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PHYTOPHTHORA DISEASE OF ALDER: THE SITUATION IN 1995, by John Gibbs and David Lonsdale

Summary

Research continued during 1995 on a lethal *Phytophthora* disease of alder first recognised in 1993. Various steps were taken to improve knowledge of disease distribution and in consequence a more complete picture has been obtained. The disease is now known to be widespread through much of England and Wales. However, it is not known to be present in Scotland, parts of northern England and the extreme south-western peninsula.

Survey data from rivers more than 8 m wide indicate that although the increase in disease between 1994 and 1995 was relatively small, more than 20 000 trees are severely affected and up to 11 000 have died. The history and possible origin of the disease is discussed, together with questions of infection biology and control. Landowners should consider a temporary cessation in the planting of alder.

Introduction

1. A lethal disease of alder in southern Britain has recently been described (Gibbs, 1994, 1995; Brasier *et al.*, 1995). It is caused by a fungus resembling *Phytophthora cambivora*. This organism is well-known as a pathogen of broadleaved trees but neither it nor any other *Phytophthora* has previously been reported from alder. Most of the affected trees are in riparian sites or on land that is subject to flooding from adjacent rivers. This provides circumstantial evidence that the fungus can be disseminated through the flow of water. However, the disease has also been found in some alders well away from any stream, for example in an orchard shelterbelt. Most cases of disease have concerned the common alder, *Alnus glutinosa*, but the grey alder, *A. incana*, and the Italian alder, *A. cordata*, have also been affected. It has not been possible to determine if the disease is new or if it has been long present but previously unrecognised. This Note describes advances in knowledge that have been made during the past 12 months.

Disease distribution

2. During 1995 a coloured publicity leaflet on disease identification, produced jointly by the National Rivers Authority and the Forestry Commission, was distributed widely. Staff of both organisations followed up reports of possible sightings. Additional information on disease distribution came from the expanded Forestry Commission survey (see para 3) and from the NRA's River Habitat Survey, which encompasses 1521 sites in England and Wales. The locations of river systems within which the disease is known to be present are shown in Figure 1. The main changes since 1994 are in respect of records for riparian trees in Wales, Cheshire, Shropshire and North Yorkshire. The disease is also present on the River Yare in Norfolk and in alder carr on the Norfolk Broads. There are several additional records for newly planted woodlands in river floodplains and one for an orchard shelterbelt. The disease has also been found in young alders in a tree nursery.

Disease severity

3. In summer 1994 a series of plots was established on rivers over 8 m wide in the southern half of England and east Wales. These provided data on numbers of alders within 10 m of the riverbank, an alder being defined as a maiden tree or coppice stool with at least one stem over 7 cm diameter at breast height. In summer 1995 the plots were revisited and it was found that the percentage of alders which were either showing crown symptoms of the disease or had died had increased from 5.2% to 5.9%. Dramatic damage has been recorded in some places, for example on the River Lugg in Herefordshire and the River Colne in Essex, with between 25 and 50% of the trees being seriously affected.

4. Also during 1995 the survey area was extended further to the north and west to cover in total some 100 000 km² (see Figure 1). Within this area it is estimated that on rivers over 8 m wide there are some 840 000 alders, of which 24 000 show current symptoms of the disease and 11 000 are dead. Not all the latter will have been killed by the disease however.
5. No data on numbers of affected trees are available for streams below 8 m in width or for alder woodland. However, observations suggest that the disease is very much less common in these situations. In addition some information on disease incidence comes from the NRA River Habitat Survey. Thus the disease was recorded on 1.2% of streams below 5 m in width as compared to 2.2% on wider streams.

Disease biology

6. With riparian alders a significant part of the root system develops out into the water. This would seem to offer continuous opportunities for infection by a fungus like *Phytophthora* which produces water-borne spores. However, excavation of diseased trees has indicated that bark-killing often begins not at the periphery of the root system but on its upper parts, or at the base of the stem itself. If this proves to be the normal pattern of events, periods of flooding when the river leaves its banks and inundates the bases of the trees may be crucial for infection.
7. Studies are continuing on the relationship between the 'alder *Phytophthora*', *P. cambivora* and other *Phytophthora* species. The 'alder *Phytophthora*' resembles *P. cambivora* in the morphology of its sexual structures. However, it also exhibits a range of characters which distinguish it from *P. cambivora*, including some which suggest (but do not prove) that it is of relatively recent origin (Brasier *et al.*, 1995).
8. The 1994 survey data have been examined in relation to various measures of water quality, and there is some evidence for an association between disease severity and high nitrate levels. In addition, on one small stream the occurrence of severe disease seems to date back to a time several years ago, when there was a marked increase in the level of nitrate in the water. Elsewhere, however, the disease has been found alongside streams of very high water quality.

Disease history and origin

9. Although the disease was not identified until 1993, it was certainly present well before that date. Thus the 'alder *Phytophthora*' was isolated in 1994 from a farm woodland in Bedfordshire in which dieback in alder was ascribed to *Phytophthora* 7 years earlier (records of the Disease Diagnostic and Advisory Service at Alice Holt, PAT 87/99). Isolation attempts for *Phytophthora* at that time were unsuccessful.
10. Efforts are being made to determine the status of the disease abroad, particularly in Europe. In September 1995 it was reported from Lower Saxony in Germany (Hartmann, 1995), where it may have been present for a long time. Also a *Phytophthora* isolate with strong similarities to the 'alder *Phytophthora*' has been isolated from alder in the Netherlands although here no significant mortality was involved (Brasier *et al.*, 1995). Links with research workers in countries elsewhere in Europe and further afield are being developed.

Disease control

11. There is no case for attempting sanitation operations as it is not conceivable that the removal of diseased trees could be conducted in a sufficiently effective and comprehensive way. Felling would not eliminate affected root systems and winching often leaves much root material in the ground. The question of whether there are sufficient grounds for the introduction of controls on the movement of alder plants is under review. In the meantime, landowners should recognise that there is a good case for a temporary cessation in alder planting. The reason for this differs with the locality: in areas where the fungus is present, the planted trees may well die. In areas where the fungus is absent, there is a possibility, however remote, that it might be introduced with the planting stock.

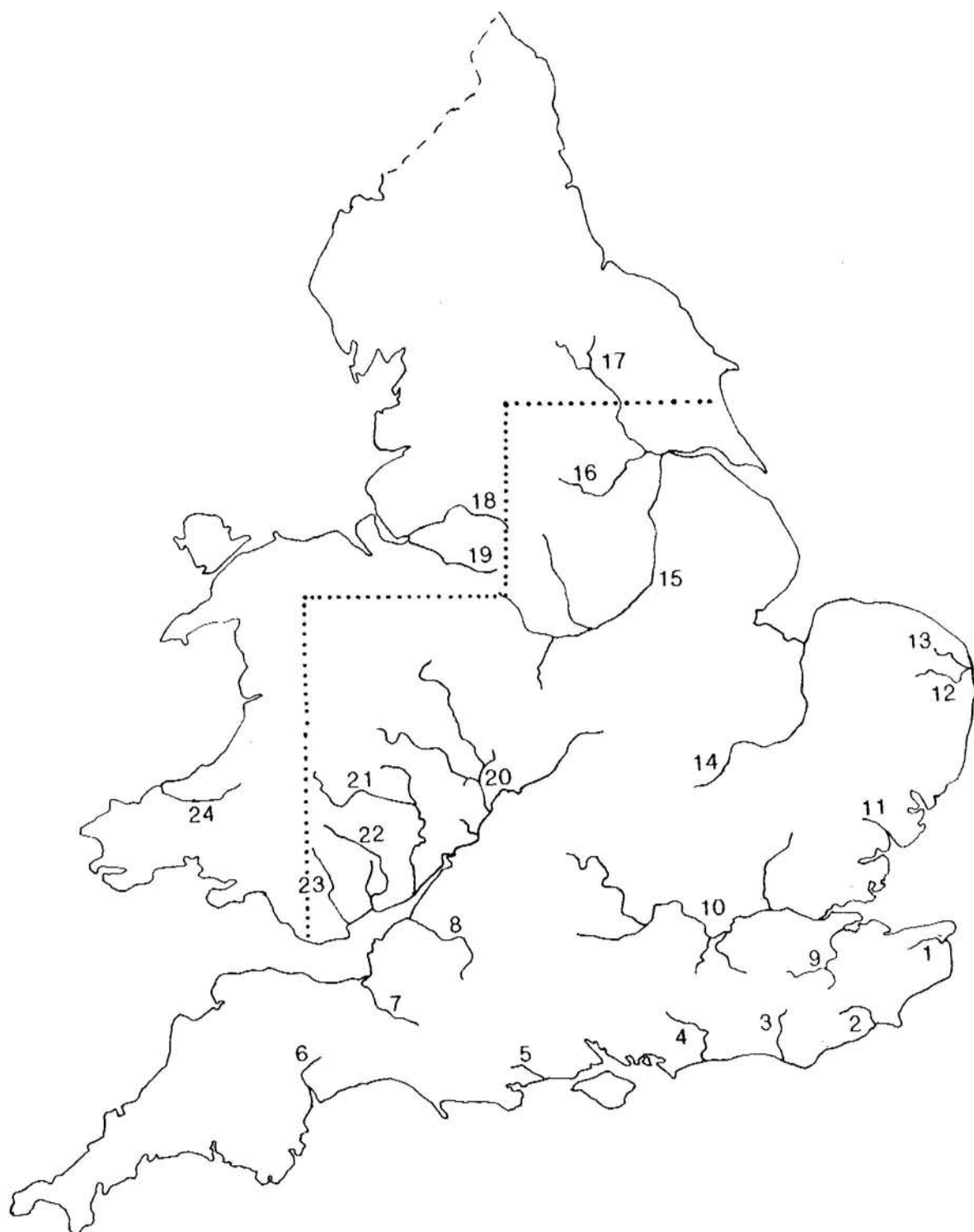


Figure 1. Map of England and Wales showing rivers on which symptoms characteristic of *Phytophthora* root disease of alder have been observed. The dotted line indicates the boundary of the Forestry Commission survey.

Numbers refer to river systems opening into estuaries or the open sea. Parts of the following rivers are affected:

- | | | |
|------------------------------------|--|---|
| 1. Great Stour (Kent) | 11. Colne (Essex) | 19. Weaver, Dane (Cheshire) |
| 2. Rother (Kent) | 12. Yare (Norfolk) | 20. Severn, Leadon, Avon, Teme, Clun, Salwarpe (various counties) |
| 3. Ouse, Uck (East Sussex) | 13. Bure (Norfolk) | 21. Wye, Lugg, Arrow, Ithon (various counties) |
| 4. Arun, Rother (West Sussex) | 14. Great Ouse, Ouse (Cambridgeshire, Bedfordshire) | 22. Usk, Lwyd (Gwent, Powys) |
| 5. Stour (Dorset) | 15. Trent, Derwent, Churnet, Tame (various counties) | 23. Taff, Cynon (South Glamorgan, Mid Glamorgan) |
| 6. Exe, Culm (Devon) | 16. Don, Deame (South Yorkshire) | 24. Teifi (Dyfed) |
| 7. Parrett, Yeo (Somerset) | 17. Ouse, Ure, Swale (North Yorkshire) | |
| 8. Avon, Frome (Avon, Somerset) | 18. Mersey, Goyt (Cheshire) | |
| 9. Eden, Teise (Kent) | | |
| 10. Thames, Lea, Stort, Mole, Wey, | | |

12. By analogy with another water-borne disease, crayfish plague, Gibbs (1994) suggested that the movement of fish stocks might be a means of disease dissemination. Although no evidence for this has been found as yet, it is recommended that the relevant authorities consider restricting the movement of fish from parts of the country where the disease is present to parts where it appears to be absent, and that movement within a river catchment should only be undertaken after careful consideration of the local disease situation. The same applies to dredging machinery and other earth moving equipment used for river works.
13. In a study of disease resistance, a series of trial plantings has begun with various provenances of the common alder and with various non-European species such as *A. rubra* and *A. hirsuta*. The experiments are being established on land that is subject to frequent inundation from neighbouring rivers upon which the disease is present.

References

- Brasier, C.M., Rose, J. and Gibbs, J.N. (1995). An unusual *Phytophthora* associated with widespread alder mortality in Britain. *Plant Pathology*. In press.
- Gibbs, J.N. (1994). *Phytophthora* root disease of common alder. *Forestry Commission Research Information Note 258*. 4pp.
- Gibbs, J.N. (1995). *Phytophthora* root disease of alder in Britain. *EPPO Bulletin*. In press.
- Hartmann, G. (1995). Wurzelhalsfäule der Schwarzerle (*Alnus glutinosa*) – eine bisher unbekannte Pilzkrankheit durch *Phytophthora cambivora*. *Forst und Holz* **18** · 25 September 1995, 3 pp.

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