A Canker Disease of *Prunus Mume* and *P. Persica* caused by a Species of *Camarosporium*

By

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In May 1915, Prof. S. ITO found that about two third of the three thousand seedlings of *Prunus Mume*, which had been planted at Maruyama-park in Sapporo, were affected and killed by a species of *Camarosporium*. He called attention of the public through a local newspaper on the outbreak of a new serious disease to the Mume-plum. In April 1921, he placed on my hand the disease for study, stating that it has since been occurring every year and at times causing a considerable damage to the Mume-plantations in the vicinity of Sapporo. Among thirty seedlings of *Prunus Mume*, which were bought from a nursery man at the beginning of my experiments, eighteen had already been affected by this disease. It shows clearly that the disease was not only very serious, but widely distributed at that time. In May 1923, many seedlings of *Prunus Persica* in the orchard of Hokkaido Imperial University were also badly affected by a disease not yet known to us. After careful examination we found the causal fungus of the disease is the same as that of the Mume-disease just mentioned.

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DESCRIPTION OF THE DISEASE.

The disease occurs on the trunks as well as young shoots of *Prunus Mume* and *P. Persica*, especially being serious to the young shoots and seedlings of the former plant. The symptoms on the trunks and shoots are not the same in outer appearance. In late autumn, no one could find this disease on any one year old shoots and seedlings, even in the orchards affected severely, but in the

next spring, these shoots and seedlings mostly present external symptoms of the disease. Of the two year old seedlings, the most vigorous ones are the most serious in damage.

The first symptom on young shoots or seedlings appears as a long elliptical, gray to whitish discolored spot around a leaf-scar, with one to three blackish lines on its border, and roughened by the concentric or scattered small black blisters, the pycnidia of the causal fungus. These spots are often confluent and sometimes entirely girdle the shoots. On the tip of shoots, the spots are sometimes provided with many longitudinal folds. The pycnidia gradually protrude through the bark presenting the appearance of small lenticels. The part above the diseased spot of the shoot does not produce any leaf and dries up gradually. Hence, these dead twigs are very conspicuous in the blooming or leafy season.

The disease occurs on the every part of the trunk, especially on the limb portion. The diseased parts turn to blackish brown in color and sometimes are provided with many cracks, and present quite a different appearance from those on the shoots or seedlings. In its later stages, these portions become softer in texture and slightly sunken, often accompanied with an exudation of yellowish brown semitransparent gum. At first, the pycnidia are covered by the bark and then they gradually protrude through it. The part above the diseased portion of the trunk is gradually weakened and dies out. When the basal part of the trunk is attacked by this fungus, a whole tree will die sooner or later.

CAUSAL FUNGUS.

The organism involved in the production of the canker has been found to be identical with the fungus described by MAUBLANC as *Camarosporium Persicae*. He described this fungus on peach tree. In our districts, *Prunus Mume* seems to be more susceptible to this disease, and its causal fungus was proved to be identical with that of peach tree canker.

The pycnidia are depressed globose or globose in shape and measure $224-351=378-420\ \mu$. The wall is comparatively thick and brown in color. When matured, a blackish brown mass of spores may be frequently seen on their apices, especially in moist weather. Spores are born singly on the short pedicels on the inner wall of pycnidia. These spores are easily liberated from pedicels after maturity. They are piriform or ellipsoidal, one celled and hyaline

at first, but turn to light brown, brown or blackish brown in color and produce one to three longitudinal and two to five transversal septa, forming mostly ten to fourteen cells. They measure 14.5–24 = 7.8–12.8 μ .

Mycelium grows in the cortical tissue and cambium as well as in the xylem portion. The infected area may be easily detected by a brownish discoloration on the cut surface of twigs at a glance.

CULTURAL STUDIES.

The fungus is easily isolated by removing the spores which ooze out in a blackish brown mass from the pycnidia on diseased twigs. These twigs for this purpose need to be sterilized with corrosive sublimate solution and washed with distilled water, and placed in moist chamber.

The following cultural media have been used in this experiment.

- I. Agar cultural media:—apricot agar, soy agar and host-plant decoction agar.
- II. Cultural solutions:—host-plant decoction, (a) sterilized with steam, and (b) filtered with Chamberland filter.
- III. Sterilized host-plant twigs.

On the agar media used, the fungus presents a similar appearance, showing a dense white mycelial mass, but the growth is very slow and ceases when the mass attained to about 1 mm. in diameter. The fungus, however, does not die out during at least one year in this state, without any production of spore.

In the host-plant decoction, the growth is comparatively better than that on the agar media, especially in the filtered solution, in which the diameter of the mycelial mass attains to about 2.5 mm., while in the heat sterilized one to about 1.5 mm. In these cultures, the growth becomes slower gradually and ceases after two weeks. In this case, it does not also produce any spore, at least in one year.

On the sterilized twigs, white aerial hyphae are produced after one week and continue the growth, but do not cover the whole surface of the twig. After six months, the hyphae turn to grayish in color with some light brownish parts. On the fourteenth month (December 1923—February 1925), mature pycnidia were produced under the aerial hyphae. These facts show that the fungus in question is a very slow growing one, and takes a long time for the formation of its pycnidium.

GERMINATION OF SPORES.

The matured spores were sown in a drop of sterilized tap water. The spores at first swell up in considerable degree on the second or third day of culture and germinate in the third or fourth day, putting out one to four germ-tubes. Then, the branching and septation of the hyphae resulting from the growth of the germ-tubes take place, and the swelling of the spores becomes more enormous, attaining about four times the size of non-germinated ones. The hyphae often produce finger-like processes on the tip.

INOCULATION EXPERIMENTS.

Among thirty two year old seedlings which were prepared for the purpose of the experiments, eighteen seedlings were found to have already been attacked by this fungus, as above stated. The diseased parts on the affected seedlings were carefully carved or cut off and the wounds thus produced were sterilized with corrosive sublimate solution. On the fiftieth day after the operation, these potted seedlings were used for the inoculation experiments, after having ascertained that they are perfectly free from the disease.

Experiment I. (Aug. 31, 1921).

The places of inoculation were as follows :—

- 1) in wounds on internodes
- 2) in wounds on leaf-scars
- 3) on leaf-scars, after the leaves being picked off
- 4) on intact bark

These wounds were made with a sharp sterilized knife and the spores, which had oozed out from the pycnidia in a moist chamber, were applied with a sterilized needle. The inoculated portion was covered with moist absorbent cotton and all was bound up with oil paper. Twice per day, distilled water was poured from the upper part of the bandage for the sake of moisture and these pots were placed outdoors. The result of this experiment is all negative and there is no sign of infection until late autumn.

Experiment II. (Nov. 2, 1921).

The places of inoculation were as follows :—

- 5) on burnt bark of leaf-scars
- 6) on burnt bark of internodes

- 7) on leaf-scars, after the leaves being picked off
- 8) on intact bark

The spores obtained from a Mume-twigg collected at the Maruyama-park, and suspended in sterile distilled water, were applied to the above mentioned places. Other process of inoculation is the same as in the case of Experiment I. The pot of the seedlings used in this experiment as well as in the above were buried in soil and let under snow during winter. Examination in the next spring showed that all the seedlings of Experiment I. remained healthy, while nos. 5, 6 and in Experiment II. were infected, producing the characteristic spots with small blisters here and there on the inoculated bark. From all these artificially inoculated parts, the fungus was examined under microscope and proved to be *Camarosporium Persicae*.

Experiment III. (Dec. 2, 1923).

Six pots of Mume-seedlings were used in this experiment. They were wounded on leaf-scars with a sterilized knife, and the bark was burnt with alcoholic flame. The spores oozed out from pycnidia in moist chamber were introduced to the wounds with a sterilized needle, the other process of inoculation being the same as in the case of the above experiments. In the next spring, three seedlings were found to be successfully infected, and three others gave negative results.

At the same time, inoculation was made also upon apple seedlings with the spores of this fungus. It gave negative results, though the spores were applied to the artificial wounds.

The inoculation experiments herein reported upon show the fungus is a wound parasite and possibly can attack the host plants only in late autumn.

CONTROL MEASURES.

No attempts to control the canker disease have been made in orchard, but the results of the inoculation experiments show, that the most important precaution for its prevention is to prevent external wounds on the bark, especially those on the limb portion of aged trees, and all dead twigs must be cut off carefully. For its cure, carving off the diseased parts and then sterilized of the wounds with corrosive sublimate or copper sulphate solution are advisable. A special attention for the disease is also needed at the time of buying the seedlings.

SUMMARY.

The disease is a serious one to *Prunus Mume* and *P. Persica*, especially to the seedlings of the former, at least in the vicinity of Sapporo.

Causal fungus is identical to *Camarosporium Pericae* MAUBL.

The fungus is a wound parasite.

The growth of the fungus is very slow on various cultural media.

Control measures are also discussed.

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梅 及 ビ 桃 ノ 癌 腫 病

摘 要

本病害ハ大正四年五月札幌ニ於テ梅樹ノ苗木ニ認メラレタルヨリ以後年々梅樹ニ發生シ、時ニ大害ヲナシツ、アル所ノモノナリ。尙大正十二年五月ニ至リ北海道帝國大學農學部所屬果樹園ニ於ケル桃樹ニモ發生シ、大害ヲナセルモノニシテ、極メテ注意スベキ病害ノ一ナリトス。

二年生ノ枝ニ於テハ葉痕部ヲ圍繞シテ長橢圓形灰白色ノ病斑ヲ生ジ、其部内ニ同心圓狀又ハ不規則ニ散在セル小黑點隆起シ來リ、該被害部ヨリ上部ハ枯死スルヲ常トス。成木ニ於テハ樹幹ノ分岐部ニ多ク發病シ、表皮黑褐色ニ變ジ幾分凹陷シ、樹脂ヲ分泌スルコト多シ。後皮部ヲ破リ病原菌ノ子殻ハ小皮目ノ如キ觀ヲ呈シテ外出ス。此ノ場合ニ於テモ病勢進ムトキハ上部枯死スルヲ以テ、若シ本幹ノ基部ニ發病セバ全樹枯死スルニ至ル。

本病々原菌ハ *Camarosporium Persicae* MAUBL. ニシテ一九〇七年桃樹ニ寄生スルモノトシテ MAUBLANC 氏ノ記載セルモノニシテ未ダ梅樹ニ寄生スルヲ報ゼルモノナシ。子殻ノ孔ヨリ湧出スル胞子ヲ取リテ種々ナル培養基上ニ培養スルニ其發育一般ニ不良ニシテ殊ニ子殻生成ノ遅々タルモノナルヲ認メタリ。

本菌ノ胞子ヲ取リテ接種試験ヲナシタル結果ヨリ見ルトキハ、決シテ健全ナル樹皮ヲ貫キテ侵入スルコトナク必ズ損傷ノ存スルヲ必要ナルモノニシテ、其接種ハ晩秋ニ於テ行ハル、モノナルヲ知ル。從ツテ本病豫防ノ方法トシテハ損傷部ヲ生ゼシメザルヲ必要トシ、治療ノ目的ニハ被害部ヲ去リ其傷口ニ千倍昇汞水ヲ塗布スルヲ可トス。