Floristic Composition and Characteristics of Xuzhou, China

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Abstract. Located in the southeastern part of the North China Plain, Xuzhou is the northernmost city in Jiangsu Province. According to the investigation, there are 733 species of 462 genera and 127 species of wild plants in Xuzhou. According to the type of distribution area of families and genera, the proportion of the pantropical distribution is 31.50%, which is the largest in the tropical northern margin of Xuzhou. The total tropical composition is 144 genera, accounting for 31.17%. The temperate distribution has a total of 236 genera, accounting for 51.08%. According to the geographical composition of the subordinates, the wild flora of Xuzhou is mainly composed of temperate elements, and the typical temperate components account for 51.08%. Therefore, the wild flora of Xuzhou should be temperate flora.

Keywords: Xuzhou, Floristic Composition, Characteristics

1. Introduction

A flora is a general term for all plant species, such as certain vegetation, in a certain region or period, in a certain taxonomic group [1]. It is the product of nature and the result of the long-term development and evolution of the plant kingdom under certain natural geographical conditions, especially natural history and other comprehensive conditions [2]. It can theoretically reveal and solve some difficult problems of plant systematics and plant geography. Studying the flora of wild plants can provide scientific basis for the formulation of socio-economic development plans and provide important reference materials for the effective protection and sustainable use of wild plant resources [3]. Since the 21st century, there has been a wealth of research in domestic flora surveys, division and study of distribution types, flora analysis, and analysis of regional flora. The characteristics of vascular plant flora in Beijing Wetland Nature Reserve The analysis revealed its species composition and flora distribution law, and also provided a scientific basis for the construction and management of the reserve [4]; Yang et al. studied the vegetation profile of the Chaxi Snow Ridge Spruce National Nature Reserve and proposed The problem of lichen protection and utilization in this area [5]; He et al. analyzed the flora of the upper reaches of the Lancang River in the Sanjiangyuan Nature Reserve to provide basic evaluation data for the biodiversity and the status of endangered species [6], Guangxi [7], Heilongjiang [8], Shenzhen [9], Hong Kong [10] and other places have made research and analysis on the current status of the flora of the area, and used it for the socio-economic development, biodiversity, and resource use after this area.
Provide basic data in areas such as protection. Abroad, Tserendulam et al.'s research and analysis of the flora of Hustai National Park provided basic data for the biodiversity of the region [11]; Khine et al.'s data on the flora of mountain forests in northern Myanmar is forthcoming Myanmar's flora and fauna have contributed, providing benchmark data sets to prioritize conservation and protected areas [12]. There are 733 species of 127 families, 4632 genera in Xuzhou after investigation. Based on this survey, we conducted a statistical analysis of the families and genera of Xuzhou wild plants. It is expected that based on this data, an accurate assessment of Xuzhou's biodiversity and endangered species will be made, scientific protection measures will be made for the protection and utilization of Xuzhou resources, and it will provide scientific basis for Xuzhou's social and economic development planning.

2. Overview of Natural Geography in Xuzhou

2.1. Climatic Characteristics
Xuzhou is located in the southeastern part of the North China Plain, between 116°22′~118°40′ east longitude and 33°43′~34°58′ north latitude. It is about 210 kilometers long from east to west and 140 kilometers wide from north to south. Xuzhou is a warm temperate semi-humid monsoon climate with four distinct seasons, sufficient sunshine, moderate rainfall, simultaneous rain and heat, no heat in summer, and no cold in winter. The spring and autumn are short in the four seasons, the winter and summer are long. The spring weather is changeable, the summer is hot and rainy, the autumn is high, and the winter cold wave is frequent. The annual temperature is 14 °C, the annual sunshine hours are 2284 to 2495 hours, the sunshine rate is 52% to 57%, the annual average frost-free period is 200 to 220 days, the average annual precipitation is 800 to 930 mm, and the rainy season precipitation accounts for 56% of the whole year.

2.2. Topography
The terrain of Xuzhou is mainly plain, and the total terrain of the plain is reduced from northwest to southeast. The average slope is 1/7000-1/8000, and the altitude is generally between 30-50 meters. There are a few hilly mountains in central and eastern Xuzhou, and the hills are generally about 100-200 meters above sea level.

Xuzhou is located in the downstream of Yi River, Shu River and Si River, tributaries of the ancient Huaihe River. Taking the Old Yellow River as the watershed, it forms the river system of Yi River, Shu River and Si River in the north, and Sui River, An River in the south [13]. There are crisscross rivers in this area, with lakes, reservoirs dotted. The Old Yellow River flow through the east and west, the Beijing-Hangzhou Grand Canal traverse the north and south. There are Yi River, Su River, Luoma Lake in the east and Xiaxing River, Dasha River, Weishan Lake in the west.

2.3. Soil Conditions
Xuzhou soil can be divided into six categories: brown soil, cinnamon soil, purple soil, fluvo-aquic soil, shajiang black soil and paddy soil according to the differences of soil-forming conditions, processes, soil structure and properties. Among them, brown soil and cinnamon soil are zonal soils in warm temperate humid, semi-humid climate and deciduous vegetation. The tidal soils are the main soils of the alluvial plains of the region, accounting for 79.5% of the total soil area of the city. In addition, there are a small amount of marsh soils in some lakes.

3. Family Analysis

3.1. Analysis of the Size of Families
According to statistics, there are 127 families of wild plants in Xuzhou, of which 50 families and 50 species have 3 families, including 122 genera and 205 species, accounting for 26.41% of the total, 27.97% of the total species; 21-49 species have 1 family, including 41 species of 18 genera, accounting
for 3.90% of the total, 5.59% of the total species; 12 families of 11-20 species, including 168 species of 103 genera, accounting for 22.29% of the total, 22.92% of the total species; 6-10 species There are 18 families, including 76 genera and 131 species, accounting for 16.45% of the total number, 17.87% of the total species, 48 families of 2-5 species, 143 species of 98 genera, accounting for 21.21% of the total, 19.51% of the total species; 1 species has 45 families, including 45 genera and 45 species, accounting for 9.74% of the total, and 6.14% of the total species. According to the order of the number of species (Table 1). There are 16 families with more than 10 species, accounting for 12.60% of the total number of families, but the total number is 52.60% of the total genera, and the total number of species accounts for 56.48% of the total species; The important components have a significant impact on the composition and nature of the flora in Xuzhou and the composition, structure and characteristics of the community. It is an important component of wild plants in Xuzhou.

**Table 1. Size sorting of Xuzhou wild plant family**

| Families       | Genera | Species |
|----------------|--------|---------|
| ≥50 Families   |        |         |
| Gramineae      | 54     | 83      |
| Compositae     | 41     | 72      |
| Leguminosae    | 27     | 50      |
| 21-49 Families |        |         |
| Rosaceae       | 18     | 41      |
| 11-20 Families |        |         |
| Labiatae       | 14     | 19      |
| Euphorbiaceae  | 11     | 18      |
| Oleaceae       | 8      | 16      |
| Polygonaceae   | 6      | 15      |
| Apiaceae       | 12     | 14      |
| Liliaceae      | 10     | 14      |
| Cruciferae     | 9      | 13      |
| Caprifoliaceae | 7      | 13      |
| Scrophulariaceae| 8     | 12      |
| Cyperaceae     | 6      | 12      |
| Ranunculaceae  | 6      | 11      |
| Ulmaceae       | 6      | 11      |
| 6-10 Families  |        |         |
| 2-5 Families   |        |         |
| 1 Families     |        |         |

### 3.2. Analysis of the Types of Branch Distribution Areas

According to Zhengyi Wu the distribution area type scheme of the world seed plant family [14], 118 families of wild plants in Xuzhou are divided into 8 regional types (table 2): There are 51 families in the world, accounting for 40.16%, such as Alismataceae, Nymphaeaceae, Convolvulaceae, Polygonaceae, Umbelliferae, Onagraceae, Compositae and so on. There are 40 families in the pantropical region, accounting for 31.50%, such as Amaryllidaceae, Asclepiadaceae, Sapindaceae, Theaceae, Malvaceae, Ebenaceae, and Iris. There are 7 families, accounting for 5.51%, in East Asia (tropical, subtropical) and tropical South America. They are Verbenaceae, Araliaceae, Aquifoliaceae, Gleicheniaceae, Lardizabalaceae, Styracaceae, and Staphyleaceae. There are 2 families in the old world, accounting for 1.57%, which are Musaceae and Alangiaceae. There are 20 families in the north temperate zone, accounting for 15.75%, such as Cupressaceae Bartling, Hamamelidaceae, Salicaceae, Juglandaceae, Fagaceae, Pinaceae, Taxodiaceae, and the like. There are 4 families in East Asia and North America, accounting for 3.15%, and are Saururaceae, Magnoliaceae, Calycanthaceae, and Nyssaceae. There are 1 branch of Punicaceae in the Mediterranean region, from West Asia to Central Asia, accounting for
0.79%. There are 2 families in China, accounting for 1.57%. They are Ginkgoaceae Engler and Eucommiaceae.

**Table 2.** Distribution types of families

| Distribution area type of a family | Families | Percentage |
|-----------------------------------|----------|------------|
| 1. Worldwide                       | 51       | 40.16%     |
| 2. Pantropical                     | 40       | 31.50%     |
| 3. East Asia (tropical, subtropical) and tropical South American disjunction | 7 | 5.51% |
| 4. Ethiopian realm                 | 2        | 1.57%      |
| 8. North temperate zone            | 20       | 15.75%     |
| 9. East Asia and North American disjunction | 4 | 3.15% |
| 12. Mediterranean, west and central Asia | 1 | 0.79% |
| 15. Peculiar to China              | 2        | 1.57%      |
| Total                             | 127      | 100%       |

In addition to the world's widely distributed families, the Pan-tropical distribution has the largest proportion, and the main tropical families such as Mulberry, Rubiaceae, and Ramie can grow naturally in the wild, reflecting the tropical northern margin of Xuzhou.

### 3.3. Analysis of Genera

According to the statistics, there are 462 genera of wild plants in Xuzhou. According to the distribution type of Chinese seed plants of Professor Zhengyu Wu [15-16], the study can be divided into 15 distribution types (Table 3).

**Table 3.** Distribution types of genera

| Types | Genera | Percentage |
|-------|--------|------------|
| 1. Worldwide | 65 | 14.07% |
| 2. Pantropic | 81 | 17.53% |
| 3. East Asia (tropical, subtropical) and tropical South American disjunction | 13 | 2.81% |
| 4. Ethiopian realm | 20 | 4.33% |
| 5. Tropical Asia to tropical Oceania | 12 | 2.60% |
| 6. Tropical Asia to tropical Africa | 4 | 0.87% |
| 7. Tropical Asia (i.e. Tropical Southeast Asia to India-Malay, Pacific Islands) | 14 | 3.03% |
| 8. North temperate zone | 98 | 21.21% |
| 9. East Asia and North American disjunction | 30 | 6.49% |
| 10. Old World Temperate | 45 | 9.74% |
| 11. Temperate Asia | 11 | 2.38% |
| 12. Mediterranean, west and central Asia | 11 | 1.73% |
| 13. Central Asia | 1 | 0.21% |
| 14. East Asia | 43 | 9.31% |
| 15. Peculiar to China | 17 | 3.68% |
| Total | 462 | 100% |

The worldwide distributed genus accounts for 14.07% of the total genera, such as Selaginella, Equisetum, Osmunda, Sophora and so on. Pantropical genera accounted for 17.53% of the total genera, such as Vitex, Buddleja, Abutilon, Ilex and so on. East Asia (2.81%), such as Cinnamomum, Sanguisorba, Sageretia, Eurya and so on. Ethiopian realm (4.33%), such as Thesium, Stephania, Alangium, Rostellularia and so on. Tropical Asia to tropical Oceania accounted for 2.60%, such as Glycine, Rhamnella, Lagerstroemia, Centranthera and so on. Tropical Asia to tropical Africa
accounted for 0.87%, such as Cyrtomium, Miscanthu, Rabdosia, Crassocephalum and so on. Tropical Asia accounted for 3.03%, such as Broussonetia, Duchesnea, Pueraria, Paederia and so on. The north temperate zone accounts for the most: 21.21%, such as Rosa, Agrimonia, Prunus, Armeniaca. East Asia and North American disconjunction accounts for 6.49%, such as Toxicodendron, Aralia, Panax, Chionanthus and so on. Old World Temperate accounts for 9.74%, such as Lolium, Hemerocallis, Ajuga, Adenophora and so on. Temperate Asia accounts for 2.38%, such as Pterocarya, Orychophragmus, Caragana, Gueldenstaedtia and so on. The Mediterranean region, west Asia to central Asia accounted for 1.73%, such as Glycyrrhiza, Pistacia, Punica, Hedera and so on. The central Asia accounts for the lowest: 0.21%, exactly Incarvillea. East Asia accounts for 9.31%, such as Reineckia, Euscaphis, Perilla, Platycodon and so on. Genera peculiar to China accounts for 3.68%, such as Xanthocera, Camptotheca, Kolkwitzia, Indocalamus and so on.

Tropical components (types 2-7) totaled 144 genera, accounting for 31.17%. The temperate distribution genus (type 8-14) has a total of 236 genera, accounting for 51.08%. According to the geographical composition of the subordinates, the wild flora of Xuzhou is mainly composed of temperate elements, and the typical temperate components (types 2-7) account for 51.08% (Table 3). Therefore, the wild flora of Xuzhou should be temperate flora in nature

4. Conclusions
Through the analysis of plant species diversity in Xuzhou, we have reached the following conclusions:

1. After investigation, there are abundant wild plants in Xuzhou. There are 127 families, 462 genera, and 733 species in Xuzhou. The families, genera and species of wild plants account for 82.5%, 73.3%, and 60.9% of Xuzhou City, respectively, and their flora is of certain importance and particularity in Jiangsu.

2. Among the surveyed wild plants, Gramineae, Compositae, Leguminosae, Rosaceae, Labiatae, Euphorbiaceae, Oleaceae, Liliaceae, Cruciferae, Lonicerae, Scrophulariaceae, Ranunculaceae, Ulmaceae plants dominated; the single species and the single species account for a large proportion, which is an important part of the wild plants in Xuzhou, which has certain influence on the succession of the community and is an important component.

3. In the composition of the distribution area of the family, in addition to the large proportion of the world's widely distributed families, the main tropical families such as Mulberry, Valerian, and Ramie can grow naturally in the wild, and the pantropical distribution The largest proportion of the department is 31.50%, reflecting the tropical north edge of Xuzhou.

4. In the composition of the distribution area and geographic composition of the genus, the tropical distribution is a total of 144 genera, accounting for 31.17%. The temperate distribution has a total of 236 genera, accounting for 51.08%. The wild flora of Xuzhou is mainly composed of temperate elements, and the typical temperate components account for 51.08%. Therefore, the wild flora of Xuzhou should be temperate flora.

Acknowledgments
This work was supported by the National Spark Plan Projects (Nos: 2013GA690441; 2015GA690089), the National Natural Science Foundation of China (No. 41807368), the Science and Technology Plan Projects of Xuzhou City (Nos. KC14SM078, KC18148), the Xuzhou University of Technology (Nos. XKY2018134, XKY2017236).

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