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From ex situ to in situ:  
The risk of stowaways from the  
nursery growing media

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# Stowaways

For horticulturists and other specialists, 'stowaways' or 'plant stowaways' are unexpected species which grow in flowerpots or nurseries, due that their seeds have entered 'whithout an invitation', often travelling from far origins, caught within several substrata.

There are some stowaways species specialized in greenhouse environments, which are considered 'nursery weeds' world wide, e.e. *Marchantia polymorpha* var. *ruderalis*, *Cardamine flexuosa*, etc.

During the last years, the specialists working in nurseries where perennial plants are produced in the Valencian Community (E of Spain), have noticed an extreme increase in the presence of stowaways.



# The influence of nursery production

Forest nurseries and othe devoted to produce perennial species are more receptive to accumulate and maintain stowaways due that:

- Most stowaways are small herb, theorically few competitiveness sif compared with the cultivated species (but.... this ERRONEOUS!).
- The stowaways probably will not resist the hard environmental conditions of the plantation site, so they will die after transplantation (this is also ERRONEOUS).
- Use of coconut fiber –which is not a sterile substratum – is often recommended in standars of high quality for forest plant production (due to good flugging and avoiding disgregation of culture media, so able for culture on grid tables).
- Culture is made preferably on grid tables (the top of the nursery tables is made in a metal grid, so allowing the full percolation of water dropping from diffusers), where culture media are continuously washed, losing the allelopathic substances which stop or retard the germination of stowaway seeds. Grid tables are recommended for forest plant production, due that the base of tubes is directly contacting the air (instead of soil), so the vertical growth of roots is stopped and no root-winding is produced; the usual reaction of the root system is to produce lots of secondary roots, which favor a quick tooting after transplantation to a definitive site in field.



## How coconut fiber is produced

Coconut fiber is often marketed in pressed blocks. They come from coir husks a time separated from copra. The husks are often processed in India and southeastern Asia, where the fibers can remain drying in contact with close native vegetation and/or import small seeds of the more expansive species. Heat shock can destroy some of the properties of coconut fiber and any other treatments for disinfection of stowaways (i.e. chemical) could add toxic substances which disable the product to be used as culture media in plant nurseries.



## How stowaways emerge

Most stowaways are annuals or short-cycle species whose germination is inhibited by the allelopathic substances from peat and coconut fiber, so they only germinate after mid or long term of regular top-down irrigation.

Bottom-up irrigation (often made in nurseries for aquatic plants) and culture on plane tables does not eliminate stowaways, but they can not germinate (due to the concentration of allelopathic substances which maintain on the tubes for more time).



# Stowaways detection and identification

Since 2005, we have found more than 40 species regularly emerging from the substrata in the greenhouses of the CIEF and other research and conservation plant nurseries in the Valencian Community. 16 of them were new records for the Valencian Community, Spain, the Iberian Peninsula or the whole European continent.

Identification use to be difficult due that it deals often with tropical species (the use of field guides of India and close countries is recommended).

Some species are 'cryptic' due to its resemblance to some cultivated (i.e. *Tamarix ramossisima*, invading cultures of native *Tamarix* or some *Juniperus* spp) or native species (i.e. *Oxalis stricta* vs. *O. corniculata*).



## Main risks

Some stowaways are proved to be aggressive invaders or suitable habitats, mainly for dunes, coastal cliffs and wet environments (wetlands, wet grasslands, shaded mature forests, etc.), i.e. *Epilobium ciliatum*, *Oenothera rosea*, *Oxalis stricta*, *Chamaesyce/Euphorbia hypericifolia*, *Dactyloctenium aegyptium*, *Cyperus* spp. etc.



## Main risks

Even some tree species with tiny seeds such as *Tamarix ramosissima* and *Muntingia calabura* (first record for Europe) have been detected. *M. calabura*, named 'jam tree' or 'marmelade tree', due to the sweet flavor of their fleshy fruits, could be easily dispersed by birds.



# Preventive measures

Avoiding if possible the use of coconut fiber. Although a part of their properties can be lost, heat treatment or composting is recommended to disinfect the fibers.

Monitoring the emergence of weeds in the nursery, removing them and avoiding their spreading out of the containers or tubs. Removal of young invaders is quite easier than adult plants (which in fact often cannot be removed without damage for the cultivated plant)

Paying attention to the planted sites, especially for sensible habitats for new weeds such as dunes, wetlands, etc... Accurated monitoring of the plantation holes for at least 2-3 years is recommended, removing the invasive stowaways and avoiding its natural spreading.



Many thanks for your attention

