Flora analysis of seed plants in Daxiong mountain of Hunan province

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Abstract. Based on field investigation and relevant information about Daxiong Mountain, we do the area types analysis of the seed plant. The results showed that: (1) There were 1218 species of seed plants in this region, belong to 166 families and 668 genera, including 6 families, 11 genera, 14 species of gymnosperm and 160 families, 657 genera, 1204 species of angiosperms. (2) The composition of the seed plants in this region was highly dispersed and very complex. In the composition of the families, the number of small families was the most, which rate was 40.00%. However, the major families contains the largest number of plant species, the rate was 34.51%. In the composition of the genus, species focus on the small genera and the single genus that accounted for 37.14% and 51.43%. (3) The flora of seed plants in this region was complex. There were 267 genera, 46.05% genera of the total, in the tropical distribution. Followed by the temperate distribution of 171 genera, accounting for 28.24%. In addition, the Asian distribution including 168 genera, 27.71% of the total and the world distribution including 62 genera, accounting for 9.28% of the total.

1. Introduction

The flora was the collection of all plant species in a region, which was the basis of the distribution of vegetation, and the spatial reflection of the process of species formation. Therefore, the flora contains a large number of historical, geographical environment and system evolution information[1]. So transitional flora, floristic composition in the geographical space changes, indicating past the natural and historical conditions, especially to temperature was dominant factor of climatic conditions of historical change[2]. So it was of great significance to study the relationship between the transition of the flora and environmental conditions, especially the climatic conditions, for a better understanding of the origin, distribution and migration of the flora. Wu Zhengyi as represented China botanists through systematic research in recent 30 years, Great progress has been made in the research content, research methods and so on[3-9]. At present, there were some deficiencies in the research area, and the Daxiong Mountain in Hunan was the blank space, The Daxiong Mountain National Forest Park, the park as an important part of Xinhua biodiversity was Hunan biological diversity in the region, but its floristic study has not been reported. The study to Hunan Daxiong Mountain National Forest Park as the research object, in the plant system investigation based on the, on the flora of seed plant species composition and geographical elements were analyzed, this research can provided scientific basis for explore the flora development, biodiversity protection, plant population dynamic state analysis, plant resources ultiazation.
2. General situation of study area
The Daxiong Mountain National Forest Park was located in the north of Hunan Province, Xinhua County, Loudi City. The geographic coordinates was 28°04′~28°30′N, 110°14′~110°22′E. Between east and west was 27.5km, Between north and south was 12.5km, the total area of was 8102.4 hm².

3. Research methods
According to the topographic features of the Forest Park in Hunan, combined with the topographic map, Lin Xiangtu, Lin Bantu and other data, the survey adopts line survey and sample survey method. Special environment uses special survey methods to carry out the census, collect plant samples and record plants, collect plant diversity information. The areal types of families in accordance with the areal types of the family of Professor Li Xiwen world seed plant division, the areal types of genera areal types according to Wu Zhengyi academy genera of Chinese seed plants were divided into [2-5].

4. Results and analysis
4.1. Statistical analysis on the seed plant groups of Daxiong mountain
According to the investigation and specimen collection, there were 1218 kinds of seed plants in the Daxiong Mountain (including the introduction and cultivation of plants). Among the 6 families of gymnosperm belonging to 11 genera and 14 species, 160 families, 657 genera and 1204 species of angiosperms. There were 573 kinds of woody plants in these plants. Plant species accounted for the proportion of the province of Hunan in the Table 1.

| Group unit          | Pteridophyta | Gymnosperms | Angiosperm |
|---------------------|------------|-------------|------------|
|                     | family     | genera      | specie     | family     | genera      | specie     | family     | genera      | specie     |
| Hunan               | 46         | 106         | 351        | 10         | 32          | 75         | 203        | 1261        | 4968       |
| Daxiong mountain    | 30         | 48          | 68         | 6          | 11          | 14         | 160        | 657         | 1204       |
| Accounted for(%)    | 65.2       | 45.3        | 19.4       | 60         | 34.4        | 18.7       | 80         | 52.1        | 24.2       |

4.2. Statistical analysis on family level
Flora was the sum of all the plants in a certain region (families, genera and species), it reflects the sum of the plants in the region and the fundamental nature, it was the regional development history and modern geographical conditions influence the results[10-11]. First of all, statistical analysis on the level of family to analysis of the flora.

| Genera no. of families | Family numbers | Accounted for | The genera numbers | Accounted for |
|------------------------|----------------|---------------|--------------------|---------------|
| ≥9                     | 5              | 4.76          | 83                 | 29.75         |
| 5~8                    | 7              | 6.67          | 39                 | 13.98         |
| 2~4                    | 39             | 37.14         | 103                | 36.92         |
| 1                      | 54             | 51.43         | 54                 | 19.35         |
| Total                  | 105            | 100.00        | 279                | 100.00        |
Table 3. Species composition in the family of Daxiong mountain

| Genera no. of families | Family numbers | Accounted for | The genera numbers | Accounted for /% |
|------------------------|----------------|--------------|--------------------|-----------------|
| ≥10                    | 7              | 6.67         | 137                | 34.51           |
| 5~9                    | 16             | 15.23        | 115                | 28.96           |
| 2~4                    | 42             | 40.00        | 105                | 26.45           |
| 1                      | 40             | 38.10        | 40                 | 10.08           |
| Total                  | 105            | 100.00       | 397                | 100.00          |

4.3. Statistical analysis of the genus level

Based on the principle of the distribution of the genera of seed plants in China by Wu Zhengyi[3], the 668 genera of the seed plants of the Daxiong Mountain are divided into 14 types.

Table 4. The areal genera types of seed plants in Daxiong mountain

| Areal -types                     | No. of Genus | Ratio/% |
|----------------------------------|--------------|---------|
| 1. Cosmopolitan†                 | 62           | /       |
| 2. Pantropic                     | 126          | 22.79   |
| 3. Trop. Asia & Trop. Amer. disjuncted | 18       | 2.97    |
| 4. Old World Tropics             | 34           | 5.61    |
| 5. Tropical Asia & Trop. Australasia | 18      | 2.97    |
| 6. Trop. Asia to Trop. Africa    | 19           | 3.13    |
| 7. Trop. Asia                    | 52           | 8.58    |
| 8. North Temperate               | 124          | 20.47   |
| 9. E. Asia & N. Amer. disjuncted | 54           | 8.91    |
| 10. Old World Temperate          | 38           | 6.28    |
| 11. Temp. Asia                   | 5            | 0.82    |
| 12. Mediterranea, W. Asia to C. Asia | 4       | 0.67    |
| 13. C. Asia                      | 0            | 0.00    |
| 14. E. Asia                      | 95           | 15.67   |
| 15. Endemic to China             | 19           | 3.13    |
| Total                            | 668          | 100.00  |

There were 62 genera in the area of the world, which account for 9.28% of the total genera. This type was mainly composed of herbs, which were very common in the protected area, usually on the roadside or in the forest, such as Phytolacca, Amaranthus, Chenopodium, Stellaria, Polygonum, Ranunculus. Woody mainly Rubus genus Rubus, buckthorn Rhamnus, Sophora sophora, and these plants of the genus mostly constitute a reserve of shrub layer and liana layer of an important component.

Pan tropical distribution of 126 genera, accounting for 22.79% of the total number of genera. This type was mainly composed of woody species, such as Podocarpus, Styrax, Symlocos, Caesalpinia, Euonymus, Ilex, Ardisia etc. The plants of these genera were important components of the tree layer and the layer of the tree layer of the forest community in the protected area. Herbs were mainly Pratia Pratia, Cynodon Cynodon, Paspalum Paspalum, Pennisetum Pennisetum etc.

There were 18 genera of tropical Asia and tropical America, which account for 2.97% of the total genera. The main type was mainly dominated by woody plants, such as Litsea, Phoebe, Eurya etc. The Litsea and Phoebe were an important part of the subtropical evergreen broad-leaved forest, and Eurya contains some species for protection forest area of shrub layer common species.

There were 34 genera in the Old World tropics, which account for 5.61% of the total genera. The types of woody species common in protected areas, such as Maesa, Syzygium, Pittosporum, which were
the main component of the shrub layer in forest community, and Herbs were mainly Alpinia, Pollia, Elatostema and Isodon.

There were 18 genera in the tropical Asia to the tropical Pacific, which account for 2.97% of the total genera. This type contains Cinnamomum, 100 Stemona, Cymbidium etc. Among them, Cinnamomum plant was an important part of the native forest community, some species even tree layer construction group, determines the appearance of community characteristics in a certain extent.

There were 19 genera of tropical Asia to tropical Africa, which account for 3.13% of the total genera. The main types of single species genera and species were rare species, including Amorphophallus, Microstegium, Neyraudia, themeda, Thladiantha, Taxillus, Dichrocephala, Adina, Periploca, Tricalysia etc..

There were 52 genera in the tropical Asia, accounting for 8.58% of the total genera. This type contains Michelia, Neolitsea, Cyclobalanopsis, Daphniphyllum, Camellia, Gonostegia, Ophiorrhiza, Paederia etc..These genera were important components of forest vegetation in protected areas.

There were 124 genera in the north temperate zone, accounting for 20.47% of the total genera, such as common needles were Pinus, Cupressus, Juniperus. The common deciduous trees or small shrubs of the forest were Quercus, Fagus, Tilia, Carpinus, Acer, Viburnum etc..Forest common herbs including Lilium, Echinochloa, Corydalis, Circaea etc..The Pinus, Quercus, Fagus, Tilia and Carpinus was an important part of the forest community in this area.

East Asia and North America were distributed in 54 genera, which account for 8.91% of the total genera. This type was mainly dominated by woody plants, including orreya, Sassafras, Castanopsis, Liquidambar etc..The distribution types of Castanopsis, Liquidambar, Sassafras etc. was an important component of forest community, and some species such as Castanopsissclerophylla, Castanopsis carlesii, Castanopsis fargesii and Liquidambar formosana were the advantages of forest community species.

The temperate zone of Old world distribution has 38 genera, accounting for 6.28% of the total genera. The distribution pattern of the plant was a herbaceous and woody plants, such as Amygdalus, Ligustrum, Medicago, Pyracantha, Pyrus etc..

The temperate Asia distribution has 5 genera, accounting for 0.82% of the total genera, such as Pseudostellaria, Kalimeris and Trigonotis. The Mediterranean region of West and Central Asia distribution only 4 genera, such as Pistacia.

Chinese endemic genera, 19, accounting for 3.13% of total genera, such as gymnosperm Ginkgo, Cunninghamhamia genus, angiosperm Cyclocarya, Tutcheria, Camptotheca genus. These genera have distinct taxonomic status in Botany, which were relatively primitive and ancient. The existence of these genera of seed plants in the area shows the origin of the plants in this area.

From the above analysis, we can see that there were 62 genera in the world, which account for 9.28% of the total genera. Tropical genera (2~7) have 267 genera, which account for 46.05% of the total genera. The temperate distribution of genera (8~10~12 distribution) has 173 genera, which accounts for 28.24% of the total genera. Asian species distribution (9, 13~15 distribution) there were 168 genera, accounting for the total number of 27.71%. The distribution of tropical species was the largest, but the temperate distribution was also a certain proportion, in line with the Daxiong Mountain was located in the geographical location of the northern subtropical.

5. Conclusion and discussion

Plant species richness in the area was higher, after investigation, to 166 families, 668 genera and 1628 species of seed plants. Among them, 6 families, 11 genera and 14 species of gymnosperms, 160 families,
657 genera and 1204 species of angiosperms. Genera of seed plants in the area of relatively scattered, plant composition was more complicated. Less kinds of families and single species accounted for 40.00% and 38.10% respectively, and less species and the number of single species accounted for 37.14% and 51.43% respectively. From the seed plants of the genus flora structure point of view, tropical composition proportion was highest, 46.05%. Temperate class also occupies certain proportion, 28.24%. The world and Asia distribution accounted for 9.28% and 27.71% respectively. Although in the floristic composition varied, but showed obvious tropical to temperate transition nature, conform to the reserve of geographic location.

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