Survey of ornamental plants with medicinal values at The Saigon Zoo and Botanical Garden in Ho Chi Minh City

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ABSTRACT

This study investigated the diversity of ornamental plants with medicinal values at the Saigon Zoo and Botanical Garden in Ho Chi Minh City. The research was conducted through a comprehensive survey, including questionnaires, observation, taking pictures and notes on each sample. The study identified 223 species of ornamental plants, of which species with medicinal values accounted for 55.6% (124 species). Among the identified families, the *Fabaceae* and the *Zingiberaceae* were the most popular families and each had 7 species detected. We also categorized ornamental plants with medicinal values according to different approaches, including tree morphology, layout in the landscape, shade tolerance and light-loving ability, and medicinal uses for application in the landscaping of townhouses and apartments.

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1. Introduction

For thousands of years, medicinal plants have existed together with the forest ecosystem and agricultural field. There is a close correlation between the biodiversity of medicinal plants with cultural diversity and traditional medicine associated with medical knowledge of 54 ethnic groups, which is the cultural identity of the Vietnamese people. According to the World Health Organization (WHO), up to 80% of the population in developing countries still uses plants available in nature for health care needs. Currently, the global trend is to use herbal medicines with natural ingredients to treat diseases to ensure safety.

Medicinal plants are mostly exploited in nature (95%), when put into gardens and landscapes, they can both beautify the landscape and can be used as an urgent treatment for people (Haridasan & Ganesh, 2017). More than 30% of all plants have been used for medicinal purposes (Joy, 1998). More than three quarters of the world's population relies heavily on plants and plant extracts for health care. According to the World Health Organization, in Africa, more than 80% of people rely on traditional medicinal plants for health care and treatment (Hamilton, 2008).

According to the statistics of the special collection on biodiversity and potential of Vietnamese medicinal plants, Vietnam has more than 4,000 species of herbs, which can be used to treat many

different diseases. However, due to continuous exploitation and not paying attention to the conservation and regeneration, 144 species of medicinal plants are listed in the Vietnam Red Book 2007 (Nguyen, 2021). In addition, the current domestic source of medicinal herbs can only meet 10-20% of the demand, leaving more than 80% of the market to be imported from China.

Built in 1864 and operated for more than 150 years, the Saigon Zoo and Botanical Garden – Ho Chi Minh City is considered one of the rare old forests located in the center of a big city with a large number of heritage trees. In addition, it is a place to preserve animals and plants. The Saigon Zoo and Botanical Garden – Ho Chi Minh City is one of the eight oldest parks in the world that owns the record of the first flora and fauna collection garden in Vietnam with more than 2500 trees belonging to about 900 species of plants preserved (Tran, 2007).

One of the most compelling motivations to integrate native medicinals into the landscape is the multi-layered benefits that they provide to habitat, ecosystem services, and social and cultural value, as well as wellness for people. Typically, native medicinal plants are wild harvested. Landscapers can help sustain wild populations of medicinal plants, like ginseng and purple coneflower, by integrating those plants into their installations. Cultivation of rare and endangered plants can help to reduce pressure to harvest wild populations, while at the same time helping to ensure the survival of these species. Raising awareness of the threat of extinction in the wild through educating clients also can develop wild populations of plants as well as help people realize the many levels of value these plants provide. Organizations like United Plant Savers, as well as local native plant societies and botanic gardens, can be important resources to consult for guidance and education (Todd, 2014). The market for ornamental plants used in the landscaping in Vietnam in general and in Ho Chi Minh City, in particular, has not yet taken advantage of the use of medicinal plants. Research on surveying ornamental plants with medicinal value at the Zoo and Botanical Garden, Ho Chi Minh City was carried out in order to find out the benefits which can contribute to the beauty of the landscape and help people easily treat diseases quickly by growing them in-house. The results of the research have shown that medicinal plants are suitable for use in landscaping, contributing to bringing medicinal plants closer to people's lives.

2. Materials and Methods

2.1. Research subjects

Ornamental plants with medicinal value were grown at the Saigon Zoo and Botanical Garden in Ho Chi Minh City, Vietnam.

2.2. Research methods

Document reference methods: collecting documents and information related to ornamental plants with medicinal value through books and reports to select important information for research.

Field survey methods: a survey of ornamental plants with medicinal value at the Saigon Zoo and Botanical Garden in Ho Chi Minh City. The survey was conducted through survey sheets. The form of the survey includes survey sheet numbers, photo numbers, investigation dates, enumerators, common names, scientific species names, plant families, and morphological descriptions.

Identification: using pictures taken in the field to compare the morphological characteristics to identify the names of species and plant families based on reference databases such as Vietnam Bonsai Resources by Tran (2016), Vietnamese herbs by Pham (2002), Vietnamese medicinal plants and herbs by Do (2004), documents on Vietnamese medicinal plants by Vo (1998, 2012), Poisonous plants in Vietnam by Tran & Pham (2004).

Methods of data processing and visualization: the collected data were processed using Microsoft Excel. Descriptive statistics (e.g., the number and percentage (%) of different choices) together with visualization items were then provided to comprehensively communicate the results of the survey.

3. Results and Discussion

3.1. The composition of ornamental plants with medicinal value is popular at the Zoo and Botanical Garden

The survey results showed that ornamental plants in the Zoo and Botanical Garden were very diverse in species. Accordingly, ornamental plants

Table 1. Statistics on the number of ornamental plants with medicinal value in the Saigon Zoo and Botanical Garden

No.	Scientific Family	Number of Species	No.	Scientific Family	Number of Species
1	Acanthaceae	2	31	Lecythidaceae	1
2	Agavaceae	1	32	Liliaceae	1
3	Alismataceae	1	33	Magnoliaceae	1
4	Alliaceae	1	34	Maliaceae	2
5	Amaranthaceae	2	35	Malvaceae	3
6	Amaryllidaceae	3	36	Marantaceae	1
7	Anacardiaceae	2	37	Moraceae	5
8	Annonaceae	1	38	Myrtaceae	1
9	Apiaceae	2	39	Nephrolepidaceae	1
10	Araceae	3	40	Nymphaeaceae	2
11	Araliaceae	3	41	Orchidaceae	1
12	Aramanthaceae	1	42	Oxalidaceae	1
13	Asclepiadaceae	2	43	Papilionaceae	2
14	Asparagaceae	4	44	Piperaceae	1
15	Asteraceae	6	45	Plumbahinaceae	1
16	Bignoniaceae	2	46	Poaceae	1
17	Cactaceae	1	47	Polygalaceae	1
18	Campanulaceae	2	48	Polygonaceae	2
19	Caricaceae	1	49	Portulacaceae	1
20	Clusiaceae	1	50	Rosaceae	2
21	Combretaceae	1	51	Rubiaceae	5
22	Commelinaceae	2	52	Rutaceae	3
23	Dracaenaceae	1	53	Scrophulariaceae	3
24	Eucommiaceae	1	54	Solanaceae	1
25	Euphorbiaceae	3	55	Trilliaceae	1
26	Fabaceae	7	56	Tropaeolaceae	1
27	Ginkgoaceae	1	57	Verbenaceae	2
28	Iridaceae	1	58	Vitaceae	1
29	Lamiaceae	5	59	Zingiberaceae	7
30	Lauraceae	2			

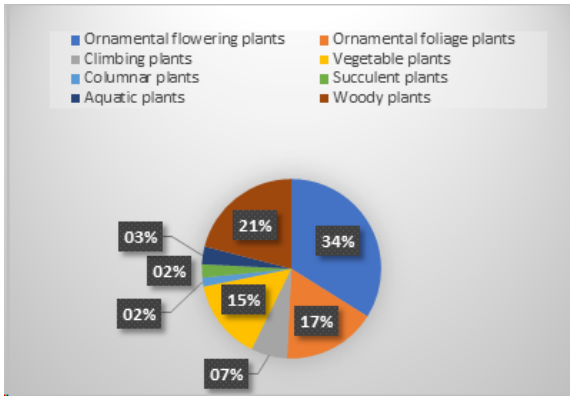

Figure 1. Percentage of ornamental plants with medicinal value in the Saigon Zoo and Botanical Garden – Ho Chi Minh City by morphological characteristics.

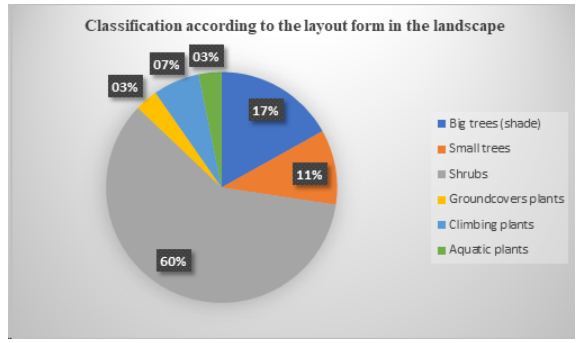

Figure 2. Percentage of ornamental plants with medicinal value at The Saigon Zoo and Botanical Garden according to the layout characteristics in the landscape.

in the Botanical Garden had 223 species belonging to 81 plant families, of which the most was the *Fabaceae* with 17 species. Of the 223 species, 124 species were medicinal plants, accounting for 55.6% of the total number of ornamental plants. The statistics in Table 1 show that, out of 124 medicinal plant species in the Zoo and Botanical Garden, belonging to 59 families, the families with the largest number of species were the *Fabaceae* and the *Zingiberaceae* family with 7 species each.

3.2. Grouping of ornamental plants with medicinal value

3.2.1. Grouping according to morphological characteristics

According to Tran (1998) and Pham (2002), ornamental plants with medicinal effects at the Zoo and Botanical Garden were divided into eight groups: ornamental flowering plants, ornamental foliage plants, climbing plants, vegetable plants, columnar plants, and succulent plants, aquatic plants, and woody plants. The main ornamental plants with medicinal properties were those in the group with ornamental flower plants, accounting for 33.9% with 42 species, the group with little medicinal properties was the columnar group, accounting for 1.6% with 2 species (Figure 1).

3.2.2. Classification according to the layout form in the landscape

Based on Han (1996) guideline on the arrangement of plants in the landscape, ornamental plants in the Botanical Garden were classified into six groups according to their arrangement in the landscape: big trees (shade), small trees, shrubs, groundcovers, climbing plants and aquatic plants. Through looking up the documents of Pham (2002), Tran (2016), the number of medicinal species according to the morphology planted in the landscape was calculated (Figure 2). Accordingly, the species with the highest proportion (59.7%) was the group of shrubs with 74 species, and the group with the lowest percentage is the group of groundcover plants (4 species) and aquatic plants (4 species) with the rate of 4 species (3.2%).

3.2.3. Classification according to the outdoor and indoor planting location

Based on plant morphology and physiology, combined with a quick interview survey, the research team classified plants into two groups: light-loving plants and shade-tolerant plants. The results of Figure 3 showed that the number of outdoor species was more dominant than the indoor species. There were 99 species of outdoor plants, accounting for 79.8%, while indoor plants had 25 species, accounting for 20.2%.

Knowing the ability of plants to live according to light needs and applying them to landscape design to arrange them in indoor or outdoor locations such as balconies, terraces, front gardens and behind the house (outdoor plants) are extremely important. With only 20.2% of the investigated medicinal plant species being shade-tolerant, this number was not diverse in the arrangement of indoor plants. However, through research on artificial light (led light), which can re-

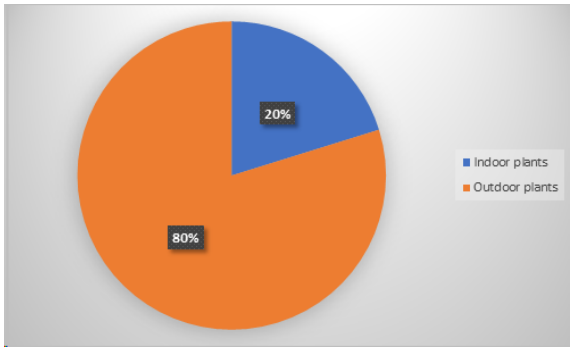

Figure 3. Percentage of ornamental plants with medicinal value at the Zoo and Botanical Garden according to their indoor and outdoor suitable characteristics.

place sunlight in providing light waves for photosynthetic plants, we can diversify indoor plant species. It is possible to arrange outdoor plants in the indoor environment with suitable positions by using lights to illuminate the plants. (Salama, 2021).

3.2.4. Classification according to the medicinal uses of the investigated ornamental plants

Based on medicinal plant books by Vo (1998, 2012) and Do (2004), the investigated medicinal plant species were classified into 14 different groups of medicinal lants (Table 2). The results in Table 2 showed that the group of ornamental plants with the effect of treating diseases of the stomach and digestive system accounted for the largest number with 25 plant species belonging to 18 plant families. The *Fabaceae* and *Zingiberaceae* families had the highest number with 3 species, the *Poaceae*, the *Moraceae*, the Asteraceae and the *Anacardiaceae* had 2 species. The group of plants that were used to treat nosebleeds and stop bleeding accounted for the smallest number with 1 species *Bletilla striata* (Thunb.) Reichb.f. belonging to the *Orchidaceae* family.

4. Conclusions

In the Saigon Zoo and Botanical Garden in Ho Chi Minh City, ornamental plants with medicinal values were very diverse in species. It was found that there were 124 species of ornamental plants with medicinal values belonging to 59 plant families at the Botanical Garden. Among them, *Fabaceae* and *Zingiberaceae* families were the most abundant with 7 species present. Ornamental plants with medicinal values can be grouped on the basis of plant morphology, landscape layout, outdoor and indoor suitability and medicinal uses so that they would be used in the landscaping of townhouses and apartments.

Table 2. Classification of ornamental plants at the Zoo and Botanical Garden according to medicinal uses

No.	Medicinal uses	Number of species
1	Sedation, insomnia	2
2	Fever	11
3	Women's disease	13
4	Skin Infections	8
5	Stomach and intestinal diseases	25
6	Blood pressure disease	5
7	Lung disease	12
8	Kidney disease	15
9	Diseases of the heart and circulatory system	3
10	Osteoarthritis	9
11	Inflammatory disease, swelling	3
12	Stop bleeding, nosebleed	1
13	Cure snake bites	2
14	Clear heat, detoxify	15

Conflict of interest

The authors declare no conflict of interest.

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