Some factors governing mycelial establishment and lesion extension in the larch canker disease

By S. T. Buczacki

Abstract

From inoculations on larch trees with mycelium of *Trichoscyphella willkommii* it was shown that seasonal variation in lesion development was the result of varying ability by the host to limit mycelial spread. Freezing conditions as well as fungal infection were shown to be essential for canker extension and the mechanism was apparently an alternation of the two factors during the winter.

1. Introduction

Since the early work of Hartig (1880), several investigators have made inoculations with mycelium of *Trichoscyphella (= Dasyscypha) willkommii* (Hart.) Nannf. into the healthy bark of European larch (*Larix decidua* Mill.). In many instances, canker lesions have arisen from the inoculations, and from some of these results, deductions have been made concerning the relative importance of fungal action and other factors, notably frost, in bringing about lesion extension. However, the inoculation conditions were often imperfectly controlled while additional observations, relating for example, to the varied success of inoculations at different times of the year, have also been recorded. However, there has been little attempt to explain the factors responsible for these observed results.

This paper describes experiments intended to clarify the factors responsible for the establishment of mycelium in host tissues and the subsequent extension of canker lesions.

2. Materials and Methods

The fungal mycelia used for inoculations were monosporous or polysporous cultures obtained from apothecia of *T. willkommii* which had been allowed to discharge their spores overnight onto agar in a petri dish as described by Manners (1953). On some occasions, mycelium isolated from natural cankers or reisolated from artificially induced lesions was used. All cultures were maintained on 3% malt agar at 22.5°C. Sterile malt agar was used in control incisions.

The inoculation procedure used was basically that of Manners (1953) except that all inoculation wrappings were removed after two months to avoid asphyxiation of host tissues. As far as possible, stems and branches of 2–2.5 cm diameter were in-
occulated although this was not possible with potted transplants. Only one pair of
incisions (mycelium and control) was made on each branch or stem although frequently
several branches on the same tree were used. In all instances the control incision was
made proximally to the mycelial inoculation.

After harvesting, inoculations were assessed for external symptoms as follows:
Grade 1 – Incision closed; apparently healing.
Grade 2 – A sunken area of bark around the incision with some bark necrosis
beyond the visible limits of the wound.
Grade 3 – As 2 but with microconidial stromata of T. willkommii present.
Grade 4 – As 2 or 3 but with apothecia of T. willkommii present.

All lesions were sawn transversely through the centre and sections cut and stained
using a procedure with thionin and orange G based on that described by Stoughton
(1930). Internal symptoms were then assessed as follows:
1. Depth of incision wound.
2. Extent of healing overgrowth, either of the incision wound itself or of any necrosis
developed from it.
3. Presence or absence of a wound periderm laid down to isolate the incision before
any extension of necrosis.
4. Extent of necrosis in addition to that resulting from the incision wound, expressed
as the proportion of the stem circumference to which tissue death had extended:
Extensive (> 1/2), Moderate (> 1/4 < 1/2), Slight (< 1/4) or Very Slight (barely
discernible). The inoculation wound itself usually extended to 1/4 of the circum-
ference.
5. Presence or absence of wound periderm laid down to isolate any extension of
necrosis.

The four forest sites used in the studies were as follows:
Forestry Garden, Science Area, Oxford University. A mixed crop comprising P.64
and P.65 European larch of unknown provenance, and P.66 Japanese larch (Larix kaempferi
[Lamb.] Sarg.). No natural cankering.
King's Wood, Blenheim Estate, Oxfordshire. P.55 and P.58 European larch of unknown
and probably mixed provenances and including some Hybrid larch (Larix eurolepis Henry).
Some natural cankering.
Compartment 485 and 486, Speech House Walk, Forest of Dean, Gloucestershire. P.48
and P.49 European larch of unknown provenance. Moderate to severe natural cankering.
Compartment 192, Worcester Walk, Forest of Dean, Gloucestershire. P.46 European larch
of unknown provenance. Slight natural cankering.
Some inoculations were also made on potted plants in a glasshouse at Oxford. These were
vigorous transplants of European larch (Ident. no. 63/4532, South Tyrol) planted as 2 + 1 in
John Innes No. 3 compost in 12.5 cm pots six months before inoculation.
NB. A crop described as P.64 was planted during the dormant season 1963–1964.

The techniques for the isolation of mycelium from natural cankers and the nature
of host tissue zones comprising the canker lesions have been described elsewhere
(Buczacki, 1973).

3. Results and Discussion

3.1. Investigations of seasonal variation in inoculation success

Commencing in July 1969, twelve pairs of inoculated incisions were made at the
beginning of each month for six months at Oxford, Blenheim, Speech House Walk and
Worcester Walk. Subsequently the inoculations continued for a further six months at
Oxford and Worcester Walk only. The inoculations at Oxford in the second six-
month period were confined to Japanese larch. Fungal cultures used were the same at
all sites in any one month. The twelve pairs of incisions made each month at each site were harvested at monthly intervals so giving a complete year's record of lesion development.

Thirty of the 432 incision pairs are excluded from the analyses as the branches died from causes unconnected with the experiment. The results of the remaining 402 inoculations are given in Table 1. Data for control incisions will be described separately.

The months May to September inclusive were considered as the active growing season for larch and November to March, the dormant season. During the latter period, the trees were seen to be incapable of laying down a wound periderm. April and October were treated as transition months which at some sites and in some years might fall into the active, and in others, the dormant period. Only 12.7% of the inoculations made during the active season showed any extension while 67% of those made during the dormant season did so. Only one of the twenty-two active season inoculations to extend, did so before the onset of dormancy. When individual months were considered (Fig. 1), the lowest success was shown by the May inoculations, i.e. those made during the first month of active host
growth, while the highest success was shown by the November inoculations i.e. those made during the first month of host dormancy.

In general the longer the period of host dormancy remaining after inoculation before the resumption of active growth, the greater the proportion of extending lesions that fell into the extensive or moderate necrosis categories. When the time before the resumption of host activity was short, most of the extending inoculations were in the slight or very slight categories.

The percentages of inoculations showing extension and made in the July to December period at each

**Fig. 1. Relationship of lesion extension to inoculation month at all sites**

**Table 2**

Effect of age and depth of inoculation wound on subsequent lesion development

<table>
<thead>
<tr>
<th>Inoculation date and length of delay after inoculation</th>
<th>Outer bark</th>
<th>Mid-bark</th>
<th>Inner bark</th>
<th>Wood</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. 2. 70 None</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2. 3. 70 4 days</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>12. 3. 70 2 weeks</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9. 4. 70 6 weeks</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>27. 8. 70 6 months</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

+ extension of necrosis; - no extension of necrosis; ( ) control incision
Factors governing mycelial establishment in the larch canker disease

site were: Oxford 44.7, Blenheim 44.4, Speech House Walk 42.9 and Worcester Walk 33.3. On this basis therefore, the Worcester Walk trees were less susceptible than those at the other three sites. The percentages of the inoculations made at Oxford and Worcester Walk in the January to June period that showed extension were 25.0 and 38.6. As the inoculations at Oxford in the January to June period were confined to Japanese larch, this was thus shown to be less susceptible than the most resistant of the European larches in the experiment. It was noted however, that the inoculations on the Japanese larch that were successful all showed very much greater production of microconidial stromata and a much more obvious sunken bark area than did those on any of the European larch trees.

There was no significant difference between the success of inoculations in which the initial wound was shallow and those in which it reached at least to the cambium. The possible significance of incision depth is considered more fully below.

Of the 402 control incisions, definite extension of necrosis was seen in only seven instances. From the periphery of three of these, *Aureobasidium pullulans* (de Bary) Arnaud was isolated. In two others an unidentified mycelium occurred while two lesions were sterile.

Except where microconidial stromata were present (grade 3), the external grading of the inoculations gave little indication of the degree of extension, and implied that Manners' faith in this method of assessment may have been misplaced (MANNERS, 1953; 1957). The percentage of inoculations in each of the four grades showing some extension was as follow:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>31.8%</td>
</tr>
<tr>
<td>2</td>
<td>44.6%</td>
</tr>
<tr>
<td>3</td>
<td>80.5%</td>
</tr>
<tr>
<td>4</td>
<td>50.0%</td>
</tr>
</tbody>
</table>

3.2. Investigations of the effect of age and depth of inoculation incision on subsequent lesion development

Five groups of incisions were made on the main stems of small trees at Blenheim in February 1970. Each group comprised five incisions each into the outer bark, mid-bark, cambial region and wood.

The first group of twenty incisions was inoculated immediately, while the remaining groups were inoculated after four days, two weeks, six weeks or six months. Three of the five incisions into each host tissue were inoculated with *T. willkommii* mycelium, while into the other two, the controls, sterile agar was inserted. One of the controls in each instance was harvested at the time the inoculations were made to determine the penetration depth of the incision and to assess the degree of healing that had occurred before insertion of the inoculum. The remaining controls and all mycelial inoculations were harvested on 22 March 1971. Extension of the lesion in the season of inoculation and in the following season were scored separately.

Results of the inoculations are shown in Table 2. There was extension of necrosis from all the inoculations performed immediately after wounding and this was resumed the following winter, regardless of the depth of the incision. There was a decline in the success of the inoculations thereafter. With only one exception, no extension occurred from any of the remaining inoculations into the wood. There was generally little difference in success between the inoculations made four days or two weeks after wounding at any depth into the bark.

None of the inoculations performed after six weeks extended in the season of inoculation, but with the exception of two of those into the wood, all showed extension in the following season. None of the inoculations performed six months after wounding developed any extension.
3.3. Investigations of the effect of frost on lesion extension

As no European larches grow naturally on sites totally free from frost throughout the year, inoculations were made on transplants under artificially controlled temperature regimes. Forty-three vigorous transplants which had been planted in pots at Oxford in autumn 1969, were inoculated in early spring 1970. On 23 February 1970, one inoculation with *T. willkommii* and one control incision were made on the lower part of the main stem of each of fifteen dormant plants in an outdoor frame, not protected from frost. The remaining twenty-eight plants were in a cool glasshouse, free of frost and with fourteen-hour day conditions. These plants had retained their needles and not become dormant. Each of them was similarly inoculated on 18 March 1970, and all were subsequently examined for external symptoms on 16 September 1970. By that time, two of the plants inoculated in the frame had died, while the remaining thirteen all showed signs of necrosis around the incision. Nine showed grade 3 symptoms and bore microconidial stromata, and four showed grade 2 symptoms. The latter four, together with one of the grade 3 plants, were retained in the open frame. The remaining eight with grade 3 symptoms were placed in a cool, frost-free glasshouse. No artificial lighting was used and the plants shed their needles and became dormant normally.

Of the transplants originally inoculated in the glasshouse, four had died when inspected in September, and none of the remainder showed any signs of necrosis. All

<table>
<thead>
<tr>
<th>Site where plants inoculated and maintained until 16. 9. 70</th>
<th>Site where plants maintained between 16. 9. 70 and 29. 3. 71</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glasshouse</td>
<td>Open frame</td>
</tr>
<tr>
<td>-</td>
<td>+</td>
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<td>-</td>
<td>+</td>
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<td>-</td>
<td>+</td>
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<tr>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>(14 plants)</td>
<td>(9 plants)</td>
</tr>
<tr>
<td>Open frame</td>
<td></td>
</tr>
<tr>
<td>?</td>
<td>+</td>
</tr>
<tr>
<td>?</td>
<td>+</td>
</tr>
<tr>
<td>?</td>
<td>+</td>
</tr>
<tr>
<td>(8 plants)</td>
<td>(5 plants)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Glasshouse</th>
<th>Open frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
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<tr>
<td>?</td>
<td>+</td>
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<td>?</td>
<td>+</td>
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+ ++ Extensive extension (>$\frac{1}{2}$ stem circumference); ++ Moderate extension ($\frac{1}{2}$$<$$\frac{1}{2}$ stem circumference); + Slight extension ($<$$\frac{1}{2}$ stem circumference); ? Very slight extension (barely discernible); - No extension.

For each inoculation, upper symbol denotes extension in spring 1970 and lower symbol denotes extension in winter 1970-71. There was no extension at all on the control incisions.
Factors governing mycelial establishment in the larch canker disease were assessed as grade 1. Fourteen of these plants were placed in the cool glasshouse, and ten in the open frame.

Thermographs and maximum/minimum recording thermometers were placed in both glasshouse and frame. All plants were harvested on 29 March 1971 and assessed externally and internally for degree of extension. Isolations were taken from most specimens. These results are shown in Table 3.

The plants that had been inoculated in the frame and had remained there, all showed two seasons of extending necrosis from the inoculations, and all bore microconidial stromata when harvested.

None of the plants that had been inoculated while actively growing and had remained in a glasshouse, showed any extension of the lesions in either spring 1970 or winter 1970-1. In most instances, the inoculation wound had healed during 1970. No microconidial stromata were produced.

In all the plants that had been originally inoculated in the glasshouse and then placed in the frame, considerable healing of the inoculation wound had taken place in summer 1970. Four of the inoculations had healed completely. However, during winter 1970-1, when outside, all lesions had developed microconidial stromata, and all showed necrotic extension. In most lesions this was graded extensive and in three instances, the stem had been completely girdled by the necrosis from which T. wilkommii was readily isolated. The origin of the necrosis appeared to be the outer dead bark which had been cut off by the wound periderm formed in the spring and summer of 1970.

The plants that were inoculated in the frame and then transferred to the glasshouse, all showed extension of necrosis in spring 1970. In two instances, this was graded as extensive. Some slight healing of the infected tissue took place in a few lesions in summer 1970. After being placed in the glasshouse, only very slight necrosis for a few cells distance beyond the periderm, developed on one side of the lesion only in four specimens. In the other lesions there was no extension of infection at all in winter 1970-1. In every instance, the microconidial stromata had shrivelled and from most of the lesions, T. wilkommii could still be isolated from the dead tissue.

In none of the plants was there any infection from the uninoculated control incisions.

The temperature in the glasshouse during winter 1970-1 never fell below 3.9°C, while in the open frame, frosts occurred on seventeen occasions. The frame temperature was frequently at or below 0°C for only 2–3 hours, although particularly during December and January, frosts of at least 36 hours duration were recorded, with the temperature as low as −5°C for several hours.

The deduction from these results is that the lesions on L. decidua arising from artificial inoculation with mycelium of T. wilkommii are unable to extend in the absence of freezing temperatures (or at least of temperatures below 3.9°C) during the winter. The actual establishment of fungus in damaged host tissues can take place in the absence of frost however, and freezing temperatures alone were unable to initiate lesion formation.

The association of winter frost with lesion extension as described above agrees with the belief of Langner (1936). He proposed a mechanism by which this might arise. Provided it could by-pass the wound periderm, mycelium of T. wilkommii in canker lesions was thought, during mild weather, in winter, to affect living host tissue, here termed the A zone, (Day, 1958; BucZacki, 1973) within a few millimeters of the hyphal tips in such a way as to render that tissue liable to be killed by a very slight frost. LANGNER in fact, claimed to be able to distinguish this frost-susceptible tissue before freezing actually occurred. The newly killed tissue (the B zone) was then invaded by fungal mycelium to form a fully colonised Bi zone. From there it affected
more live A-zone tissues, and following their death by further freezing, grew into them as another mild spell returned. For this mode of action, LANGNER coined the term thryptophytism. As LANGNER recognised, support for his views would come from a demonstration of the distribution of *T. willkommii* in the various zones under different conditions.

A large collection of natural cankers had been made in connection with microecological studies (BUczACKI, 1973), and a thermograph and maximum/minimum recording thermometer were maintained in the plantation at Blenheim from which these were collected. This provided the opportunity therefore of comparing the incidence of *T. willkommii* in the B extension zone of forty-four cankers with the daily minimum temperature from 19 February to 15 April 1970. This relationship is shown in Fig. 2. It may be seen that the degree of infection of the B zone was higher during periods of frost-free weather. Closer inspection of the data reveals a more intimate relationship however, in keeping with LANGNER's hypothesis. Following the collection of specimens on 19 February, there were five frost-free days. A frost occurred on the sixth day, and when a collection was made on 26 February, one day later, the percentage of B zone isolates yielding *T. willkommii* had halved. According to LANGNER, the fungus would have been colonising recently killed tissue during the mild weather and then affecting the adjacent A zone which became a new sterile B zone within twenty-four hours of the frosting. Little colonisation of this new B zone could have taken place during the next thirteen days which were all predominantly frosty. This suggestion was borne out by the totally sterile B zone in the 12 March collection. (Personal observation has shown that mycelial growth on several artificial culture media is nil at 0°C and this may well apply in host tissue also.) After two mild, and one frosty, days, there followed three very mild days after which a figure of 23.1% infection was obtained on 19 March. This was even higher than the 19 February value. Frosts were infrequent in the next month and only one occurred in the eleven days before the collection on 15 April. Little new sterile B zone could have formed in that period. This was borne out by the figure of 55% infected B zone isolations on 15 April. The one anomalous result was the 23 March collection which yielded totally sterile B zones despite being in a mild period.

**Fig. 2.** Relationship between infection of B zone and daily minimum temperature at Blenheim in Spring 1970

4. Conclusions

The close correlation between the ability of the host tree to produce a wound periderm and the degree of canker extension indicated that this was probably the major factor limiting lesion development to certain times of the year. The periods during which
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Inoculations were most successful agreed with the findings of Hahn and Ayers (1943) and further demonstrated the theory of Day (1931) by which spring and possibly autumn frosts brought about lesion extension, to be untenable.

The results described in 3.2 in which none of the inoculations performed after six weeks extended in the season of inoculation, but with two exceptions, extended the following season, seemed to verify the suggestion by Manners (1957). He proposed that the persisting mycelium in the outer bark might be able to reinvade the inner bark tissues.

The failure of all inoculations into the wood other than those performed immediately after wounding may be explained by the protective effect of resin reduction by the damaged xylem. The decline in success of bark inoculations with incision age suggested that even during the winter, when unable to produce a wound periderm, the host bark tissues possess some other protective process. This presumably develops within four days of the wounding.

In addition to providing support for the ideas of Langner, the findings on the relationship of frost with lesion extension appeared to contradict those of Hahn and Ayers (1943), Manners (1953, 1957) and Ito et al. (1963). Their claims to have produced extending lesions from inoculations in frost-free conditions, have often been cited in subsequent accounts. However, examination of these published results shows that in no instance was winter frost actually proved to be absent from the experimental sites at which European larch plants were inoculated. In some instances, the criterion for the conditions being supposedly frost-free was in fact the absence of the type of tissue damage known to be caused by spring and not winter frosts. Thus, Hahn and Ayers' criterion for the plantation they used being frost-free was 'the non-occurrence of frost lesions either on the smooth bark of non inoculated trunks and branches or on the incisions inoculated with the nonpathogenic Dasyscyphae, and on those serving as experimental checks'. Hahn and Ayers actually stated that the type of frost injury that was absent (frost rings and similar tissue abnormalities) was that ascribed by Day (1931) and Day and Peace (1934) to spring frosts. They did not publish, nor apparently did they make, any temperature measurements and never stated that actual freezing conditions in the winter were absent from their plantations. Peace (1962) conceded that the plantations used by Hahn and Ayers may have suffered frosting at some stage, although he seems to have been one of very few to appreciate this.

Hahn and Ayers also made inoculations on Larix occidentalis Nutt., and L. gmelini (Rupr.) Litvin., (although not on L. decidua,) in an unheated glasshouse without stating whether it was frost-free. On L. occidentalis, one of five saplings 'of pencil thickness' that were inoculated developed extending lesions, but the extension rate was so slow that after eight years, the lesions had still not girdled the stems. On L. gmelini, two of eleven vigorous plants developed lesions in the season of inoculation which subsequently failed to extend further. One of two non-vigorous plants developed lesions which also failed to extend in the following season. On the other non-vigorous plant, nine inoculations were made. Six of these developed necrosis but only three extended subsequently and six years later had still not girdled the tree.

Hahn and Ayers also reported unpublished work by Peace at Oxford who inoculated European larch transplants in a cold frame 'which was kept open except on frosty nights'. It is quite probable that these plants may well have been subjected to freezing temperatures at some stage. Nine of sixteen saplings inoculated were girdled within a year.

Manners (1953, 1957), who has also been frequently quoted as having produced extending lesions under frost-free conditions, in fact stated that 'during the course of the experiments there were never more than two or three frosty nights per year, and no frost sufficient to cause any damage to larch' (Manners, 1953). Manners was
presumably referring to spring frost damage of the type discussed by Day and Peace (1934).

Ito et al. (1963) concluded that from their results, *T. willkommii* could cause cankers in the absence of frost, although they were uncertain how long the lesions could grow and persist under such conditions. In fact, they also had not used a frost-free site for their experiments which were performed in Tokyo, where, they stated 'frost was not severe and the chances of frost damage were therefore negligible'.

It appears that in assessing experimental conditions therefore, previous workers have discounted the possibility that the winter frost required for lesion extension may not need to be very severe and the degree of frost that is able to penetrate larch bark would seem to merit further investigation.

I wish to thank Dr. R. G. Pawsey for his advice and support, Mr. C. D. B. Lewis for technical assistance, Mr. J. Coates for glasshouse maintenance and officers of the Forestry Commission and Blenheim Estate for kindly making sites available to me. Financial support by the N. E. R. C. is gratefully acknowledged.

**Summary**

A large number of inoculations was made into larch trees with mycelium of *Trichoscyphella willkommii*. It was shown that while only 12.7% of the inoculations made during the host's active growing season subsequently extended, 67.0% of those made during the dormant season did so. This finding was probably explainable by the tree's ability to limit lesion extension with a wound periderm.

Evidence was obtained to support the view that mycelium can persist in the outer bark and reinvade the inner tissues in the following season. Even in the absence of a wound periderm during the winter, larch bark was shown probably to possess some other method of limiting mycelium establishment, although this took a few days to develop. Resin production in the xylem could also apparently prevent mycelial establishment.

From controlled experiments in frost-free and frost-susceptible conditions, it was clearly demonstrated that mycelial inoculations were unable to develop into canker lesions in the absence of near-freezing temperatures in the winter. Mycelial establishment could take place in the absence of frost however. Evidence was found in isolations of mycelium from natural cankers that supported a theory of canker extension by the alternation of frost and fungal action in mild weather during the winter.

**Zusammenfassung**

Einige Faktoren, die das Anwachsen des Mycels und die Ausdehnung des Befalls beim Lärchenkrebs bestimmen

Es wurden zahlreiche Inokulationen mit *T. willkommii*-Mycel an Lärchen durchgeführt. Während sich von den während der Hauptwachstumszeit des Wirtes vorgenommenen Inokulationen nur 12,7% ausdehnten, geschah das bei jenen während der Vegetationsruhe infizierten zu 67%. Dieses Ergebnis läßt sich wahrscheinlich mit der Fähigkeit des Baumes erklären, die Ausdehnung des Befalls durch Wundperiderm zu begrenzen.

Es gab Hinweise dafür, das das Mycel in der äußeren Rinde überdauern und die inneren Gewebe in der folgenden Saison erneut besiedeln kann. Selbst beim Fehlen eines Wundperidermes im Winter übt die Lärchenrinde wahrscheinlich eine andere Wirkung aus, die das Anwachsen des Mycels erschwert, obwohl das einige Tage dauert. Auch die Harzproduktion im Holzteil könnte das Anwachsen des Mycels verhindern.

Factors governing mycelial establishment in the larch canker disease

Résumé
Sur quelques facteurs qui commandent l’installation du mycélium et le développement des lésions dues au chancre du Mélèze

Un grand nombre d’inoculations ont été pratiquées sur des mélèzes avec du mycélium de *Trichoscyphella willkommii*. On a pu montrer que, tandis que 12,7% seulement des inoculations pratiquées pendant la saison de végétation de l’hôte se développèrent, 67% de celles pratiquées pendant la période de repos végétatif réussissaient. Ce résultat peut probablement s’expliquer par la capacité que présente l’hôte de limiter l’extension de la lésion grâce à une périodème de blessure.

Il apparaît à l’évidence que le mycélium peut persister dans les parties externes de l’écorce et envahir à nouveau les tissus internes au cours de la saison suivante. Même en l’absence d’un périodème de blessure durant l’hiver, l’écorce du Mélèze possède probablement un autre mécanisme pour limiter le développement du mycélium, bien que ce phénomène ait besoin de quelques jours pour se manifester. La production de résine dans le bois pourrait empêcher également l’installation du mycélium.

A partir d’expérimentations contrôlées dans des conditions d’absence de gelées et de présence de gelées, on a pu démontrer clairement que les inoculations avec du mycélium ne pouvaient aboutir à un développement en lésions chancreuses en l’absence de températures proches du point de congélation. L’installation du mycélium est toutefois possible sans que l’influence du gel soit nécessaire. Des isoléments de mycélium, à partir de drupes en nature, ont permis de mettre en évidence des faits soutenant l’hypothèse d’une extension des drupes par alternance de périodes de gel et d’activité du champignon durant les temps doux d’hiver.

References


Hahn, G. G.; Ayers, T. T., 1943: Role of *Dasyscypha willkommii* and related fungi in the production of canker and die-back of larches. J. For. 41, 483–495.


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