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Arboriculture Research Note

Reporting Research Undertaken Under a DoE Contract
Issued by the Arboricultural Advisory and Information Service

Choosing the time of year to prune trees

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Summary

The time of year for pruning is discussed in relation to the biology of the tree and experimental evidence. The amounts of cambial dieback and 'callus' growth around wounds and wood discoloration beneath them may differ considerably according to the time of pruning. A tentative calendar of 'good' and 'bad' times is presented for nine species.

Introduction

1. Physiological changes take place in woody tissues during the year, and these may influence the extent to which wounds are invaded by micro-organisms. There are also seasonal changes in the external environment and in the spore production (sporulation) patterns of different decay fungi.

2. It has long been recognised that some times of year are likely to be more suitable for the cutting of woody plants than others. Pruning for specific purposes, such as shortening the current years shoots on apple trees, may be timed according to the shoot growth rhythms of the tree. For pruning in general there has been a view that autumn and early winter is a favourable time, and that it is bad to prune trees at the time of year when sap tends to bleed from wounds, especially late winter to early spring. However, the question of timing is commonly decided by the availability of manpower.

Principles based on the biology of trees and micro-organisms

3. There have been few attempts to relate current pruning practice to tree biology and pathology. However, it can be argued that the best time for pruning is when the tree's natural defences against wound parasites and decay fungi are at their peak.

4. A seasonal cycle of change occurs in several of the factors that are believed to influence the defences of wounded tissues. These factors include: - cell growth activity in the bark and cambial zone, total carbohydrate reserves, ratio of starch to sugars, moisture content and gaseous content. Many of the micro-organisms that colonise wounds also show seasonal patterns of growth and dissemination. Apart from these cyclic patterns in the tree and in micro-organisms, there may also be changes brought about by seasonally varying and fluctuating external factors such as atmosphere humidity and temperature.

5. Although some data exist on most of the seasonal changes outlined above, prediction of good and bad times for pruning is difficult, since different factors affecting tree defences may, in effect, be working against each other.

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6. Despite the complexity of the seasonal changes, it can be predicted that, contrary to tradition, autumn is a bad time to prune trees. Components of the tree's defences that depend on cell growth are clearly less effective that in the growing season. Also, wood moisture is at its lowest in many species in autumn. A high moisture content in wood equates with low oxygen content which limits the activity of decay fungi, even though some can survive such conditions. Finally, autumn is the time when a high proportion of decay fungi are releasing their spores.

7. Predictions for winter, spring and summer are more difficult. In winter, the tree is at least active, but so are most micro-organisms. However, in maritime climates like that of Britain, as well as in the subtropical and war-temperate zones, microbial growth in winter may nevertheless be considerable. In mid-spring, when the tree's food reserves are being depleted by flushing and perhaps by flowering, the availability of sugars for conversion into defensive chemicals may be reduced. On the other hand, defences involving cell growth can operate better than in autumn and winter. It has been suggested (Shigo 1986) that the best time to prune is at the end of winter when the tree's defence systems are about to become active, but before its food reserves are depleted by flushing.

8. Mid to late summer is theoretically a relatively good time for pruning, since the tree is active, wood moisture is fairly high and food reserves have been restored by photosynthesis. There is little experimental proof of this, but in the particular case of the silver-leaf fungus (*Chondrostereum purpureum*) on plum trees (*Prunus* sp), it has long been established that pruning wounds are far less susceptible to infection in June, July and August than at other times (Brooks & Moore, 1926)

An experimental approach

9. The complex interactions of the factors mentioned above make it extremely difficult to define good and bad pruning times on a theoretical basis. Indeed, it is possible that the interactions determining the incidence and severity of post-wounding discoloration and decay are so complex that not time of year, is in general, predictably good or bad for pruning.

10. An experiment was set up to examine the main effects of creating pruning wounds at different times of year. The effects measured were cambial dieback and 'callus' growth around the sound edge and the discoloration and microbial colonization of the wood beneath the wound surface.

11. Wounds were created on nine tree species at monthly or tow-monthly intervals throughout a twelve-month period in 1988-89. The species were: - beech (*Fagus sylvatica*), Wild cherry (*Prunus avium*), English oak (*Quercus robur*), Red oak (*Q.rubra*), sycamore (*Acer pseudoplatanus*), Norway maple (*A.platanoides*), hornbeam (*Carpinus betulus*), ash (*Fraxinus excelsior)* and yew (*Taxus baccata*). The sounds were of the 'target' type now routinely used in arboriculture (Lonsdale 1983) and were either left untreated or treated with the proprietary, biologically inert sealant 'Lac Balsam'[2].

Experimental results

12. The wounds were assessed after one year, at which stage there were highly significant differences between times of year with respect to cambial dieback and 'callus' in all nine species. For an example see Fig1.

13. The extent of cambial dieback and callus growth varied markedly around the wound circumference, and the differences were significant for all the species. Dieback was greatest below wounds, and least at the top, while 'callus' growth was greatest at the sides and intermediate in value above the wounds. Important interactions occurred between season and wound treatment.

[2]Lac Balsam is not approved for use as a treatment for pruning wounds and as a result is not available in Britain

14. Seasonal variations in the depth of xylem staining behind wounds were also statistically significant and in most species there was a distinct cyclic pattern, with a January or February maximum value and a summer minimum (see example in Figure 2).

15. treatment of the wounds with Lac Balsam[2] had a significant effect on 'callus' growth of cambial dieback in some species, so that the timing and duration of 'good' and 'bad' seasons were altered, but the effects were not consistently beneficial. The same was true for discoloration of the wood.

16. The occurrence of basidiomycetes (decay fungi) and non-basidiomycete fungi was also recorded, and it was found that the former were not present in wounds made at certain times of year on beech, Wild cherry, hornbeam, ash, sycamore, and Norway maple. Ash and two Acer species yielded basidiomycetes mainly from wounds created in autumn and early winter, whilst Wild cherry yielded these fungi from autumn to spring, with a fairly pronounced peak in December.

17. Among the effects of pruning at different times of year, there are two that perhaps deserve especial consideration; these are the depth discoloration in wood and cambial dieback. Extensive discoloration of the wood is undesirable, although at present it is not clear whether results after one year are a good indication of the long term outcome. As far as cambial dieback is concerned, it may effectively enlarge the wound, impinging on tissues that belong anatomically to the main stem, perhaps thus allowing extensive decay columns to develop.

18. The other two effects examined her-'callus' growth and the nature of microbial colonization-seem at this stage of research to be rather less important. If 'callus' growth could be hastened by the choice of favourable time of pruning, it might take less time for a wound to become totally occluded, with the consequent development of conditions within the wood that are favourable for decay. However, there is no reason to suppose that this seasonal advantage would persist linger than the first growing season. As far as the presence or absence of decay fungi is concerned, there is a need to differentiate between three main groups: (a) aggressive fresh wound parasites; (b) relatively non-aggressive fresh wound colonists and (c) species that tend to appear only in old wounds but which can cause extensive decay in the long term. In the short term experiment reported here, only the first two groups were represented and it would require further research to determine which of the species recorded are likely to pose a threat to their various host tree species, as well as to test the repeatability of the results at different sites and in different years.

Conclusions

19. the data on cambial dieback and wood discoloration obtained in the above study can be used as a basis for a very tentative 'calendar' of periods when pruning for each nine species gave relatively good results, as defined by arbitrary limits of 'allowable' dieback and the extent of discoloration. Such a 'calendar' Fig.3 shows this interpretation with and without the use of 'Lac Balsam'[2]. It can be seen that, in certain cases, treatment might ameliorate the effects of choosing a relatively unfavourable time of year. In a few other cases, the converse is true.

20. Further research is desirable, in order to find whether the results obtained here are relevant to the long- term development of decay. However trees of a suitable type that can be used for destructive sampling are in short supply, as are the resources which would need to be available at both the start and finish of a future study. There is equally a need to determine whether the results so far obtained are reproducible on different sites and in different years and to define 'good' and 'bad' times of year more exactly, perhaps by reference to tree pathology rather that the calendar date.

Addendum

21. Bark wounds, as opposed to pruning wounds, may respond differently according to results obtained in Germany after the present work begun. Liese and Dujesiefken (1989) found that bark wounds on beech, Red oak and English oak showed better wound closure following wounding in April than in October, December of February.

Acknowledgements

22. The work reported was funded by the Department of the Environment. I gratefully acknowledge the assistance of Mr I T Hickman, Mrs S E Brown and Mr C Palmer who have worked on the project.

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Published by: November 1993

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