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Does access to natural environments explain differences in the use of wild plants between rural and urban populations?

¿El acceso a los entornos naturales explica las diferencias en el uso de plantas silvestres entre las poblaciones rurales y urbanas?

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Abstract

Background: The use of wild plants depends on a number of sociocultural and ecological factors, such as the ease of access to natural environments. This limitation for urban inhabitants leads to differences in the knowledge and use of wild plants compared to rural inhabitants.
Hypothesis: Rural and urban populations tend to share a similar knowledge of plants and use similar plants species when easy access to natural landscapes is available.
Study site and years of study: Rural and urban area of Curarrehue, La Araucanía region (southern Chile), 2017.
Methods: The use patterns of wild edible plants (WEPs) and wild medicinal plants (WMPs) were compared between the rural and urban population of Curarrehue. We evaluated the number of WEPs and WMPs gathered, their richness and diversity, the most important gathering environments and the way in which knowledge was acquired.
Results: No differences were observed in the use of wild plants between the populations, except for the richness of WMPs. The WEPs were gathered mainly from the forest by both populations, and in the case of the WMPs, from forest and disturbed areas. The knowledge was acquired mainly through relatives by gathering plants from forest areas.
Conclusions: Access to natural environments is key to preserving traditional practices and contributes to reducing gaps in the knowledge and use of wild plants between local rural and urban populations.
Keywords: Ecological indices, protected areas, urban ethnobotany, wild edible plants, wild medicinal plants.

Resumen

Antecedentes: El uso de plantas silvestres depende de diversos factores socioculturales y ecológicos, como la facilidad de acceso a los entornos naturales. Esta limitación para los habitantes urbanos conduce a diferencias en el conocimiento y uso de las plantas silvestres respecto a los habitantes rurales.
Hipótesis: Las poblaciones rurales y urbanas tienden a compartir un conocimiento similar sobre plantas y utilizar especies similares cuando pueden acceder fácilmente a los ambientes naturales.
Sitio y años de estudio: Área rural y urbana de Curarrehue, región de La Araucanía (sur de Chile), 2017.
Métodos: Se compararon los patrones de uso de plantas silvestres comestibles (WEPs) y plantas silvestres medicinales (WMPs) entre la población rural y urbana de Curarrehue. Evaluamos el número de WEPs y WMPs recolectadas, su riqueza y diversidad, los entornos de recolección más importantes y la forma en que el conocimiento fue adquirido.
Resultados: No se observaron diferencias en el uso de plantas silvestres entre las poblaciones, excepto por la riqueza de WMPs. Las WEPs fueron recolectadas principalmente desde el bosque por ambas poblaciones, y en el caso de las WMPs, desde bosque y áreas perturbadas. El conocimiento fue adquirido principalmente a través de los familiares, recolectando plantas desde áreas forestales.
Conclusiones: El acceso a los entornos naturales es clave para preservar las prácticas tradicionales y contribuye a reducir las brechas en el conocimiento y uso de plantas silvestres entre las poblaciones locales rurales y urbanas.
Palabras clave: Áreas protegidas, etnobotánica urbana, índices ecológicos, plantas silvestres comestibles, plantas silvestres medicinales.

Humans have always used wild plants for various purposes, such as firewood, food, clothing, medicine, and construction (Rapoport *et al.* 2009). Uses related to edible and medicinal purposes have always been of importance, as they are fundamental to human survival (Toledo *et al.* 2009). Even today, wild edible plants (WEPs hereafter) help to diversify and enrich modern diets by providing vitamins, minerals, carbohydrates, fiber, proteins, and fatty acids, as well as other compounds beneficial to human health (Pereira *et al.* 2011, Sánchez-Mata *et al.* 2012, Romojaro *et al.* 2013). Wild medicinal plants (WMPs hereafter) can represent an effective and low-cost complement to modern medicine. They may be used to cover the basic health needs of people as they contain biologically active compounds that can prevent and treat physical and mental diseases (Bakkali *et al.* 2008, Delbanco *et al.* 2017, Moore *et al.* 2017). For these reasons, the conservation of traditional knowledge about WEPs and WMPs is not only critical to the livelihood security of human cultures worldwide, but also has a role to play in preserving cultures in modern societies in developed countries (Cunningham 2001).

In the last few decades, knowledge of traditional practices has progressively declined as a result of different processes which occur on a global scale (Rajbhandary & Ranjitkar 2006). Several factors have been identified as causes of this, such as cultural homogenization, consumerism, modernization, and a general fading of interest in and negative perceptions of wild plants, especially among younger generations (Pilgrim *et al.* 2008, Rana *et al.* 2012, Turreira-García *et al.* 2015). Nevertheless, the use of wild plants is determined not only by sociocultural but also by ecological factors (Barreau *et al.* 2016). The abundance, diversity and productivity of wild plants are usually related to the intensity of the gathering and use of wild plants (Albuquerque & Lucena 2005, Molina *et al.* 2014, Bortolotto *et al.* 2015). Furthermore, the direct interaction of people with local environments is one of the most significant ways of traditional knowledge acquisition (Turreira-García *et al.* 2015, Pardo de Santayana *et al.* 2017).

Urbanization has been recognized as an important factor behind the decrease of traditional practices (Ahmad *et al.* 2013). Urban development causes environmental degradation mainly due to changes in land-use and deforestation (Goddard *et al.* 2009), which directly impacts the quantity and quality of wild vegetation available to be gathered (Ahmad *et al.* 2013). These changes result in a loss of plant diversity and consequently in a loss of knowledge of plant use (Teklehaymanot *et al.* 2007).

Since natural landscapes are fragmented or reduced in urban areas, wild plants are only available to be gathered from a few types of environments, mainly anthropogenic disturbed sites, such as vacant lots, pathways, planting strips, railroad tracks, and streets (Díaz-Betancourt *et al.* 1999, Tardío 2010, Turner *et al.* 2011, McLain *et al.* 2014). Conversely, in rural areas natural environments are often well preserved and tend to contain a greater diversity of vegetation, facilitating the gathering of wild plants, a common practice maintained over time by local populations (Bortolotto *et al.* 2015, Kujawska & Luczaj 2015). Due to the restrictions in resource availability, as well as the sociocultural factors mentioned above, people in cities usually know and use fewer wild plants than those living in rural areas (Sogbohossou *et al.* 2015).

To maintain the integrity of natural environments and to preserve traditional knowledge and the security of livelihoods, it is necessary to develop strategies for biodiversity conservation (Berkes 2003, Bortolotto *et al.* 2015). This is particularly important in urban areas because they are subject to greater threats to their biological and cultural diversity (Joos-Vanderwalle 2015). The presence of open green spaces in cities, such as urban forests, has been shown to encourage the use of wild plants for medicinal and food purposes, since they facilitate the interaction of urban inhabitants with nature (Poe *et al.* 2013).

We explored how the access to natural environments in urban populations contributes to the preservation of traditional practices, reducing the gap in knowledge with rural populations about the use of wild plants. We hypothesize that under a landscape conservation scenario, characterized by the abundance of wild vegetation without restriction of access to natural environments from rural and urban areas, both urban and rural populations would tend to share similar plant knowledge and use similar plants species. To assess our hypothesis, we compared the use of WEPs and WMPs by urban and rural populations and identified the most important gathering environments in Curarrehue. In addition, we looked into the mechanisms of traditional knowledge transmission.

Materials and methods

Study area. The study was conducted in Curarrehue, a province located in southern Chile (La Araucanía region, Figure 1). Curarrehue covers a surface of 1,170 km^2 (INE 2019) and is part of the Chilean Winter Rainfall-Valdivian Forest hotspot (Myers 2000). The climate is warm temperate with a dry season of less than 4 months. The mean annual rainfall exceeds 2,000 mm and the mean annual temperature is about 12 °C (PLADECO 2009). Two protected areas surround the study area, Villarrica National Park and Villarrica National Reserve, which combined cover 74 % of the Curarrehue surface (MMA 2011). Primary forest is the dominant vegetation type, mainly composed of *Aextoxicon punctatum* Ruiz & Pav., *Araucaria araucana* (Molina) K. Koch, *Gevuina avellana* Molina,

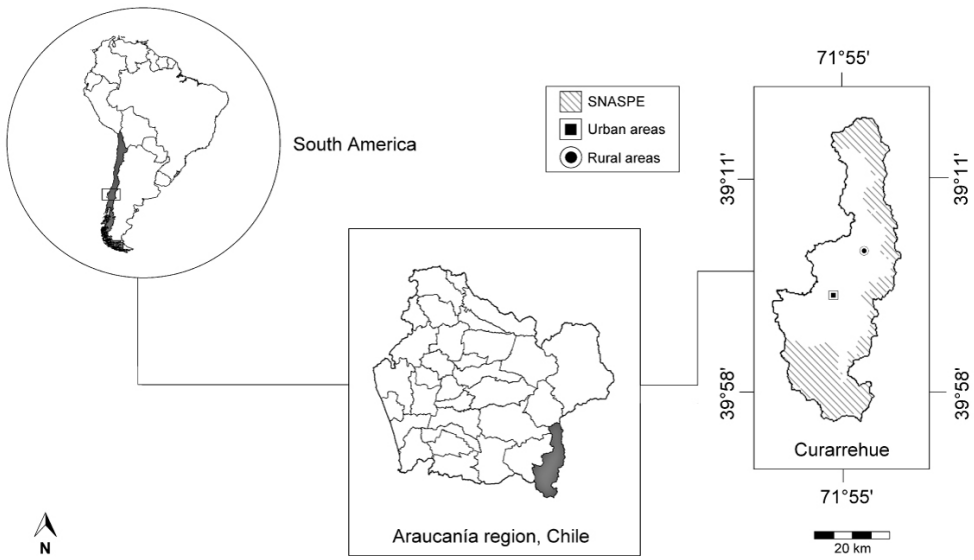

Figure 1. Study area in La Araucanía, an administrative region of southern Chile. We included the urban area and the rural area, as well as wild protected areas of the state.

Laurelia sempervirens (Ruiz & Pav.) Tul., *Lomatia hirsuta* (Lam.) Diels ex J.F.Macbr., *Luma apiculata* (DC.) Burret, *Nothofagus alpina* (Poepp. & Endl.) Oerst., *Nothofagus dombeyi* (Mirb.) Oerst., *Nothofagus obliqua* (Mirb.) Oerst., and *Weinmannia trichosperma* Cav. Also, Curarrehue has several bodies of water, such as the Trancura, Maichin and Pucón rivers, and lakes such as the Huesquefilo, Los Patos, Huenfuica, Hualalafquen and Quillelgue (PLADECO 2009). Since these are not private lands and local government programs promote regular visits, the inhabitants of Curarrehue can easily access them and gathering wild plants, especially during the seedfall periods for the pehuén (*A. araucana*).

The population of Curarrehue is about 6,784 inhabitants (52.6 % men and 47.4 % women) (INE 2019). About 50.6 % of the population identifies themselves with the *Mapuche* culture (PLADECO 2009). The economy is based mainly on tertiary industry, such as retail, education, public administration, and domestic services. Primary and secondary industries make up a smaller proportion of the economy and include activities such as agriculture, hunting, and the production and manufacture of wood and cork products (PLADECO 2009).

Data collection. Field research was conducted during the summer of 2017 through semi-structured interviews with 121 participants, using open-ended questions. The interviewees were split into two groups, based on the type of area where they live: rural and urban. The rural area was defined based on functional and demographic features: low population density and non-urbanized land used mainly for agricultural, agro-industrial, extractive, forestry and environmental conservation activities, and non-concentrated dwellings. Conversely, the urban area was defined based on characteristic population features: high population density and the presence of all types of infrastructure; as well as by functional characteristics: activity and employment concentrated in the secondary and tertiary sectors, with a lower participation of the primary sector. From these definitions, our rural population included people living in a non-urbanized area at least 5 km away from the urban core, and consisted of 57 interviewees (54.4 % men and 45.6 % women) whose age was 48.4 years ± 2.4 (mean ± standard error; range: 19 to 86). On the other hand, our urban population considered people living in the urban center and consisted of 64 interviewees (46.9 % men and 53.1 % women), which age was 49.7 years ± 1.9 (range: 19 to 82). For the urban group, the interviewees were approached from public spaces within the urban core (squares, bus stops, shopping centers), asking to confirm if they permanently reside in the urban area of Curarrehue or if they were just visiting the urban center. Also, we knocked on the front doors of houses distanced by at least 125 m and then interviewed those who were willing to take part in the study. For the rural group, we knocked on the front doors of houses in the rural area, selecting houses at least 1 km apart to cover the largest rural surface. Interviewees were asked to provide a list of WEPs and WMPs they usually gather. Wild plants were defined as "plants gathered from the wild that are not grown in gardens or agricultural systems but

grow without human intervention", requiring confirmation for controversial species that occur spontaneously but are also usually cultivated. For each species we asked: which plant part they used, the mode of use (preparation or application), and the type of environment from which the plant is gathered (forest, riparian and disturbed areas). In addition, we asked about the sources of knowledge through which interviewees learned about the uses of WEPs and WMPs (*e.g.*, parents, grandparents, local people).

In order to identify the mentioned taxa, pictures and herbarium specimens were shown to interviewees and in some cases, short walks through the locality were carried out to identify and collect samples. The collected specimens of plant species were deposited in the herbarium at the Pontificia Universidad Católica de Valparaíso (UCVA). To standardize scientific names, the plant inventory was compared with The Plant List (www.theplantlist.org/), the most comprehensive working list of all plant species (Kalwij 2012).

Data analysis. Based on the collected information, we compared the mean number of WEPs and WMPs used per interviewee in rural and urban populations using the Mann-Whitney test. Also, we built a quantitative "interviews x species" matrix to assess the richness and diversity of WEPs and WMPs used by rural and urban populations. Richness was estimated as the number of species mentioned by each population. Diversity was evaluated as a measure of the heterogeneity of the number of reports of the species (frequency of use) by using the Shannon-Weiner index, an index used in ecology modified for ethnobotanical studies according to Begossi (1996) as:

1. $H = -\sum pi \cdot \log(pi)$

where $pi = \frac{ni}{N}$

ni = number of reports for a given species
N = total number of reports of all species

Both richness and diversity were calculated from rarefaction curves using 999 randomizations and sampling without replacement by using iNEXT (Hsieh *et al.* 2016). To make comparable observations between populations with different numbers of interviewees, extrapolations were performed to end 150 interviews, and then we compared both estimators to 100 interviews. Differences were considered to be statistically significant when 95 % confidence intervals did not overlap. In order to evaluate the similarity of WEPs and WMPs used between both groups of populations, we conducted a one-way analysis of similarities (ANOSIM) based on Bray-Curtis distance and using 999 permutations. Then, a similarity percentage (SIMPER) analysis was used to identify the main species responsible for the differences observed between the populations. Furthermore, we evaluated the most important environments for collection by comparing the mean number of WEPs and WMPs gathered from each type, using the Kruskal-Wallis test with post hoc Dunn test.

Finally, to highlight the differences and similarities in the patterns of use of wild plants by the studied populations, we grouped plants based on categories related to the illnesses, conditions or disorders they are used to treat (illness category for WMPs) and the mode they are consumed (edible category for WEPs). Illness category was subcategorized as: *articulatory system diseases and traumatic injuries* (articular degeneration or traumatism), *circulatory system diseases* (diseases that affect the heart or blood vessels), *dermatology diseases and skin injuries* (diseases and conditions that affect the skin, hair, and nails), *digestive system diseases* (diseases and disorders of the digestive tract), *metabolic disorders* (deficiencies in enzymes involved in the metabolism), *respiratory system diseases* (conditions that affect organs and tissues making breathing difficult), *urogenital system diseases* (problems that affect the urinary and genital tracts), and *others* (including headache, fever, sleep disorders, and depression). On the other hand, edible category was subcategorized according to the way of consumption of wild plants as: *beverages* (plants used to elaborate cold or hot herbal infusions due to their pleasant taste, without medicinal purposes), *condiments* (plants used for flavoring beverages), *flours* (plants whose seeds are ground into powder and used as flour for making bread and others), *fruits* (plants whose fruits are eaten raw or cooked), *green vegetables* (plants with shoots eaten raw or cooked), *seeds* (plants whose seeds are eaten raw or cooked), and *others* (plants who are used as preservatives). These categories allowed us to identify the most commons purposes for which plants were used.

All statistical analyses were conducted using the software R version 3.4.2 (R Development Core Team 2017), except ANOSIM and SIMPER, for which we used the software PAST version 3.14 (Hammer *et al.* 2001).

Wild edible and medicinal plants definition. There is not a single definition for wild edible and medicinal plants. However, the treatment for wild plants in our study derives from Heywood's definition (Heywood 1999), which has been modified as: "plants species, native or exotic, that grow spontaneously in self-sufficient populations in natural or disturbed ecosystems and can exist independently of direct human action". This definition also considers those plants that probably escaped cultivation but can grow without human intervention. Thus, WEPs were considered as those wild plants that can be used as food and WMPs as wild plants that can be used to treat or prevent some illness.

Results

Wild edible and medicinal plants used in Curarrehue. We recorded a total of 61 species of vascular plants used in Curarrehue. Of these, 55 species were WMPs and 27 species were WEPs (21 species were used both as food and medicine) (see Appendix 1). The patterns of use for WEPs and WMPs were similar between the rural area and the urban area, showing that people from both population types use local plants for the same purposes and with a similar frequency of use (Tables 2, 3).

Digestive system diseases and *urogenital system diseases* were identified as the illness categories with the greatest number of reports in the two studied areas (rural: 113 and 30, respectively; urban: 113 and 35) (Table 1). Most of the WMPs were used because of their digestive properties as herbal infusions after meals, which was indicated as a common practice in Curarrehue. However, other uses of WMPs were mentioned as circumstantial or infrequent, except for interviewees who use plants to treat a permanent medical condition (*e.g.,* diabetes). The most used WMPs by the interviewees was menta (*Mentha suaveolens* Ehrh.) (rural and urban: 25 reports), followed by manzanilla (*Matricaria chamomilla* L.) and matico (*Buddleja globosa* Hope) in rural (13), and maqui (*Aristotelia chilensis* Stuntz) in urban (18).

Fruits and *seeds* were the food categories with the greatest number of reports in both areas (rural: 172 and 66, respectively; urban: 140 and 60) (Table 2). In general, species with edible fruits and seeds were highly valued by rural and urban inhabitants. Fruits were perceived as being nutritious and seeds as a key resource for obtaining flour and derived products. In both the rural and the urban area, the most mentioned edible species were maqui (*A. chilensis*; 33 and 39 reports, respectively) and pehuén (*A. araucana*; 33 and 32), which were also gathered to be commercialized in local and non-local markets, mainly by rural inhabitants. *Beverages* category was also important for both populations (rural: 12 used species and 40 reports; urban: 8 and 31), being *Mentha pulegium* L. and *M. suaveolens* the most widely used species, employed as herbal infusion because of their pleasant taste and smell. On the other hand, the least important categories were *green vegetables* with only three species used and *others,* with a single species mentioned by a rural interviewee who used *Ribes magellanicum* Poir. to curdle milk.

Overall, interviewees of both the rural and the urban area more frequently cited species that are used as both food and medicine.

Gathering environments. Both rural and urban populations gather WEPs and WMPs from three types of environments in Curarrehue: (i) forest, (ii) anthropogenic disturbed areas and (iii) riparian areas. In the case of WEPs, no differences in the preference patterns of gathering environments by urban and rural populations were observed. Comparisons of the number of WEPs gathered per respondent from the different environments showed statistical differences between the rural area (KW: $\chi^2 = 50.995$, df = 2, $p < 0.001$) and the urban area (KW: $\chi^2 = 69.895$, df = 2, $p < 0.001$). In both cases, forest was identified as the main environment from which WEPs are gathered, followed by disturbed areas and riparian areas as the least used, with significant differences between each of the pairs (Dunn test: $p < 0.05$; Table 3).

No differences were observed for WMPs between the two populations in terms of the preference patterns of gathering environments. However, significant differences in the number of species gathered from the environments were found between the rural area (KW: $\chi^2 = 19.498$, df = 2,

Table 1. Illness categories of WMPs used in Curarrehue by rural and urban populations.

	Rural population		Urban population	
Illness category[a]	**No. used species**	**No. of reports**	**No. used species**	**No. of reports**
Articulatory system diseases and traumatic injuries	4	14	5	8
Circulatory system diseases	4	9	3	15
Dermatology diseases and skin injuries	7	13	6	12
Digestive system diseases	18	113	13	113
Metabolic disorders	7	15	2	3
Respiratory system diseases	13	19	8	16
Urogenital system diseases	13	30	10	35
Others[b]	15	25	8	19

[a] Several species were mentioned to be used to treat more than one illness

[b] Including headache, fever, sleep disorderes, and depression

Table 2. Edible categories of WEPs used in Curarrehue by rural and urban populations.

	Rural population		Urban population	
Edible category[a]	**No. used species**	**No. of reports**	**No. used species**	**No. of reports**
Beverages	12	40	8	31
Condiment	5	8	7	23
Flours	2	12	2	8
Fruits	15	172	11	140
Green vegetables	3	26	3	7
Seeds	2	66	2	70
Others[b]	1	1	0	0

[a] Several species were mentioned to be used for different purposes

[b] Including preservatives

$p < 0.001$) and the urban area (KW: $\chi^2 = 24.402$, df = 2, $p < 0.001$). In both cases, disturbed areas and forest were preferred for gathering WMPs, which showed no significant differences between them ($p > 0.05$) but differed significantly from riparian areas (Dunn test: $p < 0.05$; Table 3).

Traditional knowledge acquisition. In Curarrehue, traditional knowledge about WEPs and WMPs was transmitted from different sources (on several occasions through more than one), but mainly from relatives. In both populations, the vast majority of interviewees mentioned that they had learned it from their parents (rural: 61.4 % of the cases; urban: 60.9 % of the cases) or grandparents (rural: 31.6 % of the cases; urban: 14.1 % of the cases) during their childhood. In addition, the main activities involved in the process of knowledge acquisition were participating in the gathering of WEPs and WMPs mainly from the forest for both populations, and drinking "yerba mate" infusion (*Ilex paraguariensis* A.St-Hil.) in the case of the rural population. A small proportion of the interviewees from the rural population (15.8 %) indicated that they acquired the knowledge from other sources, such as educational regional programs of rural development and from *ñañas* and *machis* (old grandmothers and female herbalists belonging to the *Mapuche* people, respectively, in Mapuzungun language). On the other hand, 12.5 % of the interviewees from the urban population affirmed it was by reading digital books on the internet. Finally, 8.8 % of the rural population and 12.5 % of the urban population mentioned that they learned it through conversations with elderly rural people of Curarrehue and by watching them gathering WEPs and WMPs from different environments that often are subsequently sold in local markets.

Table 3. Number of WEPs and WMPs gathered by rural and urban populations from different environments of Curarrehue (forest, disturbed and riparian areas).

Gathering environments	Number of WEPs gathered per respondent (mean ± standard error)	Number of WEPs gathered	Number of WMPs gathered per respondent (mean ± standard error)	Number of WMPs gathered
Rural population				
Forest	2.09 ± 0.2[a]	17	1.67 ± 0.2[a]	24
Disturbed areas	1.26 ± 0.2[b]	6	1.44 ± 0.2[a]	21
Riparian areas	0.30 ± 0.06[c]	2	0.44 ± 0.08[b]	4
Urban population				
Forest	1.98 ± 0.2[a]	16	1.17 ± 0.2[a]	17
Disturbed areas	0.70 ± 0.1[b]	4	1.33 ± 0.2[a]	17
Riparian areas	0.13 ± 0.04[c]	2	0.27 ± 0.06[b]	3

Different letters represent significant differences ($p < 0.05$)

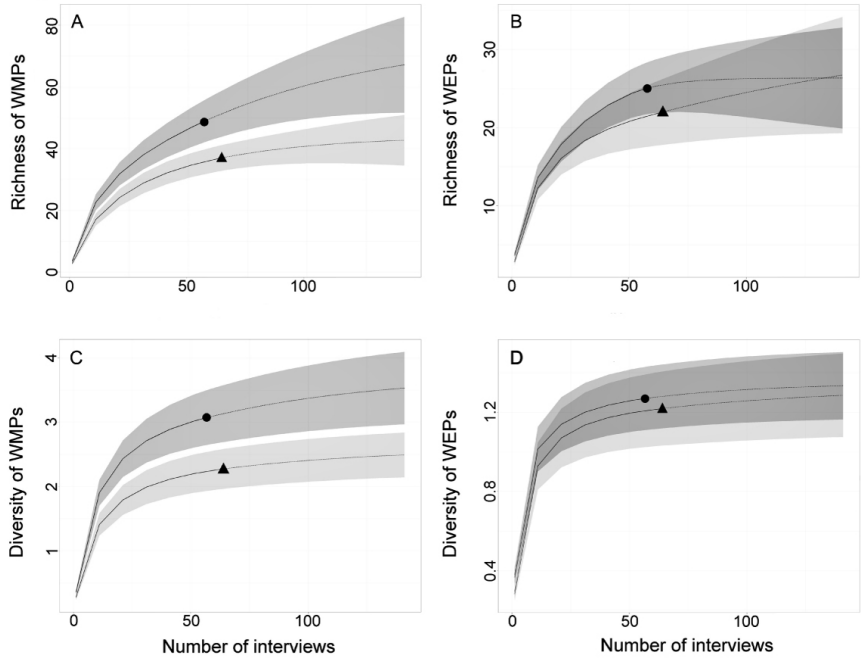

Figure 2. Rarefaction curves: A: Richness of WMPs; B: Richness of WEPs; C: Diversity of WMPs; D: Diversity of WEPs. Curves represent rural population (circles), urban population (triangles), interpolations (entire lines) and extrapolations (discontinuous lines).

Richness, diversity and similarity of the species used by rural and urban populations. We observed that the mean number of WEPs and WMPs used per respondent was greater in the rural area (WEPs: 3.65 ± 0.3; WMPs: 3.54 ± 0.4; mean ± standard error) than in the urban area (WEPs: 2.81 ± 0.3; WMPs: 2.77 ± 0.3). Nevertheless, no statistically significant differences between populations were found, neither for WEPs, nor for WMPs ($p < 0.05$). On the other hand, rarefaction curves showed that the rural population use a greater richness of WEPs species than the urban one (Rural: S_{RAR100} = 26.28 ± 5.0; Urban: S_{RAR100} = 24.57 ± 5.7), as well as WMPs species (Rural: S_{RAR100} = 60.82 ± 11.1; Urban S_{RAR100} = 40.91 ± 5.6), although significant differences were observed only for WMPs (Figure 2 A, B). Furthermore, the diversity of used WEPs species was also greater in the rural area (Rural: H_{RAR100} = 1.32 ± 0.2; Urban: H_{RAR100} = 1.26 ± 0.2), as well as the diversity of WMPs species (Rural: H_{RAR100} = 3.38 ± 0.5; Urban: H_{RAR100} = 2.40 ± 0.3), but statistically different only in the last case (Figure 2 C, D).

Finally, with regard to the similarity of the species used in the rural and the urban area, an ANOSIM test revealed no significant differences, neither for WEPs (R = 0.0068; p = 0.245), nor for WMPs (R = -0.0024; p = 0.512). The plants with the greatest contributions to the dissimilarity of used species between populations were pehuén (*A. araucana;* 22.0 %), maqui (*A. chilensis*; 17.0 %) and murra (*Rubus ulmifolius* Schott; 14.2 %) in the case of WEPs, and menta (*M. suaveolens*; 11.4 %), manzanilla (*M. chamomilla*; 8.3 %) and matico (*B. globosa*; 7.5 %) in the case of WMPs, according to the SIMPER test.

Discussion

In Curarrehue, both rural and urban populations gather WEPs mainly from primary forests because these areas contain several species with highly valuable edible fruits and seeds. The remarkable prevalence of forest areas being used for gathering wild foods in Curarrehue supports the notion that protecting this type of environment is important to the conservation of traditional practices in both urban and rural contexts. This idea is presumably applicable to other Chilean regions because several ethnobotanical studies have shown that most WEPs belong to native species with edible fruits that inhabit forest areas (Cordero *et al.* 2017). However, forests in other regions of the world may contain less diversity of edible species, such as the sclerophyllous forests in central Chile (Cordero *et al.* 2017). Therefore, it is necessary to evaluate the role that forest areas play in maintaining traditional knowledge and practices of different cultures and in different geographic regions.

On the other hand, most WMPs in Curarrehue are gathered from disturbed areas and forests by rural and urban inhabitants. This pattern has also been observed in some studies (*e.g.,* Voeks 1996, Caniago & Siebert 1998, Frei *et al.* 2000) suggesting an explanation based on ecological aspects of WMPs: medicinal plants that inhabit disturbed habitats are predominantly exotic herbaceous species, while those that inhabit primary forests are mainly tree species (Stepp 2004, Albuquerque & Lucena 2005). Herbaceous plants tend to produce a wider variety of secondary compounds for diverse ecological functions, which can be useful as medicine for humans (Stepp & Moerman 2001). The preference for WMPs with short life-cycles shows that people are mostly attracted to plants that contain strongly bioactive compounds (Stepp 2004). Moreover, according to Stepp & Moerman (2001) plants that are closer to human settlements (*e.g.*, disturbed areas) are preferred to be used for medicinal purposes. However, we observed in several cases that plants used to treat illnesses are gathered from forests, despite the proximity of disturbed areas to residential areas, which suggests that preferences in the selection of species between these types of environments are not so evident.

In this study we reported 61 useful wild species, which inhabit mainly forest areas. This number may not be as great as those reported in other regions of South America, as in the case of WEPs used in the Bolivian tropical rainforest (102 species), the Peruvian tropical rainforest (98) or the Argentinian tropical rainforest (76) (Rapoport & Ladio 1999). However, the Chilean flora is quite smaller with only 5,471 species (Rodríguez *et al.* 2018) and the inhabitants of Curarrehue use a large proportion of the local wild resources available, based on the number of species reported as edible and medicinal in the studied region (Cordero *et al.* 2017). Regarding the patterns of use of wild plants, we observed similarities and differences with other regions of South America. Some studies have shown that WEPs used are mainly shrubs and trees with edible fruits that inhabit forest areas (*e.g.,* the Andean Patagonian forest of Argentina, Rapoport & Ladio 1999; the Peruvian Amazonia, Lawrence *et al.* 2005). Other studies have reported patterns of WMPs use very similar to those shown in this work, as in the case of Begossi *et al.* (2002) for the Brazilian Atlantic forest, where plants were used mainly to treat digestive problems, respiratory diseases, and fever. Nevertheless, despite the similarities with some regions, there are also cases where wild plants gathered from forest areas are not primarily used for edible or medicinal purposes (*e.g.*, firewood in the Bolivian Amazon, Reyes-García *et al.* 2005). Therefore, preferences for certain resources may be motivated by particular requirements of local populations or by the availability of some plant species. Thus, forest areas may not be relevant for medicinal or edible purposes, but to obtain firewood, construction materials or others.

Most ethnobotanical researches have shown that more species are used for medicinal purposes than for any other purpose (Bennett & Prance 2000), which is consistent with our results since the richness and diversity of species used by both populations were higher for WMPs than for WEPs. Knowledge about medicinal uses of plants is critical for health and human wellbeing, especially in rural populations (McCarter & Gavin 2015, World Health Organization 2013). In our study, the richness and diversity of WMPs were the only metrics compared between rural and urban populations that showed significant differences, being greater in rural than urban in both cases. It is possible that the existence of a great number of drugstores in the urban area of Curarrehue is causing a progressive abandonment of herbal medical systems by local inhabitants and, consequently, the decrease in the richness and diversity of used species. It has been documented that access to modern medicine by local populations can lead to the disappearance of traditional practices (Zank & Hanazaki 2012). However, in the urban area of Curarrehue these practices seem to have been maintained over time.

Knowledge on wild plants is generally acquired from parents (Somnasang & Moreno-Black 2000, Setalaphruk & Price 2007, Turreira-García *et al.* 2015), through familiarizing with the gathering environment, observing and helping other members of the community (Ohmagari & Berkes 1997, Zarger 2002). In our study, knowledge is acquired mainly from parents and grandparents, through direct observation and by helping them to gather wild plants. The socialization of the ecological knowledge within the family group it is also favored by drinking yerba mate, which is an important part of the cultural identity of many traditional communities from South America. The fact that plants gathering occurs mainly from the forest, confirms the importance of preserving natural landscapes to preserve traditional knowledge (Berkes 2003), because the interaction with the environment is fundamental in traditional knowledge acquisition (Turreira-García *et al.* 2015). The protection and easy access to natural environments in Curarrehue has contributed not only to improvements in the availability of useful wild vegetation, but also has increased the interaction of people with nature, resulting in effective traditional knowledge acquisition. However, it is possible that other factors not evaluated in this study have also influenced these processes. In some cases, cities develop around populations with a long history of living on that land and rich traditional ecological knowledge, which can cushion the effects of urbanization on traditional knowledge and practices, preventing its extinction (Emery & Hurley 2016). In our study area, some urban inhabitants told us that they learned from elderly rural

inhabitants and from *ñañas* and *machis*. Even though half of the Curarrehue population has Mapuche ancestry, interviewees mentioned that they did not consider themselves as Mapuche when consulted. This can be explained by the fact that the Mapuche people live mainly in closed communities that we did not visit in this study. However, only a few interviewees mentioned that they have learned from them. According to several interviewees from both populations, Mapuche people usually do not share their knowledge with people outside of their culture, which may explain the reason why their participation in the process of knowledge acquisition is not so relevant for rural and urban populations. On the other hand, the urban center is relatively recent in Curarrehue with only a few decades of existence (PLADECO 2009). In this sense, it is possible that many interviewees migrated to the city at an early age from the rural area, or even that their relatives continue to live in them. Nevertheless, even though migration processes could explain why traditional knowledge has been preserved and transmitted in the last few decades in the urban area, there are no population censuses available that can confirm this idea. The censuses in Curarrehue only consider the area of residence of people in the last five years and were implemented relatively recently, thus it is not possible to assume a cause-effect relationship between historical rural-to-urban migration and traditional knowledge transmission in the urban area.

We did not observe significant differences in the parameters compared between rural and urban populations, except for the richness and diversity of WMPs, which were greater in the rural area than in the urban area. The diversity of types of environments available determines the knowledge and use of wild plants by human populations (Bortolotto *et al.* 2015). A greater diversity of available vegetation tends to result in a greater diversity of wild plants used as food or medicine by surrounding populations (Ladio *et al.* 2007). For this reason, the use of wild plants in cities tends to be limited since natural environments have usually been reduced or destroyed, and the availability of vegetation is consequently reduced (Kujawska & Luczaj 2015). Conversely, the urban area in Curarrehue is surrounded by protected natural areas which allow the urban populations to access the natural environmental and therefore to gather a greater diversity of wild plants. Access to natural landscapes is critical to maintain local traditions since the physical environments of communities define the characteristics of their cultural identity (Vianna 2008). Furthermore, a high degree of similarity in terms of WEPs and WMPs use by urban and rural populations was observed, which could be explained by the fact that both populations have access to the same types of environments of Curarrehue. According to Saslis-Lagoudakis *et al.* (2015), communities surrounded by similar floristic environments tend to share similar plant knowledge and use similar plants species.

Due to the particular characteristics of Curarrehue in terms of size, it may be the case that the findings of this work cannot be extrapolated to large cities. In this sense, it is important to point out that Curarrehue should be classified as a town rather than a city. Since the degree of urbanization differs between towns and cities, its detrimental impact on traditional knowledge within the urban area of Curarrehue could be less severe, explaining the small differences observed between the urban area and the rural area. Furthermore, the rural area represents a great proportion of the total surface of Curarrehue, which as discussed above, could directly or indirectly influence the flow of traditional knowledge from rural to urban. In regions with larger cities and fewer rural areas, the interaction between urban and rural inhabitants may be less significant. Consequently, more industrialized cities with a smaller proportion of rural areas may not exhibit patterns of interaction patterns similar to those observed in this study. Nevertheless, green urban areas are considered to be spaces preferred for gathering by urban inhabitants (Poe *et al.* 2013), thus, protected areas within or around cities could have a more important role for the gatherers than parks or other public and private spaces, regardless of the extent of the city, especially if these are as easily accessible as in Curarrehue.

The protection of natural landscapes through strategies of public policy may contribute to avoiding the progression of the erosive process that traditional knowledge undergoes, especially in urban contexts. Nevertheless, more studies are still needed for a better understanding of the relevance of protected areas on the preservation of traditional knowledge and gathering practices, given the particular characteristics of the studied area and the varied sociocultural and ecological features of cities around the world.

Conclusion

In this work, we have shown that access to natural environments could have an important role to the maintenance of traditional practices in the urban area and the rural area from Curarrehue, as well as to reduce gaps in knowledge and use of wild plants between local populations. Forest areas contain a great diversity of wild resources, which are preferred for gathering by rural and urban inhabitants. However, disturbed areas have also great relevance for gathering practices in Curarrehue, since these provide a wide variety of medicinal resources used by both populations.

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Appendix 1. Wild edible and medicinal plants used in Curarrehue

Voucher No.	Species	Family	Local name	Gathering environment	No. of reports Rural	No. of reports Urban	Edible category	Illness category	Used part and mode of use
UCVA 15812	*Acaena ovalifolia* Ruiz & Pav.	Asteraceae	Trune	Disturbed areas	WMPs = 0 WEPs = 0	WMPs = 1 WEPs = 0		DIG	Med: leaves, infusion to treat diarrhea
UCVA 15814	*Adesmia boronioides* Hook. f.	Fabaceae	Paramela	Forest	WMPs = 9 WEPs = 2	WMPs = 9 WEPs = 3	CON	DIG	Food: shoots, condiment for beverages Med: shoots, infusion to treat stomachache and liver diseases
UCVA 15815	*Araucaria araucana* (Molina) K. Koch	Araucariaceae	Araucaria, pehuén	Forest	WMPs = 0 WEPs = 33	WMPs = 0 WEPs = 32	BEV, FLO, SEE		Food: seeds, raw, stew, boiled or roasted; ground into flour to make bread and juice; fermented to prepare *muday* (alcoholic beverage)
UCVA 15817	*Aristotelia chilensis* (Molina) Stuntz	Elaeocarpaceae	Maqui	Forest	WMPs = 12 WEPs = 33	WMPs = 18 WEPs = 39	BEV, CON, FRU	DIG, MET	Food: fruits, raw or cooked; dehydrated to prepare a cold beverage; dehydrated and ground added to the flour to condiment the bread; boiled to prepare jam, sweetmeats and juice; fermented as alcoholic beverage Med: fruits, eaten dehydrated to treat diarrhea. Leaves, infusion to treat stomachache, reduce cholesterol and low blood sugar; chewed as antacid. Seeds, dehydrated and ground added to boiled water to treat stomachaches
UCVA 15819	*Artemisia absinthium* L.	Asteraceae	Ajenjo	Disturbed areas	WMPs = 1 WEPs = 0	WMPs = 0 WEPs = 0		DIG	Med: leaves, infusion as stomach tonic

Voucher No.	Species	Family	Local name	Gathering environment	No. of reports Rural	No. of reports Urban	Edible category	Illness category	Used part and mode of use
UCVA 15820	*Berberis darwinii* Hook.	Berberidaceae	Michay, calafate	Forest	WMPs = 2 WEPs = 2	WMPs = 0 WEPs = 3	FRU	URO	Food: fruits, raw; boiled to prepare jam Med: root bark, infusion to treat urinary infections
UCVA 15821	*Buddleja globosa* Hope	Scrophulariaceae	Matico	Forest	WMPs = 13 WEPs = 0	WMPs =11 WEPs = 1	CON	ART, DER, DIG	Food: leaves, condiment for beverages Med: leaves, crushed to make a poultice to disinfect and heal wounds and treat rheumatism; infusion to treat liver diseases, indigestion, ulcers, and intestinal disorders
UCVA 15822	*Caldcluvia paniculata* (Cav.) D. Don	Cunoniaceae	Triaca	Forest	WMPs = 4 WEPs = 0	WMPs = 0 WEPs = 0		RES	Med: leaves, infusion to treat cold and cough
UCVA 15823	*Cestrum parqui* L'Hér.	Solanaceae	Palque, palqui parque	Forest	WMPs = 0 WEPs = 0	WMPs = 1 WEPs = 0		OTH	Med: cortex, decoction to relieve fever
UCVA 15824	*Chusquea culeou* E. Desv.	Poaceae	Coligüe, quila	Forest	WMPs = 1 WEPs = 2	WMPs = 0 WEPs = 1	VEG	MET	Food: young shoots, raw, boiled, or roasted Med: young shoots, infusion to reduce cholesterol and low blood sugar
UCVA 15826	*Cryptocarya alba* Molina	Lauraceae	Peumo	Forest	WMPs = 0 WEPs = 1	WMPs = 0 WEPs = 0	FRU		Food: fruits, raw or cooked
UCVA 15827	*Drimys winteri* J.R. Forst. & G. Forst.	Winteraceae	Canelo	Forest	WMPs = 5 WEPs = 0	WMPs = 3 WEPs = 0		ART, RES, OTH	Med: leaves, as herbal steam bath to treat rheumatism; crushed to make a poultice to treat rheumatism; infusion to relieve fever. Cortex, infusion to treat cough. Seeds, boiled to make scrubs to treat rheumatism

Voucher No.	Species	Family	Local name	Gathering environment	No. of reports Rural	No. of reports Urban	Edible category	Illness category	Used part and mode of use
UCVA 15828	*Dysphania ambrosioides* (L.) Mosyakin & Clemants	Amaranthaceae	Paico	Disturbed areas	WMPs = 3 WEPs = 0	WMPs = 7 WEPs = 0		DIG, URO	Med: shoots, infusion to treat stomachache, intestinal inflammation, and kidney pain
UCVA 15829	*Embothrium coccineum* J.R. Forst. & G. Forst.	Proteaceae	Notro	Forest	WMPs = 1 WEPs = 0	WMPs = 0 WEPs = 0		MET, OTH	Med: leaves and flowers, infusion to low blood sugar and relieve fever
UCVA 15830	*Equisetum bogotense* Kunth	Equisetaceae	Limpia plata	Riparian areas	WMPs = 8 WEPs = 0	WMPs = 4 WEPs = 0		DER, URO	Med: shoots, infusion to treat kidney pain and as diuretic; decoction to disinfect wounds
UCVA 15833	*Foeniculum vulgare* Mill.	Apiaceae	Hinojo	Disturbed areas	WMPs = 1 WEPs = 0	WMPs = 4 WEPs = 0		OTH	Med: shoots, infusion to treat sleep disorders
UCVA 1534	*Fragaria chiloensis* (L.) Duchesne ex Weston	Rosaceae	Frutilla silvestre	Forest	WMPs = 0 WEPs = 2	WMPs = 0 WEPs = 2	FRU		Food: fruits, raw
UCVA 15836	*Francoa appendiculata* Cav.	Melianthaceae	Llagui	Forest	WMPs = 1 WEPs = 0	WMPs = 1 WEPs = 0		RES	Med: leaves, infusion to treat cold and cough
UCVA 15837	*Fuchsia magellanica* Lam.	Onagraceae	Chilco	Forest	WMPs = 1 WEPs = 1	WMPs = 3 WEPs = 5	FRU	DIG	Food: fruits, raw; boiled to prepare jam Med: fruits, infusion to treat indigestion
UCVA 15839	*Gevuina avellana* Molina	Proteaceae	Avellano	Forest	WMPs = 0 WEPs = 14	WMPs = 1 WEPs = 9	BEV, FLO, SEE	DER	Food: seeds, raw or roasted; roasted and ground into flour to make bread; as beverage by roasting and soaking into liquor; roasted and ground added to boiled water as coffee substitute Med: seeds, oil to remove skin blemishes

Voucher No.	Species	Family	Local name	Gathering environment	No. of reports Rural	No. of reports Urban	Edible category	Illness category	Used part and mode of use
UCVA 15840	*Gunnera tinctoria* (Molina) Mirb.	Gunneraceae	Nalca	Riparian areas	WMPs = 5 WEPs =15	WMPs = 2 WEPs = 5	BEV, VEG	DIG, MET, RES, URO	Food: petioles, raw as salad or prepared as juice Med: petioles, as juice to low blood sugar. Root, infusion to treat stomachache, kidney pain and lung infections. Whole plant, infusion to treat diarrhea
UCVA 15841	*Hypericum perforatum* L.	Asteraceae	Hierba de San Juan	Disturbed areas	WMPs = 4 WEPs = 0	WMPs = 0 WEPs = 0		OTH	Med: leaves, infusion to treat depression
UCVA 15842	*Lapageria rosea* Ruiz & Pav.	Philesaceae	Copihue, copiu	Forest	WMPs = 0 WEPs = 2	WMPs = 0 WEPs = 0	FRU		Food: fruits, raw
UCVA 15844	*Laurelia sempervirens* (Ruiz & Pav.) Tul.	Atherospermataceae	Laurel	Forest	WMPs = 6 WEPs = 0	WMPs = 2 WEPs = 0		ART, DIG, RES	Med: leaves, infusion to treat cold, cough and stomachaches; crushed to make a poultice to treat rheumatism; as herbal steam bath to treat rheumatism
UCVA 15845	*Lepechinia salviae* (Lindl.) Epling	Lamiaceae	Salvia de cerro	Forest	WMPs = 1 WEPs = 0	WMPs = 0 WEPs = 0		DIG	Med: leaves, infusion to treat stomachache
UCVA 15846	*Leptocarpha rivularis* DC.	Asteraceae	Palo negro	Forest	WMPs = 1 WEPs = 0	WMPs = 0 WEPs = 0		DER	Med: cortex, infusion to disinfect wounds
UCVA 15847	*Linum chamissonis* Schiede	Linaceae	Ñancolahuen	Forest	WMPs = 2 WEPs = 0	WMPs = 0 WEPs = 0		DIG, OTH	Med: leaves, infusion to treat stomachache and headache
UCVA 15848	*Lomatia hirsuta* (Lam.) Diels	Proteaceae	Radal	Forest	WMPs = 2 WEPs =	WMPs = 1 WEPs = 0		RES	Med: leaves, infusion to treat cough
UCVA 15849	*Luma apiculata* (DC.) Burret	Myrtaceae	Arrayán	Forest	WMPs = 0 WEPs = 5	WMPs = 0 WEPs = 0	FRU, BEV		Food: fruits, raw; boiled to prepare jam; fermented as alcoholic beverage
UCVA 15851	*Marrubium vulgare* L.	Myrtaceae	Toronjil cuyano	Disturbed areas	WMPs = 4 WEPs = 0	WMPs = 2 WEPs = 0		ART	Med: shoots, crushed to make a poultice to treat rheumatism

Voucher No.	Species	Family	Local name	Gathering environment	No. of reports Rural	No. of reports Urban	Edible category	Illness category	Used part and mode of use
UCVA 15852	*Matricaria chamomilla* L.	Asteraceae	Manzanilla	Disturbed areas	WMPs = 13 WEPs = 1	WMPs = 20 WEPs = 0	BEV	DIG, RES, URO, OTH	Food: shoots, as herbal infusion Med: shoots, infusion to treat cold, stomachaches, digestive diseases, and cystitis. Flowers, infusion to relieve fever
UCVA 15854	*Mentha pulegium* L.	Lamiaceae	Poleo	Riparian areas	WMPs = 11 WEPs = 2	WMPs = 11 WEP: 3	BEV, CON	ART, DIG, RES, OTH	Food: shoots, as herbal infusion, and condiment for beverages Med: shoots, infusion to treat stomachache, rheumatism and sleep disorders. Leaves, boiled into milk to treat cold
UCVA 15855	*Mentha suaveolens* Ehrh	Lamiaceae	Menta	Disturbed areas	WMPs = 25 WEPs =	WMPs = 25 WEPs = 7	BEV, CON	ART, DIG, OTH	Food: shoots, herbal infusion, and condiment for beverages Med: shoots, infusion to treat stomachaches, rheumatism, and sleep disorders
UCVA 15857	*Myrceugenia exsucca* (DC.) O. Berg	Myrtaceae	Pitra	Forest	WMPs = 1 WEPs = 1	WMPs = 0 WEPs = 0	FRU	DIG	Food: fruits, raw; boiled to prepare jam Med: bark, infusion to treat diarrhea
UCVA 15859	*Otholobium glandulosum* (L.) J.W. Grimes	Fabaceae	Culén	Forest	WMPs = 1 WEPs = 0	WMPs = 0 WEPs = 0		OTH	Med: leaves, infusion to relieve fever
UCVA 15851	*Petasites fragrans* (Vill.) C.Presl	Asteraceae	Tusílago	Disturbed areas	WMPs =0 WEPs = 0	WMPs =2 WEPs = 0		RES	Med: leave, infusions to treat cough
UCVA 15852	*Peumus boldus* Molina	Monimiaceae	Boldo	Forest	WMPs = 2 WEPs = 0	WMPs = 2 WEPs = 1	CON	DIG	Food: leaves, condiment for beverages Med: leaves, infusion to treat stomachache and liver diseases

Voucher No.	Species	Family	Local name	Gathering environment	No. of reports Rural	No. of reports Urban	Edible category	Illness category	Used part and mode of use
UCVA 15853	*Plantago lanceolata* L.	Plantaginaceae	Siete venas	Disturbed areas	WMPs = 2 WEPs = 0	WMPs = 3 WEPs = 0		DER	Med: leaves, crushed to make a poultice to disinfect and heal wounds
UCVA 15854	*Plantago major* L.	Plantaginaceae	Llantén	Disturbed areas	WMPs = 6 WEPs = 0	WMPs = 4 WEPs = 0		DIG	Med: leaves, infusion to treat stomachache and indigestion
UCVA 15855	*Polygonum aviculare* L.	Polygonaceae	Sanguinaria	Disturbed areas	WMPs = 4 WEPs = 0	WMPs = 2 WEPs = 0		CIR, OTH	Med: shoots, infusion to treat headache and as blood depurative
UCVA 15856	*Prumnopitys andina* (Poepp. ex Endl.) de Laub.	Podocarpaceae	Lleuque	Forest	WMPs = 0 WEPs = 4	WMPs = 0 WEPs = 6	FRU, BEV		Food: arils, raw; boiled to prepare jam and juice; fermented as alcoholic beverage
UCVA 15857	*Prunella vulgaris* L.	Lamiaceae	Tapón	Disturbed areas	WMPs = 1 WEPs =	WMPs = 0 WEPs = 0		DIG	Med: leaves, infusion to treat diarrhea
UCVA 15858	*Quinchamalium chilense* Molina	Schoepfiaceae	Quinchamalí	Forest	WMPs = 11 WEPs = 2	WMPs = 8 WEPs = 3	CON	DIG, URO	Food: condiment for beverages Med: shoots, infusion to treat stomachache, kidney pain and liver, prostate and colon diseases
UCVA 15860	*Ribes magellanicum* Poir.	Grossulariaceae	Zarzaparrilla, parrilla	Forest	WMPs = 6 WEPs = 5	WMPs = 3 WEPs = 4	FRU, OTH	CIR, MET, RES, URO, OTH	Food: fruits, raw. Stems, crushed to curdle milk Med: fruits, infusion to low blood sugar. Leaves, crushed to make a poultice to relieve fever. Stems, infusion to treat kidney pain and as blood depurative
UCVA 15861	*Rosa rubiginosa* L.	Rosaceae	Rosa mosqueta	Disturbed areas	WMPs = 7 WEPs = 30	WMPs =6 WEPs = 23	FRU, BEV	ART, RES, URO, OTH	Food: fruits, boiled to prepare jam Med: fruits, infusion to treat cold and kidney pain; roasted and ground to treat rheumatism. Root, infusion to treat bladder disorders and lung infection

Voucher No.	Species	Family	Local name	Gathering environment	No. of reports Rural	No. of reports Urban	Edible category	Illness category	Used part and mode of use
UCVA 15862	*Rubus ulmifolius* Schott	Rosaceae	Murra, mora, zarzamora	Disturbed areas	WMPs = 2 WEPs = 31	WMPs = 1 WEPs = 18	FRU, BEV, VEG	CIR, MET	Food: fruits, raw or cooked; boiled to prepare jam and juice. Flowers as salad Med: Flowers, infusion to low sugar blood. Root, infusion as blood depurative. Young shoots, infusion to low sugar blood and reduce cholesterol
UCVA 15863	*Rumex conglomeratus* Murray	Polygonaceae	Romasa	Disturbed areas	WMPs = 1 WEPs = 0	WMPs = 0 WEPs = 0		DER	Med: leaves, decoction to disinfect wounds
UCVA 15864	*Salix babylonica* L.	Salicaceae	Sauce	Riparian areas	WMPs = 1 WEPs = 0	WMPs = 0 WEPs = 0		OTH	Med: leaves and stems, infusion to treat headache
UCVA 15865	*Sambucus nigra* L.	Adoxaceae	Sauco	Disturbed areas	WMPs = 1 WEPs = 2	WMPs =2 WEPs = 3	FRU, BEV	OTH	Food: fruits, raw; boiled to prepare juice Med: fruits, crushed to make a poultice to relieve fever
UCVA 15866	*Silybum marianum* (L.) Gaertn.	Asteraceae	Cardo mariano	Disturbed areas	WMPs = 1 WEPs = 0	WMPs = 0 WEPs = 0		URO	Med: leaves, decoction as invigorating kidney
UCVA 15867	*Solanum americanum* Mill.	Solanaceae	Llagui	Disturbed areas	WMPs =1 WEPs = 0	WMPs = 0 WEPs = 0		OTH	Med: leaves, infusion to relieve fever
UCVA 15868	*Solanum crispum* Ruiz & Pav.	Solanaceae	Natre	Forest	WMPs = 3 WEPs = 0	WMPs = 4 WEPs = 0		RES, OTH	Med: leaves and cortex, infusion to treat cold and relieve fever
UCVA 15869	*Sophora cassioides* (Phil.) Sparre	Solanaceae	Pelú	Forest	WMPs = 1 WEPs = 0	WMPs = 0 WEPs = 0		URO	Med: leaves, infusion to treat prostate diseases
UCVA 15870	*Stellaria media* (L.) Vill.	Caryophyllaceae	Quilloy-quilloy	Disturbed areas	WMPs = 0 WEPs = 0	WMPs = 1 WEPs = 0		DER	Med: leaves, decoction to disinfect wounds

Voucher No.	Species	Family	Local name	Gathering environment	No. of reports Rural	No. of reports Urban	Edible category	Illness category	Used part and mode of use
UCVA 15871	*Taraxacum campylodes* G.E. Haglund.	Asteraceae	Diente de león	Disturbed areas	WMPs = 1 WEPs = 0	WMPs = 0 WEPs = 0		OTH	Med: leaves, infusion to treat headache
UCVA 15872	*Tristerix corymbosus* (L.) Kuijt	Loranthaceae	Quintral del maqui	Forest	WMPs = 4 WEPs = 1	WMPs = 4 WEPs = 1	FRU	CIR, MET, URO	Food: fruit, raw Med: leaves and flowers, infusion to low sugar blood and as depurative. Leaves, infusion to treat kidney pain and reduce blood pressure
UCVA 15873	*Ugni molinae* Turcz.	Myrtaceae	Murta, Murtilla, Mutilla	Forest	WMPs = 0 WEPs = 9	WMPs = 1 WEPs = 10	FRU, BEV	DIG	Food: fruits, raw; boiled to prepare jam; as *murtillao* (alcoholic beverage prepared by soaking the fruits into liquor) Med: leaves, infusion to treat diarrhea
UCVA 15875	*Urtica urens* L.	Urticaceae	Ortiga	Disturbed areas	WMPs = 1 WEPs = 2	WMPs = 3 WEPs = 1	VEG	URO	Food: leaves, cooked as green vegetable Med: leaves, infusion as diuretic
UCVA 15876	*Verbascum thapsus* L.	Scrophulariaceae	Hierba del paño	Disturbed areas	WMPs = 2 WEPs = 0	WMP = 1 WEPs = 0		DER	Med: leaves, decoction to disinfect wounds; crushed to remove postpartum skin blemishes
UCVA 15877	*Weinmannia trichosperma* Cav.	Cunoniaceae	Palo santo	Forest	WMPs = 5 WEPs = 0	WMPs = 3 WEPs = 0		RES, URO	Med: cortex, infusion to treat tuberculosis and kidney pain
	Unidentified taxa		Palo trébol	Disturbed areas	WMPs = 1 WEPs =0	WMPs = 1 WEPs = 0		URO	Med: cortex, infusion to treat kidney pain

*Edible categories: BEV: beverages; CON: condiment; FLO: flours; FRU: fruit; SEE: seeds; VEG: green vegetables; OTH: others

*Illness categories: ART: articulatory system diseases and traumatic injuries; CIR: circulatory system diseases; DER: dermatology diseases and skin injuries; DIG: digestive system diseases; MET: metabolic disorders; RES: respiratory system diseases; URO: urogenital system diseases; OTH: others