樹木炭疽病の研究—Ⅱ
キリに寄生する *Glomerella* 菌

伊藤一雄[1]
千葉修[2]

著者らは，キリに激害を与える炭疽病菌 *Gloeosporium Kawakamii* MIYABE の生活圏を調査した際に，炭疽病病斑に *Glomerella* 菌をしばしば見い出した（伊藤・千葉 1952, 1954）。そしてこの *Glomerella* 菌は，あるいは，*Gloeosporium Kawakamii* の完全時代かもしれないと考えて実験を進めたのであるが，その後，この予想は否定された。

さらに，この *Glomerella* 菌のほかに，少数ながらいま1種の *Glomerella* 菌とその *Colletotrichum* 世代をえたのであるが，後者はリンゴその他の果樹類をおかす *Glomerella cingulata* (STONEM.) S. et S. の原記載（STONEMAN 1898）に，形状がまつたく一致することを知つた。

本報文は，著者らがキリにおいてしばしば見い出した *Glomerella* 菌の形態・生理・生態的性質・病原性を *Gloeosporium Kawakamii* および *Glomerella cingulata* と比較した実験結果を述べたものである。

形　態

1. 子嚢時代

本菌の子嚢時代は寄主上および培養基上に形成される。寄主上では特に葉柄にしばしば認められる。

子嚢殻は孤生または群生し，"beak" を突出して寄主の組織内に埋もれ，大きさ 80～120×144～176μ。子嚢殻の "beak" には褐色の毛茸状物をともなう。子嚢は棍棒状で 51～64×8－10μ。子嚢胞子は子嚢内に1列あるいは2列に不規則に並び，楕円形，無色，単胞で大きさ 13～15×4～6μ。側糸あるいは側糸状体を欠く（Plate 1, B, C; Text-fig. 1）。

本菌とこれに近類の *Glomerella cingulata* の大きさを示せば Table 1 のとおりで，すなわち，これら両者間には形状，大きさに若干の差が認められる。*Glomerella cingulata* の子嚢胞子は一般にやや彎曲してバナナ形を呈する（STONEMAN 1898, 鋳方 1942）のに対し，本菌ではほとんど彎曲することなく，また子嚢および子嚢胞子もやや小である。

2. 分生胞子時代

本菌の分生胞子はいまだ寄主上では認められないが，培養基上には多量に形成される。本菌，*Glomerella cingulata* および *Gloeosporium Kawakamii* の分生胞子時代の大きさを示せば Table 2 のとおりで，すなわち，いずれも近似であるが，本菌の分生胞子の大きさは他の2菌よりもやや小である。

3. 胞子内の核

本菌，*Glomerella cingulata* および *Gloeosporium Kawakamii* の分生胞子と子嚢胞子を固定，染色して核の数，形状，大きさをしらべた。各菌の胞子はそれぞれ1核を有し，大きさは 1.5～2μ で，菌の種

(1) 盛岡分場長・農学博士　(2) 保護部樹病科樹病研究室員

類による核数，核の形状および大きさに差はほとんど認められなかつた（Text-fig. 1, D, E; Text-fig. 2; Text-fig.3）。

生理・生態的性質

1. 培養基における菌叢の特徴

馬鈴薯寒天上の各菌の菌叢は，本菌と *Glomerella cingulata* との間には顕著な差は認められないが，これらと *Gloeosporium Kawakamii* でははなはだしい差がある（Table 4, Plate 3）。

2. 培養基上における子嚢時代の形成

本菌および *Glomerella cingulata* は培養基に子嚢殻を多数形成するが，*Gloeosporium Kawakamii* ではまつたく認められない。なお，培養基上に形成される子嚢時代の形態は自然に形成されるものと等しい。

3. 菌糸の発育と温度との関係

供試3菌の菌糸の発育と温度の関係を Petri 皿法によつて調べた結果は Table 5 に示すとおりで，本菌は 25°C を最適温度とするのに対して *Glomerella cingulata* は 28°C である。また，*Gloeosporium Kawakamii* は本菌と等しい発育曲線をえがくが，しかし，発育はきわめておそい点にいちぢるしい差が認められる。

菌糸の発育と温度との関係からみると，本菌は *Glomerella cingulata* とはやや遠く（EDGERTON 1915），むしろ *Gloeosporium Kawakamii* により近い。

4. 分生胞子の低温度に対する抵抗力

本菌と *Gloeosporium Kawakamii* の分生胞子が低温度（0°～2°C）に対する耐度を比較した結果は Table 6 に示すとおりで，本菌では 50 日後には発芽能力を保持するもの皆無に近いが，*Gloeosporium Kawakamii* では約 35% の発芽率を示した。

病　原　性

本菌の病原性を *Gloeosporium Kawakamii* および *Glomerella cingulata* と比較するため，次の接種試験を行つた。

1. キリ実生苗に対する接種試験

2回の実験結果（Table 7）からみて，本菌の病原性は *Gloeosporium Kawakamii* に比べてはなはだ微弱である（Plate 2, A, B, C）。

2. キリ成木の葉柄に対する接種試験

キリの葉柄に対して付傷および無傷接種を試みた。供試菌は本菌，*Gloeosporium Kawakamii*, *Glomerella cingulata* とし，なお *Glomerella cingulata* は著者らがキリから分離した菌株のほかに，リンゴからの菌株も使用した。

3回の実験結果（Tables 8～10）からみると，本菌は無傷接種によつて明らかに病斑を形成し，*Glomerella cingulata* よりもやや強い病原性をあらわすが，*Gloeosporium Kawakamii* に比べればきわめて微弱である（Plate 2, D）。

3. 他の樹種に対する接種試験

モミジバスズカケノキ，カキおよびオニグルミに対して，本菌，*Glomerella cingulata*, *Gloeosporium*

Kawakamii の3菌を接種したが，結果はすべて陰性に終つた。

以上述べた接種試験から本菌がキリをおかすことは明らかであるが，しかし *Gloeosporium Kawakamii* に比べれば，病原性ははるかに微弱である。また，本菌はその病原性において *Glomerella cingulata* といささか差があるようにみられる。

結　　言

キリを侵す最も重要な炭疽病菌 *Gloeosporium Kawakamii* の子嚢時代はまだ発見されていない。著者らは炭疽病病斑に *Glomerella* 菌をしばしば見い出し，あるいはこれが *Gloeosporium* 菌の完全時代かも知れないと考えた。しかし形態・生理・生態的諸実験および接種試験の結果によりこの予想は否定された。

本菌のほかにいま1種の *Glomerella* 菌が少数ながら見い出され，これは分生胞子時代，子嚢時代とも，形態的に *Glomerella cingulata* (STONEM.) S. et. S. 〔*Gnomoniopsis cingulata* STONEMAN〕の記載にきわめてよく一致する。

リンゴの苦腐病（Bitter rot）病原菌としてよく知られている *Glomerella cingulata* は，また多犯性菌で，多くの樹木を侵すことが報告されている。ところで，*Glomerella cingulata* という名称で取り扱われている菌についての多くの論文を比較してみると，原記載とは形態的にかなりの差があるものまで含まれている。それで，著者らは従来諸学者が *Glomerella cingulata* と同定してきた分類学的基準にいささか疑義をもたざるをえない。

著者らの菌は，原記載と比較すれば *Glomerella cingulata* と別種，あるいは，すくなくともこの変種とすべきだと考えられるのであるが，上に述べた事情から種名の決定をしばらく留保しておくことにする。

Kazuo ITÔ and Osamu CHIBA: Studies on Some Anthracnoses of Woody Plants-II
Glomerella parasitic on paulownia trees.

Introduction

As anthracnoses of the paulownia tree (*Paulownia tomentosa* STEUD.), *Gloeosporium Kawakamii* MIYABE (HEMMI 1920, YOSHII 1931—1933) and *Sphaceloma Tsujii* HARA (TSUJI 1926, HARA 1927) have been well known among plant pathologists in Japan.

In the course of studying the life cycle of *Gloeosporium Kawakamii*, the authors have frequently found an Ascomycetous fungus belonging to the genus *Glomerella*. At first the authors presumed that this *Glomerella* might be the perfect stage of *Gloeosporium Kawakamii*, but this assumption was later found to be incorrect by detailed experiments.

Besides this *Glomerella*, the authors have on rare occasions gained another species of *Glomerella* as well as its conidial stage, *Colletotrichum*, on the petioles of the fallen leaves of paulownia trees, which was clearly identified as *Glomerella cingulata* (STONEMAN) S. et S. by the genetic relation between these two stages and the morphological characteristics.

On the fungus the authors have made some comparative studies with *Gloeosporium Kawakamii* and *Glomerella cingulata*, knowing that the authors' *Glomerella* has some different characteristics from these common fungi. Preliminary reports of these studies have been published already (ITÔ and CHIBA 1952, 1954).

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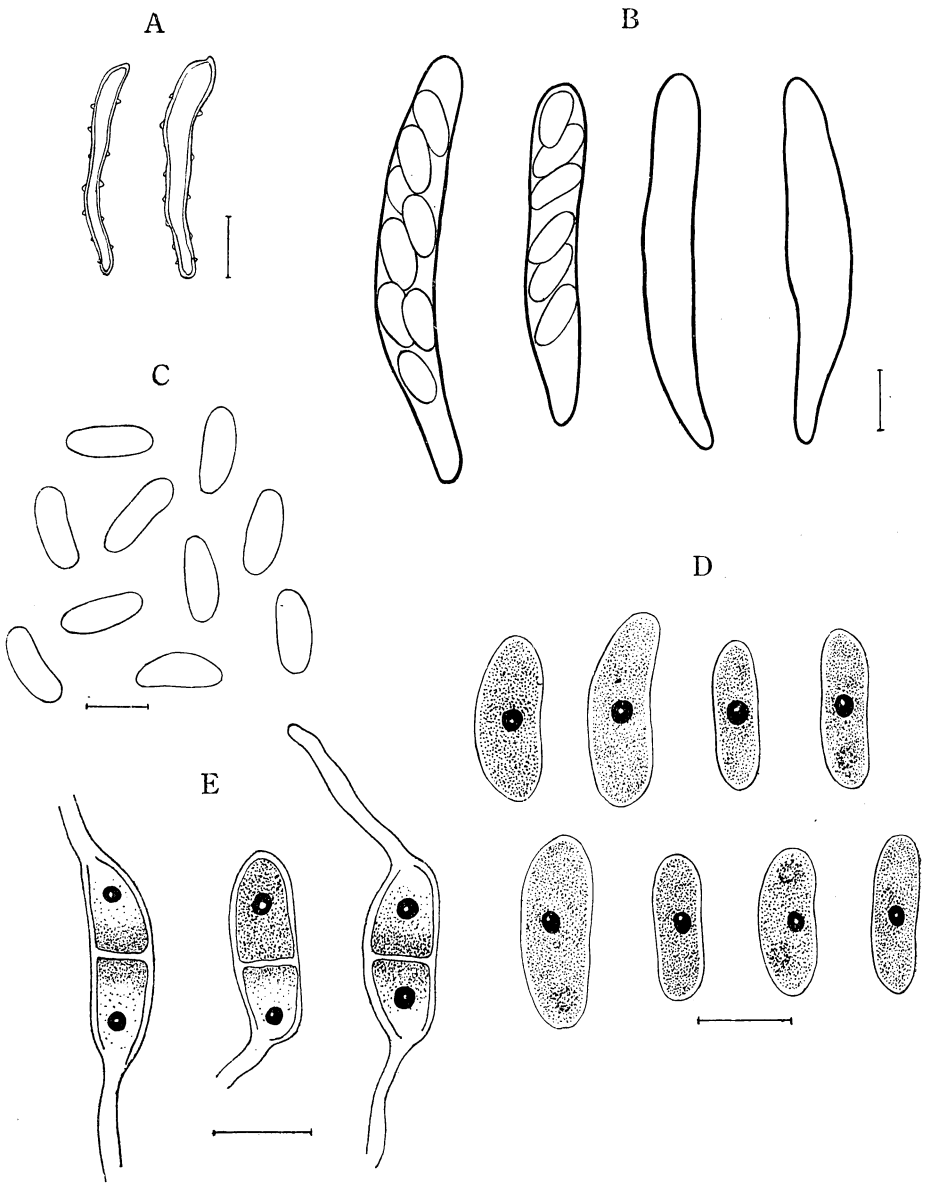
Morphology of the fungus

1. Ascigerous stage

Perithecial stage of each of *Glomerella* sp. and *Glomerella cingulata* occurs naturally, but the best development has been observed on artificial media or on diseased pieces of the host plant kept in a moist chamber (Plate 1, A).

Perithecia distinct or crowded, abundant, buried in the tissue of the host with only the beaks protruding, dark brown to almost black, subglobose to pyriform, 80—120×144—176 μ. Beaks of the perithecia with numerous brown hairs. Asci clavate, 51—64×8—10 μ. Ascospores uni- or biseriate irregularly,



Text-fig. 1. *Glomerella* sp. in perfect stage. (——|=10μ)
A. Hairs on the beak of perithecium, B. Asci and ascospores, C. Ascospores,
D. Ascospores stained with HEIDENHAIN'S iron-alum haematoxylin,
E. Germinating ascospores stained with HEIDENHAIN'S iron-alum haematoxylin.

elliptical, unicellular, hyaline, 13—15×4—6 μ. Paraphyses or paraphysoides none (Plate 1, B, C: Text-fig. 1).

Dimensions of the authors' *Glomerella* and an allied species, *Glomerella cingulata*, in the perfect stage are summarized in table 1.

As shown in table 1, between *Glomerella cingulata* and authors' *Glomerella*, there can be seen some differences in the shape of ascospore and the size of ascus and ascospore. Ascospores of *Glomerella cingulata* are generally curved

Table 1. Dimension of *Glomerella* sp. and *Glomerella cingulata* in perfect stage (μ).

Fungus	Host	Perithecium	Ascus	Ascospore
Glomerella sp. (Itô & Chiba)	*Paulownia*	144～176×80～120	51～64×8～10	13～15×4～6
Glomerella cingulata (Itô & Chiba)	*Paulownia*	——	68～71×10～12	21～23×4～5
Glomerella cingulata (Stoneman '98)	*Ligustrum*	250～320×150	64×14	20～28×5～7

and elongate (banana-shape), while those of *Glomerella* sp. are rarely curved and elliptical. In the size of both ascus and ascospore, the former is larger than the latter (Stoneman 1898, Ikata 1942).

2. Conidial stage

The conidial stage of *Glomerella* sp. has never been found on the host plant, but the conidia of the fungus were produced abundantly on agar-media.

Results of the measurement for the dimension of each of *Glomerella* sp., *Glomerella cingulata* and *Gloeosporium Kawakamii* are shown in table 2.

Table 2. Results of measurement for the dimension of anthracnoses of paulownia tree in conidial stage (μ).

Fungus	Host	Acervulus	Conidiophore	Conidium	Seta
Glomerella sp.* (Itô & Chiba)	*Paulownia*	——	——	12～19×4～5	——
*Glomerella cingulata*** (Itô & Chiba)	*Paulownia*	500～1500	21～23×5～6	24～28×6～7	96～132×6～7
*Glomerella cingulata*** (Ikata 1942)	*Diospyros*	99～250	14～50×4～5	13～25×4～6	33～165×4～5
*Gloeosporium Kawakamii*** (Itô & Chiba)	*Paulownia*	100～200	15～20×5～6	18～21×4～6	
*Gloeosporium Kawakamii** (Itô & Chiba)	*Paulownia*	——	——	18～22×4～6	

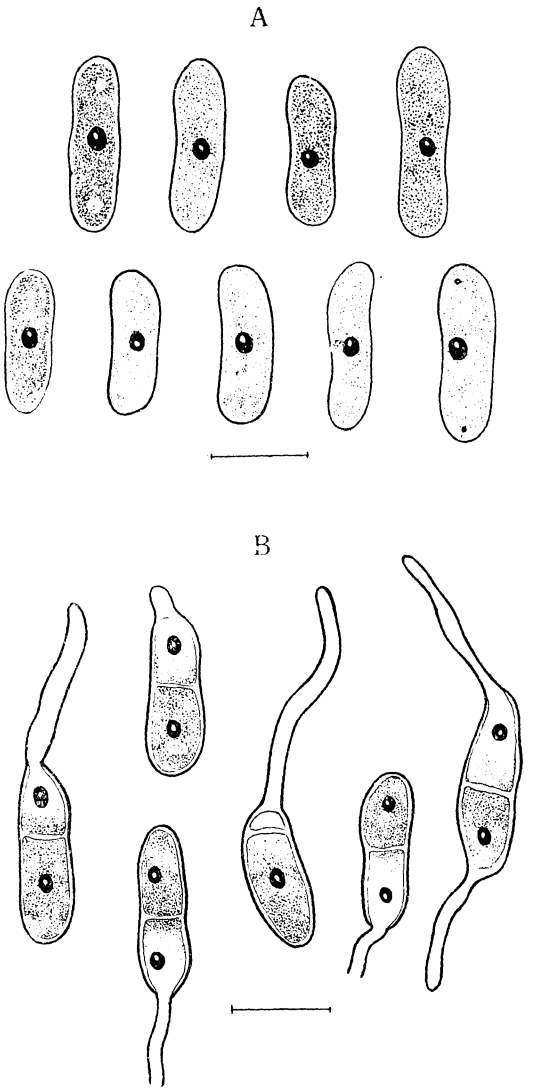
Notes: *....On agar-medium,　　**....on host plant.

It is clear from table 2 that conidia of *Glomerella* sp. are cylindrical or elliptical and very similar to each of *Glomerella cingulata* and *Gloeosporium Kawakamii* in shape, but rather smaller in length than the other two fungi.

3. Nucleus in the spore

A modified Fukano's (1932) procedure was employed by using 2 per cent glucose agar (Itô 1949) to observe nucleus in the spore. The spores smeared on the agar film on the slide were fixed in Sass' (1929) solution (1 per cent glacial acetic acid 40 cc., formalin 10 cc., 95 per cent alcohol 50 cc.), and for the staining Heidenhain's iron-alum haematoxylin was used. Germinating spores were also fixed and stained with the same methods.

Conidia of *Glomerella* sp., *Glomerella cingulata* and *Gloeosporium Kawakamii* as well as ascospores of the former two fungi contain usually one nucleus. The nucleus is globular or ovoid in shape and 1.5—2 μ in size. There were no



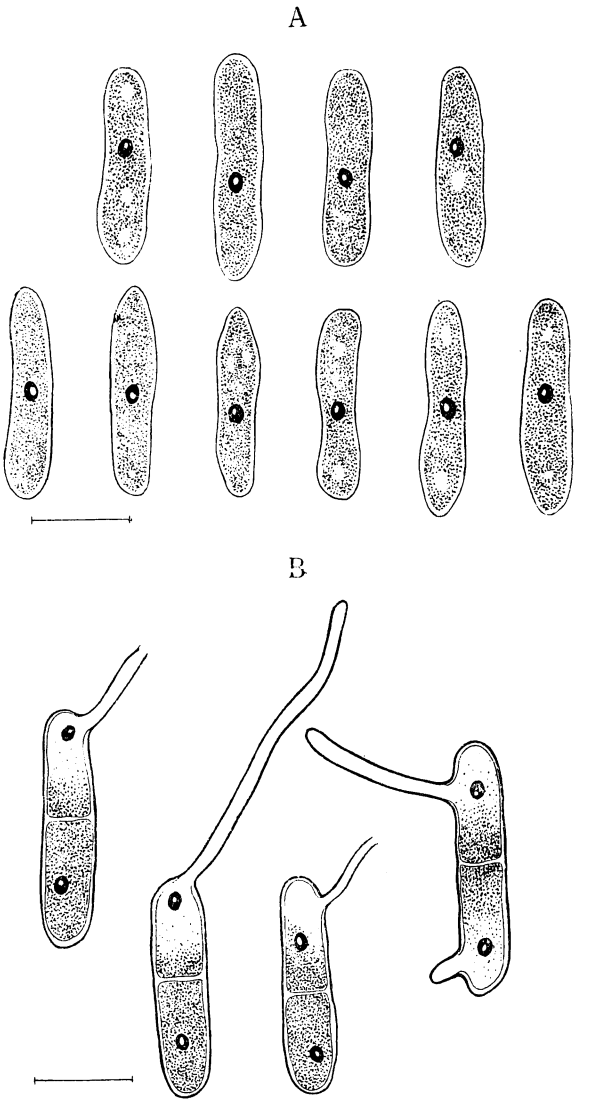
Text-fig. 2. Conidia of *Glomerella* sp. produced on potato agar. (⊢——⊣=10μ)
A. Conidia stained with HEIDENHAIN'S iron-alum haematoxylin,
B. Germinating conidia stained with HEIDENHAIN'S iron-alum haematoxylin.

remarkable differences in shape, number and size of nucleus among the spores of all these fungi (Text-fig. 1, D, E; Text-fig. 2; Text-fig. 3).

Physiological characters of the fungus

1. Isolation of the fungi

Monosporous isolates were obtained by a modification of YOSHII'S (1933) method using 2 per cent aqueous solution of copper sulphate to avoid bacterial contamination. Isolates used in the experiments are shown in table 3.



Text-fig. 3. Conidia of *Gloeosporium Kawakamii* produced on potato agar. (⊢——⊣=10μ)
A. Conidia stained with HEIDENHAIN'S iron-alum haematoxylin,
B. Germinating conidia stained with HEIDENHAIN'S iron-alum haematoxylin.

Table 3. Isolates of the fungi used in the experiments.

Fungus	Host		Source of isolation	Date of isolation
	Host species	Part of host		
Glomerella sp.	*Paulownia*	Petiole of fallen leaf	Ascospore	Oct., 1950
Glomerella cingulata	*Paulownia*	Petiole of fallen leaf	Ascospore	Dec., 1951
Glomerella cingulata	*Paulownia*	Petiole of fallen leaf	Conidium	Dec., 1951
Gloeosporium Kawakamii	*Paulownia*	Petiole of living leaf	Conidium	July, 1951

Table 4. Macroscopic appearances of the mycelial colonies on potato-sucrose agar.

Fungus	Source of isolation	Macroscopic appearances of the colonies
Glomerella sp.	Ascospore	Mycelial growth is very well. At first colony with abundant aerial mycelium is whitish and later becomes grayish green to dark green in color. Conidial masses in salmon pink are produced abundantly.
Glomerella cingulata	Ascospore	Mycelial growth is well. Central part of the colony is gray to dark green, lacking in aerial mycelium. Marginal part of the colony is whitish and rich in aerial mycelium. Pinkish conidial masses are produced abundantly.
	Conidium	*Ditto.*
Gloeosporium Kawakamii	Conidium	Mycelial growth is very slow. Colony is like yeast or bacterium, and lacking in the growth of aerial mycelium. Central part of the colony is dark olivaceous. Conidial masses in salmon pink are produced abundantly.

2. Macroscopic appearances of the fungi on agar-medium

The fungi shown in table 3 were cultured on potato-sucrose agar (distilled water 1000 cc., potato 200 g., sucrose 20 g., agar-agar 20 g.) at 25°C. Macroscopic appearances of the fungi observed at the end of 10 days are summarized in table 4 (Plate 3).

3. Production of ascigerous stage on agar-medium

The isolates listed in table 3 were cultured on potato-sucrose agar in test tubes and kept at 25°C. All of them except *Gloeosporium Kawakamii* produced the ascigerous stages on agar-medium as follows:

Glomerella sp.....mature perithecia appeared in about 3 weeks.

Glomerella cingulata isolated from ascospore....mature perithecia were found in 25-day-old cultures.

Glomerella cingulata isolated from conidium....mature perithecia were obtained after 30 days.

Gloeosporium Kawakamii....ascigerous stage never appeared even after 6 months.

Perithecia and ascospores of each of the fungi produced on agar medium are very similar to those found in nature.

4. Relation between the mycelial growth and the temperature

Temperature relations of *Glomerella* sp. for comparison with the other anthracnoses were tested by the plate culture method with Petri dishes containing potato agar. The results of the experiments at each temperature were determined by taking the averaged diameters of 10 colonies in Petri dishes.

The influence of temperatures upon the mycelial growth of each of the

Table 5. Effects of temperature on mycelial growth of the fungi.

Fungus	Source of isolation	Diameter of mycelial colony (mm)							
		Temperature (°C)							
		10	15	20	25	28	30	35	40
Glomerella sp.	Ascospore	16	37	57	**79**	66	32	7	0
Glomerella cingulata	Ascospore	8	25	47	67	**76**	56	18	0
Glomerella cingulata	Conidium	8	28	46	64	**77**	55	16	0
Gloeosporium Kawakamii	Conidium	5	9	16	**20**	18	8	+	0

anthracnoses at the end of 5 days is summarized in table 5.

As shown in table 5, the optimum temperature for the mycelial growth of *Glomerella cingulata* from the paulownia tree is about 28°C, and this result agrees well with that of the bitter rot fungus given by EDGERTON (1915), while that for each of *Glomerella* sp. and *Gloeosporium Kawakamii* lies equally at about 25°C.

It will also be seen from table 5 that the cardinals for the mycelial growth of *Glomerella* sp. are accordant with those for *Gloeosporium Kawakamii*, but the former's growth is considerably larger than that of the latter.

5. Durability of conidia to low temperature

Glomerella sp. and *Gloeosporium Kawakamii* were cultured on potato-sucrose agar at 25°C. After 10 days' incubation, conidia produced on the medium were used in the experiment. Drops of the conidial suspensions were placed on the slides and dried in the laboratory. The slides were held at a temperature of approximately 0°C. (0°~2°) for 50 days, and during this period germination tests were made at the desirable intervals.

Data obtained by this experiment (at 25°C., after 48 hours) are summarized in table 6.

Table 6. Effects of low temperature on the germinability of conidia.

Period exposed to low temperature (days)	Germination percentage (%)	
	Glomerella sp.	*Gloeosporium Kawakamii*
0	55	83
1	13	73
3	12	70
5	7	44
7	3	50
10	8	47
15	4	55
20	3	53
25	6	38
30	1	42
40	0.8	36
50	0.5	35

From table 6, it is clear that the conidia of *Gloeosporium Kawakamii* is remarkably resistant to the low temperature, while those of *Glomerella* sp. is

very sensitive and, therefore, between these two fungi, there are considerable differences in durability to the low temperature.

Pathogenicity of the fungus

In order to test the pathogenicity of *Glomerella* sp. as compared with *Gloeosporium Kawakamii* and *Glomerella cingulata*, some inoculation experiments were performed on paulownia seedlings and petioles of the same adult tree.

1. Inoculation to the paulownia seedlings

Experiment—1. On September 6, 1951, potted healthy seedlings (sowed in May, 1951) were sprayed with the conidial suspensions by means of an atomizer, then being covered with bell-jars for 2 days. The check-plants were sprayed with sterilized water instead of the conidial suspensions. Results of the experiments made with *Glomerella* sp. and *Gloeosporium Kawakamii* are summarized in table 7 (Plate 2, A, B, C).

Table 7. Inoculation experiments on paulownia seedlings.

Fungus	Result of the experiment
Glomerella sp.	Lesions were produced on some of the leaves 6 days after inoculation, and then diseased leaves were dried and curled. Progress of the damage was very slow, and the lesions were not produced on the stems. None of the seedlings except several small ones was killed by the fungus even at the end of 25 days.
Gloeosporium Kawakamii	A large number of brown and water-soaked lesions were produced on almost all of the leaves on the 3rd day after inoculation. The fungus attacked not only the leaves but also the stems. As the damage caused by this fungus was very severe, the seedlings were killed 10 days after inoculation.
Check	All of the check seedlings remained healthy.

Experiment—2. On September 23, 1951, another experiment was made on the seedlings. Results obtained were the same as those of Experiment—1.

2. Inoculation to the petioles of the adult trees

Experiment—3. On July 21, 1951, healthy petioles of the adult paulownia trees were inoculated with *Glomerella* sp. and *Gloeosporium Kawakamii*. The methods of inoculation made here are the same as those applied by TOGASHI (1924) and ITÔ (1950). The surfaces of the petioles were carefully treated with 80 per cent alcohol, 0.1 per cent aqueous solution of mercuric chloride, and washed several times with sterilized distilled water; then, in the case of wound inoculation, small slits were incised with a sterilized scalpel on the petioles. Heavy conidial suspensions made by dissolving the fresh conidia produced on potato-sucrose agar in sterilized distilled water were introduced into the incisions, or were smeared on the surface with the aid of sterilized platinum loops. Similar incisions, to serve as checks, were made in other petioles, but a few

drops of sterilized distilled water were applied instead of the conidial suspensions. The inoculated parts were covered with moist absorbent cotton and paraffin paper for 48 hours.

The results of the experiment at the end of 2 weeks after inoculation are given in table 8.

Table 8. Results of the inoculation to petioles of adult paulownia trees—1.

Fungus	Treatment	Number of petioles inoculated	Number of petioles infected
Glomerella sp.	Wounded	20	2
	Non-wounded	30	2
Gloeosporium Kawakamii	Non-wounded	50	26
Check	Wounded	20	0
	Non-wounded	30	0

Experiment—4. On July 23, 1952, inoculations to the petioles of the adult paulownia trees were repeated by the same method as that of Experiment—3. In this experiment, the inoculated parts were covered with moist absorbent cotton and paraffin paper for 7 days, and the fungi used were as follows: *Glomerella* sp., *Glomerella cingulata* isolated from paulownia tree, *Glomerella cingulata* from the apple tree* and *Gloeosporium Kawakamii*.

Results obtained at the end of 3 weeks after inoculation are shown in table 9.

Table 9. Results of the inoculation to petioles of adult paulownia trees—2.

Fungus	Treatment	Number of petioles inoculated	Results of inoculation	
			Number of petioles infected	Infection percentage(%)
Glomerella sp.	Wounded	64	11	17
Glomerella cingulata[1)]	do.	30	2	7
Glomerella cingulata[2)]	do.	30	0	0
Gloeosporium Kawakamii	do.	52	43	83
Check	do.	50	0	0

Notes: 1)....isolated from paulownia tree, 2)....isolated from apple tree.

Experiment—5. On August 5, 1952, the shoots of the paulownia tree bearing several leaves were brought into the glass house and placed in water in flasks.

Table 10. Results of the inoculation to petioles of cut shoots of paulownia tree.

Fungus	Number of petioles inoculated	Number of petioles producing fruit-bodies of the fungus
Glomerella sp.	22	15
Glomerella cingulata[1)]	15	3
Gloeosporium Kawakamii	12	10

Note: 1)....isolated from paulownia tree.

* This culture was kindly supplied by Mr. T. YANO, of Yamanashi Agriculture Experiment Station.

Petioles of the cut shoots were immediately inoculated with the fungi by the same method mentioned above, and the inoculated parts were kept in a moist condition for 3 days. On August 11, the inoculated petioles were removed from the shoots, and then they were placed in moist chambers for 2 days to examine the formation of fruitbodies of the fungi on the inoculated parts.

Results of the experiment are given in table 10.

3. Inoculation to the other trees

Experiment—6. It is the purpose of this experiment to ascertain whether the authors' *Glomerella* and the allied fungi, *Glomerella cingulata* isolated from *Paulownia* and *Gloeosporium Kawakamii*, can infect some other species of plants. On July 28, 1952, the potted seedlings of the following kinds of trees were inoculated with the fungi by the ordinary atomizing method: *Platanus acerifolia*, *Diospyros Kaki* and *Juglans Sieboldii*.

Results of the experiment observed on August 20 showed that pathogenicity of the fungi to these tree species was all negative.

It is obvious from the foregoing results of the inoculation experiments that the pathogenicity of *Glomerella* sp. to the paulownia tree was proved by the authors, but it is remarkably weaker than that of *Gloeosporium Kawakamii*. Furthermore, it is also known that there may be some differences in pathogenicity between the authors' *Glomerella* and the fungus treated as *Glomerella cingulata*.

Conclusion

The ascigerous stage of *Gloeosporium Kawakamii* Miyabe, the most important and virulent anthracnose of the paulownia tree, has not been discovered up to the present time. The authors frequently observed a fungus belonging to the genus *Glomerella* near the lesions caused by *Gloeosporium Kawakamii*. Since many species of *Glomerella* have been described as the perfect stages of *Gloeosporium* or *Colletotrichum*, it was presumed by the authors that there will be a possible connection between these two fungus forms. But, this presumption was denied by the experiments, because there were clearly remarkable differences in morphological and physiological characteristics as well as pathogenicity between these two fungi.

On the petioles of the paulownia fallen leaves the authors have found in rare instances another *Glomerella*, which was identical with *Glomerella cingulata* (Stoneman) S. et S. by its morphological and physiological characteristics. *Glomerella cingulata*, the causal organism of the bitter-rot of apples, is well known as an omnivorous facultative parasite, occurring on a wide range of host plants including many woody species (Edgerton 1908, 1909, Mix 1925, 1930, Ocfemia and Agati 1925, Small 1926. Dodge 1927, Tunstall 1935, Fowler 1947, Ikata 1942, Prihoda 1949, Weimer and Dunegan 1949, Dunlap 1950, Dunegan and Petersen 1951, Baxter and Plakidas 1954, etc.).

Considered from the original description made by Stoneman (1898) and

SACCARDO (1902), there are distinct differences in shape and size of ascospores between *Glomerella cingulata* (*Gnomoniopsis cingulata* STONEM.) and the authors' *Glomerella*. However, as has been shown by various investigators, many of the anthracnoses found on different hosts are treated as members of a single species, *Glomerella cingulata*, despite a large deviation in morphology among them (LEHMAN 1926, OCFEMIA and AGATI 1925, TUNSTALL 1935, etc.). Although the authors have here many doubts regarding taxonomical basis for *Glomerella cingulata*, the *Glomerella* under consideration is very similar in morphological characteristics to the fungus parasitic on avocado (*Persea gratissima*), mango (*Mangifera indica*) and upo (*Cucurbita pepo*), which was identical with *Glomerella cingulata* by OCFEMIA and AGATI (1925).

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GOVERNMENT FOREST EXPERIMENT STATION
MEGURO, TOKYO, JAPAN.

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Explanation of plates

Plate 1

A, A petiole of paulownia tree attacked by *Glomerella* sp. ×3.5

B, Perithecia of *Glomerella* sp. ×150

C, *Ditto*. ×310

Plate 2

Results of inoculation experiments with *Glomerella* sp. and *Gloeosporium Kawakamii* to paulownia trees.

A—C, Inoculation to paulownia seedlings.

A, *Glomerella* sp.; B, *Gloeosporium Kawakamii*; C, Check.

D, Inoculation to petioles of adult paulownia trees.

a, *Glomerella* sp., (wound inoculation),

b, *Glomerella* sp., (non-wound inoculation),

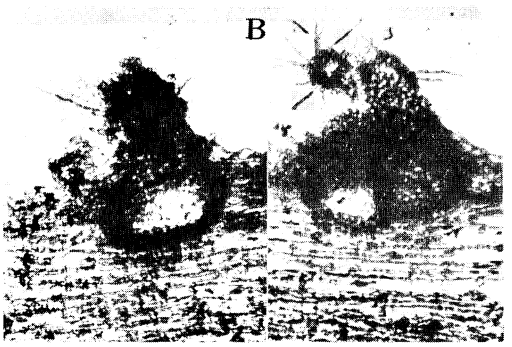
c, *Gloeosporium Kawakamii* (non-wound inoculation).

Plate 3

Mycelial colonies of *Glomerella* sp. and *Gloeosporium Kawakamii* on potato-sucrose agar at 25°C., after 7 days' incubation.

A, *Glomerella* sp.,　　B, *Gloeosporium Kawakamii*.


A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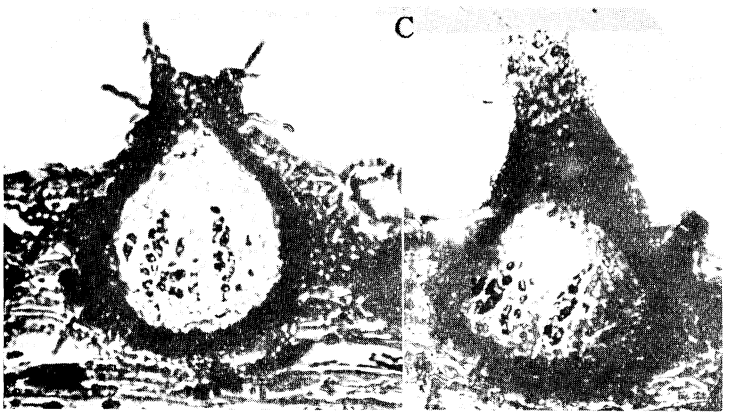
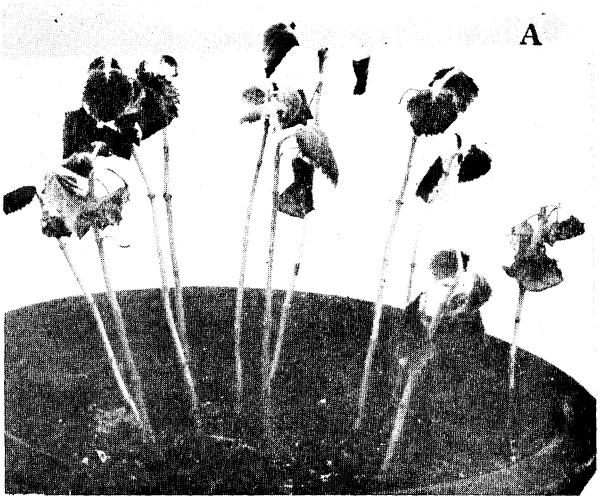
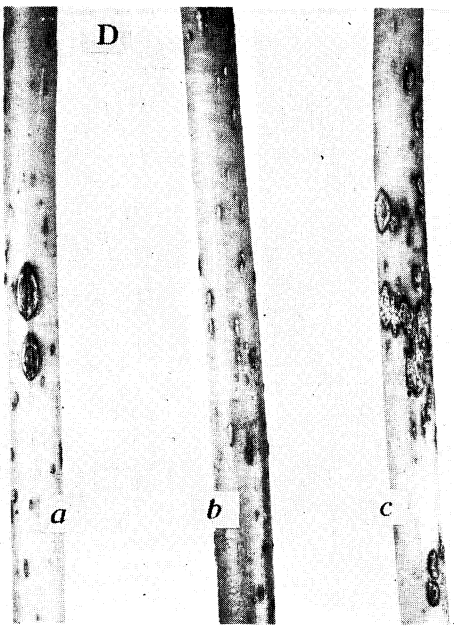

C

—Plate 2—





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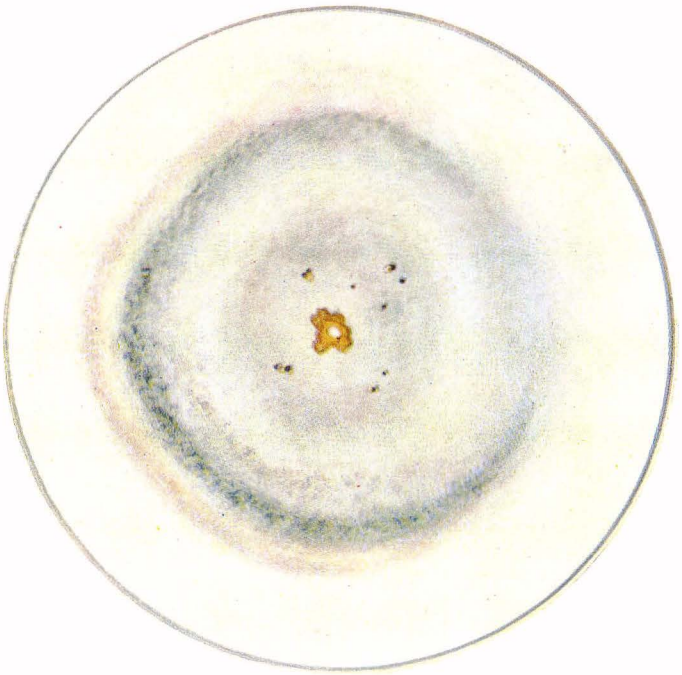

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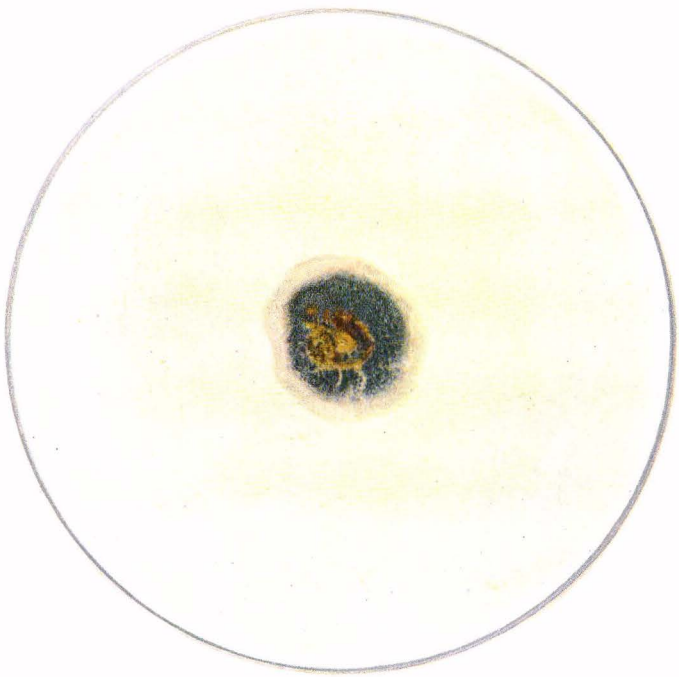

del. Huzisima.