



Arboriculture Research Note

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Issued by the D O E Arboricultural Advisory & Information Service.

Stakes and Ties

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Summary

Stakes and ties used to anchor a newly planted tree will damage the tree if they are not adjusted, repaired or in time removed. The materials used should be capable of accommodating tree growth without applying a damaging compression, or allowing abrasion of the stem to occur between maintenance visits to the tree.

Introduction

1. The practice of staking newly planted trees was reviewed in Arboriculture Research Note 40 in which it was recommended that only half standard and larger trees need artificial support, and then only until new roots have developed a natural anchorage. Support should be low on the stem and secured with a single tie. Damage to the tree may still occur if the tie or its management is unsuitable.

Evaluation of Tree Ties

2. Tying materials evaluated by Glenn (1965) showed that for orchard use coir yarn, which had to be replaced annually, was the most practical and economical material. Recent years have seen increasing numbers of proprietary ties offered in a range of materials, but there are no records of evaluations or comparative trials of these products. The choice of tie, therefore, may reflect cost and longevity rather than consideration of the purpose of the tie and the needs of the tree.

The Need for Support

3. A short stake and single tie should minimise movement of the root collar of a newly-planted tree until a new root anchorage has developed. Provided the soil conditions are suitable for root growth, this period should not be more than 18 months (Patch 1987). If the tree has not become self-supporting in that time, it is unlikely that it will ever do so. As soon as firm anchorage has developed the stake and tie should be removed.

Growth and Movement of the Tree

4. The girth of the stem of a newly-planted tree can increase by up to 35 mm per year (Glenn 1965). Maximum diameter growth of an unsupported tree is usually at or close to the root collar and is closely related to diameter growth of the main roots close to the stem base. Jacobs (1954), Neel, (1967) and (Patch 1987) have shown that preventing the stem from swaying raises the position of maximum stem diameter growth to above the tie. Hence the need for early removal of support.

5. The stem of a tree expands and even contracts in response to air temperature changes and the flow of sap. A tie must be capable of accommodating such changes.
6. The stem of a young tree is sheathed in a very thin layer of fleshy bark. As Brown (1987) has shown, pressure on the thin young bark can affect the cambium causing morphological changes in the stem. An ideal tie system would avoid such pressures, but in the absence of the ideal the pressure must be minimised.
7. The support system must prevent movement that would damage the roots, but without compressing the stem tissue or allowing the stem to become abraded at the point of support or along its length. Abrasion is minimised if a short stake (Patch 1987) is placed on the windward side of the tree and the stem is separated from the stake with a pad or spacer of inert non abrasive material.

Selection of Support Materials

8. In any support system the materials used should be chosen to meet an anticipated life. If, therefore, a support is intended to stop root collar movement until a new anchorage has developed, it is obviously unnecessary to use a stake pressure treated with preservative to give a life expectancy of 20-25 years. That is unless recovery of the stake, when it is no longer needed by the tree and before it damages the tree, can be assured.
9. If the stake also supports a guard designed to protect the tree from damage, then a stake with a longer life than 18 months may be required. Care must then be taken to ensure that the stake and guard do not themselves become damaging to the growing tree.
10. The minimum life of the tie must reflect the maintenance that can realistically be provided, and the material of the tie must accommodate the possible growth of the tree during that time. For example, the coir yarn favoured by Glenn (1965) was suitable for orchard use because annual replacement of the ties was accepted as an essential feature of routine management of the trees along with pruning and pest and disease control. Such a system is unlikely to be accepted in amenity plantings, but a tie with a maximum life of 2 years should be adequate unless recovery and re-use of the materials are programmed.
11. The whole range of proprietary ties may have a place in amenity planting. However, if a tie includes a non-elastic material such as a synthetic fibre webbing or expanded metal, it is not designed to expand to accommodate stem girth increment. Such ties must be adjusted at least once a year and preferably twice to allow for seasonal changes in the stem. Failure to do this will result in stem constriction and eventually stem breakage. All rubber or all-plastic ties are more elastic and therefore require less maintenance. Even so regular inspections are needed to ensure that tie and spacer materials have not failed allowing the tree to abrade on the stake.
12. Choice of ties should relate to ease of application and adjustment and consideration should be given to the need for the system to be tamper-proof. Buckle, nail-on and chain lock ties must all be correctly assembled and *secured at the top of the stake* so that the tree cannot abrade on the stake.

Conclusions

13. In many tree planting schemes it should not be necessary to provide any support at all. If large trees and, therefore, artificial support are unavoidable the materials selected must reflect the ability of the manager to provide aftercare to either adjust, repair, replace or remove materials before they damage the trees they were designed to support.

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Published by:
Arboricultural Advisory and Information Officer
Forest Research Station
Alice Holt Lodge
Wrecclesham
Farnham
Surrey GU10 4LH

April 1989

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