

Indigenous people's ornamentals for future gardens

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Abstract

All ornamental plants were originated from wild resources. Most of them were selected and acclimatized by our ancestors who grew or transplanted wild good characteristic plants in their home gardens or near their dwelling places. The indigenous people around the world are still practicing introduction and domestication of wild plants including ornamentals. This paper deals with the ornamentals which are not common in horticulture or gardens but have been managed traditionally by the indigenous people in tropical and subtropical regions for generations. The methods of ethnobotany, botany, literature studies and horticulture were used in the surveys and analysis. Some sites had been investigated in southern China and mainland Southeast Asian countries. Indigenous peoples including Ahka, Bai, Chin, Dai, Hani, Hmong, Jinuo, Kachin, Karen, Lahu, Li, Lisu, Miao, Shan, Wa, Yi, and Zhuang were interviewed during the investigations. The results showed that there were rich species diversity of ornamentals maintained in the living environments of local communities. Many species are with great potentials to be developed as ornamentals. *Orchidaceae*, *Zingiberaceae* and *Araceae* are the most dominant families contributed to the floristic components of indigenous people's ornamentals in the tropics. Traditional ornamental species with cultural and religious values had been preserved in traditional societies. Based on our investigations and analysis, we proposed *Camellia* spp., *Dendrobium* spp., *Rhododendron* spp., *Musella lasiocarpa*, and *Leucocasia gigantea* to be the most potential candidates for gardens uses in the future. The origin of ornamentals, indigenous property right and sustainable uses of local ornamental genetic resources were also discussed.

Keywords: indigenous people's ornamentals, ethnobotany, homegarden, development potentials, biodiversity, cultural value

INTRODUCTION

All cultivated species including ornamental crops were originated from wild resources. When ancient people from hunter-gatherers to cultivators, they grew or transplanted plants into their home gardens or near their dwelling places, including good characteristic species for aesthetic purposes. Early civilizations encouraged the broader appreciation of horticulture as with the Hanging Gardens of Babylon once the initial need for a food supply had been satisfied. Some of the early kings of Assyria used the land adjacent to the Upper River Tigris for parkland intended for rest and relaxation.

Researchers described the development of cropping enterprises and cared for the environment in the ancient civilizations of Sumeria, Egypt, Greece, China, India, and Italy (Dixon and Aldous, 2014).

Nowadays horticulture especially floriculture becomes more and more popular and important. Horticulture is "the first of all the arts and sciences". In addition, horticulture provides job opportunities and economic benefits. For instance, in 2008 only the value of environmental horticulture (mostly for ornamental and leisure purposes) to North America, Latin America, Europe, the former Soviet Union, Asia and Oceania, the Middle East and Africa was worth almost US\$ 290.0 billion (Haydu et al., 2008).

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People in the future require more comfortable environments for living, studying, working, traveling and leisure. Ornamentals; thus, will be widely used for both outdoors and indoors, and for ecological environments. The present species and cultivars of ornamentals will still be adopted for future, but some of them will be kicked out. New cultivars or cultivars will constantly be bred to meet the demands. The existing germplasm resources of ornamentals will be the pools for new cultivar development. More importantly and directly, many ornamentals can be easily from the traditional societies. The indigenous peoples are using various plants for aesthetic purposes in different parts of the world, especially the third world.

Indigenous people's ornamentals in this paper refer to the native species or varieties of ornamental plants cultivated and managed by the indigenous people which are not commonly cultivated outside the communities. The research status, biodiversity, representative taxa, conservation strategies and species with development potential will be argued in the present paper.

MATERIALS AND METHODS

The electronic tools including Google Scholar, PubMed, Scopus, Web of Science and the Chinese database, such as VIP and Wanfang were used for literature studies. The key words including home garden, ornamental, aesthetic plants, traditional use, and/or ethnobotany had been used for searching publications. Scientific names of ornamental plants followed the Flora of China (<http://flora.huh.harvard.edu/china/>), the International Plant Names Index (<http://www.ipni.org/>), and Mansfeld's World Database of Crops (<http://mansfeld.ipk-gatersleben.de>), except for a few names which were revised recently.

The participatory approaches were used in the field investigations. The authors, especially the first author, have investigated plant biodiversity and home gardens in China and surrounding countries, such as Vietnam, Laos, Myanmar, Thailand, Japan and Korea for more than 20 years. We participated in the collection and conservation of genetic resources of wild ornamental plants in China. The methods of plant taxonomy, ethnobotany, ecology, horticulture and participatory rural appraisal had been adopted to investigate home gardens, agroforestry systems and plants. The plants with ornamental (and/or ornamental potential) values had been paid attention which occurred in old villages, home gardens and agroforestry systems.

The investigation areas mainly cover southwest China and part of mainland southeast Asian countries. As the richest province in flora and fauna in the country, China's Yunnan has been investigated since 1987, in terms of its plant biodiversity, home gardens, natural forests and agroecosystems. The other provinces in southwest China, namely Sichuan, Guangxi, Guizhou, Xizang (Tibet) and Chongqing had also been investigated intensively. Those with richer ornamental plants including southern, central and eastern China were selected for extensive investigation, particularly Hunan, Hubei, Hainan, Guangdong, Fujian and Jiangxi provinces. The authors had conducted field botanical and ethnobotanical surveys in Vietnam, Laos, Myanmar and Thailand. Some traditional villages together with their home gardens and agroforestry systems in other continents including Africa and South America were observed in the past 20 years.

Yunnan is also the richest region with cultural diversity in China. Among China's 55 ethnic groups, there are 25 in Yunnan, such as Bai, Dai, Hani, Jingpo, Jinuo, Lahu, Lisu, Miao, Wa, and Yi. Many other ethnic people live in southwest China, for example, the Zhuang, Tibetan, Li, Dong and Yao. Southeast Asia is also very rich in ethnic groups including Ahka, Burman, Chin, Hmong, Kachin, Karen, Kinh, Lao, Shan, Tai, and Thai as well. Many local peoples were interviewed during the investigations.

RESULTS

In traditional communities of many places in the world, indigenous peoples keep good characteristic trees and herbaceous plants in and surrounding their villages, or in their farming systems. They grow ornamentals in their home gardens or home-lots by introducing plants with aesthetic values from their environments including forests, grasslands or

farming fields. Some ornamentals have been improved by artificial selection, hybrid breeding or grafting in traditional communities. Most ornamentals in these traditional communities are very new to other parts of the world.

Researchers studied the plant diversity in home gardens cultivated by the Náhuatl people in Tehuacán Valley of Mexico (Larios et al., 2013). A total of 281 plant species was recorded with 12 use categories, 115 ornamental, 92 edible, and 50 medicinal plant species. In total, 34% species are native to the Tehuacán Valley and nearly 16% are components of the surrounding forests. A total of 89 native species were recorded in home gardens of the cloud forest zone, most of them ornamental plants (39 species), followed by edible plants (32 spp.), medicinal plants (14 spp.) and other uses (14 spp.). In home gardens of the tropical rainforest zone they recorded 86 native species, most of them are edible plants (32 spp.), followed by ornamental plants (28 spp.), medicinal plants (18 spp.), and other uses (16 spp.). In home gardens of the tropical dry forest zone 69 native species were recorded, most of them edible plants (28 spp.), followed by ornamental plants (18 spp.), medicinal plants (13 spp.), and other uses (16 spp.). In communities of the tropical dry forest zone people cultivate ornamental plants for commercialization and this group of plants is therefore more important than others. Similarly, scientists found that in Coxcatlán ornamental plant species of the families *Araceae* and *Liliaceae* are particularly important. In fact, ornamental purpose is relatively more important in Coxcatlán than in all villages of Coyomeapan (Blanckaert et al., 2004). These results showed local people grow a big proportion of native ornamentals in their home gardens.

Palms are important resources to rural populations in tropical areas. Among 12 palm species cultivated in indigenous Shuar and Mestizo settlers in seven villages of south-eastern Ecuador, 10 were native ones. A decline in wild sources may cause people to incorporate palms in their agricultural systems in order to ensure a continued supply of palm products (Byg and Balslev, 2006). These native palms, i.e., *Bactris gasipaes* (peach palm), *Wettinia maynensis*, *Mauritia flexuosa*, *Oenocarpus bataua*, *Iriartea deltoidea*, *Prestoea ensiformis*, *Oenocarpus mapora*, *Euterpe precatoria*, *Socratea exorrhiza* and *Pholidostachys synanthera*, have been used as food, construction, handicraft, firewood, medicine or others. But most of them are with ornamental potential for gardens.

In Europe, some traditional home gardens are also rich in ornamental species. The largest proportion of the reported 85 plant taxa registered in Csango people's home gardens of the Uz-valley, Romania, were designated as medicinal (39%) and ornamental plants (38%), while the number of food (18%) and fodder taxa (5%) was significantly lower (Papp et al., 2013).

In Asia, many ornamentals have been recorded from traditional home gardens. In Kelara home gardens; for example, 22 species were cultivated for ornamentals. Some species are native, such as *Baliospermum montanum*, *Calendula officinalis*, *Clerodendrum paniculatum*, *Codiaeum variegatum*, *Crossandra undulaefolia*, *Codiaeum variegatum*, *Garcinia gummigutta*, *Gardenia lucida*, *Hygrophila auriculata*, *Vitex negundo*, *Caesalpinia pulcherrima*, *Mussaenda indica*, *Nyctanthes arbor-tristis*, *Lagerstroemia lanceolata* and *Tabernaemontana divaricata*. Native plants with religious and cultural values are also cultivated in home gardens. They are also ornamental plants, or with ornamental potential, such as *Ixora coccinea*, *Thevetia peruviana*, *Aegle marmelos*, *Bauhinia variegata*, *Alstonia scholaris* and *Michelia champaca* (Peyre et al., 2006).

In Mainland, Southeast Asian countries like Laos, Myanmar, Thailand and Vietnam, the local people grow many ornamental species in their traditional homegardens, or cultivate ornamental plants as living fences. Plants from *Euphorbiaceae*, *Rubiaceae*, *Rutaceae*, *Moraceae*, *Orchidaceae*, *Araceae*, *Zingiberaceae* and *Rosaceae* take the dominant components. In Shan State of Myanmar, for example, local people grow *Alocasia cucullata* as living fences and put *Dendrobium* spp. on the barks of trees in their home gardens. In many communities of Laos, Myanmar and Thailand, the local people grow *Hedychium* in home gardens for both ornamental, cultural and religious purposes.

In China, a lot of ethnic people like to grow good characteristic plants in their home gardens, or on buildings, or in their villages. We investigated the plants cultivated in home

gardens of Xishuangbanna, a prefecture dominated by many ethnic groups in south Yunnan. We recorded 496 species in the home gardens selected randomly from 12 communities of three counties. Food plants, ornamental plants and medicinal plants are the major components in the gardens, with 41, 32 and 16%, respectively. Among the ornamental component, the native species occupies 77% while the exotic species have rapidly been introduced into the home gardens in recent years. The local people prefer to grow bamboo and those from families like *Orchidaceae*, *Zingiberaceae* and *Araceae* in their home gardens for aesthetic purposes. The native species in *Dendrobium*, *Hedychium*, *Raphidophora*, *Pandanus*, *Dendrocalamus*, *Dracaena*, *Phoenix* and many other genera are traditional components for ornamental purposes (Long, 1996). The *Hedychium* cultivation in home gardens is also for cultural and religious purposes.

Ethnic peoples in southern China have developed experiences to grow native orchids in their living environments. All species in *Cymbidium* have been cultivated in home gardens, on decks and balconies, on eaves or indoors by different linguistic groups. The Dai, Jinuo, Lahu, Bulang, Hani and Han people often grow epiphytic orchids such as *Aerides rosea*, *Vanda coerulea*, *Dendrobium* spp., and *Cymbidium hookerianum* on building walls, fences or eaves. *Cymbidium* plants in Chinese culture are spiritual and symbolic ornamentals.

In some traditional communities of Sichuan and Yunnan provinces, the local people introduced different species of *Camellia* and *Rhododendron* into their living environments. For instance, some Yi people like to grow *Rhododendron delavayi*, while the Bai people prefer to grow *R. decorum*. The old *Camellia reticulata* trees had been protected in old temple yards or historical sites. Many varieties or cultivars of *Camellia reticulata* had been developed because of their cultural and religious values (Xin et al., 2015). Some species in the genera *Camellia* and *Rhododendron* existing in the farming systems or home gardens in southwest China have attracted horticulturists' interests.

We have studied *Musella lasiocarpa* (*Musaceae*) for more than 20 years. It is a plant species endemic to Yunnan and Sichuan provinces of southwest China. This unusual ornamental plant is with big inflorescence featured by golden yellow flowers and bracts which can last up to 7 months (Liu et al., 2003). Besides the aesthetic value, it has also been used as pig fodder, medicine, wine-brewing, weaving material, source plant for honey, and as valuable for soil and water erosion control by the local Yi people (Liu et al., 2003; Long et al., 2008). It is a religious plant in Buddhism temples in southeast Asia. Although its very limited distribution area, the local people in Yunnan have developed sustainable way to manage and use *M. lasiocarpa* in their traditional agroecosystems (Long et al., 2003). We believe this indigenous people's ornamental plant will be used in garden and landscape in the future (Long et al., 2015).

Leucocasia gigantea (formerly *Colocasia gigantea*) in *Araceae* is an evergreen and beautiful herb with large leaf blade. It is distributed in Cambodia, China, Japan (south), Laos, Myanmar, Thailand and Vietnam. Many ethnic people eat the petioles of *L. gigantea* as a vegetable, which is usually cultivated in local people's home gardens. Its huge and beautiful foliage, distinguished morphology, good smell when blooming, and evergreen traits make this aroid becoming a new star in gardens (Long et al., 2015).

DISCUSSION

Although indigenous people's ornamentals have been observed to be very rich worldwide, they were ignored or regarded as less valuable components. Many researchers did not record ornamentals or treated them as low-valued species. For instance, in Dargalona village, Assam, India, only two species were recorded with aesthetic purposes, i.e., *Senna siamea*, *Delonix regia* (Das and Das, 2013). Plant species used entirely for shade or ornamental purposes occurred in less than 20% of the domestic gardens in urban home gardens of São Luís City, northeast Brazil. Some 55% of these species were exotic species (Akinnifesi et al., 2010). In 1997, six ornamental species were recorded in 18 Mayanma home gardens in San Jose, Belize, (Levasseur and Olivier, 2000). Only seven ornamental plant species in 80 traditional Mayan homegardens of 5 communities in the Zona Maya of Quintana Roo, Mexico. Total species number was 150 from these gardens, mostly food and

medicine (De Clerck and Negreros-Castillo, 2000). In a remote area of the Manu National Park, Peru, cultivated plants in home gardens were identified from 19 home gardens. Altogether 71 species were found in the home gardens. However, ornamental plants and timber species were not included in this study (Wezel and Ohl, 2006). It implies that ornamentals have not been paid attention by researchers.

Intellectual property considerations did not concern any benefits for the source countries nor the indigenous communities. The World Trade Organisation (WTO, 2015) and World Intellectual Property Organisation (WIPO, 2015) provide the legislation to protect intellectual property rights and investment in a new cultivar and encourage global trade (Dixon and Ogier, 2011). However, many authors ignored articles about indigenous people's knowledge property and genetic resource access and benefit-sharing (ABS) emphasized in the Convention on Biological Diversity (CBD) and the Nagoya Protocol on Access and Benefit-sharing (COP-10) (Dixon and Aldous, 2014; Seaton et al., 2014). To collect genetic resources including ornamentals from indigenous communities, prior informed consent (PIC) should be obtained from source countries and communities of these resources. Many countries have signed CBD and COP-10. It is necessary to follow the principles of ABS and PIC regimes when accessing genetic resources from those countries including indigenous people's ornamentals, either for scientific studies or for commercial development. The indigenous property right should be studied and relevant regulations should be issued to meet the demands of socio-economic development.

During our interviews with the local people we tried to understand the origins of their indigenous ornamental plants, which are not introduced from other areas but directly from their natural environments. It seems the dynamics is complicated. There are several ways for the local people to move or keep ornamentals in their living environments. The most frequent way mentioned by the interviewers was the local people directly move the good characteristic plants to home gardens from local natural ecosystems. Wild plants with ornamental values were often maintained in their farming lands, on the road sides, and in the communities. Some big trees surrounding traditional villages have been protected as taboo and ornamentals as well (Zhou and Yan, 2015).

The indigenous people's ornamentals are with huge development perspectives. However, these precious germplasm resources together with their traditional knowledge are losing rapidly. The conservation strategies should be discussed by different sectors. The most important strategy is probably the sustainable uses of these germplasm resources and associated traditional knowledge. Thus the documentation, evaluation, technical development, germplasm innovation and marketing of ornamentals maintained in indigenous communities should be supported and coordinated from stakeholders including government, enterprise, community, science and technology, NGOs, and individuals.

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