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MYCOLOGY IN THE CHINESE PEOPLE'S REPUBLIC

[Translation]

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[Translation]

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Two periods can be discerned in the development of mycology in China: the first period (1871-1920) when foreign scientists were busy studying fungi in China, and the second period (since 1920) when mycology has been the province of Chinese investigators who have started the study of Chinese microflora.

During a long period mycology developed in China as a botanical discipline not connected with applied science nor phytopathology, in particular. Not until the democratic regime was established did mycology in China become a more applied science, serving primarily the interests of agriculture.

The first fungus collector in China was the Russian scientist Potanin who made four trips through the country at the end of the 19th century. The lists, primarily of the Micromycetes and partially of the Macromycetes, which he collected in Central China and Tibet were published in 1881 (K. Kalchbrenner) and those which he collected in Northern China and north-western Mongolia were published in 1892 (P. Karsten).

J. Delaway, who collected principally the higher plants in Western China, was also incidentally a collector of fungi. In 1881, he settled in Yunan Province and was the first fungus collector in this area of China. In 1893, he once again visited Yunan Province and continued his collection. The fungi samples which he had collected during his two visits to China were sent to the Paris Museum and published in six lists (N. Patouillard). In the French Journal de Botanic for 1888 Patouillard described several new species of fungi collected by J. Delaway in China. For instance, he described on the leaves of *Ailanthus* sp. a new species of powdery mildew *Uncinula delawayi* Patouill., still known only in China.

O. Warburg in 1887, collected in China six new fungi which were published by Hennings in his Fungi mensunenses.

P. Giraldi was collecting higher plants and fungi in Shensi Province, China from 1890 to 1895. The lists of Micro and Macromycetes which he

collected were published in Italy. The first list of fungi was published in 1896 (G. Arcangeli) and the second in 1905 (P. Baccarini).

J. Soulie and P. Farges collected fungi in Szechwan Province and on the Tibetan border from 1890 to 1892; the fungi specimens which he collected were sent to the Paris Museum. Three lists of these fungi were published in 1892-1895 (N. Patouillard); they included in addition to the Micromycetes several species of Boletaceae, Russulaceae and others.

Some parasitic chytrid fungi were collected by S. Heden in northern Tibet in 1896 and in 1900 they were published (S. Wille); they included a description of the new species *Harpochytridium hedenii* Wille n.sp.

V. L. Komarow, as part of an 1896 expedition studying the plant life of Manchuria, collected over 50 species of fungi. The species which he collected were published in *Fungi Rossicae exsiccati* (Yachevskiy, Transhel' and Komarov). Some species of fungi, collected by Komarow, were found to be new ones: *Uredinopsis adianti* Kom. on *Adiantum pedatum* L., *Aplospora tatarinovii* Kom. et Trancz. on *Prenthes tatarinovii* Max., *Accidium lythri* Trancz. on *Lythrum salicaria* L., and others.

J. Miyake was a teacher of botany at the National Agricultural College in Peiping from 1910 to 1912. Before his arrival in Peiping he had already made collections in 1908 and 1909 in different parts of the Yangtze Valley, largely in Hunan, Hupeh and Kiangsi Provinces. The greater part of his collections was published in three lists issued in Japan in 1912-1941 (J. Miyake). The total number of fungi which he collected included approximately 270 of which 26 were published for the first time. Among the new fungi species were *Uncinula koelreuteriae* Miyake on *koelreuteria bipinnata* Franch., *Marasonina viticola* Miyake on *Vitis vinifera*, *Septogloeum anemones* Miyake on *Anemona* sp., *Cersospora aleuritidis* Miyake on *Aleurites cordata*, and others.

H. Handel Mazzetti collected fungi in Southwestern China in 1914-1918. Three articles on new fungus species from his collections were published in 1923-1924 (K. Keissler) but the list of fungi which he had collected was not published.

E. Merrill collected fungi in Kwangtung Province in 1916 and 1917 and the lists of these fungi were published in 1917 (H. Yates) and in 1922 (H. Sydow).

O. Reinking, while studying diseases of citrus crops in Kwangtung and Kwangsi Provinces in 1919, collected more than 1,000 fungi specimens. A part of these was sent to Saccardo and Sydow for processing and they published lists of these fungi in 1919 (P. Sydow and H. Sydow) and in 1921 (P. Saccardo). In addition, he published two articles on plant diseases

in Southern China. He collected a total of 160 species of which 23 were described for the first time.

M. Miura, working at the Agricultural Experimental Station of Southern Manchuria, collected fungi in Manchuria in 1918. In 1930, he published a Fungi of Manchuria and Eastern Mongolia containing 490 species of fungi of which 64 were described for the first time. Worthy of attention are the following new species described by M. Miura: *Phragmidium rosae-auricae* Miura, *Puccinia peae-pratensis* Miura, *Uromyces vignae-sinensis* Miura, *Cylindrosporium pruni-tomentosi* Miura, *Marssonina populicola* Miura on *Populus laurifolia*, *Plasmopara skvortzovii* Miura on *Abutilon avicennae*.

We have separate reports on fungi collected by M. Wilson in Tibet in 1921 and by K. Sawada in Kwangtung Province in 1922.

K. Hara collected fungi in Manchuria toward the end of 1926 and published a list of fungi containing 81 species of which six were described for the first time.

B. Skvortzov collected Phycomycetes in Northern Manchuria. He published lists of Chinese Phycomycetes in 1925 and 1927. In these two lists were cited 24 species of Phycomycetes of which 12 were described for the first time.

Then in 1930 J. Homma published an article on the powdery mildews of Manchuria. In this article he gives 19 species belonging to six genera of Erysiphaceae, of which two species were described for the first time: *Uncinula kenjiana* Homma on *Ulmus pumila* and *U. salicis-gracilistylae* Homma on *Salix gracilistyla*.

In 1931 and 1932, in Japan J. Emoto published material on the Mycomycetes of Northern Manchuria.

In 1934, H. Tagasugi presented a list of 52 species of fungi collected during the period 1926-1933 in Manchuria, of which 42 species were found for the first time in China.

Then from 1938 to 1942 N. Hiratsuka published in Japan four articles devoted to the rusts of Southern China and Manchuria.

Finally J. Tochinal and J. Hara in 1944 published a list of parasitic fungi collected in Inner Mongolia in 1942.

This data largely exhausts the mycological work of foreign scientists on Chinese soil.

The study of the microflora of China undertaken by Chinese scientists started around 1920. The first fungus collections were made by J. Ching

in several Chinese provinces. This material was published in Japan in 1921 (S. Hori).

Later some reports on the collection of fungi in Chekiang Province were published by S. Hu in 1921 and 1923 in Chinese agronomy journals.

A systemic study of Chinese microflora started with F. Tai in the 1920's and has been continued by him up to the present. During the period 1932-1939 he published nine reports on fungi collected in China. In these reports mention is made of 200 species of fungi among which a considerable number had been found in China for the first time. In the second report drawn up in conjunction with C. Wei there is a study of 27 species of the family Erysiphaceae among which there are 2 new species: *Uncinula sinensis* Tai on *Sophora japonica* and *Acer trifidum* and *Microsphaera securinegae* Tai on *Securinega fluggeoides*. In the fifth report there is an announcement of 42 species among which there is one new species *Uncinula bulbosa* on *Koelreuteria paniculata*. In the seventh report we have species of *Cercospora* found in China. Among the 4 new species is *Cercospora chinensis* on *Polygonatum officinale*, deserving of attention by the fact that the size of the conidia in this species is 51-143/2.8-5.7 microns. The eighth report deals with the rust fungi found in China. Attention is drawn to the new species of rust fungi described in this report: *Phragmidium shensianum* on *Rubus idaeus*, *Ph. sinicum* on *Rubus crataegifolius*, *Gymnosporangium fenzelianum* on *Malus kansuensis*, etc.

During this period F. Tai was making a study of the morphology and systematics of many fungus species: *Gymnosporangium jamadae* on *Juniperus chinensis* (1930), *Myriangium bambusae* (1931), *Choanephora manshurica* (1934), species of *Neurospora* (1935) and others. Then in 1936 and 1937, he published four lists of 1929 species of fungi hitherto unknown in China.

Finally, starting with 1944 through 1948, F. Tai published a number of critical surveys on the systematic classification of separate suborders, families and genera. For instance, in 1944, he made a detailed study of 29 species and four varieties of *Geoglossaceae* (collected principally in Yunan Province); in 1946 of *Erysiphaceae* with the new species *Microsphaera berberidicola* on *Berberis* sp. and *M. robiniae* on *Robinia pseudoacacia*; in 1947 *Uredinales* (including 26 new species); in 1948 *Nidulariales* (including four new species) and *Cercosporae* (including ten new species).

At present head of the Institute of Applied Mycology and Phytopathology of the Chinese Academy of Science, F. Tai is at the same time continuing his work on the compilation of a Fungi of China with a detailed diagnosis of fungi species and illustrations. His herbarium, containing almost 50,000 fungi specimens, is housed in tens of cases and is kept in exemplary order.

For a long time (from 1928 to 1947) thorough mycological studies

were conducted in China by S. Teng. He published lists of fungi collected in Chekiang, Kiangsu, Hopeh and Kwangtung Provinces and in the northwestern provinces of China. In 1934-1935, he published reports on several groups of Ascomycetes and Basidiomycetes. He has described several new species of fungi.

Among the mycologists we must also mention C. Shen who in 1932-1934 published several reports on species of Pestalozzia, Monochaetia and on the Ustilaginales, and, in particular, on the new combination of Doassansiopsis horiana (P. Henn) Shen on Sagittaria trifolia L. (= S. Sinensis Sims). Later, in 1932, he published a fourth list of fungi collected in Nanking which is actually a continuation of the list published by S. Teng.

In 1948, C. Shen and W. Siang published the results of studies on the aqueous Phycomycetes. They presented a list of 45 species of fungi of which 32 were found for the first time in China and two species were described as new.

During the period 1934-1936, T. Liou and H. Cheng described a new genus Moreana with the species M. kungii on Carex species.

The Ustilaginales were the subject of W. Jen's studies in 1934-1936, including the publication of several reports and then in 1936 of a monograph devoted to these fungi. He described several new species of the Ustilaginales, in particular Sphacelotheca lioui on Panicum miliaceum, Ustilago bungeana on Polygonum bungeanum, and others.

Several mycological reports were published by C. Chow. In 1935 he reported on Cordyceps sinensis and Tremella fucimormis which are rather common in Szechwan Province, on Armillaria elodes (= Cortinellus berkleyanus), the best known edible mushroom in China, and on a variation observed in Ganoderma lucidum. In 1937, he made a report on the Myxomycetes of Northern China.

At an earlier period (1935) S. Ou studied the Ascomycetes and Basidiomycetes of China. He published reports on Dothideales and Thelephoraceae. Later (1940) he turned to the study of the Phycomycetes of China; he collected Phycomycetes in Szechwan Province and published two critical lists; he observed and described the new species Plasmopara calaminthae on Calamintha chinensis.

J. Shih made a study of the Hyphomycetes of China. In 1936, he gave a detailed description of 42 species and varieties of Aspergillus (including two new species and three new varieties), collected in the vicinity of the city of Wuchang in Hupeh Province and processed by Doctor C. Thom.

During the period 1936-1941, W. Chiu made a study of the edible mushrooms of China. First (1936) he published a detailed description of

Armillaria matsutake Ito et Imai as one of the best edible mushrooms occurring extensively in China; then (1938) he reported on studies of edible mushrooms in Anhwei, Chekiang and Szechwan Provinces. Finally in 1941, he published an article on the technique of growing edible mushrooms. Later (1945-1948) he continued the study of the Hymenomycetes in Yunan Province and published critical reports with a description of several new species of Amanitaceae, Russulaceae and Boletaceae, for instance, *Lepiota nivalis* L., *L. chichuensis*, *Boletus sinicus*, *B. yunnanensis*, *B. cheoi*, *Boletinus kunmingensis* and others.

Of interest are mycological studies conducted by C. Wei. In 1933, in conjunction with F. Tai he published a report with a description of 27 species of the Erysiphaceae and two species new to China. In 1940, with S. Hwang he published a list of fungi collected between 1924 and 1937 and kept in the mycological herbarium at Nanking University. At present this herbarium is in very fine condition and is housed with the Department of Phytopathology of the Nanking Agricultural Institute. In 1942, C. Wei published a list of the Erysiphaceae of Western Szechwan Province. In this list are 22 species of the family Erysiphaceae including new species and two new combinations and in 1947 he described two more new species of fungi from Szechwan Province. Continuing his mycological investigations, in 1953, C. Wei published a small critical study on species of the genus *Corynespora*.

Different mycological questions have been treated by L. Ling. During the period 1933-1935 he studied fungi of the family Polyporaceae. In the list published in 1935 he mentioned 103 species of the family Polyporaceae collected in China and four of these species were described for the first time. Between 1940 and 1945, he detected species of barberry in western Szechwan Province which served as host to the aecidial stage of *Puccinia graminis* Pers. He established that the species *Berberis gangetica*, *B. julianae* and *B. sargentiana*, known in the USA as immune or highly resistant, are seriously infected with this species of fungus in China. During the period 1942-1944, L. Ling and M. Tai studied the specialization of *Bremia lactucae* on certain species of Compositae. As a result of this study they established the following forms and combinations: *B. lactucae* Regel (= *B. elliptica* Saw.) on *Lactuca sativa* and *L. indica*; *B. lactucae* Regel f. *chinensis* f. n. on *L. chinensis*; *B. lactucae* Regel f. *sonchicola* (Schlecht.) comb. nov. (= *Botrytis sonchicola* Schlecht.) on *Sonchus oleraceus*; *B. lactucae* Regel f. *taraxaci* (Ito a. Tokunaga) comb. nov. (= *B. taraxaci* Ito a. Tokunaga) on *Taraxacum mongolicum* and *B. lactucae* Regel f. *ovata* (Saw.) comb. nov. (= *B. ovata* Saw.) on *Crepis japonica*. Recently L. Ling has been studying the Ustilaginales of China.

Mycological studies of considerable interest were conducted by C. Cheo. First, in 1936, he made a study of the fungus *Corticium centrifugum* (Lev) B., the causative agent of a disease of *Pyrus bretschneideri* Rehd. He found that this fungus has two varieties easily distinguishable in pure cultures.

In 1944 he published an article on *Verticillium dahliae* Kleb., first found in Yunan Province on the cotton plant. Then in conjunction with A. Jenkins in 1941 and 1945 he published articles on species of the fungus genera *Elsinoe* and *Sphaeceloma* found in the same province. They described two new parasitic fungi: *Elsinoe dolichi* on *Dolichos lablab* and *Sphaeceloma ricini* on *Ricinus communis*. Finally from 1942 to 1948, C. Cheo made a study of *Collybia albuminosa* (Berk) Petch. and *Xylaria* sp., both parasites in Yunan Province.

The rust fungi were the subject of an investigation by J. Wang. As early as 1934-1936 in conjunction with T. Liou he published a number of articles on the rust fungi among which he described several new species. In 1949, he published a list of 55 species of rust fungi collected in Shensi Province of which 3 were published for the first time: *Melampsora saliciscupularis* on *Salix cupularis*, *Phragmidium taipaihanense* on *Rubus parvifolius* and *Puccinia saussureae-acrophyllae* on *Saussurea acrophylla*.

On the eve of the establishment of the popular government, S. Cheo made collections of fungi for several years in various parts of China. The lists of the fungi which he collected were partially published by C. Hunsford. In 1948, 16 species and two varieties among these fungi were described for the first time. Among them attention is called to *Irenina lonicerae* on *Lonicera* sp., *Irenina quercina* on *Quercus* sp. and others. The other lists of fungi collected by S. Cheo were published by J. Cummins in 1949-1951.

After the establishment of the popular government in China considerable work was done under the direction of F. Tai in compiling a mycoflora of China and in working out monographic handbooks.

Among the mycological articles published recently (1955) we should mention first of all the list of *Fusarium* species compiled by T. Ju. During the course of 26 years he made a study of the various *Fusarium* isolated from numerous species of cultivated plants in China. In his critical article he cited a list of 44 species and 35 varieties, for instance *Fusarium avenaceum* (Fr.) Sacc. v. *fabae* on *Vicia faba*, *F. nivale* (Fr.) Ces. v. *setariae* on *Setaria italica*, *F. oxysporum* f. *fabae* on *Vicia faba* and *F. solani* (Mart.) App. et Wr. f. *fabae* on *Vicia faba*, etc.

Interesting data on the edible mushroom *Tremella fuciformis* Berk, living on the bark of many Chinese trees, particularly on *Quercus*, *Salix* and *Acer*, was given by S. Jang in 1954. Then in 1955, J. Chou published an article on three species of rust fungi collected in Northeastern China among which *Triphragmium laricinum* on *Larix olgensis* is a new species. J. Cheng and K. Chang in 1957 published an article on the technique of collecting, preparing, preserving and shipping fungus specimens.

Thus at present Chinese territory has been given a rather good mycological study. While only approximately 1000 species of all the fungi groups had been recorded by 1920, at present the number exceeds 7000-10,000 species. Much mycological material has been accumulated which makes it possible to start compiling a Mycoflora of China and monographic compendia on the separate groups of fungi. Chinese mycologists are studying the fungi of their country with great enthusiasm. They hope that mycological scientists of the Soviet Union will lend them their experience and knowledge which would be useful for the further development of mycology in the Chinese People's Republic.

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