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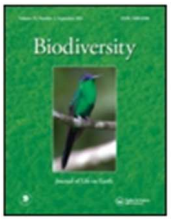

Alpine home gardens in the Western Italian Alps: role of gender on the local agro-biodiversity and its management

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Abstract

Home gardens are reservoirs of biodiversity, promoting food security and maintaining farm ecosystem processes. A study on alpine home gardens was conducted in two alpine valleys in Piedmont, North-Western Italy. Forty semi-structured interviews with garden managers were gathered. We analysed if gender roles affect the agro-biodiversity and the management of the alpine home gardens in the Western Italian Alps. The results show that mixed couples (consisting of man and woman) present higher diversity of managements and a higher number of taxa detected. 138 taxa were detected 138 taxa among couples, 82 among male gardeners and 69 among female gardeners. Indeed, when the vegetable garden is managed by men only, more than half of the taxa are represented by horticultural species. On the other hand, when the vegetable garden is managed by women only, flowering species, wild and semi-wild species represent a relevant percentage of the total number of mentioned taxa. Despite most of the literature emphasized the great role of women in biodiversity conservation and traditional ecological knowledge keeping, this study showed that the compresence of men and women appears to increase the level of biodiversity and diversity in managements many variables of alpine home gardens.

Keywords

Marginal agriculture– Food security - Foraging– Tradition ecological knowledge - Cultural identity

Introduction

Home gardens can play a key role not only in biodiversity conservation but they also promote food security and maintain farm ecosystem processes. Many studies have been carried out on home gardens in tropical areas focusing on their biodiversity (Lamont et al.1999; Kehlenbeck and Maass 2004; Albuquerque et al. 2005; Sunwar et al. 2006; Kabir and Webb 2007; Galluzzi et al. 2010, Das and Das 2015; Caballero-Serrano et al. 2016), on the role they play in food security (Montagnini 2006; Márquez and Schwartz 2008; Gray et al. 2013), the role they play in cultural identity, sense of belonging (Bhatti and Church 2001; Perreault 2005; Bhatti 2006; Ghazali 2013), their resilience (Wezel and Bender 2003; Aguilar-Støen et al. 2008; Van der Stege et al. 2012); their socio-ecological and cultural importance (Trinh et al. 2003; Buchmann 2009).

Much less literature is available about home gardens in Europe. Calvet Mir (2011) led back this phenomenon to the massive emigration from rural areas occurred in the last decays and the consequent marginality of the European home gardens. Nevertheless, in the last fifteen years more scientific papers on European home gardens have been published especially in Iberian peninsula

(Agelet, Bonet and Vallés 2000; Calvet-Mir et al. 2012; Reyes-García et al. 2010;2013;2014; Riu-Bosoms et al. 2014), in Austria (Vogl and Vogl-Lukasser 2003; Vogl-Lukasser et al. 2010), in Romania (Papp et al. 2012) in Hungary (Birol et al. 2005), and in Portugal (Carvalho 2016).

Few papers analysed home gardens from a gender perspective. As highlighted in Shiva (1995), both men and women of rural areas have deep traditional knowledge. However, men and women grow and deepen their knowledge on different species categories (Luoga et al. 2000; Trinh et al. 2003; Voeks 2007; Carvalho 2016, Ciftcioglu 2017). Indeed, home gardens are hotspots of agro biocultural diversity (Saluzzi et al. 2010) and growing a home garden is not only producing tangible goods but it also a cultural space where traditional knowledge can be actively conserved (Linares and Eyzaguirre 2004). This knowledge is often kept by women, who are considered as biodiversity guardians (Howard 2003). Many studies explored how women play a more important role in preserving biodiversity when compared to men (Agrawal 2003; Vogl-Lukasser et al. 2010; Reyes-Garcia et al. 2010; Calvet-Mir et al. 2011). Specifically, Anderson (2003) explained that the value of the home gardens' products is not only economic. Women play a major role also in neglected (and thus, not economically valued) species as wild and semi-wild plants which are crucial in maintaining biodiversity and food security (Howard 2003; Vogl-Lukasser et al. 2010). However, many researches emphasized that men and women are often both responsible for the management of the home garden, but they are involved in different tasks (Chambers and Momsen 2007; Reyes-Garcia et al. 2010).

In this study, we analysed if gender roles affect the agro-biodiversity and the management of the alpine home gardens in the Western Italian Alps.

Specifically, we aimed at:

- determine if gender influences agricultural practices in alpine home gardens.
- determine which group of *taxa* (A tree and shrubs; B horticultural species; C flower species cultivated for aestethic purposes; D wild and semi wild; E cereal and pseudocereal) is used by which gender category (female only, male only; male and female)
- intersect these data

Material and Methods

Forty interviews were gathered in two alpine valleys in Piedmont, North Western Italy. Specifically, in the Po Valley (municipalities of Ostana and Oncino) and in the Pellice Valley (municipality of Rorà). Data were gathered during spring 2013 through semi-structured interviews with garden managers who fulfil the following requirements:

- own a vegetable garden above 900 m a.s.l. in the municipality of Rorà, Ostana, Oncino;
- have know-how on vegetable garden management;
- live at least one month per year in one of the municipalities listed above.

The Pellice valley and specifically Rorà is characterized by a population of 250 people and it is located at 1000 m a.s.l. Most of the inhabitants worked in the Po plain. Only a few of them worked in the municipality in agricultural activities. There is little tourism and it influences positively the landscape conservation (Mourglia 1901; Tourn 2002, 2003; Regione Piemonte 2003).

In the Po valley, there is the source of Po river and there is one of the highest mountains in Europe, the Monviso. Oncino and Ostana, the two sites of the case study are located respectively on the orographic right and on the orographic left at an altitude of around 1200 m a.s.l. Ostana and Oncino have about 80 inhabitants each, but only a few of them (around 20 each) live permanently in the municipalities. The tortuous and long road to get to the plain does not allow daily transfers to work in denser populated areas. This means that the permanent residents are all retired and consequently the sample is characterized by elder people. The territory is also characterized by the transhumance during summer time in the mountain pasture (*meire*) above 1500 m a.s.l.

The methodological approach included quali-quantitative analysis through participatory observation. Qualitative data were gathered in a semi-structured interview, while data regarding plants of the gardens were collected through free listing method. Most of the interviews are conducted within the vegetable gardens, in a way to facilitate the plant enumeration. Some questions also regarded the management and were measured by the degree the gardeners do agree with the following statements: comply with the lunar cycle; use chemical products; apply manure; make compost; use flowering species for aesthetic purposes; the flowering species are planted within the garden; use of tree species for aesthetic purposes; garden as a hobby; productivity is not the only goal; farm organically; breed animals.

All *taxa* were recorded and were subdivided into five categories: A. tree and shrubs *taxa*; B. horticultural taxa; C. *taxa* of flowering species cultivated for aesthetic purposes; D. wild and semi-wild *taxa*; E. cereal and pseudocereal *taxa*. Moreover, ten questions were asked regarding the

management, the reason for gardening, the know-how and the way they learnt it. Per each question, a value between 0 and 1 is assigned. 0 means the interviewed does not agree or does not apply this method; 0,5 means the interviewed does partially agree or partially applies the method; 1 means the interviewed does agree or applies the method.

The sample consists of 40 vegetable gardens of which 8 are managed by women only (F), 14 are managed by men only (M) and 18 are managed by couples, men and women (MF). The average age of the interviewed is 68 for the Po valley and 63 for the Pellice valley. More than 80% of the interviewed declare to be originally from the same valley.

Results

The results (Fig 1) show a remarkable different management depending on gender. Agricultural practices were grouped into three main categories: agroecological practices ("agricultural practices aiming to produce significant amounts of food, which valorise in the best way ecological processes and ecosystem services in integrating them as fundamental elements in the development of the practices" Wezel et al. 2014, p.3); cultural practices (regarding sense of beauty and well-being); social factors (regarding the role the garden play in managers' life)

Management Agroecological practices

The lunar cycle is taken into consideration mostly by men and couples. This is probably due to a higher expectation on productivity. They believe that when planting or sowing vegetables who grow down in the soil (like roots and tubers) the moon should be waning, while in the others vegetables who grow upward in the crescent moon.

Manure application is considered as a heavy work. Nevertheless, more women use this method of fertilization. In fact, women who breed chickens also apply their manure to the home garden, as a way to use an output as an input. Gardeners also reported to get manure once a year by the cow shepherds (*marghè*) who graze the mountain pasture during summer time. Another mentioned method consists of incorporating deer feces naturally deposed around the garden as manure. Compost making is a wide spread technique. It is mainly pursued by women because it is considered as part of the home realm. This explained why when home gardens are farmed by men

only compost appears less used. Use of chemical products is very high when the farmer is a woman. This is due to the age of the interviewed (mostly above 60 years old) and the intensity of work required by the garden. Using chemicals is clearly a way to avoid heavy tasks. This is very evident; when the woman is not alone but in a couple, the use of chemicals is very low.

Animal breeding included chickens, cows, and goats. Poultry is mainly women domain, they are sometimes fed with kitchen waste and they do not require any masculine labour. Cows and goats are mainly kept some by transhumant shepherds and some local farmers. Organic gardens are not wide spread. This is because in these valleys there is still a traditional farming, a way of cultivating "as my grandparents used to do". There are few home gardeners who have knowledge on the distinction between organic and conventional agriculture.

Management Cultural practices

Aesthetics is also an important issue, the totality of the women affirmed to use flowering species for improving the sense of beauty, most of women also declared to incorporate them into the home garden. When gardeners are men only there are less flowers in general and much less within the garden which is supposed to be more productive and less aesthetic. The datum regarding the use of tree species for aesthetic purposes shows how men and women gardeners can improve their home garden when farming together. Trees are appreciated by men for their productivity and by women for the shade and their intrinsic beauty.

Management Social factors

Gardening is generally considered as a hobby by men, definitely not for women. To women, it means fresh good food at the doorstep, for men is mainly a way to spend their time efficiently and productively. For this reason, when couples work together in their home gardens they do consider gardening as a hobby, but it is at the same time productive and recreational.

Species and Gender

Figure 2 shows that mixed couples (MF) present a higher level of records per plant group (except for category E). Moreover, women (F) appear to have a deeper knowledge of wild and semi-wild species when compared with men (M). Regarding cereals and pseudocereals (category E) men appear to be the main responsible for this cultivation. It can also be observed that women are less prone to cultivate vegetables. Considering the others categories (A,C,D), men and women show similar values. MF group has the highest number of taxa per each category (except for E) and this is probably due to the complementarity of the M and F groups skills.

Table 1 shows that MF group has a higher level of diversification of records if compared with F and M, showing a higher level of biodiversity by complementing knowledge from both genders. This is true for categories A, B, C and D, while for E, M group has the highest level of diversification. Results above show that the mixed group is able to reduce the differences between the gardens managed by men and women. When the vegetable garden is managed by men the percentage of horticultural species (B) is more than 50%. The percentage decreases when the management is promiscuous and even more, when only women cultivate it. The opposite occurs when flowering species (C) are considered. When the vegetable garden is managed by women only the percentage of flower species (C) is very high, when the management is promiscuous it slightly decreases and it is even lower when the garden is cultivated by men only.

Among couples (MF) were detected 138 *taxa*, while 82 among male (M) gardeners (30% less) and 69 among female(F), gardeners (50% less). List of mentioned *taxa* is reported in table 2.

Discussion

A large part of the literature showed that women increase the biodiversity (Hoogerbrugge and Fresco 1993; Agrawal 2003; Vazzana et al. 2010; Calvet-Mir et al. 2011) and enrich the vegetable garden with flower species (Reyes-Garcia et al. 2010), wild and semi-wild species (Vogl-Lukasser et al. 2010). In this study, we observed that when the alpine home garden is managed by a couple (man and woman) the number of landraces is significantly higher (=138 *taxa*) than in the other two cases (F= 74 *taxa*; M= 88 *taxa*). This can be observed in 4 out of 5 plant categories we created (in A: tree and shrubs *taxa*; B: horticultural *taxa*; C: *taxa* of flower species cultivated for aesthetic purposes; D: wild and semi-wild *taxa*; but not in E: cereal and pseudocereal *taxa*). Indeed, men are generally more interested in the species who have market value, while women mainly aim at their culinary and nutritional value (Balakrishnan 1999). This can be observed in the horticultural category (B) who have a higher market value and shows higher number of *taxa* for men. It is in line with some recent studies by Ciftcioglu (2017), who reported that male respondents valued the opportunity to grow horticultural species (B) more than the women, while female respondents tended to value more ornamental plants (C). Also, women are greater foragers of products from common-pool resources (Agrawal 2003). Indeed, women are often responsible for foraging and gathering (Howard-Borjas and Cuijpers 2002), especially if wild and semi wild plants are close to houses and home-gardens. On the other hand, the gathering of wild species that grow at very high altitude or in places hard to get, like *Artemisia absinthium,* it is a man's prerogative (Ertug 2003).

The wild species have been essential during the famine in each Occitan valley of Italian Alps and the persistence of traditional knowledge regarding these species is the proof of their basic role in the food security (Mattalia et al. 2012). Having good traditional knowledge on wild and semi-wild species, also means transferring non-cultivated biodiversity from the field to the plate. This is not only an important task in the domestic realm, but also an active way to preserve biodiversity and its traditional knowledge. Furthermore, the Alpine home garden could preserve safeguarded species (particularly for semi-wild species). For instance, some managers reported the presence within their home gardens of *Lilium martagon*, *Lilium croceum* and some Gentianaceae which are totally safeguarded species (Regione Piemonte 2009). The responsible for this contamination is mainly woman who, not only insert the wild in the domesticated, but they create the habitat to allow rare not-welcomed plant to grow (Vogl-Lukasser et al. 2010).

Another important aspect regards the aesthetics within the garden. Recreating a sense of beauty, a sense of belonging, a sense of place is generally considered a women task. By decorating the house and the adjacent external areas, the woman incorporates ornamental biodiversity. Men did not value the use of ornamental ("useless") plants (Carvalho 2016). Cultivating primly the home garden, women create surplus value to the functionality of the horticultural species planted by men. Gardens become a reason for pride and satisfaction (Heckler 2004), exchange, perpetration of the cultural identity and expression of its own subjectivity (Murrieta and WinklerPrins 2009). Moreover, women take care of the nutritional point of view (in addition to the medical one) since they know the properties of the plant (Daniggelis 2003). As in the results, the female gender enhances the multi functionality of the vegetable garden while the male gender is usually more focused on the utilitarian perspective (in this case the horticultural production). Promiscuous management appears to be a good way to integrate these two aptitudes, while making the best use of the agro-biodiversity in their kitchens. The finding that men and women use different management techniques is consistent with findings by Reyes-Garcia et al. (2010). However, our findings on the use of organic fertilizers and pest controls are not in line with the mentioned research. In our study, women appeared to use chemical products way more than men, and this is because of the age of our respondents, their loneliness and their need to avoid heavy labours. In accordance with Carvalho (2016), women are in charge for poultry and this explains the high number of animal breeders among women. Fresh eggs are a source of proteins, which are not always easy to find in the alpine areas. It is important to rethink Alps (and Alpine vegetable gardens), not as marginal areas fated to die and to empty, but rather as reservoirs of biodiversity and cultural diversity (Salsa 2009), especially when perpetuated by different gendered aptitudes.

C Conclusions

Home gardens in the Alps are multifaceted productive and recreational spaces. In this study, we analysed the influence of gender roles on agro-biodiversity and management of the alpine home gardens in two Italian alpine valleys. Despite most of the literature emphasized the great role of women in biodiversity conservation and traditional ecological knowledge keeping, this research showed that the compresence of men and women appears to increase the level of biodiversity and diversity in managements of alpine home gardens. Women showed to be more attentive to aesthetics and more expert at foraging, while men are more focussed on the "productive" garden, giving preference to horticultural species. Therefore, men and women use different species and when gardening together they enhance biodiversity and diversity in managements. This results in a mitigation of the differences between genders and in some cases, the exaltation of positive aspects of one of them.

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Table 1 Percentage of taxa per gender group per plant category. A: tree and shrubs taxa; B: horticultural taxa; C: taxa of flower species cultivated for aestethic purposes; D: wild and semi wild taxa; E: cereal and pseudocereal taxa. (F: Female only; M: Male only; MF: Male and Female)

CATEGORY	M (%)	MF (%)	F (%)
A	62,5	91,6	54,2
B	81,8	97,7	50
C	48,8	93,3	46,6
D	36,6	96,6	40
E	100	66,6	0

Table 2 List of mentioned taxa

CATEGORY	FAMILY	SPECIES
A (Tree and shrub species)	Aquifoliaceae	*Ilex aquifolium* L.
	Betaluceae	*Corylus avellana* L.
	Caprifoliaceae	*Sambucus nigra* L.
	Ericaceae	*Vaccinium corymbosum* L.
	Fabaceae	*Acacia* spp.
	Fagaceae	*Castanea sativa* Mill.
	Grossulariacee	*Ribes uva-crispa* L.; *Ribes nigrum* L.; *Ribes rubrum* L.
	Juglandaceae	*Juglans regia* L.
	Lauraceae	*Laurus nobilis* L.
	Primulaceae	*Prunus armeniaca* L.
	Rosaceae	*Malus domestica* Borkh.; *Prunus avium* L.; *Prunus cerasus* L.; *Prunus domestica* L.; *Prunus persica* L.; *Pyrus communis* L.; *Rubus fructicosa* L.; *Rubus idaeus* L. var. *fallgold; Rubus idaeus* L.; *Rubus ulmifolius* Shott
	Tiliaceae	*Tilia cordata* Mill.
	Vitaceae	*Vitis labrusca* L.

B (Horticoltural species)	Apiaceae	*Apium graveolens* L.; *Daucus carota* L.; *Foeniculum vulgare* Mill.; *Petroselinum crispum* L.
	Asteraceae	*Cichorium intybus* L.; *Lactuca* spp.*; Tanacetum balsamita* L.
	Brassicaceae	*Brassica cretica* Lam.; *Brassica oleracea* L. spp.; *Brassica oleracea* L. *var. botrytis; Brassica oleracea* L. *var. gemmifera; Brassica oleracea* L. *var. sabauda; Brassica rapa* L.; *Raphanus sativus* L.
	Chenopodiaceae	*Spinacia oleracea* L.
	Cucurbitaceae	*Cucurbita pepo* L.; *Cucurbita* spp.
	Fabaceae	*Phaseolus vulgare* L.; *Pisum sativum* L.
	Lamiaceae	*Borago officinalis* L.; *Melissa officinalis* L.; *Mentha pratensis* L.; *Ocimum basilicum* L.; *Origanum majorana* L.; *Origanum vulgare* L.; *Rosmarinus officinalis* L.; *Salvia officinalis* L.; *Satureja montana* L
	Liliaceae	*Allium ampeloprasum* L.; *Allium cepa* L.; *Allium sativum* L.; *Allium schoenoprasum* L.; *Asparagus acutifolius* L.
	Polygonaceae	*Rheum officinale* Baill.
	Rosaceae	*Fragaria vesca* L.
	Saxifragaceae	*Bergenia crassulaceae* L.
	Solanaceae	*Capsicum annuum* L.; *Lycopersicon esculentum* L.; *Solanum melongena* L., *Solanum tuberosum* L.
C (Flowering species)	Amaryllidaceae	*Narcissus* L.
	Araceae	*Zantedeschia aethiopica* (L.) Spreng.
	Asteraceae	*Chrysanthemum* spp.; *Cyanus segetum* Hill.; *Dahlia* spp.; *Dimorphotheca pluvialis* (L.) Moench; *Gazania* spp.; *Tagetes* spp.
	Balsaminaceae	*Impatiens balsamina* L.
	Begoniaceae	*Begonia* spp.
	Brassicaceae	*Alyssum montanum* L.; *Aubrieta deltoidea* (L.) DC.
	Caryophyllaceae	*Dianthus* spp.
	Clusiaceae	*Hypericum perforatum* L.
	Geraniaceae	*Pelargonium graveolens* L.
	Hydrangeaceae	*Hydrangea* spp.

	Iridaceae	*Crocus biflor* L.; *Gladiolus italicus* Mill.; *Iris* spp.
	Lamiaceae	*Lavandula stoechas* L.; *Salvia splendens* Sellow ex Schult.
	Leguminosae	*Wisteria sinensis* (Sims) Sweet
	Liliaceae	*Convallaria majalis* L.; *Frittillaria* spp.; *Hemerocallis fulva* (L.) L.; *Hyacinthus orientalis* L.; *Lilium* spp.; *Muscari comosum* L.; *Tulipa* spp.
	Malvaceae	*Alcea rosea* L.; *Hibiscus* spp.
	Oleaceae	*Forsythia suspense* (Thunb.) Vahl; *Syringa vulgaris* L.
	Onagraceae	*Fuchsia* spp.
	Parmeliaceae	*Cetraria islandica* L. Ach.
	Peoniaceae	*Paeonia* spp
	Ranuncolaceae	*Anemone alpina* L.; *Aquilegia saximontana* Rydb.; *Clematis* spp.; *Delphinium inopinatum* Nevski; *Helleborus niger* L.
	Rosaceae	*Rosa* spp.
	Scrophulariaceae	*Antirrhinum majus* L.; *Digitalis* spp.
	Solanaceae	*Petunia* spp.
	Violaceae	*Viola tricolor* L.
D (Wild and semi-wild species)	Apiaceae	*Foeniculum vulgare* Mill.; *Levisticum officinale* W.D.J.Koch; *Pimpinella anisum* L.
	Apocinaceae	*Pervinca minor* L.
	Asteraceae	*Achillea erba-rotta* All.; *Achillea millefolium* L.; *Arnica montana* L.; *Arthemisia absinthium* L.; *Calendula officinalis* L.; *Leontopodium alpinum* L.; *Tanacetum vulgare* L.; *Taraxacum officinale* Weber
	Cannabaceae	*Humulus lupulus* L.
	Caryophyllaceae	*Silene vulgaris* (Moench) Garcke
	Chenopodiaceae	*Beta vulgaris* L.; *Chenopodium bonus-henricus* L.
	Ericaceae	*Arctostaphylos uva-ursi* (L.) Spreng; *Rhododendron macrophillum* L.; *Vaccinium myrtillus* L.

	Fabaceae	*Lupinus* spp.
	Gentianaceae	*Gentiana* spp
	Liliaceae	*Lilium martagon* L.
	Oxalidaceae	*Oxalis acetosella* L.
	Polygonaceae	*Polygonum bistorta* L.
	Primulaceae	*Primula vulgaris* L.
	Rosaceae	*Fragaria vesca* L.; *Rosa canina* L.
	Scrophulariaceae	*Veronica allionii* Vill.
	Urticaceae	*Urtica dioca* L.
	Violaceae	*Viola cornuta* L.
E (Cereals and pseudo-cereals)	Poaceae	*Secale cereale* L.; *Zea mays* L. var. *pignoletto*
	Polygonaceae	*Fagopyrum esculentum* L.

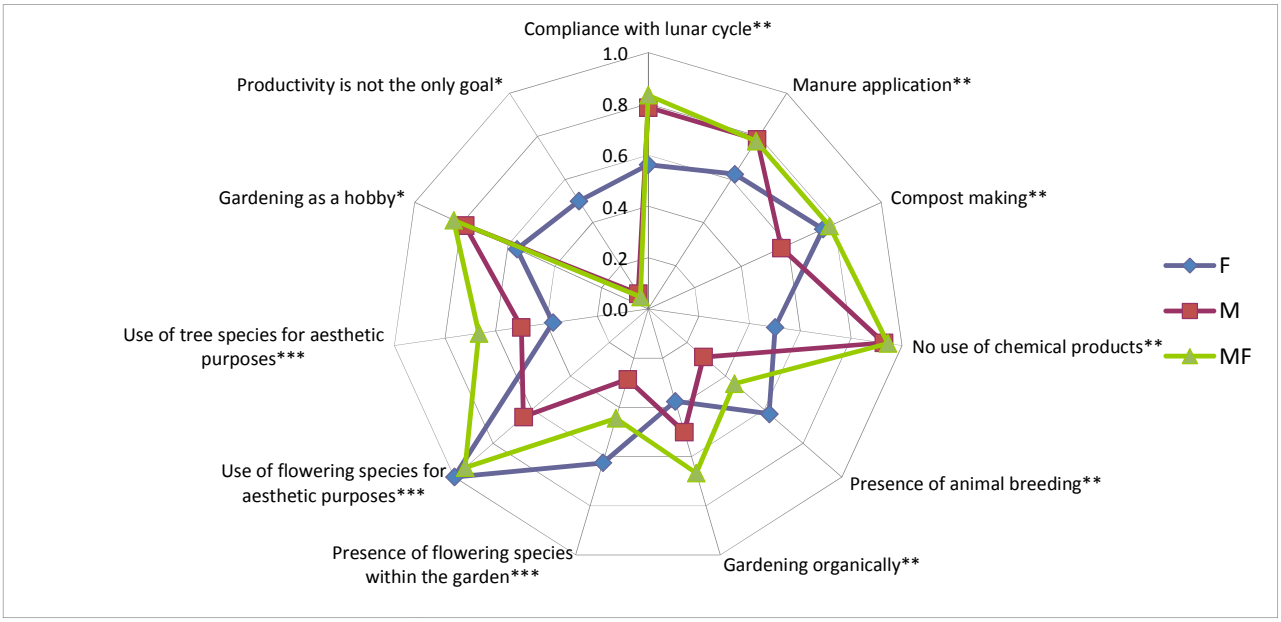

*Figure 1 Amoeba graph of selected agricultural practices per gender. Every proportion expresses a higher or lower approval per gender and per variable (0= absence; 0,5= partial application; 1=presence). Therefore, higher values mean higher agreement on the variable. Values vary between 0 and 1. * = social factors; ** agroecological practices; ***cultural practices. (F: Female only; M: Male only; MF: Male and Female)*

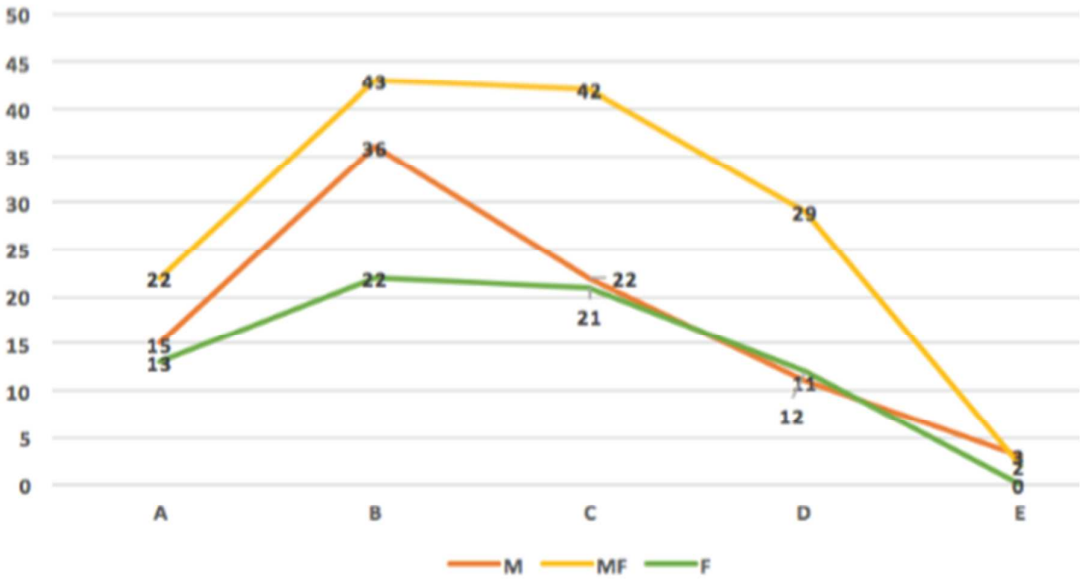

Fig 2 Number of taxa per category and gender group. A: tree and shrubs taxa; B: horticultural taxa; C: taxa of flowering species cultivated for aesthetic purposes; D: wild and semi wild taxa; E: cereal and pseudo-cereal taxa. (F: Female only; M: Male only; MF: Male and Female)

Alpine home gardens in the Western Italian Alps: role of gender on the local agro-biodiversity and its management

Abstract

Home gardens are reservoirs of biodiversity, promoting food security and maintaining farm ecosystem processes. A study on alpine home gardens was conducted in two alpine valleys in Piedmont, North-Western Italy. Forty semi-structured interviews with garden managers were gathered. We analysed if gender roles affect the agro-biodiversity and the management of the alpine home gardens in the Western Italian Alps. The results show that mixed couples (consisting of man and woman) present higher diversity of managements and a higher number of taxa detected. 138 taxa were detected ~~138 taxa~~ among couples, 82 among male gardeners and 69 among female gardeners. Indeed, when the vegetable garden is managed by men only, more than half of the taxa are represented by horticultural species. On the other hand, when the vegetable garden is managed by women only, flowering species, wild and semi-wild species represent a relevant percentage of the total number of mentioned taxa. Despite most of the literature emphasized the great role of women in biodiversity conservation and traditional ecological knowledge keeping, this study showed that the compresence of men and women appears to increase the level of biodiversity and diversity in managements ~~many variables~~ of alpine home gardens.

Keywords

Marginal agriculture– Food security - Foraging– Tradition ecological knowledge - Cultural identity

Introduction

Home gardens can play a key role not only in biodiversity conservation but they also promote food security and maintain farm ecosystem processes. Many studies have been carried out on home gardens in tropical areas focusing on their biodiversity (Lamont et al.1999; Kehlenbeck and Maass 2004; Albuquerque et al. 2005; Sunwar et al. 2006; Kabir and Webb 2007; Galluzzi et al. 2010, Das and Das 2015; Caballero-Serrano et al. 2016), on the role they play in food security (Montagnini 2006; Márquez and Schwartz 2008; Gray et al. 2013), the role they play in cultural identity, sense of belonging (Bhatti and Church 2001; Perreault 2005; Bhatti 2006; Ghazali 2013), their resilience (Wezel and Bender 2003; Aguilar-Støen et al. 2008; Van der Stege et al. 2012)~~;~~, their socio-ecological and cultural importance (Trinh et al. 2003; Buchmann 2009).

Much less literature is available about home gardens in Europe. Calvet Mir (2011) led back this phenomenon to the massive emigration from rural areas that occurred in the last decades~~yrs~~ and the

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consequent marginality of the European home gardens. Nevertheless, in the last fifteen years more scientific papers on European home gardens have been published especially in Iberian peninsula (Agelet, Bonet and Vallés 2000; Calvet-Mir et al. 2012; Reyes-García et al. 2010;2013;2014; Riu-Bosoms et al. 2014), in Austria (Vogl and Vogl-Lukasser 2003; Vogl-Lukasser et al. 2010), in Romania (Papp et al. 2012) in Hungary (Birol et al. 2005), and in Portugal (Carvalho 2016).

Few papers analysed home gardens from a gender perspective. As highlighted in Shiva (1995), both men and women of rural areas have deep traditional knowledge. However, men and women grow and deepen their knowledge on different species categories (Luoga et al. 2000; Trinh et al. 2003; Voeks 2007; Carvalho 2016, Ciftcioglu 2017). Indeed, home gardens are hotspots of agro biocultural diversity (Saluzzi et al. 2010) and growing a home garden is not only producing tangible goods but ~~is~~ also a cultural space where traditional knowledge can be actively conserved (Linares and Eyzaguirre 2004). This knowledge is often kept by women, who are considered as biodiversity guardians (Howard 2003). Many studies explored how women play a more important role in preserving biodiversity when compared to men (Agrawal 2003; Vogl-Lukasser et al. 2010; Reyes-Garcia et al. 2010; Calvet-Mir et al. 2011). Specifically, Anderson (2003) explained that the value of the home gardens~~'~~ products is not only economic. Women play a major role also in neglected (and thus, not economically valued) species as wild and semi-wild plants which are crucial in maintaining biodiversity and food security (Howard 2003; Vogl-Lukasser et al. 2010). However, many researches emphasized that men and women are often both responsible for the management of the home garden, but they are involved in different tasks (Chambers and Momsen 2007; Reyes-Garcia et al. 2010).

In this study, we analysed if gender roles affect the agro-biodiversity and the management of the alpine home gardens in the Western Italian Alps.

Specifically, we aimed at:

- determine if gender influences agricultural practices in alpine home gardens~~.~~
- determine which group of *taxa* (A tree and shrubs; B horticultural species; C flower species cultivated for aestethic purposes; D wild and semi wild; E cereal and pseudocereal) is used by which gender category (female only~~;~~ male only~~;~~ male and female)
- intersect these data

Material and Methods

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Forty interviews were gathered in two alpine valleys in Piedmont, North Western Italy. Specifically, in the Po Valley (municipalities of Ostana and Oncino) and in the Pellice Valley (municipality of Rorà). Data were gathered during spring 2013 through semi-structured interviews with garden managers who fulfil the following requirements:

- own a vegetable garden above 900 m a.s.l. in the municipality of Rorà, Ostana, Oncino;
- have know-how on vegetable garden management;
- live at least one month per year in one of the municipalities listed above.

The Pellice valley and specifically Rorà is characterized by a population of 250 people and it is located at 1000 m a.s.l. Most of the inhabitants worked in the Po plain. Only a few of them worked in the municipality in agricultural activities. There is little tourism and it influences positively the landscape conservation (Mourglia 1901; Tourn 2002, 2003; Regione Piemonte 2003).

In the Po ~~V~~valley, there is the source of Po river and there is one of the highest mountains in Europe, the Monviso. Oncino and Ostana, the two sites of the case study are located respectively on the orographic right and on the orographic left at an altitude of around 1200 m a.s.l. Ostana and Oncino have about 80 inhabitants each, but only a few of them (around 20 each) live permanently in the municipalities. The tortuous and long road to get to the plain does not allow daily transfers to work in denser populated areas. This means that the permanent residents are all retired and consequently the sample is characterized by elder people. The territory is also characterized by the transhumance during summer time in the mountain pasture (*meire*) above 1500 m a.s.l.

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The methodological approach included quali-quantitative analysis through participatory observation. Qualitative data were gathered in a semi-structured interview, while data regarding plants of the gardens were collected through free listing method. Most of the interviews are conducted within the vegetable gardens, in a way to facilitate the plant enumeration. Some questions also regarded the management and were measured by the degree the gardeners do agree with the following statements: comply with the lunar cycle; use chemical products; apply manure; make compost; use flowering species for aesthetic purposes; the flowering species are planted within the garden; use of tree species for aesthetic purposes; garden as a hobby; productivity is not the only goal; farm organically; breed animals.

All *taxa* were recorded and were subdivided into five categories: A. tree and shrubs *taxa*; B. horticultural taxa; C. *taxa* of flowering species cultivated for aesthetic purposes; D. wild and semi-wild *taxa*; E. cereal and pseudocereal *taxa*. Moreover, ten questions were asked regarding the

management, the reason for gardening, the know-how and the way they learnt it. Per each question, a value between 0 and 1 is assigned. 0 means the interviewed does not agree or does not apply this method; 0,5 means the interviewed does partially agree or partially applies the method; 1 means the interviewed does agree or applies the method.

The sample consists of 40 vegetable gardens of which 8 are managed by women only (F), 14 are managed by men only (M) and 18 are managed by couples, men and women (MF). In some cases, we found vegetable gardens managed by two men or two women; we classified them as F or M, despite the number of people taking part in the management. The average age of the interviewed is 68 for the Po valley and 63 for the Pellice valley. More than 80% of the interviewed declare to be originally from the same valley.

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Results

The results (Fig 1) show a remarkable different management depending on gender. Agricultural practices were grouped into three main categories: agroecological practices ("agricultural practices aiming to produce significant amounts of food, which valorise in the best way ecological processes and ecosystem services in integrating them as fundamental elements in the development of the practices" Wezel et al. 2014, p.3); cultural practices (regarding sense of beauty and well-being); social factors (regarding the role the garden play in managers'life)

Management Agroecological practices

The lunar cycle is taken into consideration mostly by men and couples. This is probably due to a higher expectation on productivity. They believe that when planting or sowing vegetables who grow down in the soil (like roots and tubers) the moon should be waning, while in the others vegetables who grow upward in the crescent moon.

Manure application is considered as a heavy work. Nevertheless, more women use this method of fertilization. In fact, women who breed chickens also apply their manure to the home garden, as a way to use an output as an input. Gardeners also reported to get manure once a year by the cow shepherds (*marghè*) who graze the mountain pasture during summer time. Another mentioned method consists of incorporating deer feces naturally deposed around the garden as manure.

Compost making is a wide spread technique. It is mainly pursued by women because it is considered as part of the home realm. This explained why when home gardens are farmed by men only compost appears less used. Use of chemical products is very high when the farmer is a woman. This is due to the age of the interviewed (mostly above 60 years old) and the intensity of work required by the garden. Using chemicals is clearly a way to avoid heavy tasks. This is very evident; when the woman is not alone but in a couple, the use of chemicals is very low.

Animal breeding included chickens, cows, and goats. Poultry is mainly women domain, they are sometimes fed with kitchen waste and they do not require any masculine labour. Cows and goats are mainly kept some by transhumant shepherds and some local farmers. Organic gardens are not wide spread. This is because in these valleys there is still a traditional farming, a way of cultivating "as my grandparents used to do". There are few home gardeners who have knowledge on the distinction between organic and conventional agriculture.

Management Cultural practices

Aesthetics is also an important issue, the totality of the women affirmed to use flowering species for improving the sense of beauty, most of women also declared to incorporate them into the home garden. When gardeners are men only there are less flowers in general and much less within the garden which is supposed to be more productive and less aesthetic. The datum regarding the use of tree species for aesthetic purposes shows how men and women gardeners can improve their home garden when farming together. Trees are appreciated by men for their productivity and by women for the shade and their intrinsic beauty.

Management Social factors

Gardening is generally considered as a hobby by men, definitely not for women. To women, it means fresh good food at the doorstep, for men is mainly a way to spend their time efficiently and productively. For this reason, when couples work together in their home gardens they do consider gardening as a hobby, but it is at the same time productive and recreational.

Species and Gender

Figure 2 shows that mixed couples (MF) present a higher level of records per plant group (except for category E). Moreover, women (F) appear to have a deeper knowledge of wild and semi-wild species when compared with men (M). Regarding cereals and pseudocereals (category E) men appear to be the main responsible for this cultivation. It can also be observed that women are less prone to cultivate vegetables. Considering the others categories (A,C,D), men and women show

similar values. MF group has the highest number of taxa per each category (except for E) and this is probably due to the complementarity of the M and F groups skills.

Table 1 shows that MF group has a higher level of diversification of records if compared with F and M, showing a higher level of biodiversity by complementing knowledge from both genders. This is true for categories A, B, C and D, while for E, M group has the highest level of diversification. Results above show that the mixed group is able to reduce the differences between the gardens managed by men and women. When the vegetable garden is managed by men the percentage of horticultural species (B) is more than 50%. The percentage decreases when the management is promiscuous and even more, when only women cultivate it. The opposite occurs when flowering species (C) are considered. When the vegetable garden is managed by women only the percentage of flower species (C) is very high, when the management is promiscuous it slightly decreases and it is even lower when the garden is cultivated by men only.

Among couples (MF) were detected 138 *taxa*, while 82 among male (M) gardeners (30% less) and 69 among female (F), gardeners (50% less). List of mentioned *taxa* is reported in table 2.

Discussion

A large part of the literature showed that women increase the biodiversity (Hoogerbrugge and Fresco 1993; Agrawal 2003; Vazzana et al. 2010; Calvet-Mir et al. 2011) and enrich the vegetable garden with flower species (Reyes-Garcia et al. 2010), wild and semi-wild species (Vogl-Lukasser et al. 2010). In this study, we observed that when the alpine home garden is managed by a couple (man and woman) the number of landraces is significantly higher (=138 *taxa*) than in the other two cases (F= 74 *taxa*; M= 88 *taxa*). This can be observed in 4 out of 5 plant categories we created (in A: tree and shrubs *taxa*; B: horticultural *taxa*; C: *taxa* of flower species cultivated for aesthetic purposes; D: wild and semi-wild *taxa*; but not in E: cereal and pseudocereal *taxa*). Indeed, men are generally more interested in the species who have market value, while women mainly aim at their culinary and nutritional value (Balakrishnan 1999). This can be observed in the horticultural category (B) who have a higher market value and shows higher number of *taxa* for men. It is in line with some recent studies by Ciftcioglu (2017), who reported that male respondents valued the opportunity to grow horticultural species (B) more than the women, while female respondents tended to value more ornamental plants (C). Also, women are greater foragers of products from common-pool resources (Agrawal 2003). Indeed, women are often responsible for foraging and gathering (Howard-Borjas and Cuijpers 2002), especially if wild and semi wild plants are close to

houses and home-gardens. On the other hand, the gathering of wild species that grow at very high altitude or in places hard to get, like *Artemisia absinthium,* it is a man's prerogative (Ertug 2003). The wild species have been essential during the famine in each Occitan valley of Italian Alps and the persistence of traditional knowledge regarding these species is the proof of their basic role in the food security (Mattalia et al. 2012). Having good traditional knowledge on wild and semi-wild species, also means transferring non-cultivated biodiversity from the field to the plate. This is not only an important task in the domestic realm, but also an active way to preserve biodiversity and its traditional knowledge. Furthermore, the Alpine home garden could preserve safeguarded species (particularly for semi-wild species). For instance, some managers reported the presence within their home gardens of *Lilium martagon*, *Lilium croceum* and some Gentianaceae which are totally safeguarded species (Regione Piemonte 2009). The responsible for this contamination is mainly woman who, not only insert the wild in the domesticated, but they create the habitat to allow rare not-welcomed plant to grow (Vogl-Lukasser et al. 2010).

Another important aspect regards the aesthetics within the garden. Recreating a sense of beauty, a sense of belonging, a sense of place is generally considered a women task. By decorating the house and the adjacent external areas, the woman incorporates ornamental biodiversity. Men did not value the use of ornamental ("useless") plants (Carvalho 2016). Cultivating primly the home garden, women create surplus value to the functionality of the horticultural species planted by men. Gardens become a reason for pride and satisfaction (Heckler 2004), exchange, perpetration of the cultural identity and expression of its own subjectivity (Murrieta and WinklerPrins 2009). Moreover, women take care of the nutritional point of view (in addition to the medical one) since they know the properties of the plant (Daniggelis 2003). As in the results, the female gender enhances the multi functionality of the vegetable garden while the male gender is usually more focused on the utilitarian perspective (in this case the horticultural production). Promiscuous management appears to be a good way to integrate these two aptitudes, while making the best use of the agro-biodiversity in their kitchens. The finding that men and women use different management techniques is consistent with findings by Reyes-Garcia et al. (2010). However, our findings on the use of organic fertilizers and pest controls are not in line with the mentioned research. In our study, women appeared to use chemical products ~~way~~ more than men, and this is because of the age of our respondents, their loneliness and their need to avoid heavy labours. In accordance with Carvalho (2016), women are in charge for poultry and this explains the high number of animal breeders among women. Fresh eggs are a source of proteins, which are not always easy to find in the alpine areas. It is important to rethink Alps (and Alpine vegetable gardens), not as marginal areas fated to

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die and to get empty, but rather as reservoirs of biodiversity and cultural diversity (Salsa 2009), especially when perpetuated by different gendered aptitudes.

C Conclusions

Home gardens in the Alps are multifaceted productive and recreational spaces. In this study, we analysed the influence of gender roles on agro-biodiversity and management of the alpine home gardens in two Italian alpine valleys. Despite most of the literature emphasized the great role of women in biodiversity conservation and traditional ecological knowledge keeping, this research showed that the compresence of men and women appears to increase the level of biodiversity and diversity in managements of alpine home gardens. Women showed to be more attentive to aesthetics and more expert at foraging, while men are more focussed on the "productive" garden, giving preference to horticultural species. Therefore, men and women use different species and when gardening together they enhance biodiversity and diversity in managements. This results in a mitigation of the differences between genders and in some cases, the exaltation of positive aspects of one of them.

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Table 1 Percentage of taxa per gender group per plant category. A: tree and shrubs taxa; B: horticultural taxa; C: taxa of flower species cultivated for aestethic purposes; D: wild and semi wild taxa; E: cereal and pseudocereal taxa. (F: Female only; M: Male only; MF: Male and Female)

CATEGORY	M (%)	MF (%)	F (%)
A	62,5	91,6	54,2
B	81,8	97,7	50
C	48,8	93,3	46,6
D	36,6	96,6	40
E	100	66,6	0

Table 2 List of mentioned taxa

CATEGORY	FAMILY	SPECIES
A (Tree and shrub species)	Aquifoliaceae	*Ilex aquifolium* L.
	Betaluceae	*Corylus avellana* L.
	Caprifoliaceae	*Sambucus nigra* L.
	Ericaceae	*Vaccinium corymbosum* L.
	Fabaceae	*Acacia* spp.
	Fagaceae	*Castanea sativa* Mill.
	Grossulariacee	*Ribes uva-crispa* L.; *Ribes nigrum* L.; *Ribes rubrum* L.
	Juglandaceae	*Juglans regia* L.
	Lauraceae	*Laurus nobilis* L.
	Primulaceae	*Prunus armeniaca* L.
	Rosaceae	*Malus domestica* Borkh.; *Prunus avium* L.; *Prunus cerasus* L.; *Prunus domestica* L.; *Prunus persica* L.; *Pyrus communis* L.; *Rubus fructicosa* L.; *Rubus idaeus* L. var. *fallgold; Rubus idaeus* L.; *Rubus ulmifolius* Shott
	Tiliaceae	*Tilia cordata* Mill.
	Vitaceae	*Vitis labrusca* L.

B (Horticoltural species)	Apiaceae	*Apium graveolens* L.; *Daucus carota* L.; *Foeniculum vulgare* Mill.; *Petroselinum crispum* L.
	Asteraceae	*Cichorium intybus* L.; *Lactuca* spp.*; Tanacetum balsamita* L.
	Brassicaceae	*Brassica cretica* Lam.; *Brassica oleracea* L. spp.; *Brassica oleracea* L. *var. botrytis; Brassica oleracea* L. *var. gemmifera; Brassica oleracea* L. *var. sabauda; Brassica rapa* L.; *Raphanus sativus* L.
	Chenopodiaceae	*Spinacia oleracea* L.
	Cucurbitaceae	*Cucurbita pepo* L.; *Cucurbita* spp.
	Fabaceae	*Phaseolus vulgare* L.; *Pisum sativum* L.
	Lamiaceae	*Borago officinalis* L.; *Melissa officinalis* L.; *Mentha pratensis* L.; *Ocimum basilicum* L.; *Origanum majorana* L.; *Origanum vulgare* L.; *Rosmarinus officinalis* L.; *Salvia officinalis* L.; *Satureja montana* L
	Liliaceae	*Allium ampeloprasum* L.; *Allium cepa* L.; *Allium sativum* L.; *Allium schoenoprasum* L.; *Asparagus acutifolius* L.
	Polygonaceae	*Rheum officinale* Baill.
	Rosaceae	*Fragaria vesca* L.
	Saxifragaceae	*Bergenia crassulaceae* L.
	Solanaceae	*Capsicum annuum* L.; *Lycopersicon esculentum* L.; *Solanum melongena* L., *Solanum tuberosum* L.
C (Flowering species)	Amaryllidaceae	*Narcissus* L.
	Araceae	*Zantedeschia aethiopica* (L.) Spreng.
	Asteraceae	*Chrysanthemum* spp.; *Cyanus segetum* Hill.; *Dahlia* spp.; *Dimorphotheca pluvialis* (L.) Moench; *Gazania* spp.; *Tagetes* spp.
	Balsaminaceae	*Impatiens balsamina* L.
	Begoniaceae	*Begonia* spp.
	Brassicaceae	*Alyssum montanum* L.; *Aubrieta deltoidea* (L.) DC.
	Caryophyllaceae	*Dianthus* spp.
	Clusiaceae	*Hypericum perforatum* L.
	Geraniaceae	*Pelargonium graveolens* L.
	Hydrangeaceae	*Hydrangea* spp.

	Iridaceae	*Crocus bicolflor* L.; *Gladiolus italicus* Mill.; *Iris* spp.
	Lamiaceae	*Lavandula stoechas* L.; *Salvia splendens* Sellow ex Schult.
	Leguminosae	*Wisteria sinensis* (Sims) Sweet
	Liliaceae	*Convallaria majalis* L.; *Fritillaria* spp.; *Hemerocallis fulva* (L.) L.; *Hyacinthus orientalis* L.; *Lilium* spp.; *Muscari comosum* L.; *Tulipa* spp.
	Malvaceae	*Alcea rosea* L.; *Hibiscus* spp.
	Oleaceae	*Forsythia suspensa* ~~*Forsythia suspense*~~ *(Thunb.) Vahl; Syringa vulgaris L.*
	Onagraceae	*Fuchsia* spp.
	Parmeliaceae	*Cetraria islandica* L. Ach.
	Peoniaceae	*Paeonia* spp
	Ranuncolaceae	*Anemone alpina* L.; *Aquilegia saximontana* Rydb.; *Clematis* spp.; *Delphinium inopinatum* Nevski; *Helleborus niger* L.
	Rosaceae	*Rosa* spp.
	Scrophulariaceae	*Antirrhinum majus* L.; *Digitalis* spp.
	Solanaceae	*Petunia* spp.
	Violaceae	*Viola tricolor* L.
D (Wild and semi-wild species)	Apiaceae	*Foeniculum vulgare* Mill.; *Levisticum officinale* W.D.J.Koch; *Pimpinella anisum* L.
	Apocinaceae	*Pervinca minor* L.
	Asteraceae	*Achillea erba-rotta* All.; *Achillea millefolium* L.; *Arnica montana* L.; *Arthemisia absinthium* L.; *Calendula officinalis* L.; *Leontopodium alpinum* L.*; Tanacetum vulgare* L.; *Taraxacum officinale* Weber
	Cannabaceae	*Humulus lupulus* L.
	Caryophyllaceae	*Silene vulgaris* (Moench) Garcke
	Chenopodiaceae	*Beta vulgaris* L.; *Chenopodium bonus-henricus* L.
	Ericaceae	*Arctostaphylos uva-ursi* (L.) Spreng; *Rhododendron macrophillum* L.;

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		Vaccinium myrtillus L.
	Fabaceae	*Lupinus* spp.
	Gentianaceae	*Gentiana* spp.
	Liliaceae	*Lilium martagon* L.
	Oxalidaceae	*Oxalis acetosella* L.
	Polygonaceae	*Polygonum bistorta* L.
	Primulaceae	*Primula vulgaris* L.
	Rosaceae	*Fragaria vesca* L.; *Rosa canina* L.
	Scrophulariaceae	*Veronica allionii* Vill.
	Urticaceae	*Urtica dioica* L.
	Violaceae	*Viola cornuta* L.
E (Cereals and pseudo-cereals)	Poaceae	*Secale cereale* L.; *Zea mays* L. var. *pignoletto*
	Polygonaceae	*Fagopyrum esculentum* L.

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