

The extraction of medical paclitaxel and docetaxel from taxus trees

A sustainable extraction technology based on TU Delft research.

Medicine

Docetaxel (trade name Taxotere®) and paclitaxel (tradename Taxol®) are medicines for the treatment of breast cancer and ovarian cancer. Tiny quantities of these substances can be harvested from one taxus tree. Therefore, they are extremely high-priced.

Raw material

The medicines are harvested from the bark and the needles of various species of the plant families of Taxaceae en Cephalotaxaceae. To give an example: it is possible to extract the substance required to produce paclitaxel from the needles of our taxus hedges, *Taxus baccata*. However, harvested quantities are very small. A one hundred years old tree can produce 350 mg, one dosage for one patient. For the complete treatment of one patient six of those trees would be necessary.

Traditional method

The present practice to harvest paclitaxel is by steam distillation and purification of the inside of the bark of old taxus trees. Needles also produce paclitaxel but in much smaller quantities. To produce 1 kilogram of paclitaxel 9000 kilograms of biomass are needed. Therefore, the pharmaceutical industry prefers the use of the bark of very old trees. But, after harvesting the bark, the tree dies. Reason why *Taxus brevifolia* from North America and *Taxus wallichiana* from China and Japan are threatened plant species now.

Electrospraying technology

The new method of harvesting paclitaxel is by means of electrical extraction. Plant fluids and substances contained are taken from the needles by electrostatic hydrodynamic atomisation, EHDA® technology. Through the stomata, the needles evaporate water and contained substances. Then, at the tip of the needle, a drop is formed. In the electrical field this drop takes a conical shape and breaks up into microdrops which are trapped. After evaporation of the water the substance, in this case paclitaxel remains.

Benefit

By the application of this new harvest technology, chemotherapeutic medicines can be obtained in a one step simple and sustainable way, resulting in a lower price for the treatment of a patient. Moreover, this method does not kill the plant, as is the case with the traditional method and, after a period of recovery, the plant can be used again.



plant fluids issuing from the tips of taxus needles...