PRODUCTION OF BARK FOR COMPOSTS

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Bark appears on trees from the seedling stage, protecting the plant, storing and conducting absorbed salts from the soil to the all-important leaves. Epidermal cells, the precursor to bark, carry out photosynthesis in the immediate post-seedling state, helping the plant to make headway against the many difficulties of its surroundings. In a short space of time the chlorophyll fades to be replaced more and more by the characteristic colour and markings of the firmer and increasingly tough layers of cells we now describe as bark. This layer which can, in mature trees, be quite thick, has been described as "bark, the protector". The latter is the main function against the many enemies from outside which include pests, diseases, and predators of many kinds as well as the natural hazards of tempest and fire. But protection is not complete and defences can be and are breached by endemic problems which, as far as the United Kingdom is concerned, restrict international trade in bark unless it has been fumigated.

Bark used for plant growing in the United Kingdom in composts or mixes is almost entirely softwood. Broad-leaved hardwood trees are not grown in plantations and the bark is usually relatively thin. Softwoods, on the other hand, are grown in plantations throughout the country in numbers large enough to make full scale harvesting possible. In the east of the country pine species grow well — *Pinus sylvestris* (Scots pine), *P. nigra* (Corsican Pine) and *P. contorta* (Lodgepole pine). In the west of England, Wales, and Scotland species suited to the higher rainfall are grown — spruce, larch, and fir.

Planting, management, and harvesting of forest plantations is now big business and at all stages up to date techniques and facilities are used. The Forestry Commission leads the way with a considerable programme of research and development. It was a member of their staff, a Mr. Jack Aaron who, in the 1960's, began trials on bark for plant growing. In the early 1970's it was he who focused my attention as a horticulturist on the commercial possibilities of bark. From these early discussions arose the involvement of Camland in bark. Now the brand name "CAMBARK" is recognised nationally and internationally as a high quality bark product for the growing of plants.

Between 1971 and 1973 Camland carried out a number of trials with a hammer mill product using information from research sources available. It was decided not to follow the popular line and produce a peat-like product but to supply a 100% bark product with defined particles to which the customer would add his own plant growing recipe of nutrients. We realised that we had a geographical advantage with large quantities of all pine bark which is a very slowly degradable product requiring the minimum nitrogen starter. The Regional Horticultural Advisers of the Ministry of Agriculture were kept informed of our objectives, namely a reliable constant product produced by a company respected in the trade for its high standards. Approaches were also made to national and international research and experimental stations. Throughout the years Camland has benefitted from the help and good wishes of many individuals and groups of people and this association still remains firm. By the mid-1970's the product that Camland was producing was of a consistent high quality and its reputation was becoming known. In order to expand, the company sought financial and business assistance and became part of the Gardner Watts Group and the company was re-named Camland Products Limited.

Since the beginning of our work many contacts have been made with sawmills in various parts of the United Kingdom where pine is the primary species and could be separated from others with relative ease. Verbal encouragement was given to sawmills to look at this raw material as a valuable asset, if removed from the timber with reasonable care, stored in a sensible way and kept clean and rubbish-free. It has been a long, slow job communicating our needs to increasing numbers of suppliers. Some have failed to meet our standards and no longer supply us — perhaps they will try again. We only purchase from suppliers who have good material and give good service. We are not happy to find non-bark objects in the raw material — stones (large or small), bolts and nuts, saw blades, engineering tools, etc. Clothing we accept as a soft hazard but it does wrap itself round the machinery causing delays. Damage to pulverising equipment can be very serious and costly. Over the past 10 years we have produced a natural material with admirable qualities and with the versatility which constantly surprises us and will continue to do so.

Turning the pages back to actual bark production, the selected seed of a chosen species is sown individually in multi-cell units in late winter and early spring (the compost used may well be bark-based). The plant is grown on under glass or tunnels and is ready for planting, weather permitting, in the autumn through to the following year depending on

when the quota for that season has been planted, or drought stops planting. Where the ground is suitable, machine planting will take place and will continue until ground conditions make this impossible. In hilly and mountainous areas traditional hand planting is done.

After a period of some 20 to 50 years felling is carried out. The days are long past when trees were felled by axe or two-handled saws, and horses were used to drag the logs from the plantation. Today sophisticated chain saws reduce a 50-year-old tree to ground level in a matter of seconds. The person responsible for sawing lays the logs in a criss-cross fashion trimming off any branches close to the butt. A forwarder machine will pick up some 18 to 20m^3 of logs at a time to be taken directly to the contractors' trucks or trailers. It is at this stage, too, that the same logs may be cut into suitable lengths for further use.

The removal of the bark from the logs can be done by one of two methods: the water tumbler friction method or the much more popular dry ring de-barker method. As the word "dry" signifies, water is not used to soften the bark for easy removal. The water content of the bark of the tree varies, low in summer and autumn, high in winter and spring. In early spring the flow through the sapwood increases in response to plants' requirements for water and nutrients. The moisture content during the active period is about 50 to 55%. Outside these seasons, i.e. late summer, autumn and winter, the moisture content could fall to 25 to 30% and, in very dry seasons, lower than this. Rainfall directed on to the bark of the growing tree has little or no effect on moisture content. The waxy content (suberin) of the corky cells repels the rainwater, though some could be carried in through cracks and crevices of the rough bark.

The dry system avoids any possible loss of chemicals within the bark that could enhance plant establishment and growth. To get the very best from the system the logs should be as regular in cross section as possible and clear of snags — short, stubby remains of branches. The aim is to reduce the amount of wood in the initial raw material before further treatment. The 6 to 7m. lengths of logs are brought into the sawmill yard and are stockpiled or fed directly on to a feed line attached to the de-barker. A cradle conveyor, part of the de-barker, feeds each log into a ring cutter head and is gripped by cogs which pass the now de-barked logs for grading and stockpiling. In the meantime the raw bark is conveyed either for stockpiling or pulverising (granulating).

In Camland we look for quality as well as quantity and

the raw material is collected from a sawmill, wherever that is, and stockpiled at our own depot where we have up-to-date equipment and land for expansion.

The bark is granulated, graded, and matured without additional nitrogen in carefully controlled conditions rendering harmless all phytotoxic chemicals such as an excess of monoterpenes. A small amount of monoterpenes will enhance growth, a large amount will retard, or even kill. A balance must be obtained. Similarly the manganese content must be below 300 ppm or toxicity will arise. Spruce and those other softwoods grown in the west of the United Kingdom where rainfall is high and peaty soil conditions predominate take up large amounts of manganese from the soil. These factors must be taken into consideration before the bark is sold for propagation or for potting or soil improvement.

When Cambark is ready for despatch to the customer the bark will be about three months old. The grades will be standard and consistent and the bark will have a pH of 4 to 5, an all important consideration for compost making.

Why use bark at all? For many years peat had been used but by the mid-seventies, because of mechanical harvesting and the process of mixing, the structure of peat gradually changed and became very fine. This fineness resulted in compaction and waterlogging with all the inevitable results. Even adding sand does not necessarily remedy this situation. Sand is lost in the interspaces and can decrease the air porosity of a mixture. At the time that peat became finer, bark became available in increasing amounts nationally and worldwide and research was begun into its use as an alternative, or as an amendment to peat.

On the continent where peat is scarce, or expensive, bark is marketed as a complete substitute and is processed and broken down to a similar physical consistency to that of peat. In the U.K., in the main, bark is used as an amendment to peat.

To obtain the full benefits of a processed bark for horticulture it must have clearly defined particles which are within certain parameters, depending upon the use to which the bark will be put. Pine bark, such as Cambark produces, has the outstanding characteristic of being resistant to decay and remaining resilient throughout. Rapid decomposition can result in structural loss and alteration of the air/water relationship existing within a compost or mixture. A 25 to 50% addition to peat will bulk up the compost and provide an open structured medium which is well drained, retains sufficient available water for plant growth, and has a good air volume for gaseous

exchange. As no additional nitrogen is added to our pine bark this must be compensated for at the mixing stage of a potting compost. This has the advantage that an early release of nitrogen within the compost will be mopped up by the bark, or leached out because of the free draining properties, preventing scorch occurring. This property is used to full advantage in a propagating mix for rooting cuttings, either as a 50/50 peat/bark mix or 100% bark. Controlled release fertilisers can be used which give a far superior cutting in considerably less time.

No matter how good the compost, growth of the plants is still very dependent on the management and expertise within the nursery. Nevertheless, in order that he may concentrate on growing plants, the nurseryman will want to be assured that the high quality material he buys today can be bought tomorrow and the day after.

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PROGRESS WITH DIRECT STICKING OF CUTTINGS

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Rooting cuttings directly into small containers is not a new technique but with major improvements in propagation techniques in recent years, particularly developments in using fertilized rooting media, it was felt that greater benefits from direct sticking were possible and that the subject needed looking at in greater depth. The work is still in its early stages and the scope of this paper is to preview the background of the improved rooting media, as well as the progress with direct sticking at Efford Experimental Horticulture Station.

Good quality cuttings are an essential start to any production schedule but all too often cuttings, once rooted, become neglected and starved before potting. This results in delayed establishment, slower growth initially, and poorer overall uniformity within a batch of plants which can be reflected in the