

## Difference in the distribution of *Cercospora* between Brazil and Japan

*Cercospora* is a genus name of fungus, well known as pathogens for many kinds of crops. Fungus *Cercospora* is host-specific or host-genus-specific, and is widely distributed all over the world. Especially, it is abundant in tropical and subtropical zones.

In Brazil, P. Hennings, E. Rangel, A. Maublanc, etc. reported new species of *Cercospora* in the early 20th century. This seems to be the beginning of study on *Cercospora* in Brazil. In 1934 and 1936, C. Chupp and A. S. Muller reported on the genus, describing 123 species collected in Brazil<sup>6,7</sup>. In 1945, A. P. Viégas published "Alguns Fungos do Brasil—*Cercosporae*" as one of the series of his taxonomic work<sup>8</sup>. He described 102 species of the genus including 28 new species with precise illustrations.

*Cercosporae* in Japan have been thoroughly studied by S. Katsuki on almost all the specimens collected in Japan<sup>2,3,4,5</sup>, and a monograph of Japanese *Cercosporae* was published in 1965<sup>2</sup>.

In the United States, C. Chupp published "A monograph of the Fungus genus *Cercospora*" in 1953, by compiling all *Cercosporae* reported in the world, and making synonyms clear by checking almost all type specimens<sup>1</sup>. According to his classification, 1,419 species were confirmed. After that, many new species were identified year after year.

The writers summarized *Cercosporae* already reported in Brazil, and also identified some new *Cercosporae* collected by them in Brazil for the period of 2 years from February 1974 to March 1976. The present preliminary report deals with the difference in *Cercospora* distribution between Brazil and Japan. Brazilian *Cercosporae* are summarized in Table 1 in comparison with those in Japan, one of the farthest countries from Brazil. The table indicates that 261 species are distributed in Brazil, and 235 species in Japan. Among them, only 73 species are common in both countries.

Table 1. Number of *Cercospora* species distributed in Brazil and Japan

Host family	Distributed in		
	Brazil	both Brazil and Japan	Japan
Compositae	16	7	17
Euphorbiaceae	18	3	9
Gramineae	8	6	8
Leguminosae	31	6	19
Malvaceae	12	5	5
Rosaceae	9	6	11
Solanaceae	12	5	10
Other 24 families	63	35	62
Labiatae	5	0	3
Moraceae	4	0	6
Other 17 families	32	0	30
Bignoniaceae	7	0	0
Juglandaceae	3	0	0
Other 28 families	41	0	0
Caprifoliaceae	0	0	5
Vitaceae	0	0	3
Other 32 families	0	0	47
Total 114 families	261	73	235

Crops have been introduced to each country directly or through other countries. Probably, diseases might be spread together with introduced crops. For example, *Xanthomonas citri* on orange was carried to Brazil by seedlings. In Table 2, *Cercospora* species on main crops common to both countries are summarized. In this Table, 38 species are found common to both countries. This number, is more than half of 73, which is the number of species common to both countries as mentioned above. These species are considered to be introduced together with crops, by seedlings, seeds, etc. Most of these species are common not only in Brazil and Japan, but also in most of the world, such as *C. oryzae* on rice, *C. kikuchii* on soybean, *C. canescens* and *C. cruenta* on bean and cowpea, *C. arachidicola* and *C. personata* on peanut, *C. citrullina* on

**Table 2. Distribution of *Cercospora* species on main crops common to both Brazil and Japan**

Crops	Distributed in		
	Brazil	both Brazil and Japan	Japan
Rice	1	1	1
Corn and sorghum	2	1	2
Italian millet	1	1	1
Potato	1	0	1
Sweet potato	3	2	2
Chinese yam	4	3	5
Soybean	1	1	2
Bean and cowpea	4	2	2
Peanut	2	2	2
Tomato	0	0	1
Eggplant	1	0	2
Pepper	2	1	1
Watermelon	1	1	1
Brassica spp.	1	1	1
Radish	1	0	0
<i>Nasturtium</i>	1	1	1
Asparagus	1	1	1
Burdock	0	0	1
Lettuce	1	1	1
Carrot	1	1	1
Celery	1	1	1
Parsley	1	0	0
Beet and spinach	1	1	1
New Zealand spinach	1	1	1
Okra	3	2	2
Orange	1	1	1
Persimmon	1	1	2
Apple and pear	1	0	0
Quince	1	1	1
Peach	2	2	2
Loquat	0	0	1
Raspberry	1	1	1
Fig	0	0	2
Pomegranate	1	1	1
Chestnut	1	0	0
Tobacco	1	1	1
Mulberry	2	0	1
Tea	1	1	2
Sugarcane	2	2	3
Sesame	1	1	1
Peppermint	1	0	0
Castor bean	1	1	1
Total	54	38	54

watermelon, *C. asparagi* on asparagus, *C. apii* on celery, *C. beticola* on beet and spinach, *C. nicotianae* on tobacco, *C. koepkei* and *C. vaginiae* on sugarcane, *C. sesami* on sesame,

*C. ricinella* on castor bean, etc.

However, even on crops common to both countries, some *Cercospora* species which are specific to each country could be found. These were *C. zeae-maidis* in Brazil (hereafter referred to B) on corn, *C. concors* in Japan (referred to J) and *C. solanicola* (B) on potato, *C. cordobensis* (B) on sweet potato, *C. carbonacea* (B), *C. contraria* (J) and *C. hiratsukana* (J) on chinese yam, *C. caracallae* (B) and *C. vanderysti* (B) on bean, *C. fuliginea* (J) on tomato, *C. deightonii* (J), *C. solan-melongenae* (J) and *C. melongenae* (B) on eggplant, *C. unamunoi* (B) on pepper, *C. cruciferarum* (B) on radish, *C. hibicina* (B) on okra, *C. kakivora* (J) on persimmon, *C. mali* (B) on apple and pear, *C. bolleana* (J) and *C. fici* (J) on fig, *C. castaneae* (B) on chestnut, *C. mori* (J), *C. moricola* (B) and *C. morina* (B) on mulberry, *C. chaeae* (J) on tea, *C. taiwanensis* (J) on sugarcane, *C. menthicola* (B) on peppermint, etc.

Besides the crops mentioned in Table 2, there are still more plants common in both countries, and *Cercospora* species specific to each country were found on them, such as *C. calendulae* (B) on pot marigold, *C. gerberae* (B) on Transvaal daisy, *C. wistariae* (B) on wistaria, *C. populina* (J), *C. salicina* (B) and *C. salicis* (B) on willow, etc.

In view of the different host plant distribution, it is natural that different *Cercospora* species were found on host plants not common to both countries, because the fungus is host-specific. However, regarding the fungus species on host plants common to both countries, it can be said that 1) in spite of the existence of many common host plants, only a limited number of the fungus species are common to both countries, 2) most of these common fungus species seems to be associated with the transportation of plants, and 3) even on the common plants there are many species specific to each country.

Thus, the results obtained indicate that microflora of *Cercospora* in Brazil is, perhaps, originally different from that in Japan, and the species common to both countries might

be introduced by the transportation of plants.

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- 1) Chupp, C.: A monograph of the fungus genus *Cercospora*, Ithaca, New York (1953).
- 2) Katsuki, S.: *Cercosporae* of Japan, *Trans. Mycol. Soc. Japan*, Extra Issue, No. 1, 1-100 (1965).
- 3) Katsuki, S.: *Cercosporae* of Japan (Supplement 1), *Trans. Mycol. Soc. Japan*, 7, 101-105 (1966).
- 4) Katsuki, S.: *Cercosporae* of Japan and allied genera (Supplement 2), *Rept. Tottori Mycol. Inst.* (Japan), No. 10, 561-563 (1973).
- 5) Katsuki, S. & Kobayashi, T.: *Cercosporae* of Japan and allied genera (Supplement 3), *Trans. Mycol. Soc. Japan*, 16, 1-15 (1975).
- 6) Muller, A. S. & Chupp, C.: *Cercosporae* de Minas Gerais, *Arq. Inst. Biol. Veget. Rio de Janeiro*, 1, 213-220 (1934).
- 7) Muller, A. S. & Chupp, C.: Uma segunda contribuição às *Cercosporae* de Minas Gerais, *Arq. Inst. Biol. Veget. Rio de Janeiro*, 3, 91-98 (1936).
- 8) Viégas, A. P.: Alguns fungos do Brasil—*Cercosporae*, *Bol. Soc. Brasil. Agron.*, 8, 1-160 (1945).

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