IPM 2.0
Towards future-proof crop protection in Europe

B.I.T.E.

a low impact tool for xylematic injections

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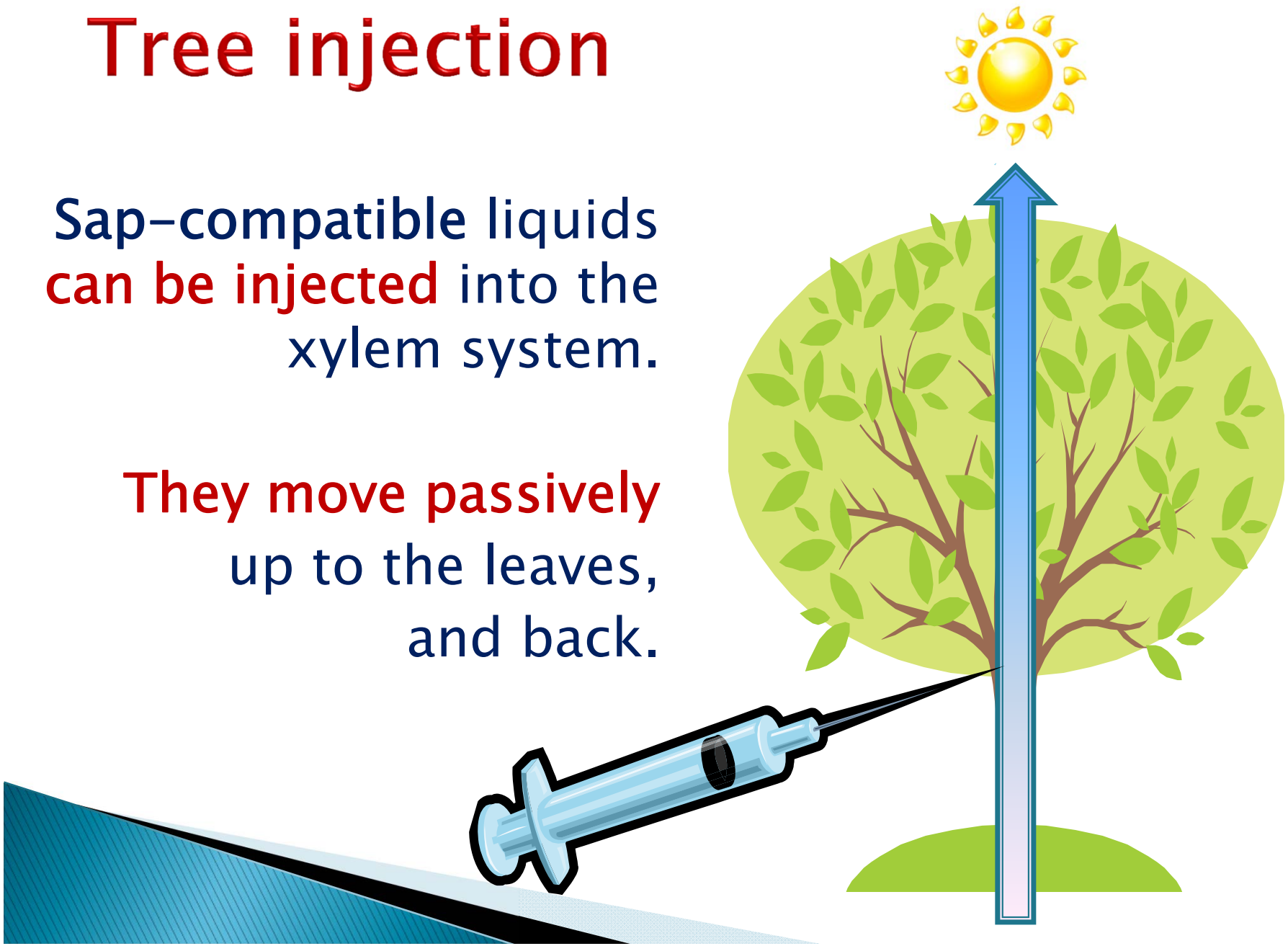
EFPP

Tree injection

Sap-compatible liquids **can be injected** into the xylem system.

They move passively up to the leaves, and back.



Liquid injection is at least 5-century-old !!!

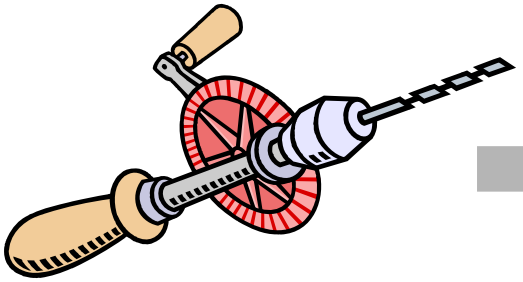
1478-1519: Leonardo da Vinci described how to inject a poisonous liquid in a tree from an external container through a hole, preferably in spingtime.

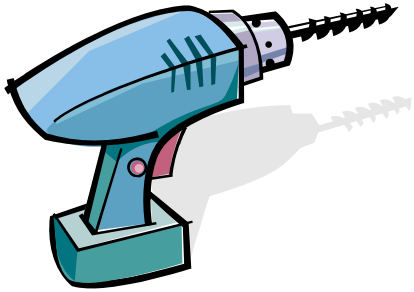
" Facendo un buco con un succhio in un albuscello e cacciandovi arsenico e sangallo sollimati e stemprati con acqua arzente [...] Ma vuole il detto foro esser grande e andare per infino al midollo [...] "

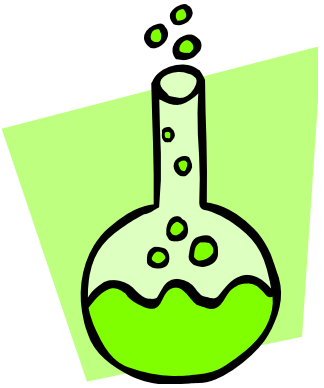
" [...] la detta acqua velenosa vuole essere messa in detto foro con uno ischizzatoio e turar con forte legno. Puossi far questo medesimo quando gli albuscelli sono in succhio [...] "

Codice Atlantico, fol. 76 recto a; fol. 12 recto a.

Little has changed in 500 years





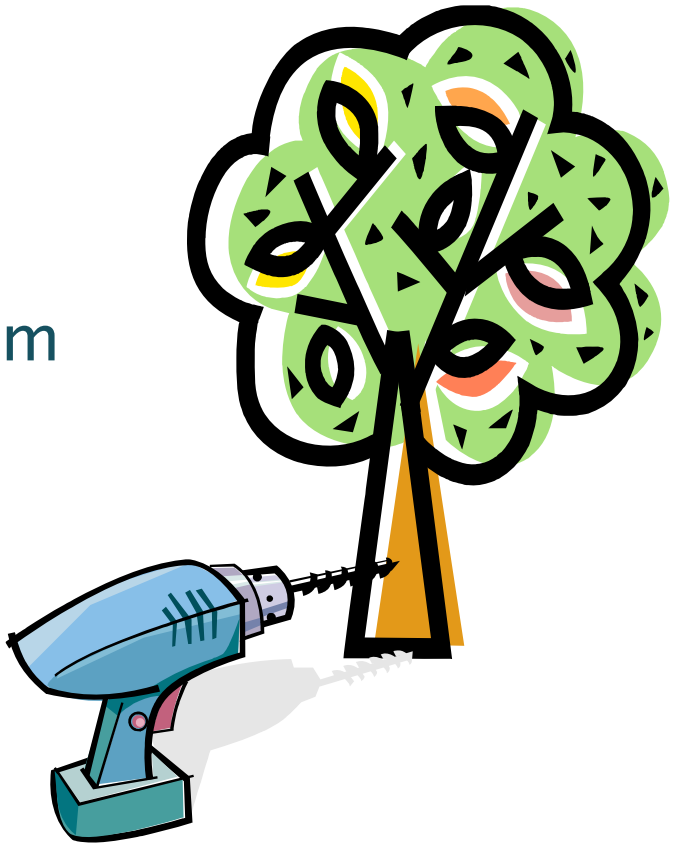


Tree injection is cheap and safe,
it reduces the use of pesticides

but with discouraging
long-term damages
mainly due to drill ports
production and closure

“Drill” problems

- Need of **well-functioning, long-lasting, expensive drill** + sharp **bits.**
- Removal of vital tissues + cambium overheating and devitalization + vessels’ cavitation = **delay in hole closure.**
- Hole infections by **parasites.**

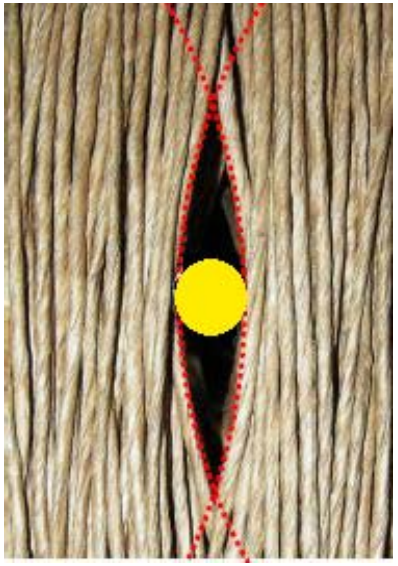


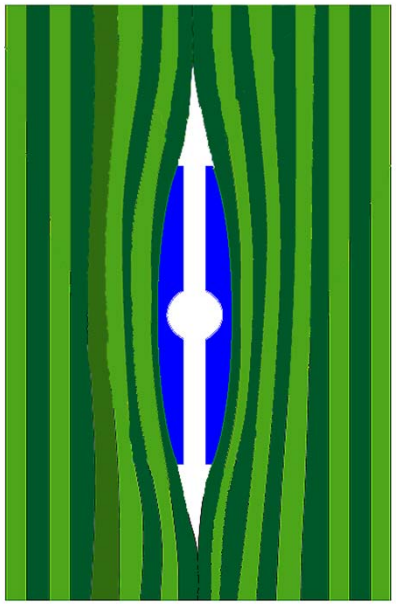
The traditional way

Can we imagine a drill-free, low impact xylem injection ?

First observation

By introducing an object of any shape into a bunch of fibers, they separate according to a **lenticular biconvex geometry.**





A lenticular blade separates the fibers with **the lowest friction and damage**

No wood removal
Quick closure

4 mm Ø hole vs. BITE (after 30 days)

BITE (above)
4 mm hole
(below)
(before injection)

BITE: full
closure
(30 days)

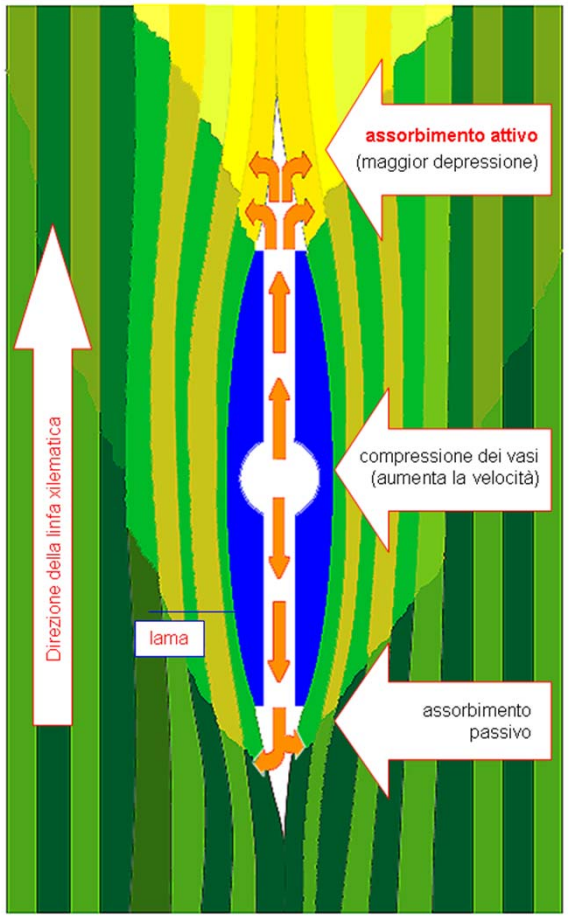
BITE: low
internal physical
alterations
(one year)

Second observation

Gently squeezing the vessels, a natural up-take can happen

The blade shape causes a temporary reduction of the vessels section.
The sap pressure decreases and its speed increases (*Bernoulli principle*).

<u>When the sap speed is substantial</u>,
liquids from an external source are actively up-taken *(Venturi effect).*

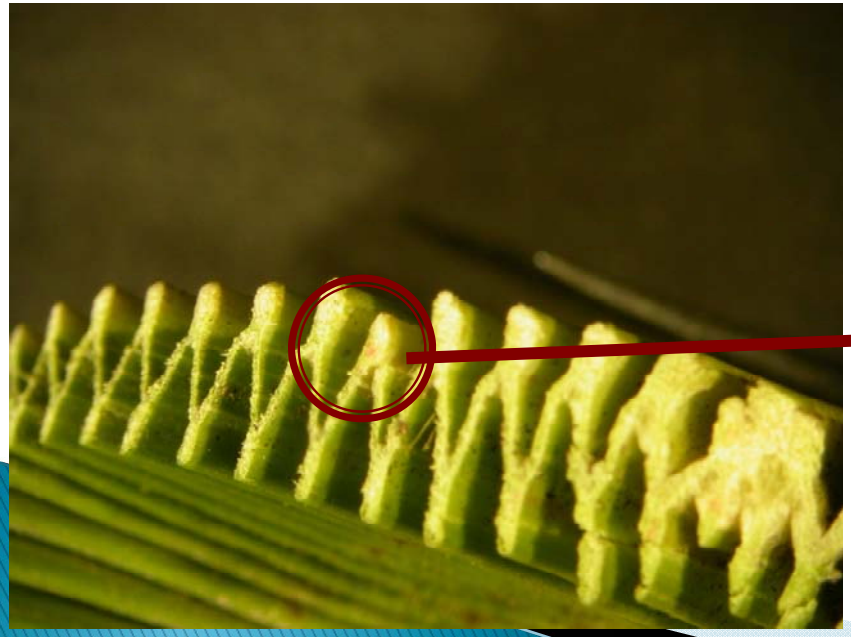


Natural up-take

BITE can be used with low pressure (30-35 psi)

Palm trees and *R. ferrugineus*

Up-take to the shoots



BITE vs. traditional methods

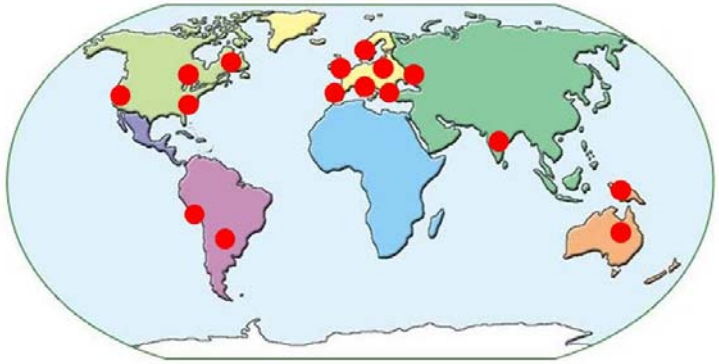
(field trials and pictures by Scott Irwin, Florida)

Few days after treatment

Few years after treatment

Main uses in the last year

- Urban and forest trees (insecticides, fungicides, biostimulants)
- Agriculture (apple, pear, cherry, walnut, avocado)
- Archeological sites (dessiccants)

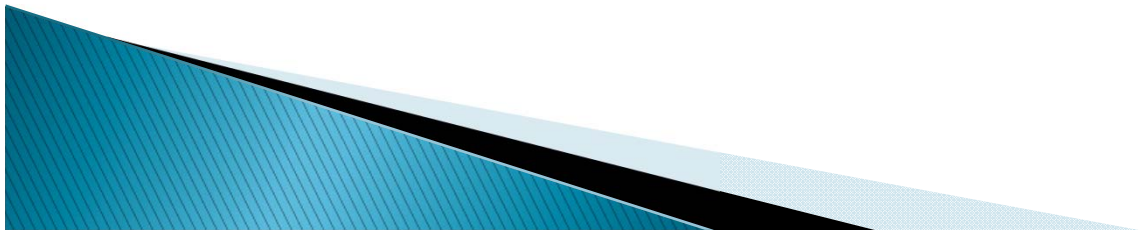


BITE is just a tool:
not to expect miracles !

- The ability to reach canopy mainly depends on the **liquid properties**
- **Results against diseases depend on the a.i.**
- **BITE doesn't reduce the chemicals' phytotoxicity.** Active ingredients are exactly the same used with other methods.
- The **Venturi effect** takes place when the sap speed is substantial.

For technical information

- Questions are welcome.
- montecchio@unipd.it
- www.biteinfusion.com
- “biteinfusion” channel in Youtube



Prosit !