

Preface

The Inner Mongolia Autonomous Region is located in the north of China and borders Russia, Mongolia, and eight provinces or autonomous regions including Heilongjiang, Jilin, Liaoning, Hebei, Shanxi, Shaanxi, Ningxia and Gansu. It is an important part of the famous Ancient Tea-Horse Road in the history of China, Russia, and Mongolia, and is also a brilliant pearl embedded in this ancient Silk Road.

Inner Mongolia is a crescent-shaped region from northeast to southwest, with a distance of about 2400km from east to west, and 1700km from north to south. The land area is 950,000km², accounting for about 1/8 of the land area of China. The overall terrain is elevated in the northwest and low in the southeast. In the eastern part of Inner Mongolia, there is a continuous stretch of the Great Hinggan Mountain; in the middle, there are winding Yin Mountain range; to the west, there is the upright Helan Mountain. Due to the unique topography and geomorphology of Inner Mongolia, the overall climate is cold and windy in the winter, relatively short in the summer, and not well-marked during spring and autumn. Precipitation decreases from east to west, and evaporation and temperature increase from east to west. Water and heat are not synchronized and are unevenly distributed. The rainy season is from July to September each year. Affected by topography and climatic factors, the eastern forest, the central grassland and the western desert constitute the three major vegetation types of Inner Mongolia. There are more than 2600 species of vascular plants, including more than 350 species of major trees and shrubs; more than 700 species of major forage plants; more than 70 species of excellent pasture plants; and nearly 100 species of protected plants at national and regional levels. There are also many traditional wild ornamental plants, wild edible plants and wild medicinal plants distributed in Inner Mongolia.

The research on palynology in Sweden, Japan, the United States, Germany, and the former Soviet Union started earlier, and had reached a certain level in the late 1950s, which mainly applied to geology, coal, petroleum, and medical care, and played a more prominent role in the economic development of these countries. The comprehensive and systematic development of palynology in China was established after the foundation of the People's Republic of China, especially in the 1980s. The research results have been widely used in geology, energy, agriculture, health care, environmental protection, food, and cosmetic and chemical products and other fields. However, systematic research on pollen morphology in Inner Mongolia is still a blank.

Pollen morphology is the premise of all palynology study. Therefore, powerful support can be provided for specific work such as the scientific application and production practice on the basis of pollen morphology.

Based on the current status of conservation, development and utilization of wild plant resources in Inner Mongolia, the scholars and experts from the Inner Mongolia Agricultural University, Xilingol Vocational College, and the Inner-Mongolia Medical University undertook the completion of this book.

Pollen Morphology of Inner Mongolian Plants contains 359 plant species of Inner Mongolian plants, belonging to 201 genera and 49 families (including 21 varieties, 1 subspecies and a small number of cultivars). The Engler system is used in the book of taxonomic arrangement of family, genera, and species. The pollen morphology of each plant is described in detail, such as pollen shape, size, the type and number of apertures (pollen germination pore), and surface ornamentation. Each pollen description is accompanied by one to three electron scanning micrographs; a total of 828 high-definition scanning electron microscopic pollen pictures are included. In addition, it records the flowering and fruiting period, distribution range, living environment, origin, and main application values of each plant according to literature data. Meanwhile, the natural conditions, plant resources, palynological basics, and modern pollen morphological research methods of Inner Mongolia are also described.

The research on pollen morphology of grassland plants in Inner Mongolia is one of the collaborative researches of "Key Laboratory of Grassland Resources of Ministry of Education (Inner Mongolia Agricultural University)", "Key Laboratory of Forage Cultivation, Processing and High Efficient Utilization of Ministry of Agriculture (Inner Mongolia Agricultural University)", "Inner Mongolia Key Laboratory of Grassland Management and Utilization (Inner Mongolia Agricultural University)", "Grassland Resource Innovative Research Team, Ministry of Education of China (Grant No.IRT-17R59)", "Research Center of Drought and Cold-Resistant Herbage Varieties Breeding and Propagation in Northern China, National Bureau of Forestry and Grassland", "Inner Mongolia Engineering Research Center of Herbage Varieties Breeding and Propagation" and "Inner Mongolia Engineering Research Center of Chinese-Mongolian Medicinal Improved Varieties Breeding and Propagation". The research findings documented in this book were funded by a number of National Natural Science Funds, the Ministry of Agriculture, the Ministry of Education, the Ministry of Science and Technology, and the Natural Science Foundation of Inner Mongolia. During the writing and publication of this book, the above-mentioned key laboratories and innovation teams provided strong support and assistance. During the observation and description of pollen morphology and the collection of pollen morphological picture and data, the authors received selfless help from several experts, including HAN Guodong, YAN Ling, YANG Jing, ZHANG Enhou, and JIA Yushan of the Inner Mongolia Agricultural University, and ZHAO Sheng from the South China Agricultural University. *Pollen Morphology of Inner Mongolian Plants* is translated by Dr. WANG Ruoqing, a research scientist of Canadian Food Inspection Agency, who provides a professional translation. (The interpreter was not on behalf of the Canadian Food Inspection Agency). I would like to express my sincere thanks to these contributors! I also want to thank

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We are eager to publish *Pollen Morphology of Inner Mongolian Plants*, which will provide reference to research and education for various disciplines such as palynology, plant resources, forestry, grass science, plant taxonomy, medicine, and geology, and departments such as petroleum, coal, commodity inspection, and environmental protection. Due to limitations and inexperience, there are bound to be some shortcomings and mistakes in the book. We expect subject experts and readers to give corrections.

WAN Tao

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