jacquemontii*	K363	2014	3	M	×	?	3494	0	×	×	×	×	×
Amaranthaceae	*Salsola jacquemontii*	K363	2014	3	M	×	?	3758	0	×				
Amaranthaceae	*Salsola jacquemontii*	K363	2014	3	M	×	?	3425	0	×				
Apiaceae	*Bupleurum gracilimum*	K271	2014	3	M	1.64	sex	406	3468	89.52	80.14	77.14	46.59	92.14
Apiaceae	*Bupleurum gracilimum*	K271	2014	3	M	1.56	sex	732	2388	76.54				
Apiaceae	*Bupleurum gracillimum*	K271	2014	3	O	1.50	sex	529	1535	74.37				
Apiaceae	*Conioselinum vaginatum*	K257	2014	3	M	1.50	sex	3024	2638	46.59	57.40			
Apiaceae	*Conioselinum vaginatum*	K257	2014	3	O	1.68	?	409	2607	86.44				
Apiaceae	*Conioselinum vaginatum*	K257	2014	3	M	1.49	sex	3966	3703	48.29				
Apiaceae	*Conioselinum vaginatum*	K257	2014	4	M	1.53	sex	3971	3706	48.27				
Apiaceae	*Heracleum pinnatum*	K260	2014	3	M	×	?	0	3196	×	76.06			
Apiaceae	*Heracleum pinnatum*	K260	2014	3	M	×	?	0	3450	×				
Apiaceae	*Heracleum pinnatum*	31	2013	4	M	×	?	0	0	×				
Apiaceae	*Heracleum pinnatum*	31	2013	3	M	1.44	sex	665	2684	80.14				
Apiaceae	*Heracleum pinnatum*	31	2013	4	M									
Apiaceae	*Heracleum pinnatum*	31	2013	3	M	1.64	sex	506	2801	84.70				
Apiaceae	*Heracleum pinnatum*	31	2013	3	M	1.52	sex	1062	1168	52.38				
Apiaceae	*Heracleum pinnatum*	K260	2014	3	M	1.47	sex	342	2289	87.00				
Apiaceae	*Pleurospermum lindleyanum*	K235	2014	3	O	1.58	sex	514	2255	81.44	81.05			
Apiaceae	*Pleurospermum lindleyanum*	K235	2014	3	O	1.62	sex	625	2607	80.66				
Apiaceae	*Semenovia lasiocarpa*	K248	2014	2	O	1.56	sex	290	3399	92.14	91.04			
Apiaceae	*Semenovia lasiocarpa*	K248	2014	2	O									
Apiaceae	*Semenovia lasiocarpa*	K248	2014	2	O	1.56	sex	304	3528	92.07				
Apiaceae	*Semenovia lasiocarpa*	K248	2014	2	O	1.59	sex	434	3481	88.91				
Apiaceae	*Semenovia millefolia*	8	2013	3	O	×	?	3315	0	×	×			
Apocynaceae	*Cynanchum acutum*	K254	2014	3	M	1.52	sex	2245	1204	34.91	41.63	41.63	34.91	52.46
Apocynaceae	*Cynanchum acutum*	K254	2014	3	O	1.49	sex	1382	767	35.69				
Apocynaceae	*Cynanchum acutum*	K254	2014	3	O	1.45	sex	735	811	52.46				
Apocynaceae	*Cynanchum acutum*	K254	2014	4	O	1.45	sex	660	507	43.44				
Asteraceae	*Anaphalis nubigena*	K234	2014	5	O	1.49	sex	1058	690	39.47	35.09	15.01	4.36	42.88
Asteraceae	*Anaphalis nubigena*	K234	2014	5	O	1.44	sex	1618	887	35.41				
Asteraceae	*Anaphalis nubigena*	K234	2014	5	O	1.46	sex	1503	656	30.38				
Asteraceae	*Anthemis sp.*	K264	2014	3	O	1.49	sex	3442	250	6.77	11.27			
Asteraceae	*Anthemis sp.*	K264	2014	3	O	1.47	sex	2703	420	13.45				
Asteraceae	*Anthemis sp.*	K264	2014	4	O	1.49	sex	2806	441	13.58				
Asteraceae	*Artemisia demissa*	75	2013	3	O	1.51	sex	2190	341	13.47	12.10			
Asteraceae	*Artemisia demissa*	75	2013	3	O	1.51	sex	2058	269	11.56				
Asteraceae	*Artemisia demissa*	75	2013	3	O	1.52	sex	2274	289	11.28				

Asteraceae	*Artemisia hedinii*		2013	4	O	×	?	1650	0	×	11.21
Asteraceae	*Artemisia hedinii*		2013	3	O	1.49	sex	1876	262	12.25	
Asteraceae	*Artemisia hedinii*		2013	3	O	1.51	sex	2335	264	10.16	
Asteraceae	*Artemisia minor*	51	2013	3	M	1.51	sex	3642	166	4.36	4.74
Asteraceae	*Artemisia minor*	51	2013	3	M	1.53	sex	3697	198	5.08	
Asteraceae	*Artemisia minor*	51	2013	4	M	1.52	sex	2791	140	4.78	
Asteraceae	*Artemisia moorcroftiana*	75	2013	3	O	1.49	sex	2180	347	13.73	13.91
Asteraceae	*Artemisia moorcroftiana*	75	2013	3	O	1.49	sex	2098	407	16.25	
Asteraceae	*Artemisia moorcroftiana*	75	2013	4	O	1.50	sex	2201	293	11.75	
Asteraceae	*Artemisia santolinifolia*	74	2013	2	O	×	?	1789	0	×	25.06
Asteraceae	*Artemisia santolinifolia*	74	2013	3	O	1.48	sex	702	465	39.85	
Asteraceae	*Artemisia santolinifolia*	74	2013	2	O	1.50	sex	2562	318	11.04	
Asteraceae	*Artemisia santolinifolia*	74	2013	2	O	1.43	sex	877	414	32.07	
Asteraceae	*Artemisia santolinifolia*	74	2013	2	O	1.48	sex	1521	482	24.06	
Asteraceae	*Artemisia santolinifolia*	74	2013	2	O	1.48	sex	1867	417	18.26	
Asteraceae	*Artemisia stracheyi*	74	2013	3	O	1.47	sex	2179	360	14.18	14.85
Asteraceae	*Artemisia stracheyi*	74	2013	3	O	1.48	sex	2206	395	15.19	
Asteraceae	*Artemisia stracheyi*	74	2013	3	O	1.49	sex	2028	363	15.18	
Asteraceae	*Askellia naniformis*	K282	2014	3	O	1.45	sex	2579	487	15.88	13.74
Asteraceae	*Askellia naniformis*	K282	2014	3	O	1.45	sex	2876	377	11.59	
Asteraceae	*Aster flaccidus*	K235	2014	3	O	1.45	sex	2157	439	16.91	18.11
Asteraceae	*Aster flaccidus*	K235	2014	5	O	1.48	sex	1566	399	20.31	
Asteraceae	*Aster flaccidus*	K235	2014	5	O	1.45	sex	1905	393	17.10	
Asteraceae	*Brachyactis roylei*	K231	2014	3	O	1.49	sex	1771	410	18.80	24.44
Asteraceae	*Brachyactis roylei*	K231	2014	3	O	1.48	sex	1244	934	42.88	
Asteraceae	*Brachyactis roylei*	K231	2014	4	O	1.47	sex	2260	298	11.65	
Asteraceae	*Cousinia thomsonii*	46	2013	3	O	1.43	sex	2869	467	14.00	11.43
Asteraceae	*Cousinia thomsonii*	46	2013	3	O	1.46	sex	2067	263	11.29	
Asteraceae	*Cousinia thomsonii*	46	2013	4	O	1.46	sex	2165	214	9.00	
Asteraceae	*Cremanthodium elisii*	8	2009	3	M	×	?	2765	0	×	27.93
Asteraceae	*Cremanthodium elisii*	8	2009	3	M	×	?	2833	0	×	
Asteraceae	*Cremanthodium elisii*	20	2013	3	O	×	?	272	0	×	
Asteraceae	*Cremanthodium elisii*	73	2013	3	O	1.46	sex	1989	671	25.23	
Asteraceae	*Cremanthodium elisii*	73	2013	3	O						
Asteraceae	*Cremanthodium elisii*	73	2013	4	O	1.49	sex	446	197	30.64	
Asteraceae	*Crepis flexuosa*	75	2013	3	M	1.49	sex	3821	384	9.13	8.76
Asteraceae	*Crepis flexuosa*	75	2013	3	M	1.52	sex	3753	359	8.73	
Asteraceae	*Crepis flexuosa*	75	2013	3	M	1.48	sex	3906	359	8.42	
Asteraceae	*Erigeron uniflorus*	K241	2014	5	O	1.46	sex	2212	353	13.76	12.22
Asteraceae	*Erigeron uniflorus*	K241	2014	5	O	1.45	sex	2177	284	11.54	
Asteraceae	*Erigeron uniflorus*	K241	2014	5	O	1.44	sex	2246	288	11.37	
Asteraceae	*Erigeron venustus*	K231	2014	5	O	1.50	sex	1932	539	21.81	28.99
Asteraceae	*Erigeron venustus*	K231	2014	5	O	1.43	sex	1359	1001	42.42	
Asteraceae	*Erigeron venustus*	K231	2014	5	O	1.49	sex	1360	613	31.07	
Asteraceae	*Erigeron venustus*	K231	2014	5	O	1.49	sex	1529	398	20.65	
Asteraceae	*Himalaiella albescens*	TR4	2013	3	O	1.48	sex	2562	457	15.14	14.02
Asteraceae	*Himalaiella albescens*	TR4	2013	3	O	1.48	sex	2803	325	10.39	
Asteraceae	*Himalaiella albescens*	TR4	2013	4	O	1.48	sex	2098	416	16.55	
Asteraceae	*Leontopodium leontopodinum*	K230	2014	10	O	1.46	sex	1706	353	17.14	20.51
Asteraceae	*Leontopodium leontopodinum*	K230	2014	5	O	1.44	sex	1903	597	23.88	
Asteraceae	*Psychrogeton andryaloides*	12	2013	3	O	1.50	sex	3101	334	9.72	8.88
Asteraceae	*Psychrogeton andryaloides*	12	2013	3	O	1.48	sex	3360	235	6.54	
Asteraceae	*Psychrogeton andryaloides*	12	2013	4	O	1.48	sex	3035	351	10.37	
Asteraceae	*Psychrogeton denudatus*	12	2013	3	O	1.50	sex	2927	377	11.41	13.00
Asteraceae	*Psychrogeton denudatus*	12	2013	3	O	1.48	sex	2138	424	16.55	
Asteraceae	*Psychrogeton denudatus*	12	2013	4	O	1.50	sex	2941	365	11.04	
Asteraceae	*Saussurea andryaloides*	K316	2014	3	M	1.46	sex	1595	389	19.61	19.61
Asteraceae	*Saussurea bracteata*	K317	2014	3	M	×	?	3419	0	×	×
Asteraceae	*Saussurea bracteata*	K317	2014	3	M	×	?	3514	0	×	
Asteraceae	*Saussurea glacialis*	70	2013	3	O	1.45	sex	2137	262	10.92	16.08
Asteraceae	*Saussurea glacialis*	70	2013	4	O	1.48	sex	2177	587	21.24	
Asteraceae	*Saussurea glacialis*	70	2013	2	M						
Asteraceae	*Saussurea glacialis*	70	2013	2	M						
Asteraceae	*Saussurea glandulifera*	72	2013	3	O	1.43	sex	2582	515	16.63	16.98
Asteraceae	*Saussurea glandulifera*	72	2013	3	O	1.43	sex	2698	566	17.34	
Asteraceae	*Saussurea gnaphaloides*	4	2009	2	M	×	?	6744	0	×	14.35
Asteraceae	*Saussurea gnaphaloides*	4	2009	2	M	×	?	7388	0	×	
Asteraceae	*Saussurea gnaphaloides*	4	2009	2	M	×	?	5578	0	×	
Asteraceae	*Saussurea gnaphaloides*	3	2013	3	O	1.48	sex	2698	562	17.24	
Asteraceae	*Saussurea gnaphaloides*	70	2013	3	O	1.47	sex	2583	474	15.51	
Asteraceae	*Saussurea gnaphaloides*	70	2013	3	O	1.45	sex	2457	215	8.05	
Asteraceae	*Saussurea gnaphaloides*	70	2013	4	O	1.48	sex	2071	413	16.63	
Asteraceae	*Saussurea hypsipeta*	5	2009	3	M	×	?	2816	0	×	6.95
Asteraceae	*Saussurea hypsipeta*	5	2009	1	M	×	?	3436	0	×	
Asteraceae	*Saussurea hypsipeta*	5	2009	1	M	×	?	4114	0	×	
Asteraceae	*Saussurea hypsipeta*	5	2009	1	M	×	?	2757	0	×	
Asteraceae	*Saussurea hypsipeta*	5	2009	1	M	×	?	3031	0	×	
Asteraceae	*Saussurea hypsipeta*	5	2009	3	M	1.39	sex	2635	161	5.76	
Asteraceae	*Saussurea hypsipeta*	5	2009	3	M	1.39	sex	3063	200	6.13	
Asteraceae	*Saussurea hypsipeta*	5	2009	1	M	1.41	sex	2611	257	8.96	
Asteraceae	*Saussurea jacea*	K268	2014	3	O	×	?	1424	0	×	×
Asteraceae	*Saussurea leontodontoides*	51	2013	3	O	1.49	sex	3115	373	10.69	12.39
Asteraceae	*Saussurea leontodontoides*	51	2013	3	O	1.47	sex	3215	412	11.36	

Asteraceae	*Saussurea leontodontoides*	51	2013	4	O	1.48	sex	2470	440	15.12				
Asteraceae	*Saussurea medusa*	71	2013	3	O	×	?	2732	0	×	×			
Asteraceae	*Saussurea medusa*	71	2013	3	O	×	?	2154	0	×				
Asteraceae	*Saussurea medusa*	71	2013	3	O	×	?	3196	0	×				
Asteraceae	*Saussurea schulzii*	K242	2014	3	M	×	?	954	0	×	×			
Asteraceae	*Saussurea schulzii*	K242	2014	5	O	×	?	1345	0	×				
Asteraceae	*Saussurea schulzii*	K242	2014	5	O	×	?	1592	0	×				
Asteraceae	*Scorzonera virgata*	K248	2014	3	O	1.49	sex	3444	365	9.58	10.32			
Asteraceae	*Scorzonera virgata*	K248	2014	3	O	1.49	sex	3203	507	13.67				
Asteraceae	*Scorzonera virgata*	K249	2014	3	O	1.49	sex	3368	325	8.80				
Asteraceae	*Scorzonera virgata*	K249	2014	3	O	1.49	sex	3447	351	9.24				
Asteraceae	*Senecio dubitabilis*	4	2013	3	O	1.47	sex	1729	564	24.60	18.64			
Asteraceae	*Senecio dubitabilis*	4	2013	4	O	1.47	sex	827	438	34.62				
Asteraceae	*Senecio dubitabilis*	K363	2014	3	M	×	?	2533	0	×				
Asteraceae	*Senecio dubitabilis*	K363	2014	3	M	1.47	sex	2831	314	9.98				
Asteraceae	*Senecio dubitabilis*	K363	2014	3	M	1.48	sex	3316	187	5.34				
Asteraceae	*Tanacetum fruticulosum*	75	2013	4	O	×	?	2415	0	×	8.50			
Asteraceae	*Tanacetum fruticulosum*	75	2013	3	O	1.51	sex	2655	275	9.39				
Asteraceae	*Tanacetum fruticulosum*	75	2013	3	O	1.52	sex	3438	283	7.61				
Asteraceae	*Tanacetum pyrethroides*	31	2013	3	O						×			
Asteraceae	*Tanacetum stoliczkae*	MK9	2013	3	O	1.40	sex	560	70	11.11	12.57			
Asteraceae	*Tanacetum stoliczkae*	MK9	2013	3	O	1.43	sex	1115	182	14.03				
Asteraceae	*Tragopogon gracilis*	K249	2014	3	O	1.42	sex	3163	233	6.86	5.90			
Asteraceae	*Tragopogon gracilis*	K249	2014	3	O	1.47	sex	3090	185	5.65				
Asteraceae	*Tragopogon gracilis*	K249	2014	4	O	1.46	sex	2864	157	5.20				
Asteraceae	*Waldheimia tridactylites*	4	2009	3	M	1.47	sex	3160	203	6.04	7.90			
Asteraceae	*Waldheimia tridactylites*	4	2009	3	M	1.46	sex	3077	179	5.50				
Asteraceae	*Waldheimia tridactylites*	4	2009	3	M	1.47	sex	3438	226	6.17				
Asteraceae	*Waldheimia tridactylites*	7	2009	3	M	1.44	sex	3621	289	7.39				
Asteraceae	*Waldheimia tridactylites*	7	2009	3	M	1.44	sex	3606	307	7.85				
Asteraceae	*Waldheimia tridactylites*	7	2009	3	M	1.44	sex	3595	277	7.15				
Asteraceae	*Waldheimia tridactylites*	70	2013	3	O	1.46	sex	2275	408	15.21				
Balsamiaceae	*Impatiens brachycentra*	TR15	2013	3	M	×	?	3101	0	×	7.89	7.89	2.55	13.22
Balsamiaceae	*Impatiens brachycentra*	TR15	2013	4	M	×	?	2459	0	×				
Balsamiaceae	*Impatiens brachycentra*	TR15	2013	3	M	1.46	sex	3932	103	2.55				
Balsamiaceae	*Impatiens brachycentra*	TR15	2013	3	O	1.43	sex	2284	348	13.22				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	3.89	pseudogam	1897	636	25.11	23.75	23.75	2.70	47.53
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	3.42	pseudogam	2280	610	21.11				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	2.46	pseudogam	2160	629	22.55				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	3.92	pseudogam	2487	590	19.17				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	2.98	pseudogam	2191	653	22.96				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	3.94	pseudogam	2148	297	12.15				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	3.92	pseudogam	2317	325	12.30				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	2.77	pseudogam	408	295	41.96				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	3.21	pseudogam	1372	799	36.80				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	2.93	pseudogam	1498	270	15.27				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	2.46	pseudogam	1779	646	26.64				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	2.81	pseudogam	1499	679	31.18				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	2.51	pseudogam	1555	659	29.77				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	2.06	autonom	1905	691	26.62				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	2.07	autonom	1708	614	26.44				
Biebersteiniaceae	*Biebersteinia odora*	25	2013	1	O	3.44	pseudogam	2166	500	18.75				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.41	pseudogam	1725	729	29.71				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	3	O	2.39	pseudogam	2138	713	25.01				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.48	pseudogam	2085	706	25.30				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.47	pseudogam	1912	703	26.88				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.46	pseudogam	1221	1008	45.22				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.43	pseudogam	1479	874	37.14				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.94	pseudogam	1991	607	23.36				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.90	pseudogam	2174	595	21.49				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	3.26	pseudogam	1956	480	19.70				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.43	pseudogam	2542	614	19.46				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.41	pseudogam	2506	621	19.86				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.40	pseudogam	2256	735	24.57				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.45	pseudogam	2915	684	19.01				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.46	pseudogam	2702	673	19.94				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	3.45	pseudogam	499	452	47.53				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.44	pseudogam	2397	738	23.54				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	1.49	sex	1293	965	42.74				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	4.69	pseudogam	2278	222	8.88				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.93	pseudogam	2219	682	23.51				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	3.25	pseudogam	1991	706	26.18				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.60	pseudogam	1951	543	21.77				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.45	pseudogam	2483	787	24.07				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.46	pseudogam	2099	1025	32.81				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	3.44	pseudogam	2259	555	19.72				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.46	pseudogam	2259	747	24.85				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.46	pseudogam	2278	820	26.47				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.43	pseudogam	2541	647	20.29				
Biebersteiniaceae	*Biebersteinia odora*	K227	2014	1	O	2.42	pseudogam	2247	686	23.39				
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.46	pseudogam	2643	650	19.74				
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.44	pseudogam	2564	864	25.20				
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.47	pseudogam	2433	804	24.84				
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.42	pseudogam	2327	122	4.98				

Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.44	pseudogam	1981	849	30.00					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.96	pseudogam	2545	493	16.23					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.46	pseudogam	1352	673	33.23					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.47	pseudogam	1955	651	24.98					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.47	pseudogam	2255	653	22.46					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	1.98	autonom	2015	56	2.70					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.94	pseudogam	2330	592	20.26					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.46	pseudogam	2290	775	25.29					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.90	pseudogam	1991	403	16.83					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	3.42	pseudogam	1845	713	27.87					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	3.34	pseudogam	1723	863	33.37					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	3.39	pseudogam	2216	661	22.98					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.44	pseudogam	2706	517	16.04					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.43	pseudogam	2653	619	18.92					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.47	pseudogam	2562	784	23.43					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.93	pseudogam	2871	588	17.00					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.46	pseudogam	2450	553	18.41					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.45	pseudogam	1995	682	25.48					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.46	pseudogam	1551	479	23.60					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.42	pseudogam	1864	529	22.11					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	2.47	pseudogam	2123	616	22.49					
Biebersteiniaceae	*Biebersteinia odora*	K285	2014	1	O	3.91	pseudogam	2285	332	12.69					
Boraginaceae	*Arnebia euchroma*	K257	2014	3	O	×	?	2971	0	×	×	10.43	5.54	21.19	
Boraginaceae	*Arnebia euchroma*	K257	2014	3	O	×	?	3027	0	×					
Boraginaceae	*Eritrichum fruticulosum*	9	2013	3	M	×	?	2488	0	×	×				
Boraginaceae	*Eritrichum fruticulosum*	9	2013	3	M	×	?	2630	0	×					
Boraginaceae	*Eritrichum hemisphaericum*	4	2009	2	M	×	?	1914	0	×	9.67				
Boraginaceae	*Eritrichum hemisphaericum*	4	2009	2	M	×	?	1695	0	×					
Boraginaceae	*Eritrichum hemisphaericum*	K333	2014	1	M	×	?	2251	0	×					
Boraginaceae	*Eritrichum hemisphaericum*	4	2009	2	M	1.57	sex	2204	236	9.67					
Boraginaceae	*Eritrichum hemisphaericum*	K333	2014	1	M										
Boraginaceae	*Eritrichum villosum*	K228	2014	5	O	×	?	1356	0	×	×				
Boraginaceae	*Eritrichum villosum*	K228	2014	1	M	×	?	1947	0	×					
Boraginaceae	*Eritrichum villosum*	K228	2014	3	M	×	?	2002	0	×					
Boraginaceae	*Eritrichum villosum*	K228	2014	1	M	×	?	1435	0	×					
Boraginaceae	*Lappula tadshikorum*	42	2013	3	O	×	?	1895	0	×	16.08				
Boraginaceae	*Lappula tadshikorum*	42	2013	1	O	1.50	sex	1662	447	21.19					
Boraginaceae	*Lappula tadshikorum*	42	2013	3	O	1.55	sex	2160	314	12.69					
Boraginaceae	*Lappula tadshikorum*	42	2013	3	O	1.53	sex	1971	330	14.34					
Boraginaceae	*Lindelofia stylosa*	10	2013	2	O	×	?	1801	0	×	×				
Boraginaceae	*Lindelofia stylosa*	10	2013	2	O	×	?	1416	0	×					
Boraginaceae	*Lindelofia stylosa*	10	2013	2	O	×	?	1550	0	×					
Boraginaceae	*Lindelofia stylosa*	10	2013	2	O	×	?	2107	0	×					
Boraginaceae	*Lindelofia stylosa*	10	2013	2	O	×	?	1301	0	×					
Boraginaceae	*Lindelofia anchusoides*	K231	2014	3	O	×	?	1943	0	×	5.54				
Boraginaceae	*Lindelofia anchusoides*	K231	2014	4	O	1.546391753	sex	2370	139	5.54					
Boraginaceae	*Lindelofia anchusoides*	K231	2014	3	O	×	?	2370	0	×					
Boraginaceae	*Matthiastrum himalayense*	K254	2014	3	M						×				
Boraginaceae	*Matthiastrum himalayense*	K254	2014	3	O										
Brassicaceae	*Alyssum canescens*	K341	2014	3	M	1.387254902	sex	2645	356	11.86	17.47	15.07	1.86	65.20	
Brassicaceae	*Alyssum canescens*	K341	2014	3	M	1.43	sex	2471	386	13.51					
Brassicaceae	*Alyssum canescens*	K341	2014	3	M	1.46	sex	1827	677	27.04					
Brassicaceae	*Aphragmus oxycarpus*	K239	2014	3	O	1.47	sex	925	281	23.30	23.30				
Brassicaceae	*Arabis paniculata*	K245	2014	5	O	×	?	1090	0	×	×				
Brassicaceae	*Arabis tibetica*	K234	2014	3	M	×	?	3006	0	×	×				
Brassicaceae	*Arabis tibetica*	K234	2014	3	M	×	?	1965	0	×					
Brassicaceae	*Arabis tibetica*	K234	2014	3	M	×	?	2131	0	×					
Brassicaceae	*Arabis tibetica*	K234	2014	5	O										
Brassicaceae	*Arabis tibetica*	K234	2014	5	O										
Brassicaceae	Brassicaceae	K281	2014	3	O	1.48	sex	211	286	57.55	57.55				
Brassicaceae	*Braya humilis*	75	2013	3	O	1.49	sex	2255	466	17.13	18.97				
Brassicaceae	*Braya humilis*	75	2013	3	O	1.48	sex	1992	593	22.94					
Brassicaceae	*Braya humilis*	75	2013	3	O	1.50	sex	1990	403	16.84					
Brassicaceae	*Conringia planisiliqua*	K256	2014	3	M	×	?	3604	0	×	×				
Brassicaceae	*Conringia planisiliqua*	K256	2014	3	M	×	?	632	0	×					
Brassicaceae	*Conringia planisiliqua*	K256	2014	3	M	×	?	1423	0	×					
Brassicaceae	*Conringia planisiliqua*	K256	2014	3	M	×	?	2011	0	×					
Brassicaceae	*Conringia planisiliqua*	K256	2014	3	O										
Brassicaceae	*Desideria himalaiensis*	6	2013	3	O	1.367924528	sex	1656	220	11.73	8.88				
Brassicaceae	*Desideria himalaiensis*	6	2013	3	O	1.47	sex	3317	191	5.44					
Brassicaceae	*Desideria himalaiensis*	6	2013	4	O	1.48	sex	2661	278	9.46					
Brassicaceae	*Desideria pumila*	764	2013	3	O	×	?	0	2167	×	18.96				
Brassicaceae	*Desideria pumila*	764	2013	3	O	1.51	sex	2839	491	14.74					
Brassicaceae	*Desideria pumila*	764	2013	4	O	1.49	sex	856	1604	65.20					
Brassicaceae	*Desideria pumila*	6	2009	3	M	1.48	sex	3728	186	4.75					
Brassicaceae	*Desideria pumila*	6	2009	3	M	1.45	sex	3745	184	4.68					
Brassicaceae	*Desideria pumila*	6	2009	3	M	1.47	sex	3528	202	5.42					
Brassicaceae	*Draba cachemirica*	18	2013	3	M	×	?	3040	0	×	10.79				
Brassicaceae	*Draba cachemirica*	18	2013	3	M	×	?	3390	0	×					
Brassicaceae	*Draba cachemirica*	18	2013	3	M	1.46	sex	3123	151	4.61					
Brassicaceae	*Draba cachemirica*	K236	2014	3	O	1.47	sex	1738	355	16.96					
Brassicaceae	*Draba lasiophylla*	K235	2014	3	M	×	?	1656	0	×	25.66				
Brassicaceae	*Draba lasiophylla*	K235	2014	3	M	×	?	2204	0	×					

Brassicaceae	*Draba lasiophylla*	K235	2014	10	M	1.53	sex	1183	381	24.36					
Brassicaceae	*Draba lasiophylla*	K235	2014	3	M	1.36	sex	1047	778	42.63					
Brassicaceae	*Draba lasiophylla*	K235	2014	3	M	1.39	sex	2548	283	10.00					
Brassicaceae	*Draba oreades*	6	2009	5	M	1.44	sex	2702	192	6.63	7.80				
Brassicaceae	*Draba oreades*	6	2009	5	M	1.45	sex	3292	319	8.83					
Brassicaceae	*Draba oreades*	6	2009	5	M	1.43	sex	2762	238	7.93					
Brassicaceae	*Draba sp.*	K235	2014	5	O	×	?	2597	0	×	8.79				
Brassicaceae	*Draba sp.*	K235	2014	5	O	×	?	1836	0	×					
Brassicaceae	*Draba sp.*	K235	2014	3	M	1.48	sex	2760	214	7.20					
Brassicaceae	*Draba sp.*	K235	2014	5	O	1.43	sex	3002	279	8.50					
Brassicaceae	*Draba sp.*	K235	2014	5	O	1.44	sex	2544	304	10.67					
Brassicaceae	*Draba sp.*	K239	2014	5	O	×	?	2207	0	×	13.97				
Brassicaceae	*Draba sp.*	K239	2014	5	O	1.45	sex	2420	393	13.97					
Brassicaceae	*Draba sp.*	K318	2014	5	M	1.47	sex	2399	161	6.29	6.29				
Brassicaceae	*Hedinia tibetica*	4	2009	5	M	1.51	sex	3080	202	6.15	7.03				
Brassicaceae	*Hedinia tibetica*	4	2009	5	M	1.51	sex	3125	175	5.30					
Brassicaceae	*Hedinia tibetica*	4	2009	5	M	1.50	sex	2943	221	6.98					
Brassicaceae	*Hedinia tibetica*	7	2009	5	M	1.50	sex	2568	266	9.39					
Brassicaceae	*Hedinia tibetica*	7	2009	5	M	1.51	sex	2381	223	8.56					
Brassicaceae	*Hedinia tibetica*	7	2009	5	M	1.51	sex	2633	161	5.76					
Brassicaceae	*Christolea crassifolia*	75	2013	3	O	1.48	sex	1334	430	24.38	21.77				
Brassicaceae	*Christolea crassifolia*	75	2013	4	O	1.48	sex	1607	418	20.64					
Brassicaceae	*Christolea crassifolia*	75	2013	3	O	1.47	sex	1449	369	20.30					
Brassicaceae	*Lepidium capitatum*	K311	2014	3	M	×	?	2705	0	×	×				
Brassicaceae	*Lepidium capitatum*	K311	2014	3	M	×	?	2537	0	×					
Brassicaceae	*Lepidium capitatum*	K311	2014	3	M	×	?	3338	0	×					
Brassicaceae	*Lepidium latifolium*	60	2013	3	M	×	?	2054	0	×	×				
Brassicaceae	*Lepidium latifolium*	60	2013	3	M	×	?	2557	0	×					
Brassicaceae	*Lepidium latifolium*	60	2013	4	M	×	?	2213	0	×					
Brassicaceae	*Lepidium latifolium*	60	2013	3	M	×	?	2372	0	×					
Brassicaceae	*Matthiola chorassanica*	48	2013	3	O	1.47	sex	2067	347	14.37	15.21				
Brassicaceae	*Matthiola chorassanica*	48	2013	3	O	1.49	sex	2102	432	17.05					
Brassicaceae	*Matthiola chorassanica*	48	2013	3	O	1.50	sex	1626	269	14.20					
Brassicaceae	*Parrya nudicaulis*	K285	2014	3	M	1.48	sex	3498	76	2.13	3.94				
Brassicaceae	*Parrya nudicaulis*	K285	2014	3	M	1.45	sex	3328	214	6.04					
Brassicaceae	*Parrya nudicaulis*	K285	2014	3	M	1.47	sex	3758	142	3.64					
Brassicaceae	*Pegaeophyton scapiflorum*	69	2013	3	O	×	?	2026	0	×	2.21				
Brassicaceae	*Pegaeophyton scapiflorum*	69	2013	3	M	1.43	sex	3856	73	1.86					
Brassicaceae	*Pegaeophyton scapiflorum*	69	2013	3	M	1.45	sex	4069	92	2.21					
Brassicaceae	*Pegaeophyton scapiflorum*	69	2013	4	M	1.44	sex	3849	101	2.56					
Brassicaceae	*Sisymbrium brassiciforme*	K245	2014	3	M	×	?	3393	0	×	2.60				
Brassicaceae	*Sisymbrium brassiciforme*	K245	2014	5	O										
Brassicaceae	*Sisymbrium brassiciforme*	K259	2014	5	O	1.49	sex	3163	99	3.03					
Brassicaceae	*Sisymbrium brassiciforme*	K259	2014	5	O	1.51	sex	3691	82	2.17					
Brassicaceae	*Sisymbrium brassiciforme*	K259	2014	5	O										
Brassicaceae	*Stevenia canescens*	75	2013	3	O	×	?	3292	0	×	×				
Brassicaceae	*Tauscheria lasiocarpa*	K288	2014	3	O	×	?	2278	0	×	×				
Brassicaceae	*Tauscheria lasiocarpa*	K288	2014	3	M	×	?	3762	0	×					
Brassicaceae	*Tauscheria lasiocarpa*	K288	2014	3	M	×	?	3755	0	×					
Capparaceae	*Capparis spinosa*	60	2013	1	O	1.49	sex	914	315	25.63	21.43	21.43	18.65	25.63	
Capparaceae	*Capparis spinosa*	60	2013	3	O										
Capparaceae	*Capparis spinosa*	60	2013	3	O	1.51	sex	1176	318	21.29					
Capparaceae	*Capparis spinosa*	60	2013	3	O	1.52	sex	1620	409	20.16					
Capparaceae	*Capparis spinosa*	60	2013	3	O	1.48	sex	1658	380	18.65					
Caprifoliaceae	*Lonicera asperifolia*	K251	2014	3	O	1.49	sex	445	3090	87.41	86.34	80.47	68.74	87.41	
Caprifoliaceae	*Lonicera asperifolia*	K251	2014	3	O	1.53	sex	435	2706	86.15					
Caprifoliaceae	*Lonicera asperifolia*	K251	2014	4	O	1.49	sex	555	3260	85.45					
Caprifoliaceae	*Lonicera microphylla*	K263	2014	3	O	1.48	sex	879	1933	68.74	74.61				
Caprifoliaceae	*Lonicera microphylla*	K263	2014	3	O	1.47	sex	712	2640	78.76					
Caprifoliaceae	*Lonicera microphylla*	K263	2014	4	O	1.48	sex	708	2282	76.32					
Caryophyllaceae	*Arenaria bryophylla*	70	2013	3	O	×	?	3462	0	×	6.01	9.78	2.17	24.63	
Caryophyllaceae	*Arenaria bryophylla*	70	2013	3	O	×	?	3272	0	×					
Caryophyllaceae	*Arenaria bryophylla*	70	2013	4	O	×	?	3417	0	×					
Caryophyllaceae	*Arenaria bryophylla*	4	2009	1	M	×	?	2599	0	×					
Caryophyllaceae	*Arenaria bryophylla*	4	2009	1	M	×	?	1584	0	×					
Caryophyllaceae	*Arenaria bryophylla*	4	2009	1	M	1.43	sex	3422	262	7.11					
Caryophyllaceae	*Arenaria bryophylla*	4	2009	5	M	1.43	sex	2469	190	7.15					
Caryophyllaceae	*Arenaria bryophylla*	4	2009	5	M	1.39	sex	2779	137	4.70					
Caryophyllaceae	*Arenaria bryophylla*	70	2013	5	M	×	?	1584	0	×					
Caryophyllaceae	*Arenaria bryophylla*	70	2013	1	O	1.43	sex	2713	145	5.07					
Caryophyllaceae	*Cerastium sp.*	K287	2014	3	O	1.51	sex	2030	229	10.14	8.56				
Caryophyllaceae	*Cerastium sp.*	K287	2014	3	O	1.50	sex	2239	168	6.98					
Caryophyllaceae	*Dianthus harrissii*	TR3	2013	3	O	×	?	2403	0	×	5.61				
Caryophyllaceae	*Dianthus harrissii*	TR3	2013	3	O	1.45	sex	2474	114	4.40					
Caryophyllaceae	*Dianthus harrissii*	TR3	2013	3	O	1.43	sex	2418	177	6.82					
Caryophyllaceae	*Sagina saginoides*	K230	2014	10	M	×	?	1128	0	×	10.39				
Caryophyllaceae	*Sagina saginoides*	K230	2014	10	M	×	?	2075	0	×					
Caryophyllaceae	*Sagina saginoides*	K230	2014	10	M	1.48	sex	1345	156	10.39					
Caryophyllaceae	*Sagina saginoides*	K230	2014	10	O										
Caryophyllaceae	*Silene gonosperma*	50	2013	3	O	×	?	944	0	×	5.25				
Caryophyllaceae	*Silene gonosperma*	50	2013	4	O	×	?	1613	0	×					
Caryophyllaceae	*Silene gonosperma*	50	2013	3	O	1.43	sex	1481	82	5.25					
Caryophyllaceae	*Silene himalayensis*	K235	2014	3	M	1.47	sex	3358	156	4.44	6.72				

Caryophyllaceae	*Silene himalayensis*	K235	2014	3	M	1.46	sex	3059	313	9.28					
Caryophyllaceae	*Silene himalayensis*	K235	2014	3	M	1.47	sex	3269	225	6.44					
Caryophyllaceae	*Silene himalayensis*	K235	2014	3	O	×	?	1943	0	×					
Caryophyllaceae	*Silene moorcroftiana*	27	2013	3	O	×	?	2754	0	×	×				
Caryophyllaceae	*Silene nepalensis*	75	2013	3	O	×	?	1409	0	×	17.85				
Caryophyllaceae	*Silene nepalensis*	75	2013	3	O	1.44	sex	1246	333	21.09					
Caryophyllaceae	*Silene nepalensis*	75	2013	4	O	1.47	sex	1706	292	14.61					
Caryophyllaceae	*Silene tenius*	K235	2014	3	M	1.47	sex	3116	69	2.17	10.80				
Caryophyllaceae	*Silene tenuis*	K235	2014	3	O	1.41	sex	2359	215	8.35					
Caryophyllaceae	*Silene tenuis*	K235	2014	3	O	1.44	sex	2230	128	5.43					
Caryophyllaceae	*Silene tenuis*	K242	2014	3	O	1.44	sex	2044	260	11.28					
Caryophyllaceae	*Silene tenuis*	K242	2014	3	O	1.44	sex	1941	419	17.75					
Caryophyllaceae	*Silene tenuis*	K242	2014	4	O	1.46	sex	1250	309	19.82					
Caryophyllaceae	*Thylacospermum caespitosum*	3	2009	2	M	×	?	1580	0	×	16.80				
Caryophyllaceae	*Thylacospermum caespitosum*	3	2009	2	M	1.41	sex	1572	292	15.67					
Caryophyllaceae	*Thylacospermum caespitosum*	3	2009	5	M	1.56	sex	1879	340	15.32					
Caryophyllaceae	*Thylacospermum caespitosum*	K225	2014	5	O	×	?	2357	0	×					
Caryophyllaceae	*Thylacospermum caespitosum*	K225	2014	5	O	1.55	sex	808	264	24.63					
Caryophyllaceae	*Thylacospermum caespitosum*	K225	2014	5	O	1.44	sex	2754	361	11.59					
Crassulaceae	*Rhodiola heterodonta*	K243	2014	5	M	×	?	1858	0	×	87.54	87.54	87.54	87.54	
Crassulaceae	*Rhodiola heterodonta*	K243	2014	5	M	×	?	891	0	×					
Crassulaceae	*Rhodiola heterodonta*	K333	2014	3	M	×	?	1858	0	×					
Crassulaceae	*Rhodiola heterodonta*	K243	2014	5	O	1.54	sex	224	1574	87.54					
Cuscutaceae	*Cuscuta planiflora*	K247	2014	3	M	1.52	sex	1483	445	23.08	23.08	23.08	23.08	23.08	
Cuscutaceae	*Cuscuta planiflora*	K247	2014	3	M										
Cyperaceae	*Carex borii*	K240	2014	3	O	×	?	1184	0	×	39.11	49.58	32.78	71.85	
Cyperaceae	*Carex borii*	K240	2014	3	M	1.68	?	1012	650	39.11					
Cyperaceae	*Carex borii*	K240	2014	3	M										
Cyperaceae	*Carex microglochin*	K313	2014	3	M	×	?	2284	0	×	×				
Cyperaceae	*Carex moorcroftii*	K232	2014	3	M	1.50	sex	537	853	61.37	58.77				
Cyperaceae	*Carex moorcroftii*	K232	2014	3	M	1.49	sex	625	915	59.42					
Cyperaceae	*Carex moorcroftii*	K232	2014	3	M	1.49	sex	759	948	55.54					
Cyperaceae	*Carex nivalis*	K228	2014	3	M	1.68	?	1012	650	39.11	49.20				
Cyperaceae	*Carex nivalis*	K228	2014	5	O										
Cyperaceae	*Carex nivalis*	K228	2014	3	M	1.86	autonom	832	924	52.62					
Cyperaceae	*Carex nivalis*	K229	2014	3	M	1.55	sex	778	943	54.79					
Cyperaceae	*Carex nivalis*	K229	2014	3	M	1.54	sex	759	768	50.29					
Cyperaceae	*Carex orbicularis*	K257	2014	3	M	1.54	sex	797	1151	59.09	58.20				
Cyperaceae	*Carex orbicularis*	K257	2014	3	M	1.51	sex	734	1260	63.19					
Cyperaceae	*Carex orbicularis*	K257	2014	3	M	1.49	sex	1340	1470	52.31					
Cyperaceae	*Carex sp.*	K313	2014	3	M	1.70	?	1107	1033	48.27	59.40				
Cyperaceae	*Carex sp.*	K313	2014	1	M	1.87	autonom	791	1066	57.40					
Cyperaceae	*Carex sp.*	K313	2014	3	M	1.75	?	599	1529	71.85					
Cyperaceae	*Carex sp.*	K313	2014	3	M	1.76	?	635	955	60.06					
Cyperaceae	*Carex stenocarpa*	16	2013	1	O						33.78				
Cyperaceae	*Carex stenocarpa*	16	2013	3	M										
Cyperaceae	*Carex stenocarpa*	16	2013	3	M	1.61	sex	646	315	32.78					
Cyperaceae	*Carex stenocarpa*	16	2013	4	M	1.65	?	737	393	34.78					
Cyperaceae	*Carex stenocarpa*	16	2013	3	M										
Cyperaceae	*Kobresia macrantha*	K226	2014	3	O	×	?	1295	0	×	×				
Cyperaceae	*Kobresia macrantha*	K226	2014	3	O	×	?	537	0	×					
Cyperaceae	*Kobresia macrantha*	K226	2014	3	O	×	?	553	0	×					
Cyperaceae	*Kobresia macrantha*	K226	2014	3	M										
Cyperaceae	*Kobresia schoenoides*	4	2009	2	M	1.49	sex	249	331	57.07	48.63				
Cyperaceae	*Kobresia schoenoides*	4	2009	1	M	1.48	sex	1042	915	46.76					
Cyperaceae	*Kobresia schoenoides*	75	2013	3	M	1.54	sex	718	741	50.79					
Cyperaceae	*Kobresia schoenoides*	75	2013	3	M	1.51	sex	590	458	43.70					
Cyperaceae	*Kobresia schoenoides*	75	2013	4	M	1.56	sex	842	684	44.82					
Euphorbiaceae	*Euphorbia tibetica*	K265	2014	3	M	1.50	sex	1281	2677	67.64	60.21	60.21	44.99	68.03	
Euphorbiaceae	*Euphorbia tibetica*	K265	2014	3	O	1.49	sex	857	1824	68.03					
Euphorbiaceae	*Euphorbia tibetica*	K265	2014	3	O	1.44	sex	494	404	44.99					
Euphorbiaceae	*Euphorbia tibetica*	K265	2014	4	O	1.47	sex	593	896	60.17					
Fabaceae	*Astragalus confertus*	4	2009	2	M	×	?	1603	0	×	10.85	7.93	1.28	14.63	
Fabaceae	*Astragalus confertus*	4	2009	1	M	×	?	1665	0	×					
Fabaceae	*Astragalus confertus*	4	2009	1	M	×	?	1827	0	×					
Fabaceae	*Astragalus confertus*	4	2009	1	M	×	?	1237	0	×					
Fabaceae	*Astragalus confertus*	4	2009	2	M	1.43	sex	1536	187	10.85					
Fabaceae	*Astragalus confertus*	4	2009	2	M										
Fabaceae	*Astragalus falconeri*	43	2013	4	O	1.46	sex	2543	279	9.89	8.93				
Fabaceae	*Astragalus falconeri*	43	2013	3	O	×	?	2543	0	×					
Fabaceae	*Astragalus falconeri*	43	2013	3	O	1.48	sex	2203	216	8.93					
Fabaceae	*Astragalus munroi*	65	2013	3	O	×	?	2704	0	×	5.05				
Fabaceae	*Astragalus munroi*	65	2013	3	O	×	?	3004	0	×					
Fabaceae	*Astragalus munroi*	65	2013	4	O	1.46	sex	3085	164	5.05					
Fabaceae	*Astragalus nivalis*	12	2013	3	O	1.46	sex	2401	272	10.18	9.71				
Fabaceae	*Astragalus nivalis*	12	2013	3	O	1.48	sex	2538	267	9.52					
Fabaceae	*Astragalus nivalis*	12	2013	4	O	1.46	sex	2343	244	9.43					
Fabaceae	*Astragalus oplites*	27	2013	1	O	×	?	2607	0	×	8.80				
Fabaceae	*Astragalus oplites*	27	2013	2	O	×	?	2089	0	×					
Fabaceae	*Astragalus oplites*	27	2013	3	O	×	?	2128	0	×					
Fabaceae	*Astragalus oplites*	27	2013	1	O	1.47	sex	2623	253	8.80					
Fabaceae	*Astragalus rhizanthus*	K244	2014	3	O	×	?	3643	0	×	7.63				
Fabaceae	*Astragalus rhizanthus*	K244	2014	3	O	1.49	sex	3019	264	8.04					

Fabaceae	*Astragalus rhizanthus*	K244	2014	3	O	1.51	sex	3248	198	5.75				
Fabaceae	*Astragalus rhizanthus*	K244	2014	4	O	1.49	sex	3250	325	9.09				
Fabaceae	*Astragalus tecti-mundi*	K246	2014	3	O	×	?	3042	0	×	×			
Fabaceae	*Astragalus tecti-mundi*	K246	2014	3	O	×	?	3368	0	×				
Fabaceae	*Astragalus thomsonii*	K247	2014	3	O	1.47	sex	2752	237	7.93	7.94			
Fabaceae	*Astragalus thomsonii*	K247	2014	3	O	1.50	sex	3019	75	2.42				
Fabaceae	*Astragalus thomsonii*	K247	2014	4	O	1.52	sex	2761	430	13.48				
Fabaceae	*Caragana sp.*	27	2013	3	O	×	?	3118	0	×	×			
Fabaceae	*Caragana sp.*	27	2013	3	O	×	?	3149	0	×				
Fabaceae	*Caragana sp.*	27	2013	3	O	×	?	3103	0	×				
Fabaceae	*Cicer arietinum*	48	2013	3	O	×	?	3081	0	×	×			
Fabaceae	*Cicer arietinum*	48	2013	3	O	×	?	2982	0	×				
Fabaceae	*Cicer arietinum*	48	2013	4	O	×	?	2906	0	×				
Fabaceae	*Cicer microphyllum*	K232	2014	3	O	×	?	1959	0	×	×			
Fabaceae	*Cicer microphyllum*	K232	2014	3	O	×	?	2715	0	×				
Fabaceae	*Cicer microphyllum*	K232	2014	3	O	×	?	2784	0	×				
Fabaceae	*Cicer microphyllum*		2013	3	O	×	?	1694	0	×				
Fabaceae	*Cicer microphyllum*		2013	3	O	×	?	2347	0	×				
Fabaceae	*Cicer microphyllum*		2013	3	O	×	?	2237	0	×				
Fabaceae	*Cicer microphyllum*		2013	3	O									
Fabaceae	*Colutea nepalensis*	58	2013	3	M	×	?	1615	0	×	×			
Fabaceae	*Colutea nepalensis*	58	2013	3	O	×	?	2205	0	×				
Fabaceae	*Colutea nepalensis*	58	2013	3	O	×	?	1873	0	×				
Fabaceae	*Colutea nepalensis*	58	2013	3	O	×	?	2242	0	×				
Fabaceae	*Medicago falcata*	TR4	2013	3	O	1.46	sex	2072	355	14.63	8.86			
Fabaceae	*Medicago falcata*	TR4	2013	3	O	1.49	sex	3035	183	5.69				
Fabaceae	*Medicago falcata*	TR4	2013	3	O	1.48	sex	2777	186	6.28				
Fabaceae	*Oxytropis hypoglottoides*	K247	2014	3	O	×	?	2870	0	×	9.18			
Fabaceae	*Oxytropis hypoglottoides*	K247	2014	3	O	1.46	sex	2736	227	7.66				
Fabaceae	*Oxytropis hypoglottoides*	K247	2014	4	O	1.44	sex	2463	295	10.70				
Fabaceae	*Oxytropis chiliophylla*	4	2009	2	M	×	?	1452	0	×	7.26			
Fabaceae	*Oxytropis chiliophylla*	4	2009	2	M	×	?	1701	0	×				
Fabaceae	*Oxytropis chiliophylla*	4	2009	1	M	×	?	2256	0	×				
Fabaceae	*Oxytropis chiliophylla*	4	2009	1	M	×	?	2292	0	×				
Fabaceae	*Oxytropis chiliophylla*	4	2009	2	M	1.44	sex	2175	289	11.73				
Fabaceae	*Oxytropis chiliophylla*	72	2013	3	O	1.49	sex	2832	239	7.78				
Fabaceae	*Oxytropis chiliophylla*	72	2013	3	O	1.47	sex	2870	171	5.62				
Fabaceae	*Oxytropis chiliophylla*	72	2013	4	O	1.47	sex	3006	122	3.90				
Fabaceae	*Oxytropis microphylla*	9	2009	2	M	×	?	2659	0	×	5.97			
Fabaceae	*Oxytropis microphylla*	9	2009	2	M	×	?	1760	0	×				
Fabaceae	*Oxytropis microphylla*	9	2009	2	M	×	?	1511	0	×				
Fabaceae	*Oxytropis microphylla*	74	2013	3	M	×	?	2062	0	×				
Fabaceae	*Oxytropis microphylla*	74	2013	3	M	×	?	1382	0	×				
Fabaceae	*Oxytropis microphylla*	74	2013	3	M	×	?	2022	0	×				
Fabaceae	*Oxytropis microphylla*	74	2013	1	O	1.47	sex	3307	210	5.97				
Fabaceae	*Oxytropis pusilla*		2013	3	O	1.50	sex	2924	294	9.14	10.50			
Fabaceae	*Oxytropis pusilla*		2013	3	O	1.46	sex	2636	398	13.12				
Fabaceae	*Oxytropis pusilla*		2013	3	O	1.48	sex	2811	286	9.23				
Fabaceae	*Oxytropis tatarica*	4	2009	1	M	×	?	3028	0	×	6.96			
Fabaceae	*Oxytropis tatarica*	4	2009	2	M	×	?	2447	0	×				
Fabaceae	*Oxytropis tatarica*	4	2009	2	M	×	?	2801	0	×				
Fabaceae	*Oxytropis tatarica*	4	2009	2	M	×	?	2309	0	×				
Fabaceae	*Oxytropis tatarica*	4	2009	1	M	×	?	2966	0	×				
Fabaceae	*Oxytropis tatarica*	4	2009	1	M	1.45	sex	3028	142	4.48				
Fabaceae	*Oxytropis tatarica*	70	2013	3	O	1.47	sex	2801	270	8.79				
Fabaceae	*Oxytropis tatarica*	70	2013	4	O	1.48	sex	2773	219	7.32				
Fabaceae	*Oxytropis tatarica*	70	2013	3	O	1.48	sex	2705	212	7.27				
Fabaceae	*Thermopsis inflata*	K284	2014	3	O	1.50	sex	3311	43	1.28	3.33			
Fabaceae	*Thermopsis inflata*	K284	2014	1	O	1.45	sex	2996	190	5.96				
Fabaceae	*Thermopsis inflata*	K284	2014	3	O	1.49	sex	3685	114	3.00				
Fabaceae	*Thermopsis inflata*	K284	2014	4	O	1.47	sex	3223	102	3.07				
Fumariaceae	*Corydalis flabellata*	46	2013	3	M	×	?	0	2452	×	84.18	64.45	36.59	87.46
Fumariaceae	*Corydalis flabellata*	46	2013	4	M	1.43	sex	502	3500	87.46				
Fumariaceae	*Corydalis flabellata*	46	2013	3	O									
Fumariaceae	*Corydalis flabellata*	46	2013	3	M	1.40	sex	412	1746	80.91				
Fumariaceae	*Corydalis stricta*	9	2013	1	O	1.56	sex	1021	2271	68.99	72.04			
Fumariaceae	*Corydalis stricta*	9	2013	1	O	1.55	sex	990	2350	70.36				
Fumariaceae	*Corydalis stricta*	9	2013	1	O	1.56	sex	792	2616	76.76				
Fumariaceae	*Corydalis thyrsiflora*	K235	2014	3	M	1.50	sex	1291	782	37.72	37.14			
Fumariaceae	*Corydalis thyrsiflora*	K235	2014	3	M	1.51	sex	1725	1018	37.11				
Fumariaceae	*Corydalis thyrsiflora*	K235	2014	4	M	1.48	sex	2459	1419	36.59				
Gentianaceae	*Gentianella moorcroftiana*	12	2013	3	O	1.46	sex	677	1923	73.96	78.32	80.77	73.44	86.49
Gentianaceae	*Gentianella moorcroftiana*	12	2013	3	O	1.49	sex	312	1997	86.49				
Gentianaceae	*Gentianella moorcroftiana*	12	2013	4	O	1.47	sex	328	907	73.44				
Gentianaceae	*Gentianella moorcroftiana*	K257	2014	5	O	1.49	sex	510	1964	79.39				
Gentianaceae	*Gentianopsis wedenskyi*	TR1	2013	3	O	1.50	sex	607	2799	82.18	83.23			
Gentianaceae	*Gentianopsis wedenskyi*	TR1	2013	3	O	1.53	sex	485	2505	83.78				
Gentianaceae	*Gentianopsis wedenskyi*	TR1	2013	4	O	1.51	sex	321	1652	83.73				
Geraniaceae	*Geranium himalayense*	25	2013	3	M	×	?	3407	0	×	×	×	×	×
Geraniaceae	*Geranium himalayense*	25	2013	3	O	×	?	878	0	×				
Geraniaceae	*Geranium himalayense*	25	2013	3	M	×	?	3174	0	×				
Geraniaceae	*Geranium himalayense*	25	2013	4	M	×	?	3652	0	×				
Geraniaceae	*Geranium nepalense*	TR13	2013	3	O	×	?	3369	0	×	×			

Geraniaceae	*Geranium nepalense*	TR13	2013	3	O	×	?	2657	0	×				
Geraniaceae	*Geranium nepalense*	TR13	2013	4	O	×	?	2364	0	×				
Grossulariaceae	*Ribes orientale*	K262	2014	3	O	1.52	sex	485	2653	84.54	85.27	85.27	84.54	85.99
Grossulariaceae	*Ribes orientale*	K262	2014	3	O	1.50	sex	291	1786	85.99				
Chenopodiaceae	*Atriplex pamirica*	K256	2014	3	M	×	?	3699	0	×	×	3.17	2.05	4.65
Chenopodiaceae	*Atriplex pamirica*	K256	2014	3	O	×	?	2828	0	×				
Chenopodiaceae	*Atriplex pamirica*	K256	2014	3	O	×	?	2800	0	×				
Chenopodiaceae	*Atriplex pamirica*	K256	2014	4	O	×	?	2939	0	×				
Chenopodiaceae	*Corispermum tibeticum*	K363	2014	3	M	×	?	3151	0	×	×			
Chenopodiaceae	*Corispermum tibeticum*	75	2013	3	M	×	?	3249	0	×				
Chenopodiaceae	*Corispermum tibeticum*	75	2013	3	M	×	?	2654	0	×				
Chenopodiaceae	*Corispermum tibeticum*	75	2013	4	M	×	?	3169	0	×				
Chenopodiaceae	*Chenopodium foliosum*	K229	2014	3	O	×	?	1772	0	×	2.11			
Chenopodiaceae	*Chenopodium foliosum*	K229	2014	3	M	×	?	3127	0	×				
Chenopodiaceae	*Chenopodium foliosum*	K229	2014	3	M	×	?	3345	0	×				
Chenopodiaceae	*Chenopodium foliosum*	K229	2014	3	M	1.51	sex	3822	85	2.18				
Chenopodiaceae	*Chenopodium foliosum*	K229	2014	3	M	1.51	sex	3676	77	2.05				
Chenopodiaceae	*Chenopodium pamiricum*	K363	2014	2	M	×	?	2952	0	×	3.35			
Chenopodiaceae	*Chenopodium pamiricum*	K363	2014	3	M	1.50	sex	3551	85	2.34				
Chenopodiaceae	*Chenopodium pamiricum*	K363	2014	3	M	1.47	sex	2626	120	4.37				
Chenopodiaceae	*Kochia prostrata*	K258	2014	3	O	×	?	3143	0	×	4.06			
Chenopodiaceae	*Kochia prostrata*	K252	2014	3	O	1.49	sex	3100	111	3.46				
Chenopodiaceae	*Kochia prostrata*	K252	2014	4	O									
Chenopodiaceae	*Kochia prostrata*	K252	2014	3	O	1.45	sex	3135	153	4.65				
Chenopodiaceae	*Krascheninnikovia pungens*	75	2013	3	O	×	?	2218	0	×	×			
Chenopodiaceae	*Krascheninnikovia pungens*	75	2013	3	O	×	?	2103	0	×				
Iridaceae	*Iris hookeriana*	44	2013	3	M	×	?	2587	0	×	82.96	82.96	82.96	82.96
Iridaceae	*Iris hookeriana*	44	2013	4	M	×	?	1759	0	×				
Iridaceae	*Iris hookeriana*	44	2013	3	M	1.51	sex	577	2809	82.96				
Juncaceae	*Juncus himalensis*	K229	2014	5	M	1.51	sex	633	445	41.28	34.35	33.92	23.79	43.81
Juncaceae	*Juncus himalensis*	K229	2014	10	M	1.49	sex	1772	787	30.75				
Juncaceae	*Juncus himalensis*	K229	2014	10	M	1.50	sex	1187	534	31.03				
Juncaceae	*Juncus leucanthus*	K229	2014	5	M	1.45	sex	554	321	36.69	38.65			
Juncaceae	*Juncus leucanthus*	K229	2014	10	M	1.48	sex	690	538	43.81				
Juncaceae	*Juncus leucanthus*	K229	2014	10	M	1.49	sex	983	540	35.46				
Juncaceae	*Juncus membranaceus*	K257	2014	5	M	1.51	sex	529	286	35.09	28.77			
Juncaceae	*Juncus membranaceus*	K257	2014	5	M	1.51	sex	826	312	27.42				
Juncaceae	*Juncus membranaceus*	K257	2014	5	M	1.53	sex	1166	364	23.79				
Lamiaceae	*Dracocephallum heterophyllum*	64	2013	3	O	1.49	sex	2906	264	8.33	9.58	15.98	5.31	65.30
Lamiaceae	*Dracocephallum heterophyllum*	64	2013	3	O	1.44	sex	1799	204	10.18				
Lamiaceae	*Dracocephallum heterophyllum*	64	2013	4	O	1.48	sex	1972	225	10.24				
Lamiaceae	*Dracocephallum stamineum*	32	2013	3	O	1.50	sex	1474	334	18.47	16.61			
Lamiaceae	*Dracocephallum stamineum*	32	2013	3	O	1.43	sex	1241	322	20.60				
Lamiaceae	*Dracocephallum stamineum*	32	2013	3	O	1.48	sex	2576	310	10.74				
Lamiaceae	*Marmoritis rotundifolia*	K286	2014	3	O	1.51	sex	2478	273	9.92	9.89			
Lamiaceae	*Marmoritis rotundifolia*	K286	2014	3	O	1.49	sex	2734	266	8.87				
Lamiaceae	*Marmoritis rotundifolia*	K286	2014	4	O	1.49	sex	2490	304	10.88				
Lamiaceae	*Nepeta discolor*		2013	3	O	1.49	sex	2691	297	9.94	11.15			
Lamiaceae	*Nepeta discolor*		2013	3	O	1.48	sex	1734	253	12.73				
Lamiaceae	*Nepeta discolor*		2013	4	O	1.49	sex	1658	200	10.76				
Lamiaceae	*Nepeta eriostachya*	TR3	2013	3	O	1.44	sex	2696	399	12.89	13.59			
Lamiaceae	*Nepeta eriostachya*	TR3	2013	3	O	1.50	sex	2229	302	11.93				
Lamiaceae	*Nepeta eriostachya*	TR3	2013	4	O	1.45	sex	2309	438	15.94				
Lamiaceae	*Nepeta glutinosa*	26	2013	3	O	×	?	2083	0	×	7.97			
Lamiaceae	*Nepeta glutinosa*	26	2013	3	M	1.60	sex	2135	218	9.26				
Lamiaceae	*Nepeta glutinosa*	26	2013	3	M	1.52	sex	3586	201	5.31				
Lamiaceae	*Nepeta glutinosa*	26	2013	4	M	1.58	sex	1730	196	10.18				
Lamiaceae	*Nepeta glutinosa*	26	2013	4	M	1.62	sex	1721	132	7.12				
Lamiaceae	*Nepeta leucolaena*	TR1	2013	3	O	×	?	1480	0	×	13.10			
Lamiaceae	*Nepeta leucolaena*	TR1	2013	3	O	1.54	sex	1480	288	16.29				
Lamiaceae	*Nepeta leucolaena*	TR1	2013	4	O	1.52	sex	2516	277	9.92				
Lamiaceae	*Nepeta longibracteata*	4	2009	3	M						10.33			
Lamiaceae	*Nepeta longibracteata*	4	2009	3	M	1.56	sex	3334	249	6.95				
Lamiaceae	*Nepeta longibracteata*	4	2009	3	M	1.53	sex	2409	195	7.49				
Lamiaceae	*Nepeta longibracteata*	4	2009	3	M	1.52	sex	2006	135	6.31				
Lamiaceae	*Nepeta longibracteata*	70	2013	3	O	1.46	sex	1996	517	20.57				
Lamiaceae	*Stachys tibetica*	241b	2013	3	O	1.48	sex	1770	1370	43.63	58.05			
Lamiaceae	*Stachys tibetica*	241b	2013	3	O	1.47	sex	914	1713	65.21				
Lamiaceae	*Stachys tibetica*	241b	2013	4	O	1.45	sex	1093	2057	65.30				
Lamiaceae	*Thymus lienaris*	9	2013	3	O	1.51	sex	3142	366	10.43	9.49			
Lamiaceae	*Thymus lienaris*	9	2013	3	O	1.47	sex	2517	271	9.72				
Lamiaceae	*Thymus lienaris*	9	2013	3	O	1.50	sex	3358	305	8.33				
Morinaceae	*Morina coulteriana*	46	2013	3	O	1.51	sex	287	733	71.86	71.86	71.86	71.86	71.86
Onagraceae	*Epilobium latifolium*	20	2013	1	O	×	?	1695	0	×	×	×	×	×
Onagraceae	*Epilobium latifolium*	20	2013	3	M	×	?	2157	0	×				
Onagraceae	*Epilobium latifolium*	20	2013	3	M	×	?	2835	0	×				
Onagraceae	*Epilobium latifolium*	20	2013	4	M	×	?	2795	0	×				
Onagraceae	*Epilobium latifolium*	33	2013	3	O	×	?	2837	0	×				
Orobanchaceae	*Eupharasia foliosa*	K257	2014	4	O	1.41	sex	1003	1321	56.84	55.57	41.91	20.18	59.26
Orobanchaceae	*Eupharasia foliosa*	K257	2014	3	O	1.41	sex	1074	1101	50.62				
Orobanchaceae	*Eupharasia foliosa*	K257	2014	3	O	1.44	sex	1201	1747	59.26				

Orobanchaceae	*Leptorhabdos parviflora*	K269	2014	3	O	×	?	1878	0	×	×			
Orobanchaceae	*Leptorhabdos parviflora*	K269	2014	3	O									
Orobanchaceae	*Pedicularis bicornuta*	33	2013	3	O	1.49	sex	2525	1036	29.09	43.27			
Orobanchaceae	*Pedicularis bicornuta*	33	2013	3	O	1.48	sex	1362	1569	53.53				
Orobanchaceae	*Pedicularis bicornuta*	33	2013	3	O	1.48	sex	1756	1569	47.19				
Orobanchaceae	*Pedicularis cheilanthifolia*	62	2013	3	O	1.48	sex	1325	335	20.18	26.89			
Orobanchaceae	*Pedicularis cheilanthifolia*	62	2013	3	O	1.46	sex	1227	513	29.48				
Orobanchaceae	*Pedicularis cheilanthifolia*	62	2013	3	O									
Orobanchaceae	*Pedicularis cheilanthifolia*	62	2013	4	O	1.49	sex	1590	879	35.60				
Orobanchaceae	*Pedicularis cheilanthifolia*	K249	2014	3	O	1.47	sex	1521	436	22.28				
Papaveraceae	*Meconopsis aculeata*	K236	2014	5	M	×	?	3702	0	×	95.06	95.06	92.44	97.68
Papaveraceae	*Meconopsis aculeata*	K241	2014	5	O	×	?	2231	0	×				
Papaveraceae	*Meconopsis aculeata*	K241	2014	5	O	×	?	1441	0	×				
Papaveraceae	*Meconopsis aculeata*	K236	2014	5	O	1.58	sex	178	2178	92.44				
Papaveraceae	*Meconopsis aculeata*	K236	2014	5	O	1.57	sex	44	1850	97.68				
Plantaginaceae	*Picrorrhiza kurrooa*	K235	2014	3	M	1.47	sex	671	823	55.09	75.33	46.41	17.99	85.94
Plantaginaceae	*Picrorrhiza kurrooa*	K235	2014	3	O	1.44	sex	207	1145	84.69				
Plantaginaceae	*Picrorrhiza kurrooa*	K235	2014	5	O	1.62	sex	212	450	67.98				
Plantaginaceae	*Picrorrhiza kurrooa*	K235	2014	5	O	1.52	sex	63	385	85.94				
Plantaginaceae	*Picrorrhiza kurrooa*	K235	2014	5	O	1.42	sex	385	1875	82.96				
Plantaginaceae	*Plantago depresa*	34	2013	3	O	1.51	sex	886	257	22.48	20.71			
Plantaginaceae	*Plantago depresa*	34	2013	3	O	1.53	sex	1667	461	21.66				
Plantaginaceae	*Plantago depresa*	34	2013	4	O	1.50	sex	1454	319	17.99				
Plantaginaceae	*Plantago himalaica*	K249	2014	3	O	1.51	sex	2586	945	26.76	27.00			
Plantaginaceae	*Plantago himalaica*	K249	2014	3	O	1.52	sex	2146	890	29.31				
Plantaginaceae	*Plantago himalaica*	K249	2014	4	O	1.52	sex	2600	863	24.92				
Plantaginaceae	*Veronica biloba*	K231	2014	3	O	1.50	sex	855	1475	63.30	62.61			
Plantaginaceae	*Veronica biloba*	K231	2014	3	O	1.54	sex	998	1151	53.56				
Plantaginaceae	*Veronica biloba*	K231	2014	10	O	1.51	sex	803	1964	70.98				
Plumbaginaceae	*Acantholimon lycopodioides*	K251	2014	3	O	×	?	2714	0	×	×	×	×	×
Plumbaginaceae	*Acantholimon lycopodioides*	K251	2014	3	O	×	?	2958	0	×				
Poaceae	*Alopecurus himalaicus*	16	2013	3	M	1.46	sex	1266	1224	49.16	45.25	37.59	10.03	70.28
Poaceae	*Alopecurus himalaicus*	16	2013	4	M	1.47	sex	1486	1131	43.22				
Poaceae	*Alopecurus himalaicus*	19	2013	3	M	1.46	sex	1366	1047	43.39				
Poaceae	*Calamagrostis stoliczkae*	K255	2014	3	O	1.45	sex	1214	1190	49.50	41.17			
Poaceae	*Calamagrostis stoliczkae*	K255	2014	5	O	1.47	sex	1118	710	38.84				
Poaceae	*Calamagrostis stoliczkae*	K255	2014	4	O	1.46	sex	1053	571	35.16				
Poaceae	*Elymus cognatus*	K259	2014	1	O	1.44	sex	1012	538	34.71	35.09			
Poaceae	*Elymus cognatus*	K259	2014	3	M	1.45	sex	1868	928	33.19				
Poaceae	*Elymus cognatus*	K259	2014	3	O	1.42	sex	854	523	37.98				
Poaceae	*Elymus cognatus*	K259	2014	3	O	1.44	sex	1028	541	34.48				
Poaceae	*Elymus jacquemontii*	K224	2014	3	O	×	?	1541	0	×	26.81			
Poaceae	*Elymus jacquemontii*	K224	2014	1	O	1.50	sex	1374	331	19.41				
Poaceae	*Elymus jacquemontii*	K224	2014	3	O	1.48	sex	1125	1170	50.98				
Poaceae	*Elymus jacquemontii*	K224	2014	3	O	1.49	sex	1669	186	10.03				
Poaceae	*Elymus schrenkianus*	27	2013	3	M	1.51	sex	728	926	55.99	46.92			
Poaceae	*Elymus schrenkianus*	27	2013	3	M									
Poaceae	*Elymus schrenkianus*	27	2013	4	M	1.49	sex	499	304	37.86				
Poaceae	*Hordeum brevisubulatum*	K249	2014	3	O	1.42	sex	1651	228	12.13	27.29			
Poaceae	*Hordeum brevisubulatum*	K249	2014	3	M	1.40	sex	1557	1209	43.71				
Poaceae	*Hordeum brevisubulatum*	K249	2014	3	O	1.48	sex	2002	1244	38.32				
Poaceae	*Hordeum brevisubulatum*	K249	2014	4	O	1.49	sex	1760	310	14.98				
Poaceae	*Leymus secalinus*	K249	2014	2	O	1.52	sex	906	1016	52.86	58.44			
Poaceae	*Leymus secalinus*	K249	2014	3	O	1.53	sex	1149	1284	52.77				
Poaceae	*Leymus secalinus*	K249	2014	3	O	1.53	sex	659	1515	69.69				
Poaceae	*Melica persica*	K265	2014	3	M	×	?	2959	0	×	×			
Poaceae	*Melica persica*	K265	2014	3	O	×	?	1816	0	×				
Poaceae	*Phleum alpinum*	K232	2014	3	O	1.48	sex	1176	387	24.76	24.01			
Poaceae	*Phleum alpinum*	K232	2014	3	O	1.48	sex	1550	470	23.27				
Poaceae	*Poa attenuata*	4	2009	4	M	×	?	956	0	×	22.92			
Poaceae	*Poa attenuata*	K331	2014	3	M	2.43	pseudogam	1307	440	25.19				
Poaceae	*Poa attenuata*	K331	2014	3	M	2.38	pseudogam	999	260	20.65				
Poaceae	*Stipa capillata*		2013	1	M	×	?	1987	0	×	×			
Poaceae	*Stipa capillata*		2013	1	M	×	?	1732	0	×				
Poaceae	*Stipa orientalis*	K252	2014	1	O	1.50	sex	622	360	36.66	30.32			
Poaceae	*Stipa orientalis*	K252	2014	3	M	1.57	sex	2410	277	10.31				
Poaceae	*Stipa orientalis*	K252	2014	3	M	1.46	sex	1809	1420	43.98				
Poaceae	*Stipa splendens*	K266	2014	3	O	1.48	pseudogam	794	859	51.97	31.81			
Poaceae	*Stipa splendens*	K266	2014	3	M	2.46	pseudogam	2100	569	21.32				
Poaceae	*Stipa splendens*	K266	2014	1	M	2.17	autonom	343	280	44.94				
Poaceae	*Stipa splendens*	K266	2014	1	M	2.52	pseudogam	423	272	39.14				
Poaceae	*Stipa splendens*	K266	2014	1	M	1.53	pseudogam	2000	711	26.23				
Poaceae	*Stipa splendens*	K266	2014	1	M									
Poaceae	*Stipa splendens*	K266	2014	1	M									
Poaceae	*Stipa splendens*	K266	2014	1	M	1.46	pseudogam	2242	748	25.02				
Poaceae	*Stipa splendens*	K266	2014	1	M	2.60	pseudogam	473	86	15.38				
Poaceae	*Stipa splendens*	K266	2014	1	M									
Poaceae	*Stipa splendens*	K266	2014	1	M									
Poaceae	*Stipa splendens*	K266	2014	1	M	2.50	pseudogam	1144	272	19.21				
Poaceae	*Stipa splendens*	K266	2014	1	M	2.11	autonom	658	498	43.08				
Poaceae	*Stipa subsessiliflora*	9	2009	2	M	1.49	sex	474	1121	70.28	45.59			
Poaceae	*Stipa subsessiliflora*	9	2009	2	M	1.46	sex	974	1609	62.29				
Poaceae	*Stipa subsessiliflora*	9	2009	2	M	1.50	sex	371	405	52.19				

Poaceae	*Stipa subsessiliflora*	74	2013	3	M	1.50	sex	2256	1388	38.09				
Poaceae	*Stipa subsessiliflora*	74	2013	3	M	1.47	sex	2885	720	19.97				
Poaceae	*Stipa subsessiliflora*	74	2013	4	M	1.49	sex	2463	1091	30.70				
Poaceae	*Trisetum spicatum*	4	2009	5	M	1.52	sex	612	515	45.70	53.06			
Poaceae	*Trisetum spicatum*	4	2009	10	M									
Poaceae	*Trisetum spicatum*	4	2009	10	M	1.51	sex	441	587	57.10				
Poaceae	*Trisetum spicatum*	70	2013	3	M	1.53	sex	1095	1055	49.07				
Poaceae	*Trisetum spicatum*	70	2013	3	O									
Poaceae	*Trisetum spicatum*	70	2013	3	M	1.50	sex	1154	1297	52.92				
Poaceae	*Trisetum spicatum*	70	2013	3	M	1.51	sex	920	1242	57.45				
Poaceae	*Trisetum spicatum*	K318	2014	3	M	1.50	sex	353	452	56.15				
Polygonaceae	*Bistora affinis*	25	2013	3	O	1.32	?	888	864	49.32	61.13	39.23	12.25	72.95
Polygonaceae	*Bistora affinis*	25	2013	3	O	1.38	sex	324	874	72.95				
Polygonaceae	*Bistorta vivipara*	40	2013	3	O						×			
Polygonaceae	*Knorringia pamirica*	75	2013	3	M	1.48	sex	1398	959	40.69	18.67			
Polygonaceae	*Knorringia pamirica*	75	2013	3	O									
Polygonaceae	*Knorringia pamirica*	75	2013	3	M	1.50	sex	1921	466	19.52				
Polygonaceae	*Knorringia pamirica*	75	2013	4	M	1.51	sex	2380	516	17.82				
Polygonaceae	*Oxyria digyna*	K229	2014	3	O						66.91			
Polygonaceae	*Oxyria digyna*	K229	2014	5	O	1.50	sex	410	829	66.91				
Polygonaceae	*Oxyria digyna*	K229	2014	5	O									
Polygonaceae	*Oxyria digyna*	K229	2014	5	O									
Polygonaceae	*Polygonum cognatum*	K227	2014	5	O	×	?	258	0	×	15.19			
Polygonaceae	*Polygonum cognatum*	K227	2014	1	M	1.49	sex	2617	433	14.20				
Polygonaceae	*Polygonum cognatum*	K227	2014	1	M	1.47	sex	2328	469	16.77				
Polygonaceae	*Polygonum cognatum*	K227	2014	1	M	1.47	sex	2422	397	14.08				
Polygonaceae	*Polygonum cognatum*	K227	2014	1	M	1.49	sex	2681	615	18.66				
Polygonaceae	*Polygonum cognatum*	K227	2014	1	M	1.48	sex	3087	431	12.25				
Polygonaceae	*Polygonum rumicifolium*	K245	2014	3	M	1.45	sex	1852	1306	41.36	44.84			
Polygonaceae	*Polygonum rumicifolium*	K245	2014	1	O									
Polygonaceae	*Polygonum rumicifolium*	K245	2014	3	O	1.37	sex	1653	1037	38.55				
Polygonaceae	*Polygonum rumicifolium*	K245	2014	3	O	1.40	sex	1083	1097	50.32				
Polygonaceae	*Polygonum rumicifolium*	K245	2014	3	O	1.45	sex	1037	1002	49.14				
Polygonaceae	*Rheum tibeticum*	K283	2014	3	O	1.47	sex	1384	555	28.62	28.62			
Polygonaceae	*Rheum webbianum*	K232	2014	3	O						×			
Polygonaceae	*Rumex patientia*	K257	2014	3	M						×			
Polygonaceae	*Rumex patientia*	K257	2014	3	M	×	?	758	0	×				
Polygonaceae	*Rumex patientia*	K257	2014	3	M	×	?	1492	0	×				
Primulaceae	*Primula macrophylla*	49	2013	3	O	1.47	sex	814	1292	61.35	66.34	69.81	61.25	78.10
Primulaceae	*Primula macrophylla*	49	2013	3	O	1.46	sex	284	921	76.43				
Primulaceae	*Primula macrophylla*	49	2013	4	O	1.48	sex	544	860	61.25				
Primulaceae	*Primula moorcroftiana*	K241	2014	3	O	1.47	sex	658	2347	78.10	73.28			
Primulaceae	*Primula moorcroftiana*	K241	2014	3	O	1.47	sex	792	2179	73.34				
Primulaceae	*Primula moorcroftiana*	K241	2014	3	O	1.46	sex	843	1824	68.39				
Ranunculaceae	*Anemone rupicola*	K280	2014	3	O	1.52	sex	966	2771	74.15	76.52	67.82	7.11	97.54
Ranunculaceae	*Anemone rupicola*	K280	2014	3	O	1.52	sex	555	2954	84.18				
Ranunculaceae	*Anemone rupicola*	K280	2014	4	O	1.54	sex	558	1382	71.24				
Ranunculaceae	*Aquilegia fragrans*	K280	2014	3	M						96.29			
Ranunculaceae	*Aquilegia fragrans*	K280	2014	3	M	1.45	sex	201	3855	95.04				
Ranunculaceae	*Aquilegia fragrans*	K280	2014	3	M	1.50	sex	101	4002	97.54				
Ranunculaceae	*Aquilegia moorcroftiana*	10	2013	3	O	×	?	0	2184	×	95.35			
Ranunculaceae	*Aquilegia moorcroftiana*	10	2013	4	O	×	?	0	1748	×				
Ranunculaceae	*Aquilegia moorcroftiana*	10	2013	3	M	×	?	0	3712	×				
Ranunculaceae	*Aquilegia moorcroftiana*	10	2013	3	O	1.51	sex	165	2698	94.24				
Ranunculaceae	*Aquilegia moorcroftiana*	K281	2014	3	M	1.46	sex	152	4151	96.47				
Ranunculaceae	*Clematis tangutica*	K262	2014	3	O	1.50	sex	961	2783	74.33	66.23			
Ranunculaceae	*Clematis tangutica*	K262	2014	3	O	1.51	sex	1386	2338	62.78				
Ranunculaceae	*Clematis tangutica*	K262	2014	3	O	1.50	sex	1448	2319	61.56				
Ranunculaceae	*Clematis sp.*	K288	2014	3	O	×	?	0	3532	×	×			
Ranunculaceae	*Clematis sp.*	K288	2014	3	O	×	?	0	3608	×				
Ranunculaceae	*Clematis sp.*	K273	2014	3	O	1.53	sex	1069	2403	69.21	66.50			
Ranunculaceae	*Clematis sp.*	K273	2014	3	O	1.52	sex	1296	2283	63.79				
Ranunculaceae	*Delphinium brunonianum*	9	2009	1	M	×	?	0	3886	×	92.17			
Ranunculaceae	*Delphinium brunonianum*	9	2009	2	M	1.49	sex	276	3296	92.27				
Ranunculaceae	*Delphinium brunonianum*	9	2009	2	M	1.49	sex	242	3225	93.02				
Ranunculaceae	*Delphinium brunonianum*	9	2009	2	M	1.52	sex	281	2774	90.80				
Ranunculaceae	*Delphinium brunonianum*	70	2013	3	M	1.50	sex	263	3341	92.70				
Ranunculaceae	*Delphinium brunonianum*	70	2013	3	M	1.52	sex	276	3777	93.19				
Ranunculaceae	*Delphinium brunonianum*	70	2013	4	M	1.51	sex	317	3214	91.02				
Ranunculaceae	*Pulsatilla wallichiana*	MK2	2013	3	O	1.51	sex	569	2947	83.82	78.45			
Ranunculaceae	*Pulsatilla wallichiana*	MK2	2013	3	O	1.51	sex	715	2260	75.97				
Ranunculaceae	*Pulsatilla wallichiana*	MK2	2013	3	O	1.51	sex	722	2233	75.57				
Ranunculaceae	*Ranunculus lobatus*	765	2013	3	O	1.59	sex	1705	625	26.82	35.62			
Ranunculaceae	*Ranunculus lobatus*	765	2013	3	O	1.55	sex	1784	895	33.41				
Ranunculaceae	*Ranunculus lobatus*	765	2013	3	O	1.55	sex	1365	1192	46.62				
Ranunculaceae	*Ranunculus membranaceus*	K240	2014	3	O	2,62; 3,15	pseudogam	1529	189	11.00	9.04			
Ranunculaceae	*Ranunculus membranaceus*	K240	2014	3	O	3.09	pseudogam	1619	160	8.99				
Ranunculaceae	*Ranunculus membranaceus*	K240	2014	3	O	3.15	pseudogam	1280	98	7.11				
Ranunculaceae	*Thalictrum alpinum*	K242	2014	3	O						61.81			
Ranunculaceae	*Thalictrum alpinum*	K242	2014	3	O	1.77	?	537	869	61.81				
Ranunculaceae	*Thalictrum foetidum*	K257	2014	3	O	1.65	sex	631	1345	68.07	68.07			
Rhamnaceae	*Rhamnus prostrata*	K254	2014	3	M	1.50	sex	1653	759	31.47	32.34	32.34	31.47	33.21
Rhamnaceae	*Rhamnus prostrata*	K254	2014	3	M	1.49	sex	1619	805	33.21				

Rosaceae	*Comarum salesovianum*	MK5	2013	3	M	×	?	2176	0	×	11.65	7.89	0.50	24.92
Rosaceae	*Comarum salesovianum*	MK5	2013	3	O	×	?	1325	0	×				
Rosaceae	*Comarum salesovianum*	K273	2014	3	M	1.53	sex	2613	212	7.50				
Rosaceae	*Comarum salesovianum*	K273	2014	3	O	1.55	sex	2431	235	8.81				
Rosaceae	*Comarum salesovianum*	K273	2014	3	M	1.80	?	2681	690	20.47				
Rosaceae	*Comarum salesovianum*	K273	2014	3	O	1.55	sex	2431	235	8.81				
Rosaceae	*Comarum salesovianum*	MK5	2013	3	M	1.53	sex	1904	267	12.30				
Rosaceae	*Comarum salesovianum*	MK5	2013	3	M	1.52	sex	1632	223	12.02				
Rosaceae	*Chamaerhodos sabulosa*	4	2013	3	O	×	?	1306	0	×	×			
Rosaceae	*Chamaerhodos sabulosa*	4	2013	1	M	×	?	1017	0	×				
Rosaceae	*Chamaerhodos sabulosa*	4	2013	1	O	×	?	1344	0	×				
Rosaceae	*Chamaerhodos sabulosa*	4	2013	1	O	×	?	1249	0	×				
Rosaceae	*Chamaerhodos sabulosa*	4	2013	1	O	×	?	777	0	×				
Rosaceae	*Chamaerhodos sabulosa*	4	2013	1	O	×	?	1118	0	×				
Rosaceae	*Chamaerhodos sabulosa*	4	2013	3	M									
Rosaceae	*Potentilla bifurca*	K224	2014	3	O	×	?	1924	0	×	8.28			
Rosaceae	*Potentilla bifurca*	K224	2014	3	O	×	?	2135	0	×				
Rosaceae	*Potentilla bifurca*	K224	2014	3	O	1.54	sex	2305	208	8.28				
Rosaceae	*Potentilla evestita*	25	2013	3	O	×	?	1990	0	×	×			
Rosaceae	*Potentilla evestita*	25	2013	3	O	×	?	2342	0	×				
Rosaceae	*Potentilla evestita*	25	2013	3	O	×	?	1043	0	×				
Rosaceae	*Potentilla evestita*	25	2013	3	O	×	?	1748	0	×				
Rosaceae	*Potentilla gelida*	39	2013	3	O	×	?	3089	0	×	5.36			
Rosaceae	*Potentilla gelida*	39	2013	3	O	2.99	pseudogam	2558	78	2.96				
Rosaceae	*Potentilla gelida*	39	2013	3	O	2.94	pseudogam	1436	116	7.47				
Rosaceae	*Potentilla gelida*	39	2013	4	O	2.64	pseudogam	940	86	8.38				
Rosaceae	*Potentilla gelida*	39	2013	3	O	3.01	pseudogam	2972	80	2.62				
Rosaceae	*Potentilla multifida*	K242	2014	3	O	1.50	sex	2731	268	8.94	8.94			
Rosaceae	*Potentilla multifida*	K242	2014	3	M									
Rosaceae	*Potentilla multifida*	K242	2014	3	M									
Rosaceae	*Potentilla pamirica*	70	2013	3	O	×	?	3009	0	×	3.21			
Rosaceae	*Potentilla pamirica*	4	2009	5	M	3.00	pseudogam	1537	50	3.15				
Rosaceae	*Potentilla pamirica*	4	2009	5	M	2.98	pseudogam	3132	104	3.21				
Rosaceae	*Potentilla pamirica*	4	2009	5	M	2.96	pseudogam	3178	107	3.26				
Rosaceae	*Potentilla sericea*	K242	2014	3	O	×	?	1772	0	×	2.40			
Rosaceae	*Potentilla sericea*	K242	2014	3	M	2.91	pseudogam	3240	113	3.37				
Rosaceae	*Potentilla sericea*	K242	2014	3	M	3.08	pseudogam	3283	59	1.77				
Rosaceae	*Potentilla sericea*	K242	2014	4	M	3.12	pseudogam	3273	69	2.06				
Rosaceae	*Potentilla sojakii*	K242	2014	3	O	×	?	2759	0	×	2.11			
Rosaceae	*Potentilla sojakii*	K242	2014	3	O	×	?	2274	0	×				
Rosaceae	*Potentilla sojakii*	K242	2014	3	O	×	?	2516	0	×				
Rosaceae	*Potentilla sojakii*	K242	2014	3	M	2.97	pseudogam	3200	83	2.53				
Rosaceae	*Potentilla sojakii*	K241	2014	3	O	×	?	2253	0	×				
Rosaceae	*Potentilla sojakii*	K241	2014	1	O									
Rosaceae	*Potentilla sojakii*	K241	2014	1	O									
Rosaceae	*Potentilla sojakii*	K241	2014	2	O									
Rosaceae	*Potentilla sojakii*	K230	2014	3	O	×	?	2935	0	×				
Rosaceae	*Potentilla sojakii*	K230	2014	3	O	×	?	3153	0	×				
Rosaceae	*Potentilla sojakii*	K230	2014	3	O	3.10	pseudogam	2751	94	3.30				
Rosaceae	*Potentilla sojakii*	K230	2014	3	O	3.07	pseudogam	2990	15	0.50				
Rosaceae	*Potentilla turczaninowiana*	K241	2014	3	O						9.51			
Rosaceae	*Potentilla turczaninowiana*	K241	2014	3	O									
Rosaceae	*Potentilla turczaninowiana*	K241	2014	3	M	1.53	sex	2052	298	12.68				
Rosaceae	*Potentilla turczaninowiana*	K241	2014	3	M	1.65	sex	1608	109	6.35				
Rosaceae	*Potentilla turczaninowiana*	K241	2014	4	O									
Rosaceae	*Potentilla venusta*	K242	2014	3	O	×	?	2081	0	×	2.51			
Rosaceae	*Potentilla venusta*	K242	2014	3	O	3.04	pseudogam	2123	76	3.46				
Rosaceae	*Potentilla venusta*	K242	2014	4	O	3.13	pseudogam	3200	51	1.57				
Rosaceae	*Potentilla venusta*	K234	2014	3	O	×	?	1696	0	×				
Rosaceae	*Potentilla venusta*	K234	2014	4	O	×	?	2888	0	×				
Rosaceae	*Potentilla venusta*	K242	2014	3	M	×	?	1772	0	×				
Rosaceae	*Potentilla venusta*	K234	2014	3	O									
Rosaceae	*Potentilla venusta*	K234	2014	3	O									
Rosaceae	*Rosa webbiana*	K274	2014	3	O	×	?	2198	0	×	×			
Rosaceae	*Rosa webbiana*	K274	2014	3	O	×	?	1573	0	×				
Rosaceae	*Rosa webbiana*	K274	2014	3	O	×	?	3508	0	×				
Rosaceae	*Sibbaldia cuneata*	K229	2014	1	M						×			
Rosaceae	*Sibbaldia cuneata*	K229	2014	3	M									
Rosaceae	*Sibbalida cuneata*	K229	2014	3	O	×	?	1932	0	×				
Rosaceae	*Sorbus tianschanica*	K268	2014	2	O	1.52	sex	1437	477	24.92	24.92			
Rubiaceae	*Galium pauciflorum*	K231	2014	3	M	1.47	sex	2270	800	26.06	26.22	40.87	23.29	58.31
Rubiaceae	*Galium pauciflorum*	K231	2014	3	O	1.51	sex	1462	606	29.30				
Rubiaceae	*Galium pauciflorum*	K231	2014	3	O	1.43	sex	1867	567	23.29				
Rubiaceae	*Rubia tibetica*	K247	2014	3	O	1.52	sex	1696	1720	50.35	55.52			
Rubiaceae	*Rubia tibetica*	K248	2014	3	O	1.50	sex	1166	1631	58.31				
Rubiaceae	*Rubia tibetica*	K248	2014	4	O	1.52	sex	1213	1669	57.91				
Salicaceae	*Salix flabellaris*	K235	2014	3	M	×	?	3353	0	×	×	×	×	×
Salicaceae	*Salix flabellaris*	K235	2014	3	M	×	?	2933	0	×				
Salicaceae	*Salix flabellaris*	K235	2014	3	O	×	?	1675	0	×				
Saxifragaceae	*Saxifraga cernua*	4	2009	3	M	×	?	2566	0	×	×	77.09	65.66	87.80
Saxifragaceae	*Saxifraga hirculoides*	K339	2014	5	M	1.53	sex	188	998	84.15	78.69			
Saxifragaceae	*Saxifraga hirculoides*	K339	2014	10	M	1.53	sex	371	2328	86.25				
Saxifragaceae	*Saxifraga hirculoides*	K339	2014	10	M	1.51	sex	993	1899	65.66				

Saxifragaceae	*Saxifraga hirculus*	70	2013	5	O	1.53	sex	112	806	87.80	84.97			
Saxifragaceae	*Saxifraga hirculus*	70	2013	3	O	1.48	sex	132	607	82.14				
Saxifragaceae	*Saxifraga nanella*	6	2009	5	M	×	?	2119	0	×	67.63			
Saxifragaceae	*Saxifraga nanella*	6	2009	5	M	×	?	1369	0	×				
Saxifragaceae	*Saxifraga nanella*	6	2009	5	M	×	?	1872	0	×				
Saxifragaceae	*Saxifraga nanella*	6	2009	3	M	×	?	469	0	×				
Saxifragaceae	*Saxifraga nanella*	6	2009	3	M									
Saxifragaceae	*Saxifraga nanella*	6	2009	3	M	1.47	sex	360	752	67.63				
Scrophulariaceae	*Scrophularia dentata*	42	2013	3	O	1.42	sex	716	962	57.33	42.09	42.09	11.71	59.19
Scrophulariaceae	*Scrophularia dentata*	K254	2014	3	O	1.49	sex	1000	575	36.51				
Scrophulariaceae	*Scrophularia dentata*	K259	2014	3	O	1.47	sex	774	720	48.19				
Scrophulariaceae	*Scrophularia dentata*	K259	2014	3	O	1.47	sex	973	1411	59.19				
Scrophulariaceae	*Scrophularia dentata*	K259	2014	3	O	1.46	sex	1197	996	45.42				
Scrophulariaceae	*Scrophularia dentata*	K259	2014	3	O	1.44	sex	1063	643	37.69				
Scrophulariaceae	*Scrophularia dentata*	K259	2014	4	O	1.46	sex	1230	1077	46.68				
Scrophulariaceae	*Scrophularia dentata*	K259	2014	3	O	1.45	sex	1077	1055	49.48				
Scrophulariaceae	*Scrophularia dentata*	K259	2014	4	O	1.49	sex	1964	1698	46.37				
Scrophulariaceae	*Scrophularia dentata*	K265	2014	3	O	1.49	sex	2303	1784	43.65				
Scrophulariaceae	*Scrophularia dentata*	K265	2014	3	O	1.48	sex	2582	1085	29.59				
Scrophulariaceae	*Scrophularia dentata*	K265	2014	3	O	1.48	sex	1860	1175	38.71				
Scrophulariaceae	*Scrophularia dentata*	K265	2014	3	O	1.46	sex	1416	1287	47.61				
Scrophulariaceae	*Scrophularia dentata*	K265	2014	3	O	1.41	sex	969	1215	55.63				
Scrophulariaceae	*Scrophularia dentata*	K269	2014	3	O	×	?	0	1537	×				
Scrophulariaceae	*Scrophularia dentata*	K269	2014	3	O	1.52	sex	1418	188	11.71				
Scrophulariaceae	*Scrophularia dentata*	K269	2014	3	O	1.43	sex	1594	1589	49.92				
Scrophulariaceae	*Scrophularia dentata*	K270	2014	3	O	1.48	sex	2464	729	22.83				
Scrophulariaceae	*Scrophularia dentata*	K271	2014	3	O	1.49	sex	2659	1309	32.99				
Scrophulariaceae	*Scrophularia dentata*	K271	2014	3	O	1.49	sex	2213	1451	39.60				
Scrophulariaceae	*Scrophularia dentata*	K279	2014	3	O	1.45	sex	1639	1160	41.44				
Scrophulariaceae	*Scrophularia dentata*	K279	2014	3	O	1.46	sex	2005	1169	36.83				
Scrophulariaceae	*Scrophularia dentata*	K279	2014	3	O	1.46	sex	1063	1007	48.65				
Solanaceae	*Physochlaina praelta*	11	2009	2	M	1.49	sex	1366	948	40.97	42.94	42.94	40.83	45.52
Solanaceae	*Physochlaina praelta*	11	2009	2	M	1.50	sex	2335	1611	40.83				
Solanaceae	*Physochlaina praelta*	11	2009	2	M	1.49	sex	2187	1733	44.21				
Solanaceae	*Physochlaina praelta*	75	2013	3	O	1.51	sex	1862	1304	41.19				
Solanaceae	*Physochlaina praelta*	75	2013	3	O	1.49	sex	1776	1484	45.52				
Solanaceae	*Physochlaina praelta*	75	2013	4	O	1.49	sex	1601	1305	44.91				
Tamaricaceae	*Myricaria germanica*	K229	2014	10	M	×	?	2887	0	×	×	×	×	×
Tamaricaceae	*Myricaria germanica*	K229	2014	5	M	×	?	2930	0	×				
Urticaceae	*Lecanthus peduncularis*	TR22	2013	5	O	1.50	sex	992	516	34.22	34.22	48.82	34.22	71.22
Urticaceae	*Urtica hyperborea*	12	2009	3	M	×	?	0	1459	×	63.42			
Urticaceae	*Urtica hyperborea*	8	2009	3	M	1.50	sex	331	819	71.22				
Urticaceae	*Urtica hyperborea*	8	2009	3	M	1.39	sex	646	1030	61.46				
Urticaceae	*Urtica hyperborea*	8	2009	3	M	1.54	sex	338	669	66.43				
Urticaceae	*Urtica hyperborea*	8	2009	1	M									
Urticaceae	*Urtica hyperborea*	12	2009	3	M									
Urticaceae	*Urtica hyperborea*	12	2009	3	M									
Urticaceae	*Urtica hyperborea*	12	2009	3	M	1.50	sex	896	1076	54.56				
Urticaceae	*Urtica hyperborea*	12	2009	3	M									
Valerianaceae	*Valeriana himalayana*	K285	2014	3	O	1.48	sex	2984	261	8.04	9.50	9.50	8.04	11.67
Valerianaceae	*Valeriana himalayana*	K285	2014	3	O	1.51	sex	1976	261	11.67				
Valerianaceae	*Valeriana himalayana*	K285	2014	4	O	1.48	sex	2890	278	8.78				

Table 2

Summary of collected species with information about family, number of locality, date of collection, elevation and coordinates of collection, number of individuals collected on the locality, number of measured seeds, and information about way of reproduction. Yellow colour indicates sexual reproduction (sexual), green signals apomictic reproduction (apomictic), orange signals uncertain reproduction system (?), and grey belongs to species with undetectable endosperm (×).

family	species	locality	date	elevation	GPS N	GPS E	no. of bags from locality	no. of measured seeds	reproduction system
Alliaceae	*Allium przewalskianum*	45	25.8.2013	3120	34.42425	76.28330	5	10	sexual
Alliaceae	*Allium stoliczkae*	18	18.8.2013	4751	33.00424	77.35732	5	10	sexual
Amaranthaceae	*Salsola jacquemontii*	K363	14.9.2014	4571	33.03300	78.27468	3	9	×
Apiaceae	*Bupleurum gracillimum*	K271	31.8.2014	3459	33.72719	76.86253	3	9	sexual
Apiaceae	*Conioselinum vaginatum*	K257	26.8.2014	3960	33.16600	77.18083	3	13	sexual
Apiaceae	*Heracleum pinnatum*	31	20.8.2013	4327	33.12469	77.23027	5	17	sexual
Apiaceae	*Heracleum pinnatum*	K260	26.8.2014	3910	33.20061	77.15382	5	9	×
Apiaceae	*Pleurospermum lindleyanum*	K235	23.8.2014	4571	32.86123	77.18407	1	6	sexual
Apiaceae	*Semenovia lasiocarpa*	K248	25.8.2014	4072	33.07146	77.21993	4	8	sexual
Apiaceae	*Semenovia millefolia*	8	15.8.2013	4309	32.91022	77.58368	1	3	×
Apocynaceae	*Cynanchum acutum*	K254	26.8.2014	3970	33.14684	77.20056	3	13	sexual
Asteraceae	*Anaphalis nubigena*	K234	22.8.2014	4438	32.83256	77.15257	3	15	sexual
Asteraceae	*Anthemis sp.*	K264	27.8.2014	3824	33.25917	77.17309	3	10	sexual
Asteraceae	*Artemisia demissa*	75	8.9.2013	4698	32.98358	78.35858	1	9	sexual
Asteraceae	*Artemisia hedinii*		21.8.2013	3920	33.17703	77.17185	4	10	sexual
Asteraceae	*Artemisia minor*	51	27.8.2013	5001	34.30964	77.61867	5	10	sexual
Asteraceae	*Artemisia moorcroftiana*	75	8.9.2013	4698	32.98358	78.35858	5	10	sexual
Asteraceae	*Artemisia santolinifolia*	74	7.9.2013	5147	32.98943	78.39602	5	13	sexual
Asteraceae	*Artemisia stracheyi*	74	7.9.2013	5147	32.98943	78.39602	5	9	sexual
Asteraceae	*Askellia naniformis*	K282	1.9.2014	4033	33.81888	76.81567	3	6	sexual
Asteraceae	*Aster flaccidus*	K235	23.8.2014	4571	32.86123	77.18407	3	13	sexual
Asteraceae	*Brachyactis roylei*	K231	22.8.2014	3960	32.80444	77.11590	3	10	sexual
Asteraceae	*Cousinia thomsonii*	46	25.8.2013	3848	34.38103	76.46117	4	10	sexual
Asteraceae	*Cremanthodium elisii*	20	19.8.2013	4995	33.02831	77.34503	1	3	×
Asteraceae	*Cremanthodium elisii*	73	7.9.2013	5423	32.99544	78.41605	5	10	sexual
Asteraceae	*Cremanthodium ellisii*	8	25.8.2009	5386	32.93817	78.22036	1	6	×
Asteraceae	*Crepis flexuosa*	75	8.9.2013	4698	32.98358	78.35858	5	9	sexual
Asteraceae	*Erigeron uniflorus*	K241	23.8.2014	4720	32.92857	77.22148	3	15	sexual
Asteraceae	*Erigeron venustus*	K231	22.8.2014	3960	32.80444	77.11590	3	20	sexual
Asteraceae	*Himalaiella albescens*	TR4	31.8.2013	3365	32.67487	77.19789	5	10	sexual
Asteraceae	*Leontopodium leontopodinum*	K230	21.8.2014	4021	32.79939	77.11203	1	15	sexual
Asteraceae	*Psychrogeton andryaloides*	12	16.8.2013	4285	32.92427	77.54563	4	10	sexual
Asteraceae	*Psychrogeton denudatus*	12	16.8.2013	4285	32.92427	77.54563	4	10	sexual
Asteraceae	*Saussurea andryaloides*	K316	10.9.2014	5412	33.10357	78.38951	4	3	sexual
Asteraceae	*Saussurea bracteata*	K317	10.9.2014	5440	33.09971	78.39152	3	6	×
Asteraceae	*Saussurea glacialis*	70	7.9.2013	5636	32.99562	78.42884	6	11	sexual
Asteraceae	*Saussurea glandulifera*	72	7.9.2013	5302	32.99302	78.41013	5	6	sexual
Asteraceae	*Saussurea gnaphalodes*	3	14.8.2013	5308	33.50514	77.76550	4	3	sexual

Asteraceae	*Saussurea gnaphalodes*	4	25.8.2009	5664	32.99878	78.43294	1	6	×
Asteraceae	*Saussurea gnaphaloides*	70	7.9.2013	5636	32.99562	78.42884	5	10	sexual
Asteraceae	*Saussurea hypsipeta*	5	25.8.2009	5333	32.99556	78.41606	1	14	sexual
Asteraceae	*Saussurea jacea*	K268	30.8.2014	3414	33.71141	76.88908	6	3	×
Asteraceae	*Saussurea leontodontoides*	51	27.8.2013	5001	34.30964	77.61867	5	10	sexual
Asteraceae	*Saussurea medusa*	71	7.9.2013	5355	32.99213	78.41049	3	9	×
Asteraceae	*Saussurea schulzii*	K242	24.8.2014	4720	32.93134	77.22835	1	13	×
Asteraceae	*Scorzonera virgata*	K248	25.8.2014	4072	33.07146	77.21993	1	6	sexual
Asteraceae	*Scorzonera virgata*	K249	25.8.2014	4051	33.07653	77.21663	2	6	sexual
Asteraceae	*Senecio dubitabilis*	4	14.8.2013	4692	33.21561	77.55172	4	7	sexual
Asteraceae	*Senecio dubitabilis*	K363	14.9.2014	4571	33.03300	78.27468	3	9	sexual
Asteraceae	*Tanacetum fruticulosum*	75	8.9.2013	4698	32.98358	78.35858	5	10	sexual
Asteraceae	*Tanacetum pyrethroides*	31	20.8.2013	4327	33.12469	77.23027	2	3	×
Asteraceae	*Tanacetum stoliczkae*	MK 9	27.8.2013	3666	34.20951	76.72616	1	6	sexual
Asteraceae	*Tragopogon gracilis*	K249	25.8.2014	4051	33.07653	77.21663	3	10	sexual
Asteraceae	*Waldheimia tridactylites*	4	25.8.2009	5664	32.99878	78.43294	1	9	sexual
Asteraceae	*Waldheimia tridactylites*	7	25.8.2009	4600	32.98558	78.37489	1	9	sexual
Asteraceae	*Waldheimia tridactylites*	70	7.9.2013	5636	32.99562	78.42884	1	3	sexual
Balsaminaceae	*Impatiens brachycentra*	TR15	13.9.2013	2721	32.20002	77.24602	5	13	sexual
Biebersteiniaceae	*Biebersteinia odora*	25	20.8.2013	4752	33.10077	77.28547	6	16	apomictic
Biebersteiniaceae	*Biebersteinia odora*	K227	20.8.2014	4716	32.81374	77.45328	5	30	apomictic
Biebersteiniaceae	*Biebersteinia odora*	K285	1.9.2014	4762	33.87130	76.79153	5	26	apomictic
Boraginaceae	*Arnebia euchroma*	K257	26.8.2014	3960	33.16600	77.18083	1	6	×
Boraginaceae	*Eritrichum fruticulosum*	9	15.8.2013	4337	32.92297	77.55135	2	6	×
Boraginaceae	*Eritrichum hemisphaericum*	4	25.8.2009	5664	32.99878	78.43294	1	6	sexual
Boraginaceae	*Eritrichum hemisphaericum*	K333	13.9.2014	5771	33.00502	78.42476	2	2	×
Boraginaceae	*Eritrichum villosum*	K228	20.8.2014	4927	32.75915	77.41944	6	10	×
Boraginaceae	*Lappula tadshikorum*	42	24.8.2013	3730	34.08401	76.04742	5	10	sexual
Boraginaceae	*Lindelofia anchusoides*	K231	22.8.2014	3960	32.80444	77.11590	3	10	sexual
Boraginaceae	*Lindelofia stylosa*	10	15.8.2013	4341	32.92348	77.54813	5	10	×
Boraginaceae	*Mattiastrum himalayense*	K254	26.8.2014	3970	33.14684	77.20056	3	6	×
Brassicaceae	*Alyssum canescens*	K341	13.9.2014	5153	32.98983	78.39714	5	9	sexual
Brassicaceae	*Aphragmus oxycarpus*	K239	23.8.2014	5069	32.90885	77.20044	3	3	sexual
Brassicaceae	*Arabis pauciflora*	K245	24.8.2014	4520	32.93704	77.23843	3	5	×
Brassicaceae	*Arabis tibetica*	K234	22.8.2014	4438	32.83256	77.15257	3	19	×
Brassicaceae	Brassicaceae	K281	1.9.2014	3991	33.81822	76.81636	2	3	sexual
Brassicaceae	*Braya humilis*	75	8.9.2013	4698	32.98358	78.35858	1	9	sexual
Brassicaceae	*Conringia planisiliqua*	K256	26.8.2014	4005	33.15542	77.19190	1	15	×
Brassicaceae	*Desideria himalayensis*	6	14.8.2013	5100	33.10270	77.63190	1	3	sexual
Brassicaceae	*Desideria pumila*	6	25.8.2009	5975	32.99733	78.46233	1	9	sexual
Brassicaceae	*Desideria pumila*	764	5.9.2013	5780	33.01263	78.44185	5	10	sexual
Brassicaceae	*Draba cachemirica*	18	18.8.2013	4751	33.00424	77.35732	5	9	sexual
Brassicaceae	*Draba cachemirica*	K236	23.8.2014	4617	32.86792	77.18644	1	3	sexual
Brassicaceae	*Draba lasiophylla*	K235	23.8.2014	4571	32.86123	77.18407	3	22	sexual
Brassicaceae	*Draba oreades*	6	25.8.2009	5975	32.99733	78.46233	1	15	sexual
Brassicaceae	*Draba sp.*	K235	23.8.2014	4571	32.86123	77.18407	3	23	sexual
Brassicaceae	*Draba sp.*	K239	23.8.2014	5069	32.90885	77.20044	2	10	sexual
Brassicaceae	*Draba sp.*	K318	11.9.2014	5539	33.09537	78.39410	3	5	sexual
Brassicaceae	*Hedinia tibetica*	4	25.8.2009	5664	32.99878	78.43294	1	15	sexual
Brassicaceae	*Hedinia tibetica*	7	25.8.2009	4600	32.98558	78.37489	1	15	sexual
Brassicaceae	*Christolea crassifolia*	75	8.9.2013	4698	32.98358	78.35858	2	10	sexual
Brassicaceae	*Lepidium capitatum*	K311	9.9.2014	4998	33.13796	78.37360	3	9	×
Brassicaceae	*Lepidium latifolium*	60	28.8.2013	3072	34.72409	77.20242	5	13	×
Brassicaceae	*Matthiola chorassanica*	48	25.8.2013	3026	34.31020	76.95679	5	9	sexual
Brassicaceae	*Parrya nudicaulis*	K285	1.9.2014	4762	33.87130	76.79153	4	9	sexual
Brassicaceae	*Pegaeophyton scapiflorum*	69	5.9.2013	5741	33.05447	78.43301	5	13	sexual
Brassicaceae	*Sisymbrium brassiciforme*	K245	24.8.2014	4520	32.93704	77.23843	3	8	×
Brassicaceae	*Sisymbrium brassiciforme*	K259	26.8.2014	3962	33.18758	77.16001	3	15	sexual
Brassicaceae	*Stevenia canescens*	75	8.9.2013	4698	32.98358	78.35858	1	3	×
Brassicaceae	*Tauscheria lasiocarpa*	K288	2.9.2014	3964	33.90622	76.83012	1	9	×

Capparaceae	*Capparis spinosa*	60	28.8.2013	3072	34.72409	77.20242	5	13	sexual
Caprifoliaceae	*Lonicera asperifolia*	K251	25.8.2014	4053	33.10115	77.21462	3	10	sexual
Caprifoliaceae	*Lonicera microphylla*	K263	27.8.2014	3822	33.25159	77.16686	4	10	sexual
Caryophyllaceae	*Arenaria bryophylla*	4	25.8.2009	5664	32.99878	78.43294	1	13	sexual
Caryophyllaceae	*Arenaria bryophylla*	70	7.9.2013	5636	32.99562	78.42884	5	16	sexual
Caryophyllaceae	*Cerastium sp.*	K287	1.9.2014	4235	33.89228	76.79030	2	6	sexual
Caryophyllaceae	*Dianthus harrissii*	TR3	31.8.2013	3633	32.68439	77.18882	5	9	sexual
Caryophyllaceae	*Sagina saginoides*	K230	21.8.2014	4021	32.79939	77.11203	1	40	sexual
Caryophyllaceae	*Silene gonosperma*	50	27.8.2013	5315	34.28995	77.59465	5	10	sexual
Caryophyllaceae	*Silene himalayensis*	K235	23.8.2014	4571	32.86123	77.18407	1	12	sexual
Caryophyllaceae	*Silene moorcroftiiana*	27	20.8.2013	4668	33.10222	77.27527	2	3	×
Caryophyllaceae	*Silene nepalensis*	75	8.9.2013	4698	32.98358	78.35858	5	10	sexual
Caryophyllaceae	*Silene tenuis*	K235	23.8.2014	4571	32.86123	77.18407	1	9	sexual
Caryophyllaceae	*Silene tenuis*	K242	24.8.2014	4720	32.93134	77.22835	3	10	sexual
Caryophyllaceae	*Thylacospermum caespitosum*	3	25.8.2009	5612	32.99933	78.43314	1	9	sexual
Caryophyllaceae	*Thylacospermum caespitosum*	K225	20.8.2014	5117	33.10362	77.63248	5	15	sexual
Crassulaceae	*Rhodiola heterodonta*	K243	24.8.2014	4630	32.93208	77.23458	3	15	sexual
Crassulaceae	*Rhodiola heterodonta*	K333	13.9.2014	5356	32.99330	78.41172	4	3	×
Cuscutaceae	*Cuscuta planiflora*	K247	25.8.2014	4132	33.06148	77.22781	2	6	sexual
Cyperaceae	*Carex borii*	K240	23.8.2014	4721	32.92509	77.21188	3	9	?
Cyperaceae	*Carex microglochin*	K313	10.9.2014	5265	33.11692	78.38064	4	3	×
Cyperaceae	*Carex moorcroftii*	K232	22.8.2014	4186	32.81303	77.12123	3	9	sexual
Cyperaceae	*Carex nivalis*	K228	20.8.2014	4927	32.75915	77.41944	5	11	apomictic?
Cyperaceae	*Carex nivalis*	K229	21.8.2014	3938	32.80223	77.11360	1	6	sexual
Cyperaceae	*Carex orbicularis*	K257	26.8.2014	3960	33.16600	77.18083	1	9	sexual
Cyperaceae	*Carex sp.*	K313	10.9.2014	5265	33.11692	78.38064	3	10	apomictic?
Cyperaceae	*Carex stenocarpa*	16	18.8.2013	4488	32.97847	77.42243	5	14	sexual?
Cyperaceae	*Kobresia macrantha*	K226	20.8.2014	4942	33.06463	77.63195	5	12	×
Cyperaceae	*Kobresia schoenoides*	4	25.8.2009	5664	32.99878	78.43294	1	3	sexual
Cyperaceae	*Kobresia schoenoides*	75	8.9.2013	4698	32.98358	78.35858	5	10	sexual
Euphorbiaceae	*Euphorbia tibetica*	K265	27.8.2014	3867	33.26434	77.17808	5	13	sexual
Fabaceae	*Astragalus confertus*	4	25.8.2009	5664	32.99878	78.43294	1	9	sexual
Fabaceae	*Astragalus falconeri*	43	24.8.2013	3469	34.06869	75.93287	3	10	sexual
Fabaceae	*Astragalus munroi*	65	3.9.2013	5410	33.10611	78.38923	1	10	sexual
Fabaceae	*Astragalus nivalis*	12	16.8.2013	4285	32.92427	77.54563	1	10	sexual
Fabaceae	*Astragalus oplites*	27	20.8.2013	4668	33.10222	77.27527	5	7	sexual
Fabaceae	*Astragalus rhizanthus*	K244	24.8.2014	4611	32.93400	77.23645	1	13	sexual
Fabaceae	*Astragalus tecti-mundi*	K246	24.8.2014	4359	32.96944	77.25015	3	6	×
Fabaceae	*Astragalus thomsonii*	K247	25.8.2014	4132	33.06148	77.22781	3	10	sexual
Fabaceae	*Caragana sp.*	27	20.8.2013	4668	33.10222	77.27527	1	9	×
Fabaceae	*Cicer arietinum*	48	25.8.2013	3026	34.31020	76.95679	5	10	×
Fabaceae	*Cicer microphyllum*	K232	22.8.2014	4186	32.81303	77.12123	2	9	×
Fabaceae	*Cicer microphyllum*		17.8.2013	4407	32.94226	77.48449	4	12	×
Fabaceae	*Colutea nepalensis*	58	28.8.2013	3005	34.77983	77.11216	5	12	×
Fabaceae	*Medicago falcata*	TR4	31.8.2013	3365	32.67487	77.19789	5	9	sexual
Fabaceae	*Oxytropis hypoglottoides*	K247	25.8.2014	4132	33.06148	77.22781	3	10	sexual
Fabaceae	*Oxytropis chiliophylla*	4	25.8.2009	5664	32.99878	78.43294	1	8	sexual
Fabaceae	*Oxytropis chiliophylla*	72	7.9.2013	5302	32.99302	78.41013	5	10	sexual
Fabaceae	*Oxytropis microphylla*	9	25.8.2009	5339	32.99242	78.41039	1	6	×
Fabaceae	*Oxytropis microphylla*	74	7.9.2013	5147	32.98943	78.39602	5	10	sexual
Fabaceae	*Oxytropis pussila*		18.8.2013	4488	32.97847	77.42243	3	9	sexual
Fabaceae	*Oxytropis tatarica*	4	25.8.2009	5664	32.99878	78.43294	1	9	sexual
Fabaceae	*Oxytropis tatarica*	70	7.9.2013	5636	32.99562	78.42884	2	10	sexual
Fabaceae	*Thermopsis inflata*	K284	1.9.2014	4415	33.84740	76.79496	4	11	sexual
Fumariaceae	*Corydalis flabellata*	46	25.8.2013	3848	34.38103	76.46117	1	13	sexual
Fumariaceae	*Corydalis stricta*	9	15.8.2013	4337	32.92297	77.55135	1	3	sexual
Fumariaceae	*Corydalis thyrsiflora*	K235	23.8.2014	4571	32.86123	77.18407	3	10	sexual
Gentianaceae	*Gentianella moorcroftiana*	12	16.8.2013	4285	32.92427	77.54563	4	10	sexual
Gentianaceae	*Gentianella moorcroftiana*	K257	26.8.2014	3960	33.16600	77.18083	3	5	sexual
Gentianaceae	*Gentianopsis vvedenskyi*	TR1	27.8.2013	3735	33.90987	77.70122	5	10	sexual

Geraniaceae	*Geranium himalayense*	25	20.8.2013	4752	33.10077	77.28547	5	13	×
Geraniaceae	*Geranium nepalense*	TR13	11.9.2013	2268	32.26203	77.17497	5	10	×
Grossulariaceae	*Ribes orientale*	K262	27.8.2014	3832	33.24678	77.16468	2	6	sexual
Chenopodiaceae	*Atriplex pamirica*	K256	26.8.2014	4005	33.15542	77.19190	3	13	×
Chenopodiaceae	*Corispermum tibeticum*	75	8.9.2013	4698	32.98358	78.35858	5	10	×
Chenopodiaceae	*Corispermum tibeticum*	K363	14.9.2014	4571	33.03300	78.27468	4	3	×
Chenopodiaceae	*Chenopodium foliosum*	K229	21.8.2014	3938	32.80223	77.11360	1	15	sexual
Chenopodiaceae	*Chenopodium pamiricum*	K363	14.9.2014	4571	33.03300	78.27468	3	8	sexual
Chenopodiaceae	*Kochia prostrata*	K252	25.8.2014	4053	33.12365	77.21821	3	10	sexual
Chenopodiaceae	*Kochia prostrata*	K258	25.8.2014	3995	33.17729	77.16746	3	3	×
Chenopodiaceae	*Kraschenninnikovia pungens*	75	8.9.2013	4698	32.98358	78.35858	1	6	×
Iridaceae	*Iris hookeriana*	44	24.8.2013	3364	34.08128	75.93463	7	10	sexual
Juncaceae	*Juncus himalensis*	K229	21.8.2014	3938	32.80223	77.11360	5	25	sexual
Juncaceae	*Juncus leucanthus*	K229	21.8.2014	3938	32.80223	77.11360	5	25	sexual
Juncaceae	*Juncus memranaceus*	K257	26.8.2014	3960	33.16600	77.18083	1	15	sexual
Lamiaceae	*Dracocephallum heterophyllum*	64	2.9.2013	5147	32.98943	78.39602	4	10	sexual
Lamiaceae	*Dracocephalum stamineum*	32	20.8.2013	3971	33.12719	77.21786	5	9	sexual
Lamiaceae	*Marmoritis rotundifolia*	K286	1.9.2014	4110	33.88391	76.79256	1	10	sexual
Lamiaceae	*Nepeta discolor*		15.8.2013	4329	32.92427	77.54567	5	10	sexual
Lamiaceae	*Nepeta eriostachya*	TR3	31.8.2013	3633	32.68439	77.18882	5	10	sexual
Lamiaceae	*Nepeta glutinosa*	26	20.8.2013	4716	33.10103	77.27885	5	17	sexual
Lamiaceae	*Nepeta leucolaena*	TR1	27.8.2013	3735	33.90987	77.70122	6	10	sexual
Lamiaceae	*Nepeta longibracteata*	4	25.8.2009	5664	32.99878	78.43294	1	12	sexual
Lamiaceae	*Nepeta longibracteata*	70	7.9.2013	5636	32.99562	78.42884	6	3	sexual
Lamiaceae	*Stachys tibetica*		14.8.2013	3810	33.44113	77.44338	5	10	sexual
Lamiaceae	*Thymus linearis*	9	15.8.2013	4337	32.92297	77.55135	4	10	sexual
Morinaceae	*Morina coulteriana*	46	25.8.2013	3848	34.38103	76.46117	2	3	sexual
Onagraceae	*Epilobium latifolium*	20	19.8.2013	4995	33.02831	77.34503	1	11	×
Onagraceae	*Epilobium latifolium*	33	21.8.2013	3920	33.17703	77.17185	5	3	×
Orobanchaceae	*Euphrasia foliosa*	K257	26.8.2014	3960	33.16600	77.18083	3	10	sexual
Orobanchaceae	*Leptorhabdos parviflora*	K269	30.8.2014	3415	33.71969	76.86824	1	6	×
Orobanchaceae	*Pedicularis bicornuta*	33	21.8.2013	3920	33.17703	77.17185	1	9	sexual
Orobanchaceae	*Pedicularis cheilanthifolia*	62	28.8.2013	4818	34.25406	77.62244	1	13	sexual
Orobanchaceae	*Pedicularis cheilanthifolia*	K249	25.8.2014	4051	33.07653	77.21663	3	3	sexual
Papaveraceae	*Meconopsis aculeata*	K236	23.8.2014	4617	32.86792	77.18644	1	15	sexual
Papaveraceae	*Meconopsis aculeata*	K241	23.8.2014	4720	32.92857	77.22148	1	10	×
Plantaginaceae	*Picrorhiza kurrooa*	K235	23.8.2014	4571	32.86123	77.18407	3	21	sexual
Plantaginaceae	*Plantago himalaica*	K249	25.8.2014	4051	33.07653	77.21663	3	10	sexual
Plantaginaceae	*Platnago depresa*	34	22.8.2013	3831	33.23498	77.14468	1	10	sexual
Plantaginaceae	*Veronica biloba*	K231	22.8.2014	3960	32.80444	77.11590	3	16	sexual
Plumbaginaceae	*Acantholimon lycopodioides*	K251	25.8.2014	4053	33.10115	77.21462	3	6	×
Poaceae	*Alopecurus himalaicus*	16	18.8.2013	4488	32.97847	77.42243	5	10	sexual
Poaceae	*Calamagrostis stoliczkae*	K255	26.8.2014	3969	33.15542	77.19190	3	12	sexual
Poaceae	*Elymus cognatus*	K259	26.8.2014	3962	33.18758	77.16001	3	10	sexual
Poaceae	*Elymus jacquemontii*	K224	20.8.2014	4556	33.10202	77.76091	5	10	sexual
Poaceae	*Elymus schrenkianus*	27	20.8.2013	4668	33.10222	77.27527	5	10	sexual
Poaceae	*Hordeum brevisubulatum*	K249	25.8.2014	4051	33.07653	77.21663	3	13	sexual
Poaceae	*Leymus secalinus*	K249	25.8.2014	4051	33.07653	77.21663	4	8	sexual
Poaceae	*Melica persica*	K265	27.8.2014	3867	33.26434	77.17808	3	6	×
Poaceae	*Phleum alpinum*	K232	22.8.2014	4186	32.81303	77.12123	1	6	sexual
Poaceae	*Poa attenuata*	4	25.8.2009	5664	32.99878	78.43294	1	4	×
Poaceae	*Poa attenuata*	K331	13.9.2014	5631	32.99877	78.42861	5	6	apomictic
Poaceae	*Stipa capilata*		17.8.2013	4407	32.94226	77.48449	1	2	×
Poaceae	*Stipa orientalis*	K252	25.8.2014	4053	33.12365	77.21821	3	7	sexual
Poaceae	*Stipa splendens*	K266	27.8.2014	3839	33.23953	77.10462	3	17	apomictic
Poaceae	*Stipa subsessiliflora*	9	25.8.2009	5339	32.99242	78.41039	1	6	sexual
Poaceae	*Stipa subsessiliflora*	74	7.9.2013	5147	32.98943	78.39602	5	10	sexual
Poaceae	*Trisetum spicatum*	4	25.8.2009	5664	32.99878	78.43294	1	25	sexual
Poaceae	*Trisetum spicatum*	70	7.9.2013	5636	32.99562	78.42884	5	12	sexual
Poaceae	*Trisetum spicatum*	K318	11.9.2014	5539	33.09537	78.39410	4	3	sexual

Polygonaceae	*Bistorta affinis*	25	20.8.2013	4752	33.10077	77.28547	1	6	sexual?
Polygonaceae	*Bistorta vivipara*	40	24.8.2013	3989	34.04624	76.24646	5	3	×
Polygonaceae	*Knorringia pamirica*	75	8.9.2013	4698	32.98358	78.35858	5	13	sexual
Polygonaceae	*Oxyria digyna*	K229	21.8.2014	3938	32.80223	77.11360	3	18	sexual
Polygonaceae	*Polygonum cognatum*	K227	20.8.2014	4716	32.81374	77.45328	3	10	sexual
Polygonaceae	*Polygonum rumicifolium*	K245	24.8.2014	4520	32.93704	77.23843	3	13	sexual
Polygonaceae	*Rheum tibeticum*	K283	1.9.2014	4218	33.82450	76.81200	3	3	sexual
Polygonaceae	*Rheum webbianum*	K232	22.8.2014	4186	32.81303	77.12123	1	3	×
Polygonaceae	*Rumex patientia*	K257	26.8.2014	3960	33.16600	77.18083	3	9	×
Primulaceae	*Primula macrophylla*	49	27.8.2013	5409	34.27762	77.60632	5	10	sexual
Primulaceae	*Primula moorcroftiana*	K241	23.8.2014	4720	32.92857	77.22148	3	9	sexual
Ranunculaceae	*Anemone rupicola*	K280	1.9.2014	3989	33.81665	76.81720	4	10	sexual
Ranunculaceae	*Aquilegia fragrans*	K280	1.9.2014	3989	33.81665	76.81720	3	9	sexual
Ranunculaceae	*Aquilegia moorcroftiana*	10	15.8.2013	4341	32.92348	77.54813	4	13	sexual
Ranunculaceae	*Aquilegia moorcroftiana*	K281	1.9.2014	3991	33.81822	76.81636	1	3	sexual
Ranunculaceae	*Clemaatis tangutica*	K262	27.8.2014	3832	33.24678	77.16468	3	9	sexual
Ranunculaceae	*Clematis sp.*	K273	31.8.2014	3394	33.73200	76.85768	1	6	sexual
Ranunculaceae	*Clematis sp.*	K288	2.9.2014	3964	33.90622	76.83012	3	6	×
Ranunculaceae	*Delphinium brunonianum*	9	25.8.2009	5339	32.99242	78.41039	1	7	sexual
Ranunculaceae	*Delphinium brunonianum*	70	7.9.2013	5636	32.99562	78.42884	6	10	sexual
Ranunculaceae	*Pulsatilla wallichiana*	MK 2	27.8.2013	4475	34.18061	76.66306	1	9	sexual
Ranunculaceae	*Ranunculus lobatus*	765	6.9.2013	5650	33.00042	78.43462	1	9	sexual
Ranunculaceae	*Ranunculus membranaceus*	K240	23.8.2014	4721	32.92509	77.21188	3	9	apomictic
Ranunculaceae	*Thalictrum alpinum*	K242	24.8.2014	4720	32.93134	77.22835	3	6	?
Ranunculaceae	*Thalictrum foetidum*	K257	26.8.2014	3960	33.16600	77.18083	3	3	sexual
Rhamnaceae	*Rhamnus prostrata*	K254	26.8.2014	3970	33.14684	77.20056	2	6	sexual
Rosaceae	*Comarum salesovianum*	K273	31.8.2014	3394	33.73200	76.85768	3	12	sexual
Rosaceae	*Comarum salesovianum*	MK 5	27.8.2013	4209	34.16908	76.69171	1	12	sexual
Rosaceae	*Chamaerhodos sabulosa*	4	14.8.2013	4692	33.21561	77.55172	1	11	×
Rosaceae	*Potentilla bifurca*	K224	20.8.2014	4556	33.10202	77.76091	3	9	sexual
Rosaceae	*Potentilla evestita*	25	20.8.2013	4752	33.10077	77.28547	1	12	×
Rosaceae	*Potentilla gelida*	39	24.8.2013	4049	33.97122	76.33810	5	16	apomictic
Rosaceae	*Potentilla multifida*	K242	24.8.2014	4720	32.93134	77.22835	3	9	sexual
Rosaceae	*Potentilla pamirica*	4	25.8.2009	5664	32.99878	78.43294	1	15	apomictic
Rosaceae	*Potentilla pamirica*	70	7.9.2013	5636	32.99562	78.42884	2	3	apomictic
Rosaceae	*Potentilla sericea*	K242	24.8.2014	4720	32.93134	77.22835	3	13	apomictic
Rosaceae	*Potentilla sojakii*	K230	21.8.2014	4021	32.79939	77.11203	4	12	apomictic
Rosaceae	*Potentilla sojakii*	K241	23.8.2014	4720	32.92857	77.22148	3	7	×
Rosaceae	*Potentilla sojakii*	K242	24.8.2014	4720	32.93134	77.22835	1	12	apomictic
Rosaceae	*Potentilla turczaninowiana*	K241	23.8.2014	4720	32.92857	77.22148	3	16	sexual
Rosaceae	*Potentilla venusta*	K234	22.8.2014	4438	32.83256	77.15257	4	13	×
Rosaceae	*Potentilla venusta*	K242	24.8.2014	4720	32.93134	77.22835	3	13	apomictic
Rosaceae	*Rosa webbiana*	K274	31.8.2014	3688	33.77235	76.84057	3	9	×
Rosaceae	*Sibbaldia cuneata*	K229	21.8.2014	3938	32.80223	77.11360	5	7	×
Rosaceae	*Sorbus tianschanica*	K268	30.8.2014	3414	33.71141	76.88908	1	2	sexual
Rubiaceae	*Galium pauciflorum*	K231	22.8.2014	3960	32.80444	77.11590	1	9	sexual
Rubiaceae	*Rubia tibetica*	K247	25.8.2014	4132	33.06148	77.22781	1	3	sexual
Rubiaceae	*Rubia tibetica*	K248	25.8.2014	4072	33.07146	77.21993	2	7	sexual
Salicaceae	*Salix flabellaris*	K235	23.8.2014	4571	32.86123	77.18407	2	9	×
Saxifragaceae	*Saxifraga cernua*	4	25.8.2009	5664	32.99878	78.43294	1	3	×
Saxifragaceae	*Saxifraga cernua*	68	4.9.2013	5780	33.01263	78.44185	5	3	×
Saxifragaceae	*Saxifraga hirculoides*	K339	13.9.2014	5356	32.99330	78.41172	3	25	sexual
Saxifragaceae	*Saxifraga hirculus*	70	7.9.2013	5636	32.99562	78.42884	1	8	sexual
Saxifragaceae	*Saxifraga nanella*	6	25.8.2009	5975	32.99733	78.46233	1	24	sexual
Scrophulariaceae	*Scrophularia dentata*	42	24.8.2013	3730	34.08401	76.04742	6	3	sexual
Scrophulariaceae	*Scrophularia dentata*	K254	26.8.2014	3970	33.14684	77.20056	3	3	sexual
Scrophulariaceae	*Scrophularia dentata*	K259	26.8.2014	3962	33.18758	77.16001	3	23	sexual
Scrophulariaceae	*Scrophularia dentata*	K265	27.8.2014	3867	33.26434	77.17808	5	15	sexual
Scrophulariaceae	*Scrophularia dentata*	K269	30.8.2014	3415	33.71969	76.86824	1	9	sexual
Scrophulariaceae	*Scrophularia dentata*	K270	31.8.2014	3417	33.72277	76.85841	1	3	sexual

Scrophulariaceae	*Scrophularia dentata*	K271	31.8.2014	3459	33.72719	76.86253	1	6	sexual
Scrophulariaceae	*Scrophularia dentata*	K279	1.9.2014	3761	33.80561	76.82697	3	9	sexual
Solanaceae	*Physochlaina praealta*	11	25.8.2009	4771	32.92667	78.25703	1	6	sexual
Solanaceae	*Physochlaina praealta*	75	8.9.2013	4698	32.98358	78.35858	5	10	sexual
Tamaricaceae	*Myricaria germanica*	K229	21.8.2014	3938	32.80223	77.11360	3	15	×
Urticaceae	*Lecanthus peduncularis*	TR22	16.9.2013	2211	32.10797	77.19031	5	5	sexual
Urticaceae	*Urtica hyperborea*	8	25.8.2009	5386	32.93817	78.22036	1	10	sexual
Urticaceae	*Urtica hyperborea*	12	25.8.2009	5436	32.99608	78.42014	1	15	sexual
Valerianaceae	*Valeriana himalayana*	K285	1.9.2014	4762	33.87130	76.79153	3	10	sexual

Table 3

Calculation of reproduction system of *Biebersteinia odora* seeds. In first column is number of locality; in second is number of individual. In the next columns are calculations of ratios of seed tissues and maternal genome size to standard (bright-green – diploid embryo, bright-red – tetraploid embryo, bright-orange – triploid embryo, without colour – triploid-near embryo); and calculations of gametes genome size to standard in four different reproduction ways (grey colour indicates possible situations). In the last column is written what is the most possible way of reproduction of the measured seed (green – pseudogamy, blue – autonomy, yellow – sexuality, orange – uncertain).

locality	individual	embryo/standard	endosperm/standard	endosperm/embryo	maternal plant/standard	female gamete (sexual)	male gamete (sexual)	female gamete (pseudogamy)	male gamete (pseudogamy)	female gamete (pseudogamy, 2 sperm cells)	male gamete (pseudogamy, 2 sperm cells)	female gamete (autonomy)	male gamete (autonomy)	way of reproduction
124	**1**	3.117	12.112	3.886	×	8.996	-5.879	3.117	5.879	3.117	2.939	3.117	6.056	pseudogamy, endosperm with two unreduced sperm cells
124	**1**	2.849	9.733	3.417		6.884	-4.036	2.849	4.036	2.849	2.018	2.849	4.866	pseudogamy, endosperm with two unreduced sperm cells
124	**1**	2.844	6.995	2.460		4.151	-1.307	2.844	1.307	2.844	0.654	2.844	3.497	pseudogamy, endosperm with one reduced sperm cell
124	**1**	2.865	11.232	3.921		8.367	-5.502	2.865	5.502	2.865	2.751	2.865	5.616	pseudogamy, endosperm with two unreduced sperm cells
124	**1**	2.817	8.396	2.981		5.580	-2.763	2.817	2.763	2.817	1.381	2.817	4.198	pseudogamy, endosperm with one unreduced or two reduced cells
124	**4**	2.857	11.257	3.940	×	8.400	-5.543	2.857	5.543	2.857	2.771	2.857	5.629	pseudogamy, endosperm with two unreduced sperm cells
124	**4**	2.834	11.113	3.921		8.278	-5.444	2.834	5.444	2.834	2.722	2.834	5.556	pseudogamy, endosperm with two unreduced sperm cells
124	**4**	3.698	10.227	2.765		6.529	-2.830	3.698	2.830	3.698	1.415	3.698	5.113	pseudogamy, endosperm with one unreduced or two reduced cells, triploid-near embryo
124	**4**	3.121	10.013	3.209		6.892	-3.772	3.121	3.772	3.121	1.886	3.121	5.007	pseudogamy, endosperm with one unreduced or two reduced cells
124	**4**	3.685	10.801	2.931		7.116	-3.431	3.685	3.431	3.685	1.716	3.685	5.401	pseudogamy, endosperm with one unreduced or two reduced cells, triploid-near embryo
124	**5**	3.981	9.812	2.465	×	5.831	-1.850	3.981	1.850	3.981	0.925	3.981	4.906	pseudogamy, endosperm with one reduced sperm cell, triploid-near embryo

124	**5**	3.450	9.704	2.813		6.253	-2.803	3.450	2.803	3.450	1.402	3.450	4.852	pseudogamy, endosperm with one unreduced or two reduced cells, triploid-near embryo
124	**5**	3.696	9.293	2.515		5.598	-1.902	3.696	1.902	3.696	0.951	3.696	4.647	pseudogamy, endosperm with one reduced sperm cell, triploid-near embryo
124	**5**	5.613	11.557	2.059		5.943	-0.330	5.613	0.330	5.613	0.165	5.613	5.778	autonomous apomixis, tetraploid embryo
124	**5**	5.520	11.453	2.075		5.933	-0.413	5.520	0.413	5.520	0.207	5.520	5.727	autonomous apomixis, tetraploid embryo
124	**5**	2.801	9.637	3.440		6.836	-4.035	2.801	4.035	2.801	2.017	2.801	4.819	pseudogamy, endosperm with one reduced sperm cell
K227	**1**	2.813	6.791	2.414	2.792	3.978	-1.165	2.813	1.165	2.813	0.582	2.813	3.395	pseudogamy, endosperm with one reduced sperm cell
K227	**1**	2.808	6.719	2.393		3.911	-1.102	2.808	1.102	2.808	0.551	2.808	3.360	pseudogamy, endosperm with one reduced sperm cell
K227	**1**	2.781	6.895	2.480		4.115	-1.334	2.781	1.334	2.781	0.667	2.781	3.448	pseudogamy, endosperm with one reduced sperm cell
K227	**1**	2.795	6.894	2.467		4.099	-1.304	2.795	1.304	2.795	0.652	2.795	3.447	pseudogamy, endosperm with one reduced sperm cell
K227	**1**	2.825	6.952	2.461		4.126	-1.301	2.825	1.301	2.825	0.651	2.825	3.476	pseudogamy, endosperm with one reduced sperm cell
K227	**1**	2.824	6.868	2.432		4.044	-1.221	2.824	1.221	2.824	0.610	2.824	3.434	pseudogamy, endosperm with one reduced sperm cell
K227	**1**	2.779	8.165	2.939		5.387	-2.608	2.779	2.608	2.779	1.304	2.779	4.083	pseudogamy, endosperm with one unreduced or two reduced cells
K227	**2**	2.797	8.106	2.898	2.739	5.309	-2.512	2.797	2.512	2.797	1.256	2.797	4.053	pseudogamy, endosperm with one unreduced or two reduced cells
K227	**2**	2.891	9.417	3.258		6.526	-3.635	2.891	3.635	2.891	1.818	2.891	4.708	pseudogamy, a sperm cell from triploid plant
K227	**2**	2.781	6.749	2.427		3.969	-1.188	2.781	1.188	2.781	0.594	2.781	3.375	pseudogamy, endosperm with one reduced sperm cell
K227	**2**	2.853	6.882	2.412		4.029	-1.176	2.853	1.176	2.853	0.588	2.853	3.441	pseudogamy, endosperm with one reduced sperm cell
K227	**2**	2.807	6.749	2.405		3.943	-1.136	2.807	1.136	2.807	0.568	2.807	3.375	pseudogamy, endosperm with one reduced sperm cell
K227	**3**	2.773	6.784	2.446	2.773	4.010	-1.237	2.773	1.237	2.773	0.618	2.773	3.392	pseudogamy, endosperm with one reduced sperm cell
K227	**3**	2.814	6.911	2.456		4.097	-1.283	2.814	1.283	2.814	0.641	2.814	3.455	pseudogamy, endosperm with one reduced sperm cell
K227	**3**	2.834	9.786	3.453		6.952	-4.118	2.834	4.118	2.834	2.059	2.834	4.893	pseudogamy, a sperm cell from triploid plant
K227	**3**	2.852	6.966	2.443		4.115	-1.263	2.852	1.263	2.852	0.632	2.852	3.483	pseudogamy, endosperm with one reduced sperm cell

K227	**3**	5.568	8.295	1.490		2.726	2.842	5.568	-2.842	5.568	-1.421	5.568	4.147	sexual fertilisation of unreduced embryo-sac
K227	**3**	2.869	13.469	4.694		10.600	-7.730	2.869	7.730	2.869	3.865	2.869	6.734	pseudogamy, two sperm cells from triploid plant
K227	**4**	2.822	8.257	2.926	2.901	5.436	-2.614	2.822	2.614	2.822	1.307	2.822	4.129	pseudogamy, endosperm with one unreduced or two reduced cells
K227	**4**	2.850	9.274	3.255		6.425	-3.575	2.850	3.575	2.850	1.788	2.850	4.637	pseudogamy, a sperm cell from triploid plant
K227	**4**	4.233	10.996	2.598		6.763	-2.529	4.233	2.529	4.233	1.265	4.233	5.498	pseudogamy, triploid embryo, endosperm with one unreduced or two reduced cells
K227	**4**	2.803	6.855	2.446		4.053	-1.250	2.803	1.250	2.803	0.625	2.803	3.428	pseudogamy, endosperm with one reduced sperm cell
K227	**4**	2.799	6.886	2.460		4.087	-1.288	2.799	1.288	2.799	0.644	2.799	3.443	pseudogamy, endosperm with one reduced sperm cell
K227	**5**	2.794	9.599	3.435	2.810	6.805	-4.011	2.794	4.011	2.794	2.005	2.794	4.799	pseudogamy, a sperm cell from triploid plant
K227	**5**	2.795	6.877	2.460		4.081	-1.286	2.795	1.286	2.795	0.643	2.795	3.438	pseudogamy, endosperm with one reduced sperm cell
K227	**5**	2.784	6.847	2.460		4.063	-1.280	2.784	1.280	2.784	0.640	2.784	3.423	pseudogamy, endosperm with one reduced sperm cell
K227	**5**	2.816	6.855	2.435		4.039	-1.224	2.816	1.224	2.816	0.612	2.816	3.428	pseudogamy, endosperm with one reduced sperm cell
K227	**5**	2.821	6.834	2.423		4.013	-1.192	2.821	1.192	2.821	0.596	2.821	3.417	pseudogamy, endosperm with one reduced sperm cell
K285	**1**	2.823	6.952	0.406	2.801	4.129	-1.306	2.823	1.306	2.823	0.653	2.823	3.476	pseudogamy, endosperm with one reduced sperm cell
K285	**1**	2.822	6.888	0.410		4.066	-1.245	2.822	1.245	2.822	0.622	2.822	3.444	pseudogamy, endosperm with one reduced sperm cell
K285	**1**	2.797	6.919	0.404		4.122	-1.324	2.797	1.324	2.797	0.662	2.797	3.459	pseudogamy, endosperm with one reduced sperm cell
K285	**1**	2.834	6.869	0.413		4.035	-1.201	2.834	1.201	2.834	0.601	2.834	3.435	pseudogamy, endosperm with one reduced sperm cell
K285	**1**	2.836	6.934	0.409		4.098	-1.262	2.836	1.262	2.836	0.631	2.836	3.467	pseudogamy, endosperm with one reduced sperm cell
K285	**1**	2.818	8.329	0.338		5.511	-2.693	2.818	2.693	2.818	1.347	2.818	4.164	pseudogamy, endosperm with one unreduced or two reduced sperm cells
K285	**2**	2.836	6.974	0.407	2.802	4.138	-1.303	2.836	1.303	2.836	0.651	2.836	3.487	pseudogamy, endosperm with one reduced sperm cell
K285	**2**	2.822	6.973	0.405		4.151	-1.329	2.822	1.329	2.822	0.664	2.822	3.486	pseudogamy, endosperm with one reduced sperm cell
K285	**2**	2.795	6.904	0.405		4.110	-1.315	2.795	1.315	2.795	0.658	2.795	3.452	pseudogamy, endosperm with one reduced sperm cell
K285	**2**	2.855	5.656	0.505		2.801	0.054	2.855	-0.054	2.855	-0.027	2.855	2.828	autonomous apomixis

K285	**2**	2.802	8.242	0.340		5.440	-2.637	2.802	2.637	2.802	1.319	2.802	4.121	pseudogamy, endosperm with one unreduced or two reduced cells
K285	**3**	2.797	6.876	0.407	2.806	4.079	-1.282	2.797	1.282	2.797	0.641	2.797	3.438	pseudogamy, endosperm with one reduced sperm cell
K285	**3**	2.785	8.066	0.345		5.281	-2.497	2.785	2.497	2.785	1.248	2.785	4.033	pseudogamy, endosperm with one unreduced or two reduced sperm cells
K285	**3**	2.824	9.669	0.292		6.846	-4.022	2.824	4.022	2.824	2.011	2.824	4.835	pseudogamy, a sperm cell from triploid plant
K285	**3**	2.843	9.492	0.300		6.648	-3.805	2.843	3.805	2.843	1.902	2.843	4.746	pseudogamy, a sperm cell from triploid plant
K285	**3**	2.835	9.623	0.295		6.788	-3.953	2.835	3.953	2.835	1.976	2.835	4.811	pseudogamy, a sperm cell from triploid plant
K285	**4**	2.811	6.853	0.410	2.850	4.042	-1.231	2.811	1.231	2.811	0.615	2.811	3.427	pseudogamy, endosperm with one reduced sperm cell
K285	**4**	2.811	6.839	0.411		4.028	-1.217	2.811	1.217	2.811	0.608	2.811	3.420	pseudogamy, endosperm with one reduced sperm cell
K285	**4**	2.829	6.989	0.405		4.160	-1.331	2.829	1.331	2.829	0.665	2.829	3.494	pseudogamy, endosperm with one reduced sperm cell
K285	**4**	2.783	8.168	0.341		5.385	-2.601	2.783	2.601	2.783	1.301	2.783	4.084	pseudogamy, endosperm with one unreduced or two reduced cells
K285	**4**	2.783	6.853	0.406		4.070	-1.287	2.783	1.287	2.783	0.643	2.783	3.427	pseudogamy, endosperm with one reduced sperm cell
K285	**5**	2.827	6.936	0.408	2.827	4.109	-1.281	2.827	1.281	2.827	0.641	2.827	3.468	pseudogamy, endosperm with one reduced sperm cell
K285	**5**	2.823	6.954	0.406		4.131	-1.307	2.823	1.307	2.823	0.654	2.823	3.477	pseudogamy, endosperm with one reduced sperm cell
K285	**5**	2.825	6.839	0.413		4.014	-1.189	2.825	1.189	2.825	0.594	2.825	3.420	pseudogamy, endosperm with one reduced sperm cell
K285	**5**	2.819	6.958	0.405		4.139	-1.319	2.819	1.319	2.819	0.660	2.819	3.479	pseudogamy, endosperm with one reduced sperm cell
K285	**5**	2.819	11.010	0.256		8.191	-5.372	2.819	5.372	2.819	2.686	2.819	5.505	pseudogamy, endosperm with two unreduced sperm cells

Table 4

Summary of percentage of endosperm occurring in individual species and families. Minimum and maximum of families is noted.

family	species	average of species	average of family	min. of family	max. of family
Alliaceae	*Allium przewalskianum*	24.17	50.98	18.63	84.52
Alliaceae	*Allium stoliczkae*	77.78			
Amaranthaceae	*Salsola jacquemontii*	×	×	×	×
Apiaceae	*Bupleurum gracilimum*	80.14	77.14	46.59	92.14
Apiaceae	*Conioselinum vaginatum*	57.40			
Apiaceae	*Heracleum pinnatum*	76.06			
Apiaceae	*Pleurospermum lindleyanum*	81.05			
Apiaceae	*Semenovia lasiocarpa*	91.04			
Apiaceae	*Semenovia millefolia*	×			
Apocynaceae	*Cynanchum acutum*	41.63	41.63	34.91	52.46
Asteraceae	*Anaphalis nubigena*	35.09	15.01	4.36	42.88
Asteraceae	*Anthemis sp.*	11.27			
Asteraceae	*Artemisia demissa*	12.10			
Asteraceae	*Artemisia hedinii*	11.21			
Asteraceae	*Artemisia minor*	4.74			
Asteraceae	*Artemisia moorcroftiana*	13.91			
Asteraceae	*Artemisia santolinifolia*	25.06			
Asteraceae	*Artemisia stracheyi*	14.85			
Asteraceae	*Askellia naniformis*	13.74			
Asteraceae	*Aster flaccidus*	18.11			
Asteraceae	*Brachyactis roylei*	24.44			
Asteraceae	*Cousinia thomsonii*	11.43			
Asteraceae	*Cremanthodium elisii*	27.93			
Asteraceae	*Crepis flexuosa*	8.76			
Asteraceae	*Erigeron uniflorus*	12.22			
Asteraceae	*Erigeron venustus*	28.99			
Asteraceae	*Himalaiella albescens*	14.02			
Asteraceae	*Leontopodium leontopodinum*	20.51			
Asteraceae	*Psychrogeton andryaloides*	8.88			
Asteraceae	*Psychrogeton denudatus*	13.00			
Asteraceae	*Saussurea andryaloides*	19.61			
Asteraceae	*Saussurea bracteata*	×			
Asteraceae	*Saussurea glacialis*	16.08			
Asteraceae	*Saussurea glandulifera*	16.98			
Asteraceae	*Saussurea gnaphaloides*	14.35			
Asteraceae	*Saussurea hypsipeta*	6.95			
Asteraceae	*Saussurea jacea*	×			
Asteraceae	*Saussurea leontodontoides*	12.39			
Asteraceae	*Saussurea medusa*	×			
Asteraceae	*Saussurea schulzii*	×			
Asteraceae	*Scorzonera virgata*	10.32			
Asteraceae	*Senecio dubitabilis*	18.64			
Asteraceae	*Tanacetum fruticulosum*	8.50			
Asteraceae	*Tanacetum pyrethroides*	×			
Asteraceae	*Tanacetum stoliczkae*	12.57			
Asteraceae	*Tragopogon gracilis*	5.90			
Asteraceae	*Waldheimia tridactylites*	7.90			
Balsamiaceae	*Impatiens brachycentra*	7.89	7.89	2.55	13.22
Biebersteiniaceae	*Biebersteinia odora*	23.75	23.75	2.70	47.53
Boraginaceae	*Arnebia euchroma*	×	10.43	5.54	21.19
Boraginaceae	*Eritrichum fruticulosum*	×			
Boraginaceae	*Eritrichum hemisphaericum*	9.67			
Boraginaceae	*Eritrichum villosum*	×			
Boraginaceae	*Lappula tadshikorum*	16.08			
Boraginaceae	*Lindelofia stylosa*	×			
Boraginaceae	*Lindelofia anchusoides*	5.54			
Boraginaceae	*Matthiastrum himalayense*	×			
Brassicaceae	*Alyssum canescens*	17.47	15.07	1.86	65.20
Brassicaceae	*Aphragmus oxycarpus*	23.30			
Brassicaceae	*Arabis paniculata*	×			
Brassicaceae	*Arabis tibetica*	×			
Brassicaceae	Brassicaceae	57.55			
Brassicaceae	*Braya humilis*	18.97			
Brassicaceae	*Conringia planisiliqua*	×			
Brassicaceae	*Desideria himalaiensis*	8.88			
Brassicaceae	*Desideria pumila*	18.96			
Brassicaceae	*Draba cachemirica*	10.79			
Brassicaceae	*Draba lasiophylla*	25.66			
Brassicaceae	*Draba oreades*	7.80			
Brassicaceae	*Draba sp.*	8.79			
Brassicaceae	*Draba sp.*	13.97			
Brassicaceae	*Draba sp.*	6.29			
Brassicaceae	*Hedinia tibetica*	7.03			
Brassicaceae	*Christolea crassifolia*	21.77			
Brassicaceae	*Lepidium capitatum*	×			
Brassicaceae	*Lepidium latifolium*	×			
Brassicaceae	*Matthiola chorassanica*	15.21			
Brassicaceae	*Parrya nudicaulis*	3.94			
Brassicaceae	*Pegaeophyton scapiflorum*	2.21			
Brassicaceae	*Sisymbrium brassiciforme*	2.60			
Brassicaceae	*Stevenia canescens*	×			
Brassicaceae	*Tauscheria lasiocarpa*	×			
Capparaceae	*Capparis spinosa*	21.43	21.43	18.65	25.63
Caprifoliaceae	*Lonicera asperifolia*	86.34	80.47	68.74	87.41
Caprifoliaceae	*Lonicera microphylla*	74.61			
Caryophyllaceae	*Arenaria bryophylla*	6.01	9.78	2.17	24.63
Caryophyllaceae	*Cerastium sp.*	8.56			
Caryophyllaceae	*Dianthus harrissii*	5.61			
Caryophyllaceae	*Sagina saginoides*	10.39			
Caryophyllaceae	*Silene gonosperma*	5.25			
Caryophyllaceae	*Silene himalayensis*	6.72			
Caryophyllaceae	*Silene moorcroftiana*	×			
Caryophyllaceae	*Silene nepalensis*	17.85			
Caryophyllaceae	*Silene tenius*	10.80			
Caryophyllaceae	*Thylacospermum caespitosum*	16.80			
Crassulaceae	*Rhodiola heterodonta*	87.54	87.54	87.54	87.54
Cuscutaceae	*Cuscuta planiflora*	23.08	23.08	23.08	23.08
Cyperaceae	*Carex borii*	39.11	49.58	32.78	71.85
Cyperaceae	*Carex microglochin*	×			
Cyperaceae	*Carex moorcroftii*	58.77			
Cyperaceae	*Carex nivalis*	49.20			
Cyperaceae	*Carex orbicularis*	58.20			
Cyperaceae	*Carex sp.*	59.40			
Cyperaceae	*Carex stenocarpa*	33.78			
Cyperaceae	*Kobresia macrantha*	×			
Cyperaceae	*Kobresia schoenoides*	48.63			
Euphorbiaceae	*Euphorbia tibetica*	60.21	60.21	44.99	68.03

family	species	average of species	average of family	min. of family	max. of family
Fabaceae	*Astragalus confertus*	10.85	7.93	1.28	14.63
Fabaceae	*Astragalus falconeri*	8.93			
Fabaceae	*Astragalus munroi*	5.05			
Fabaceae	*Astragalus nivalis*	9.71			
Fabaceae	*Astragalus oplites*	8.80			
Fabaceae	*Astragalus rhizanthus*	7.63			
Fabaceae	*Astragalus tecti-mundi*	×			
Fabaceae	*Astragalus thomsonii*	7.94			
Fabaceae	*Caragana sp.*	×			
Fabaceae	*Cicer arietinum*	×			
Fabaceae	*Cicer microphyllum*	×			
Fabaceae	*Colutea nepalensis*	×			
Fabaceae	*Medicago falcata*	8.86			
Fabaceae	*Oxytropis hypoglottoides*	9.18			
Fabaceae	*Oxytropis chiliophylla*	7.26			
Fabaceae	*Oxytropis microphylla*	5.97			
Fabaceae	*Oxytropis pusilla*	10.50			
Fabaceae	*Oxytropis tatarica*	6.96			
Fabaceae	*Thermopsis inflata*	3.33			
Fumariaceae	*Corydalis flabellata*	84.18	64.45	36.59	87.46
Fumariaceae	*Corydalis stricta*	72.04			
Fumariaceae	*Corydalis thyrsiflora*	37.14			
Gentianaceae	*Gentianella moorcroftiana*	78.32	80.77	73.44	86.49
Gentianaceae	*Gentianopsis wedenskyi*	83.23			
Geraniaceae	*Geranium himalayense*	×	×	×	×
Geraniaceae	*Geranium nepalense*	×			
Grossulariaceae	*Ribes orientale*	85.27	85.27	84.54	85.99
Chenopodiaceae	*Atriplex pamirica*	×	3.17	2.05	4.65
Chenopodiaceae	*Corispermum tibeticum*	×			
Chenopodiaceae	*Chenopodium foliosum*	2.11			
Chenopodiaceae	*Chenopodium pamiricum*	3.35			
Chenopodiaceae	*Kochia prostrata*	4.06			
Chenopodiaceae	*Krascheninnikovia pungens*	×			
Iridaceae	*Iris hookeriana*	82.96	82.96	82.96	82.96
Juncaceae	*Juncus himalensis*	34.35	33.92	23.79	43.81
Juncaceae	*Juncus leucanthus*	38.65			
Juncaceae	*Juncus membranaceus*	28.77			
Lamiaceae	*Dracocephallum heterophyllum*	9.58	15.98	5.31	65.30
Lamiaceae	*Dracocephallum stamineum*	16.61			
Lamiaceae	*Marmoritis rotundifolia*	9.89			
Lamiaceae	*Nepeta discolor*	11.15			
Lamiaceae	*Nepeta eriostachya*	13.59			
Lamiaceae	*Nepeta glutinosa*	7.97			
Lamiaceae	*Nepeta leucolaena*	13.10			
Lamiaceae	*Nepeta longibracteata*	10.33			
Lamiaceae	*Stachys tibetica*	58.05			
Lamiaceae	*Thymus lienaris*	9.49			
Morinaceae	*Morina coulteriana*	71.86	71.86	71.86	71.86
Onagraceae	*Epilobium latifolium*	×	×	×	×
Orobanchaceae	*Eupharasia foliosa*	55.57	41.91	20.18	59.26
Orobanchaceae	*Leptorhabdos parviflora*	×			
Orobanchaceae	*Pedicularis bicornuta*	43.27			
Orobanchaceae	*Pedicularis cheilanthifolia*	26.89			
Papaveraceae	*Meconopsis aculeata*	95.06	95.06	92.44	97.68
Plantaginaceae	*Picrorrhiza kurrooa*	75.33	46.41	17.99	85.94
Plantaginaceae	*Plantago depresa*	20.71			
Plantaginaceae	*Plantago himalaica*	27.00			
Plantaginaceae	*Veronica biloba*	62.61			
Plumbaginaceae	*Acantholimon lycopodioides*	×	×	×	×

family	species	average of species	average of family	min. of family	max. of family
Poaceae	*Alopecurus himalaicus*	45.25	37.59	10.03	70.28
Poaceae	*Calamagrostis stoliczkae*	41.17			
Poaceae	*Elymus cognatus*	35.09			
Poaceae	*Elymus jacquemontii*	26.81			
Poaceae	*Elymus schrenkianus*	46.92			
Poaceae	*Hordeum brevisubulatum*	27.29			
Poaceae	*Leymus secalinus*	58.44			
Poaceae	*Melica persica*	×			
Poaceae	*Phleum alpinum*	24.01			
Poaceae	*Poa attenuata*	22.92			
Poaceae	*Stipa capillata*	×			
Poaceae	*Stipa orientalis*	30.32			
Poaceae	*Stipa splendens*	31.81			
Poaceae	*Stipa subsessiliflora*	45.59			
Poaceae	*Trisetum spicatum*	53.06			
Polygonaceae	*Bistora affinis*	61.13	39.23	12.25	72.95
Polygonaceae	*Bistorta vivipara*	×			
Polygonaceae	*Knorringia pamirica*	18.67			
Polygonaceae	*Oxyria digyna*	66.91			
Polygonaceae	*Polygonum cognatum*	15.19			
Polygonaceae	*Polygonum rumicifolium*	44.84			
Polygonaceae	*Rheum tibeticum*	28.62			
Polygonaceae	*Rheum webbianum*	×			
Polygonaceae	*Rumex patientia*	×			
Primulaceae	*Primula macrophylla*	66.34	69.81	61.25	78.10
Primulaceae	*Primula moorcroftiana*	73.28			
Ranunculaceae	*Anemone rupicola*	76.52	67.82	7.11	97.54
Ranunculaceae	*Aquilegia fragrans*	96.29			
Ranunculaceae	*Aquilegia moorcroftiana*	95.35			
Ranunculaceae	*Clematis tangutica*	66.23			
Ranunculaceae	*Clematis sp.*	×			
Ranunculaceae	*Clematis sp.*	66.50			
Ranunculaceae	*Delphinium brunonianum*	92.17			
Ranunculaceae	*Pulsatilla wallichiana*	78.45			
Ranunculaceae	*Ranunculus lobatus*	35.62			
Ranunculaceae	*Ranunculus membranaceus*	9.04			
Ranunculaceae	*Thalictrum alpinum*	61.81			
Ranunculaceae	*Thalictrum foetidum*	68.07			
Rhamnaceae	*Rhamnus prostrata*	32.34	32.34	31.47	33.21
Rosaceae	*Comarum salesovianum*	11.65	7.89	0.50	24.92
Rosaceae	*Chamaerhodos sabulosa*	×			
Rosaceae	*Potentilla bifurca*	8.28			
Rosaceae	*Potentilla evestita*	×			
Rosaceae	*Potentilla gelida*	5.36			
Rosaceae	*Potentilla multifida*	8.94			
Rosaceae	*Potentilla pamirica*	3.21			
Rosaceae	*Potentilla sericea*	2.40			
Rosaceae	*Potentilla sojakii*	2.11			
Rosaceae	*Potentilla turczaninowiana*	9.51			
Rosaceae	*Potentilla venusta*	2.51			
Rosaceae	*Rosa webbiana*	×			
Rosaceae	*Sibbaldia cuneata*	×			
Rosaceae	*Sorbus tianschanica*	24.92			
Rubiaceae	*Galium pauciflorum*	26.22	40.87	23.29	58.31
Rubiaceae	*Rubia tibetica*	55.52			
Salicaceae	*Salix flabellaris*	×	×	×	×
Saxifragaceae	*Saxifraga cernua*	×	77.09	65.66	87.80
Saxifragaceae	*Saxifraga hirculoides*	78.69			
Saxifragaceae	*Saxifraga hirculus*	84.97			
Saxifragaceae	*Saxifraga nanella*	67.63			
Scrophulariaceae	*Scrophularia dentata*	42.09	42.09	11.71	59.19
Solanaceae	*Physochlaina praelta*	42.94	42.94	40.83	45.52
Tamaricaceae	*Myricaria germanica*	×	×	×	×
Urticaceae	*Lecanthus peduncularis*	34.22	48.82	34.22	71.22
Urticaceae	*Urtica hyperborea*	63.42			
Valerianaceae	*Valeriana himalayana*	9.50	9.50	8.04	11.67