

KNOWLEDGE EXCHANGE ON NON-NATIVE TREE SPECIES INTRODUCED FROM CHINA (PRC) TO EUROPE

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Non-native tree species have been introduced and planted worldwide to improve services associated with human well-being. Since the 16th century, numerous tree species were introduced to Europe mainly from today's People's Republic of China (China) and North America for economic (timber, pulp, silk) but also non-material (such as aesthetic) reasons. Examples from China include *Morus alba*, *Paulownia tomentosa*, *Zelkova serrata*, *Acer sp.*, *Prunus sp.*, *Koelreuteria paniculata*, *Sophora japonica*, or *Ailanthus altissima*.

The later tree species (*Ailanthus altissima*) is a good example for a tree with both desired characteristics (fast growth, good timber quality, stress tolerance, high pollution resistance, attractive foliage) and unwanted behaviour such as invasiveness. Soon after the first introduction of this tree to Europe (to Paris) from China, around 1740, this species was introduced in other European countries where it served as forage for silk-producing caterpillar, forest tree, anti-erosion tree and for the most part of Europe as an ornamental tree. At present, *A. altissima* grows throughout the majority of European countries. To European society and plant scientific community this tree is well known because a) it is common in cities (in warmer regions of Europe), b) it colonized a broad range of rural areas and transportation corridors and c) it is hard to eradicate. Our recent molecular studies of trees collected in 62 locations in 31 European countries revealed that *Ailanthus altissima* (tree of heaven) was introduced to Europe multiple times, most probably from North-East China. Further analyses using material from the native range are crucial to narrow the introduction geographic range.

The early introductions of non-native species was mainly motivated by curiosity and botanical interest, in a time when knowledge of genetics and local adaptation was lacking, the question of seed origin and genetic variability had received little attention. After cultivation disappointments related to unforeseen pathogen sensitivity or different growth performance, the significance of geographical seed/plant origin was increasingly recognized.

Aims of this proposal are

- A. (in a long term) to establish scientific collaboration and the exchange of specialist expertise with partners from the Republic of China on non-native tree (NNT) species introduced from China in the past, but also for others, not introduced to Europe yet but of current economic and ornamental importance in China,

- B. (in a short term) to collect together with Chinese partner plant material of *Ailanthus* in a predefined native area in order to defined areas of geographical origin (from which areas/cities) this species was introduced to Europe.

To achieve these aims, we plan

1. Assessing the potential negative and positive impacts of species by exchanging knowledge on „European non-native tree species with origin in China“ during a workshop.
2. Identifying knowledge gaps on the ecological function, genetic resources and management and use of *A. altissima*, as a demonstration species with diverse ecosystem functions by geographical distribution.
3. Collecting plant material (leaves and seeds) of *A. altissima* from specific areas in China for further genetic analysis.
4. Strengthening scientific collaboration and the exchange of specialist expertise throughout the developing a dissemination strategy for future research activities on non-native tree species and joint publications.

Approval of this proposal would allow us a) to start an important cooperation with scientific partners from the Republic of China, a country of which tree species considerably contribute to European landscape, b) to bring our scientific understanding of non-native tree species to a higher level, when studying these trees in their native ranges, and c) to profit on our knowledge about these species from both sides of view, the European and Chinese, in the native and the introduced range.

The non-Austrian partners from the P. R. China will host the workshop, including all preparatory working steps. During the workshop the partners from the P. R. China collaborate with the Austrian experts to collate the most valuable information. The partners from the P. R. China lead the development of the dissemination strategy, which will be developed in the workshop. The partners from the P. R. China, together with the external partners, will provide information on the native sites which will be visited during the field trip. The partners from the P. R. China will support the Austrian partners in conducting the field trip.

Non-native tree and shrub species (NNT) have a long history of intentional and unintentional introduction to Europe outside of their natural range. Many NNT were introduced for horticultural purposes or as contamination of traded goods. Today NNT play a key role in many sectors, such as horticulture, forestry, urban management, all over the world. On the one hand introduced NNT provide various ecosystem services, while on the other hand few become a risk to natural ecosystems by invading native habitats, such as *Ailanthus altissima*, which have spread in large natural areas where they change the native species composition. In regard to this risk recently many national and international policies were adopted to mitigate the negative impact of the alien species of several taxonomic groups, targeting invasive alien, which have severe impacts on human health, livelihoods and food security, and undermine progress towards achieving many of the UN Sustainable Development Goals (CBD, 2016; IUCN Species Survival Commission, 2000; Regulation 2014).

From the current state of the art we conclude, that on the one hand NNT can be a valuable natural resource for the sustainable development of the future, and on the other hand NNT can impact native species diversity and ecosystem functions (COST Action NNEXT, 2018). The future and current sustainable handling of many NNT in Europe requires knowledge on the ecological function, genetic resources, managing and biology of NNT.

The non-native tree species *Ailanthus altissima* (Mill.) Swingle is widely distributed across Europe, along a gradient from the meridonal to the temperate zone, where it grows in wide range of habitats. Early sexual maturity, prolific fruiting, reading germination, adaptability to infertile sites and rapid growth rate make *A. altissima* to an intensely spreading tree in the countries where it has been introduced and where it got established and naturalized. *A. altissima* is considered as one of the worst invasive plant species in Europe, in North America, and many other countries (DAISIE, 2017; GISD, 2018; GRIS, 2018; Lowe, Browne, Boudjelas, & De Poorter, 2000). The native range of *A. altissima* is in eastern China, where the species grows as a natural component of broadleaf forests (Kowarik & Säumel, 2007). *A. altissima* is reported to have a negative impact on infrastructure, agricultural land, biodiversity in protected areas (Constán-Nava, Soliveres, Torices, Serra, & Bonet, 2015; Reinhardt, Herle, Bastiansen, & Streit, 2003) and human health by causing se allergic reactions, respiratory problems, and skin rashes (Ballero, Ariu, & Falagiani Piu G, 2003; Majd, Rezanejad, Irian, & Mousavi, 2013).

Very little is known about the potential beneficiary socioeconomic impact of *A. altissima* in Europe, which is also resulting from a lack of knowledge exchange with experts from the native range of the species. In its native range, *A. altissima* is used for horticultural purposes, bee keeping, forestry, urban greening, and in medicine and chemical industry (Sladonja, Susek, & Guillermic, 2015).

In the proposed project we aim to identify research gaps on the ecological function, genetic resources and management and use of *A. altissima* and to contribute to knowledge-based options for the use and the management of *A. altissima*.

The project has the following four objectives:

1. Assessing the potential negative and positive impacts of species by exchanging knowledge on „European non-native tree species with origin in China“ during a workshop.
2. Identifying knowledge gaps on the ecological function, genetic resources and management and use of *A. altissima*, as a demonstration species with diverse ecosystem functions by geographical distribution.
3. Collecting plant material (leaves and seeds) of *A. altissima* from specific areas in China for further genetic analysis.
4. Strengthening scientific collaboration and the exchange of specialist expertise throughout the developing a dissemination strategy for future research activities on non-native tree species (NNT) and joint publications.

The project will be carried out during the vegetation period 2019. The project's activities will benefit all involved Austrian and Chinese institutions by the joint knowledge exchange within a supportive environment through the workshop at the College of Forestry, Northwest A&F University in Shaanxi (Republic of China). The workshop participants will focus on collating information on the ecological function, genetic resources and management and use of *A. altissima* in both, the introduced range Europe and in the native range (China). The major output of the workshops is

1. to collate information on NNT
2. to identify knowledge gaps
3. to identify sites with NNT in the region and
4. to discuss future work packages for further analysis.

In addition to the workshop, cooperation between the Austrian and Chinese scientific groups will be supported by the development of a dissemination strategy for future joint research activities and publications. After the workshop a joint field trip will be organized to collect plant material and to address the species traits of *A. altissima* in native sites, which are preselected by local experts.