

Short communication

Pollen survey and clinical research in Yunnan, China

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Abstract

This pollen survey includes 7 counties of Yunnan Province, China: Quinjin, Xishuanbanna, Lijiang, Wenshan, Yuxi and Kunming. From 1991–1992, optical and statistical examination of exposed glass slides showed that pollen is air-borne in Yunnan throughout the year. Pollen is also in great quantity and variety with two apparent pollen peaks. This paper also discusses the influences of climate and elevation on the amount of pollen carried by air. A geographical and seasonal variation of pollen level was established. The pollen particles causing possible sensitization were collected in the field and refined into an allergen extract which was applied to clinical tests for patients suffering from allergosis in our hospital with a high rate of pollen allergy. The results show the effectiveness of specific desensitization for pollen allergic patients. This study is therefore of great significance to the diagnosis, treatment and prevention of pollen allergy.

Introduction

Yunnan Province in Southwestern China is known for its abundance of plants and animals. Pollenosis is prevalent across the area. The literature search results are all in the Chinese journals with a limited circulation within China (Fang et al.). The present paper is the first English report on airborne pollen from this region. The field work was carried out from January 1, 1991 to December 31, 1992, at seven different counties in the province. A clinical application of the results will be reported.

Materials and methods

Samples were collected on 25 × 75 mm glass slides covered with soft Vaseline that were placed on data-collection stations. The slides were retrieved at a set time each day throughout the year. The types and number of pollen were examined and counted from the slides with an optical microscope using 100x and 400x magnification.

Data collection sites were geographically distributed throughout Yunnan province, in the south

(Xishuanbanna and Wenshan), the east (Quinjin), the northwest (Lijiang), and the central part of Yunnan (Yuxi and Kunming), see in Figure 1.

Results and discussion

Based on the study of the 2,555 exposure slides collected during a one-year period in Yuxi and Kunming, the pollen distribution shows:

- 53.76% gymnosperm with 115,811 pollen grains
- 44.6% angiosperm with 96,216 pollen grains
- 1.6% pteridophyte with 3,453 pollen grains

The gymnosperm pollen comes from 7 families, genera or types, among which *Pinus*, *Cupressaceae* are the most prevalent.

The angiosperm pollen comes from taxa in 72 families, genera or types, among which the most abundant are *Poaceae*, *Moraceae*, *Rosaceae*, *Artemisia*, *Alnus*, *Chenopodiaceae/Amaranthaceae*, *Juglandaceae*, *Auercus* and *Salix*. The pteridophytes are of two main types – monolete and trilete.

All pollen types show a distinct peak from January to April. The variety and quantity during other months



Figure 1. The location of six pollen-collecting places of Yunnan, China.

of the year are about the same. The exception is Xishuanbanna, where no peak was observed. Furthermore, in Xishuanbanna, the pollen types and amounts, 11,008 pollen particles for the whole year, were much less than those in other places, only one fifth of those in Quinjin. This apparent difference needs further investigation.

The pollen peaks in the other six places, which were distinctly different from Xishuanbanna, were more uniform. The highest peak, mainly tree pollen, was in the spring (January to April). The peak of various Poaceae pollen was in autumn (September to October) (Figure 2). There were some differences of pollen types with the highest amount of Oleaceae pollen (2,991 particles, 20.59% of the total) in Wenshan. This pollen type is much less frequent in other places. In Lijiang, where it is cold and the

elevation is high, the majority of pollen types are of the Meliaceae family, Urticaceae family, Brassicaceae family and Salicaceae family, with great proportion of the total, such as 2,410 *Salix* pollen grains (12.6% of the total) in March and April, the peaks are from March to May. The pollen peaks of the other families varied in a similar way.

The individual pollen peaks varied with weather, elevation and other geographic factors. Pinaceae pollen peaked in January and February.

In Xishuanbanna, which is near sea level and hot, with no winter, the grass family contributes the greatest amount of pollen (3,335 particles, 30.29% of the total) and has the longest growing and airborne periods throughout the year.

Principal pollen types collected from the 7 places listed in Table 1 belong to the following families:

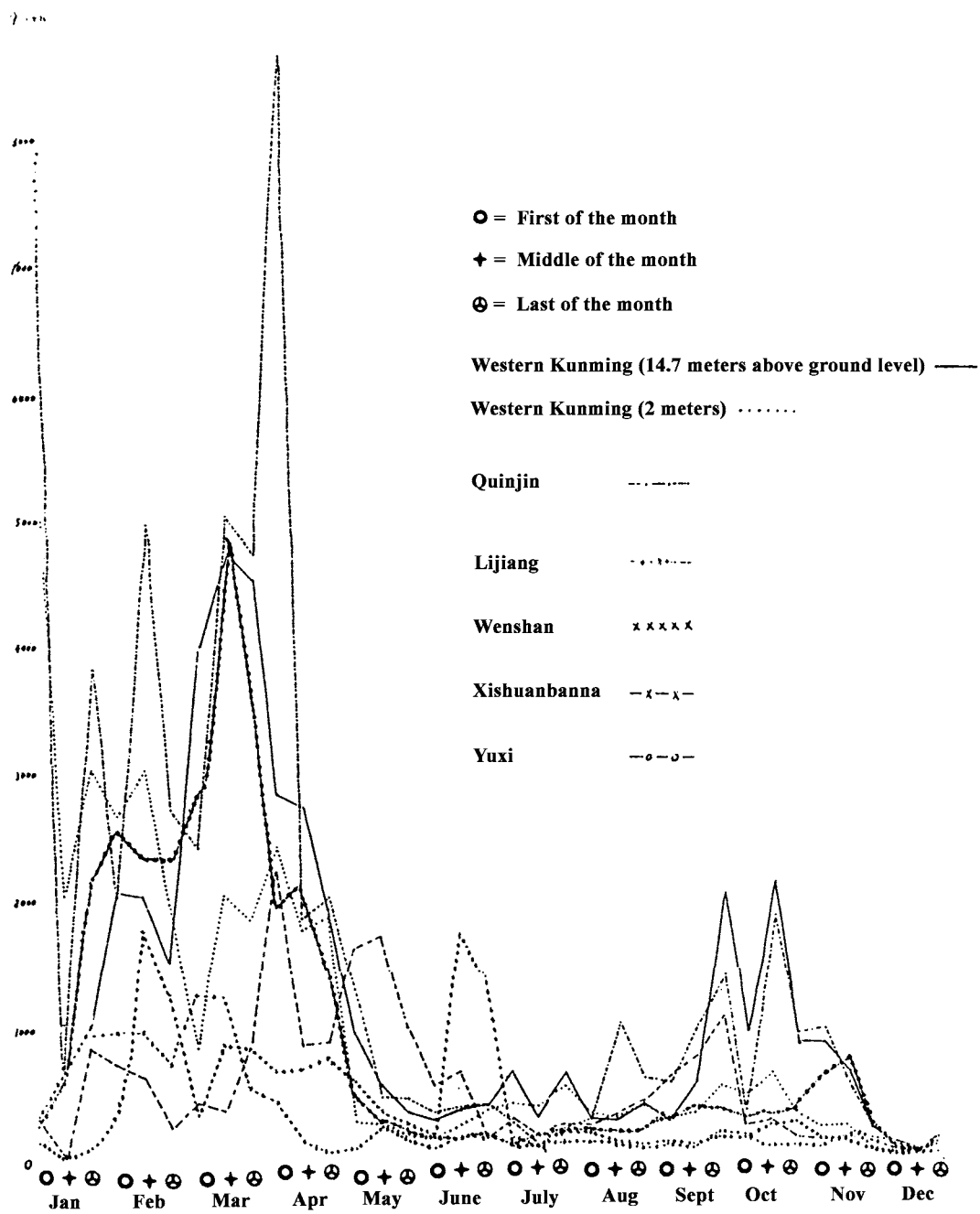


Figure 2. Pollen distribution in six places of Yunnan, China.

Table 1. Data Collection Sites.

Sampling site	Floor location	Hieght above ground level (m)	Geographical characteristic
Quinjin Third People's Hospital	Third	12.0	Temperate
Xishuanbanna Jinhong People's Hospital	Fourth	14.7	Tropic
Lijiang Lijiang Hospital		14.0	Frigid zone
Wenshan Wenshan Hospital	Third	12.0	Subtropics
Yuxi Yuxi Hospital	Third	13.0	Temperate
Kunming Station 1	Fourth	14.7	
First Affiliated Hospital			Temperate
Kunming Station 2	Ground	2.0	

Pinaceae, Cupressaceae, Poaceae, *Alnus*, Roseaceae, Moraceae, *Salix*, *Artemisia*, Juglandaceae, Meliaceae, *Brassica*, Urticaceae (mainly in Lijiang) and Oleaceae (mainly in Wenshan).

i. Pinaceae pollen, 83,326 pollen grains (38.7%) was the most abundant type of pollen.

ii. Cupressaceae pollen, 40,005 pollen grains (18.6%), was year round and was collected in all 7 sites with their peak in January and February.

iii. Poaceae pollen, 16,010 pollen grains (7.4%), was year round and was ranked first among the angiosperm which peaked in March and April, and in July, August and September, mainly in Xishuanbanna.

iv. *Alnus* pollen, 14,167 pollen grains (6.6%), peaked in October and November.

v. Rosaceae pollen, 11,417 pollen grains (5%), mainly was present in April, however, in Lijiang it was present in March, April and May.

vi. Moraceae pollen, 10,897 pollen grains (5%), mainly appeared from January to April, with minimal presence during the other months.

vii. *Salix* pollen, 9,814 pollen grains (4.6%), mainly appeared in March and April with negligible appearance in other months.

viii. *Artemisia* pollen, 7,266 pollen grains (3.4%), was airborne year round with their peak in September and October.

ix. Juglandaceae pollen, 4,052 pollen grains (1.9%), peaked in March and April, and Lijiang had another peak in August and September.

x. Oleaceae pollen, 3,510 pollen grains (1.6%), was mainly detected in Wenshan (2,991 pollen

grains) in May (2,933 pollen grains), though occasionally present other parts of the year.

xi. Meliaceae pollen, 2,400 pollen grains (1.1%), was mainly present in March and April with little presence during other the months.

xii. *Brassica* pollen, 1,802 pollen grains (0.8%), was present mainly in February and March with little presence during the other months.

xiii. Urticaceae pollen, 656 pollen grains (0.3%), was present mainly in Lijiang in September, with little presence in other places.

In summary, except for iii, v, and xiii, samples were collected from all seven locations.

The above are the dominant major pollen distributions in Yunnan, altogether 205,322 grains, representing 95% of the total collected in one year.

Airborne pollen in all sampling sites, generally had two peaks, one from January to April and the other from September to November. Pollen was classified according to the duration and the amount as follows:

i. Those with great amount and the longest airborne periods throughout the year: Pinaceae, Cupressaceae and Poaceae.

ii. Those with great amount but short airborne periods: Rosaceae, *Salix*, *Populus* and *Alnus*. These types of pollen were the leading sensitizing pollen in pollenosis cases and occurred mainly in January and February.

iii. Those with a small amount (1–2%), but long airborne periods (the whole year): *Artemisia*, Chenopodiaceae/Amaranthaceae, Brassicaceae, Juglandaceae.

iv. Those with a small amount and short airborne periods: Meliaceae and Leguminosae.

On the relationship between phenology and vegetation, the seven sampling sites were located in tropical, subtropical, temperate and frigid zones (Table 1). The valleys in the mountains and river basins create varied topography, which accounts for the variety of dense vegetation all year around. There is a great variation in climate also, all four seasons can occur at one time in different parts of the same mountain. It was obvious from the present survey that among the provinces in China, Yunnan ranks highest concerning pollen amount, pollen types and airborne pollen. Therefore, the pollen research is of great practical importance in Yunnan.

Preparation of pollen allergen and clinical application

Pollen allergen is the principal reagent for diagnosis and treatment of pollen allergic diseases. Based on a thorough study of phenology, flora in Yunnan and other pollen survey information, pollen was collected in the field at proper periods according to vegetation distribution, airborne pollen presence, and different vegetation features. The pollen was collected by twig transplanting, natural falling off, and grinding and shaking off in the field. After the collected material had been sieved by a Nr. 6–9 sifter, the remaining pollen was purified, dried in a greenhouse and then defatted in ether and ready for use or stored in a refrigerator for future use (Zhang).

In order to study the cause and side effects of pollenosis in Yunnan, we applied the allergen extract to clinical tests of over 3,000 patients suffering from various kinds of allergy symptoms in our hospital. The patients included 1,834 allergic rhinitis, 627 bronchial asthma, 174 urticaria, 170 eczema, 117 dermatitis herpetiformis, 100 vernal conjunctivitis, 38 aphthous stomatitis, 8 angioneurotic edema, 2 epilepsy, 2 idiopathic hemuresis, 2 vasculitis. The tests revealed that 2,186 patients suffered from pollen allergy (72.8%), among which there were 1,420 allergic rhinitis and 425 bronchial asthma, 61.5% of sham reaction. Therefore, apparently pollen was the main sensitizing agent for the upper respiratory tract. Strongly positive reactions were ranked in the following order: 1,488 cases of summer pollen, 1,290 cases of *Artemisia* pollen, 1,140 cases of early spring pollen, 1,068 cases of late spring pollen, 882 cases of *Chenopodium* pollen, 708 cases of *Brassica* pollen, 666 cases of pinaceae pollen, 438 cases of *Alnus* pollen, 429 cases of *Cupressaceae* pollen, 360 cases of *Populus* pollen, 288 cases of salix pollen, 210 cases of oriental cherry pollen, 210 cases of Christmas tree pollen, 186 cases of Chinese porasol pollen, 42 cases of *Populus* pollen, 6 cases of leguminosae pollen, and 6 cases of *Ailanthus altissima* pollen, most of which were multiple pollen allergies. There was pollenosis year round, with increasing seasonally in accordance with two seasonal pollen peaks. The

results revealed that there was quite a substantial potential to make specific desensitization like perennial desensitization, seasonal desensitization and rush immunotherapy. Based on two years of observation, it was found that 90.6% of the patients did not require further perennial antihistamine drugs and hormone ('steroid') drugs.

From the clinical point of view, there was a high positive rate of pollen allergy, for example: brassica pollen in spring, *Artemisia* pollen in summer and autumn and *Chenopodium* pollen in spite of their small amount and short periods of presence in the air. On the contrary, low positive rates of Pinaceae and Cupressaceae pollen allergy despite their great amounts in spring air. An explanation of this observation needs further research.

According to observation of pollen allergy, the number of allergy patients tends to increase with the development of a greener environment implying higher pollen amounts and more taxa. Therefore, pollenosis study becomes complicated.

Conclusions

This paper is the first English report of a statistical survey of pollen in Yunnan Province of China with an emphasis on the pollen types, their geographical distribution and the seasonal variation. Second, a clinical survey was made by incorporation of the statistical information collected in the present work. An optimum benefit in clinical treatment was demonstrated.

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