

Peziza Willkommii, R.H., on Larix occidentalis,
Nutt., and Larix leptolepis, Gord.

BY

A. W. BORTHWICK, D.Sc.,
LECTURER ON FOREST BOTANY, UNIVERSITY OF EDINBURGH.

With Plate LV.

THE principal aim in silviculture, as well as in the sister sciences of horticulture and agriculture, is not merely to grow plants, but rather to direct their development in such a way that they will produce the most useful material. This necessitates a certain amount of interference with the plant's natural course of development and habit of life. It is not always possible to avoid placing the plants in somewhat unnatural positions, and, again, a large number of individuals of the same species are frequently grown in close proximity to each other. Cultivated plants are thus not under the same conditions as those which grow naturally. The less we interfere with nature and allow the plants to grow under as natural conditions as artificial cultivation will permit, the better will be the results. This is a fact of great importance, especially in silviculture, where the trees require a long period in which to complete their development.

In horticulture and agriculture the case is slightly different. Here the plants are not so long lived, and consequently not exposed to such a prolonged strain. Under cultivation, plants tend to become less resistant in regard to their natural enemies in the shape of insects and fungi. Consequently they are more liable to be affected by epidemic diseases which may cause large pecuniary loss not only to the cultivator, but to the country at large.

Plant pathology is concerned with the disease of plants just as medicine and veterinary science is concerned with the cure of disease of man and animals. The plant pathologist's scope is, however, more limited. Individual attention cannot be given to each plant in a forest, and consequently the method by which success is most likely to be attained is that of pre-

vention. That is to prevent the outbreak of disease in the first instance, or, if it has once appeared, to prevent its further spread. Though the rules and precautions to be adopted are simple enough, still they are extremely difficult to put into practice. It is only within recent years that cultivators in general are beginning to realise how infectious many plant diseases are, but even yet in the majority of cases it is only after a disease has become epidemic and has occasioned considerable and irreparable damage that the advice of the plant pathologist is sought.

There are cases enough on record where valuable crops can no longer be cultivated owing to the ravages of disease which might have been prevented from occurring at all, or at least checked or considerably modified in its early stages. Such has been our unfortunate experience with the European larch. As the result of planting in unfavourable soils and situations, its predisposition to canker caused by *Peziza Willkommii* has been so much increased as to very seriously interfere with its profitable cultivation. It is therefore not surprising that attempts have been made to find a substitute in the shape of some other species of larch which would resist the ravages of the canker fungus.

Within comparatively recent years two species have been introduced in the hope that they would be less liable to attack, if not immune from the disease. These two species are Japanese larch (*Larix leptolepis*) and the western larch (*Larix occidentalis*).

The western or occidental larch was discovered in the year 1826 by Douglas, but over fifty years elapsed before it was introduced into this country. For some reason or other, possibly the difficulty in securing seed, and consequently through the scarcity of plants, this tree has not become very widely known in Britain. Mr. H. J. Elwes, after several attempts to secure a supply of seed, was finally successful in securing a small quantity in the year 1903. This he distributed to arboriculturists in many parts of the country in the hope that this species would be "less liable to the attack of *P. Willkommii* than the common larch." Speaking of the germination of the seed which he distributed, Mr. Elwes says: "The seedlings raised in 1904, from the seed which I distributed, have grown in several places, best perhaps at Murthly, under the care of Mr. Lawrie, where in September 1906 I saw some hundreds thriving very well, though not so large as the common larch of the same age."

In the winter 1908-09 two specimens were sent from Murthly to the Royal Botanic Garden, one of which had, unfortunately, developed unmistakable symptoms of attack by *P. Willkommii*. This plant is shown in Plate V, Figs. 1 and 2. The cankered portion, as will be seen in Fig. 1, is situated at

the base of the shoot formed in 1907. The parts of the tree above the canker were dead. The lower part of the stem and branches were still living. Fig. 2 shows the canker upon which the fructifications of the fungus are visible.

It would therefore appear that *L. occidentalis* is not immune from attack by *P. Willkommii*.

For a long time it was hoped that *L. leptolepis* would prove to be immune from attack by *P. Willkommii*, until several competent authorities reported the disease from different parts of the country. However, in spite of this testimony, there are still those who deny that the Japanese larch is liable to be attacked by the canker fungus. As the collection at the Royal Botanic Garden contains several typical specimens with fructifications, it may not be out of place to give here photographs of one of these specimens. Fig. 3 illustrates a stem of *L. leptolepis* with two typically cankered areas. One of these areas is seen in surface view. The higher one to the left is seen in profile. Not only are these cankered spots quite typical of *P. Willkommii*, but the cup-shaped fructifications are present, and these are shown enlarged in Fig. 4, so that there cannot be any reason to doubt that the cankered areas have been caused by this fungus.

As regards the introduction of exotics which are intended to be grown as timber-producing trees, certain objects must be kept in view. For example, an exotic species is worthy of cultivation in our forests.

Firstly, if it is of a species at present unrepresented and capable of producing a timber of utility, or if it possesses advantages as regards rate of growth and is less exacting as regards soil and climate.

Secondly, the introduction of an alien species is desirable if it is capable of resisting indigenous diseases, but great care must be exercised so as not to introduce a new disease along with an alien species. An exotic parasitic fungus, if introduced, may become rampant on indigenous species, and *vice versa* an indigenous parasitic fungus is equally liable to attack an exotic host. We know to our regret how *P. Willkommii* has followed the European larch.

It is therefore quite possible that exotic trees from virgin forests when introduced into a new country and grown under artificial conditions may readily become a prey to parasitic fungi, although hitherto in their native habitats they may have been entirely free from disease of any kind.

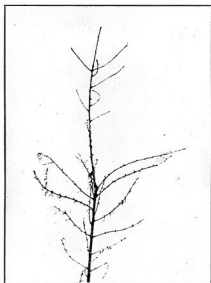
The whole question of the relationship of host to parasite is an extremely difficult and complicated one, and is a subject that certainly receives far too little systematic attention in proportion

to its vast importance. A large amount of close observations and experimental work is necessary in order to decide which new species are likely to give better results than those at present under cultivation, and no doubt experimental forest-gardens and demonstration forests would provide a means of answering many of those highly important questions.

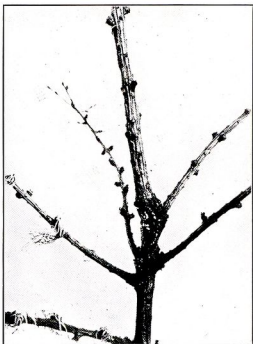
EXPLANATION OF THE FIGURES IN PLATE LV.

Illustrating Dr. A. W. Borthwick's paper on "*Peziza Willkommii*, R.H., on *Larix occidentalis*, Nutt., and *Larix leptolepis*, Gord."

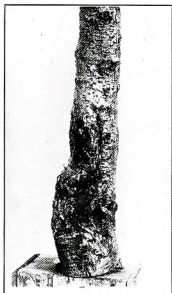
- FIG. 1. Apical portion of young *Larix occidentalis*, showing where the canker originated at the base of the shoot of 1907.
 FIG. 2. The cankered area at the base of the shoot of 1907, showing the fructifications of *Peziza Willkommii*.
 FIG. 3. Portion of stem of *Larix leptolepis* with two cankered areas, the lower one seen in surface view, the higher one seen in profile.
 FIG. 4. Part of the higher canker in Fig. 3, magnified, showing the fructifications of *P. Willkommii*.



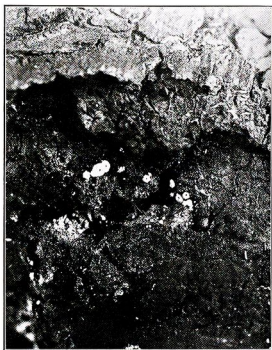
1.



2.



3.



4.