Protecting trees against wildlife damage: assessing the options

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Wildlife is integral to the life of fields. As they seek to satisfy their natural needs (food and reproduction), animals can cause damage to trees and shrubs.

Farmers need to be well acquainted with the different types of guards in order to use them properly and make the right choice for protecting their trees.

Give preference to mesh guards for protection of trees

There are a number of ways to provide protection for individual young trees

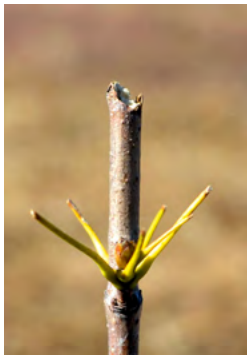
Wildlife damage to trees

Roe and red deer, rabbits and hares damage trees in various ways. Damage may be related to feeding and/or behaviour and its appearance provides clues as to the species responsible.

Browsing: this refers to the removal and consumption of seedlings, buds, leaves or needles, vertical shoots or lateral branches. Animals use their teeth to detach the palatable parts of plants within their reach. Deer, rabbits and hares all cause this type of damage, as they seek to supplement their usual diet of herbaceous and semi-woody vegetation.

Rubbing: rubs are wounds on the bark of trunk. Trunks can be stripped to varying degrees and sometimes even snapped. This type of damage mainly affects trees of less than 10 years old, and often leads to the death of the tree. The causes of rubbing are essentially behavioural. Male deer use tree trunks to rub off the velvet from their newly acquired antler growth when it starts to shed. During the rutting period, deer search for mates and engage in mock combat against young trees to release their aggression and also mark their territory with scent signals.

Bark gnawing: this type of damage is caused by rabbits and hares. It is closely correlated with food scarcity and with the animals' need to wear down their incisors. It consists of bark nibbling and is often characterised by oblique teeth marks at the collar or base of the trunk of young trees.



Browsing (rabbit)

Rubbing (roe deer)

Bark girdling (rabbit)

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Mesh tree guard (left), ventilated (centre) and unventilated (right) tree shelters

Types of device

There are several ways of providing protection for individual young trees. It is useful to differentiate between tree shelters and mesh tree guards.

Tree shelters are rigid translucent polypropylene green tubes with anti-U.V. treatment. They have a lifetime of 5 to 7 years after planting. Most shelters produced have a diameter between 8 and 12 cm. Their twin walled construction modifies the microclimate around single trees in ways that enhance height growth rates while offering protection from mammal damage [1].

Tree guards are commonly used for alley cropping systems. They are rigid cylindrical sheathing (Ø 15-33 cm), made from square or hexagonal mesh (2.5 to 25 mm). Quality products available today are made from high-density black polyethylene (HDPE) stabilised with ultraviolet (U.V.) radiation absorbers. This improves the resistance of the finished product to photo-decomposition and therefore enhances their durability.

Their life span also depends on their weight. Heavyweight (≥ 400-450 g/m^2) reinforced double-mesh tree guards will last from between 7 to 10 years. They are intended primarily to provide effective protection from mammal damage [2].

Why use mesh guards?

Cheaper and more convenient

The most marketed tubes are nested in each other by five or more, sold rolled up and delivered in boxes. Mesh tree guards are less bulky, and usually sold flat and pre-folded. This makes them easier for storage and carrying. The purchase price of mesh tree guards can be up to 35 % lower than tree shelters.

Unattractive to wasp nests

In the spring, the confined space created by the diameter of small tree shelters favours nesting of the wasps. With the summer, wasp activity and nest size increase. They proliferate and are made aggressive by the heat. During tree pruning, stings are frequent. The microclimate in tree guards is less favorable for wasps and it is rare to observe nests within them.

A wasp nest in a tree shelter

Easier for pruning

Low tree densities optimise initial growth by reducing competition from other trees, but induces the development of numerous defects in shape. Pruning is a means to correct these defects.

The diameter of the tree shelter is critical (≤ 12 cm) because it constrains branches. It can be difficult to insert pruning shears into a narrow tube when removing the unwanted branches. A mesh tree guard of 20 cm in diameter is the ideal device to facilitate the work of tree pruning.

When it is impossible to remove the shelter to prune a tree, the only solution is to damage the tube

Promotes balanced tree growth

Plastic tree shelters can cause physiological modifications in the growth of young tree seedlings by creating a microclimate within the tube. The most visible effect is a substantial elongation of the annual leading shoot (sometimes 2 to 3 fold longer than that of unsheltered tree). However, a reduction in root and stem diameter growth of the trunk has been also observed.

While earlier studies focused on temperature and light modifications to explain the distorted growth of trees inside shelters, more detailed studies have shown that ventilation is crucial. Without good ventilation, resulting from free convetion through the top of the shelter, the supply of CO_2 to the tree is too low. This results in a reduced assimilation rate.

Unstable red oak plant grown in ventilated tree shelter: it cannot support their own weight

Shelters have been improved by creating chimney-effect ventilation with holes drilled at the bottom, resulting in unnatural trunk diameter growth. However, the shoot - root ratio remains unbalanced. This abnormal biomass allocation in ventilated tree shelters results from the lack of tree movement within the shelter.

The movement of the tree stem induced by the wind influences the way in which material is allocated to different parts of the growing plant. Repeated swaying leads to a thickening of the lower stem and the rapid development of a structural root stem. This phenomenon is called **thigmomorphogenesis**. The leaves, which are free to move, might also be able to produce a signal (by wind or raindrops) that is sufficient to induce thigmomorphogenetical responses within trunks and roots [3].

Promote the growth of young saplings by:

- Protecting individual trees with mesh guards: potential negative impacts on trees are lower than those of shelters.
- Choosing protectors with a larger diameter promotes foliage development.
- Choosing a mesh with a larger size reduces the microclimatic conditions on trees.
- Avoid using protectors that are taller than necessary.

Quality criteria

Height and diameter

The effectiveness of a mesh tree guard depends on its capacity to protect tree seedlings during their entire period of vulnerability. The minimum height of a tree guard must always be greater than the critical height of possible damage inflicted on trees by an animal.

Maximum height (cm) of wounds to trees caused by animals				
	Rabbit	Hare	Roe deer	Red deer
Browsing	<60	<70	<150	<200
Rubbing	-	-	50-100	100-200
Bark gnawing	<50	<60	-	-

The standard heights of tree guards are **50 cm for rabbits, 60 cm for hares, 120 cm for roe deer, and 180 cm for red deer**. In areas where deer populations are very dense, the attractiveness of newly planted trees often compels farmers to use higher, heavier, and more rigid tree guards. These should be **150 cm high for roe deer** and **200 cm high for red deer**, and supported by reinforced wooden stakes.

The standard diameter of mesh tree guards will depend on the type of tree to be protected: 10 cm to 15 cm for poplar; 14 cm to 15 cm for hardwoods with strong apical dominance (e.g. cherry, ash, maple, red oak); 20 cm to 25 cm for hardwoods with strong lateral development and weak apical dominance (oak, beech, walnut) and 30 cm to 33 cm for conifers.

Weight

Supply catalogues currently give weights in grams per linear meter (lm). However, this is not a reliable indication when choosing between two products of equal height but of different brands and/or diameters. **Weight in grams per m²** is the only realistic criterion for reliable comparisons between types of protection.

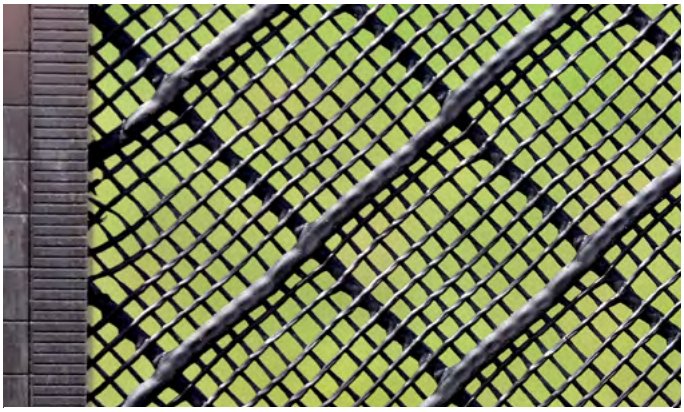
Work out the weight in grams per m²

Use the following formula to calculate the weight (W) of a mesh tree guard in grams per square meter: **W = g/(π. Ø/100)**, where:

- g: grams per linear meter (g/lm)
- π: mathematical constant equal to 3.1416
- Ø: diameter (cm) of the mesh tree guard

For protecting hardwoods from wildlife damage in agroforestry plantations, **heavyweight (± 400-450 g/m²)**, mixed and reinforced mesh tree guards combine the advantages of wide (1-3 cm) and fine (2-3 mm) mesh: thicker horizontal and vertical plastic strands provide rigidity and greater tear resistance, while the fine mesh prevents shoots from growing through the sides.

This reduces the risks of malformation and browsing of the main stems. Four pre-formed folds make the mesh guard easy to open for placing on the tree without injuring the tip, and help to maintain an oval cross-section which ensures the tree can grow easily out of the top.



Close-up of a heavyweight, reinforced double-mesh tree guard (25 x 25 mm/ 2.5 x 2.5 mm). This is suitable for agroforestry

List of references

[1] Potter MJ (1991). Treeshelters. Handbook 7. Forestry Commission. London: HM Stationery Office.
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[3] Coutand C, Dupraz C, Jaouen G, Ploquin S, Adam B (2008). Mechanical Stimuli Regulate the Allocation of Biomass in Trees: Demonstration with Young Prunus avium Trees. Ann. Bot., vol. 101 (9): 1421-1432.

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