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Working Party 2: Domestication and Conservation of Genetic Resources (WP2)

Officials in charge

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Introduction

The WP2 was established with the role to contribute to a better knowledge and interchange of information and results that relate to Domestication and conservation of genetic resources of poplars and willows. More recently, the mission was extended to other fast-growing trees.

The WP2 focuses on issues concerning:

a- Genetic improvement by different means: classical breeding, development and application of genomic tools and genetic transformations.

b- Creation of new cultivars for different applications: wood for structural uses, bioenergy, phytoremediation, waste-water treatment, restauration, pulp and paper, basketmaking.

c- Conservation of natural genetic resources and ecosystems.

d- Specifically, in the context of adaptation to climate change, promote the development of strategies with respect to genetic breeding and conservation programs to select genotypes potentially capable of coping with future climate change.

Progress with the activities 2018-2020

The major focus of work in the WP in the past period has been on:

1) Progression in the update of the data-base about the poplar and willow breeding programs in the world.

2) Creation of a database of researchers and experts involving on domestication and conservation of poplar, willow and other fast growing trees and genetic resources (initial stage).

3) Interaction with WP on Taxonomy, Nomenclature and Registration: Check-list of the Salix spp collection in CREA-Casale Monferrato, Italy and in INTA-Delta del Paraná, Argentina; collaboration between Lorenzo Vietto and Teresa Cerrillo (in the interinstitutional agreement CREA-INTA, signed in November 2018).

Some other comments, with the involvement of WP2 members:

- Technical meetings to training workshops for managers of poplar and willow nurseries, for producers and industrialists (who adopt the new improved materials), for land use planning consultants, with technical advisory groups that contribute to the review of the research program and seminars for students of forest sciences (New Zealand, Argentina).
- Collaboration with the Seventh International Poplar Symposium of IUFRO. Organization of the willow study trip. October 28 – November 4, 2018. Buenos Aires, Argentina.
- Publication of a new manual for nursery managers in August 2020, by the research team; the first time a national publication for nursery managers has been released (New Zealand).
- Publication of the *Salix viminalis* genome in Sweden (Almeida et al. 2020).

Breeding programs show some changes, extensions or updates in their objectives or directions, expanding to other applications and genetic materials:

In New Zealand: their targeted uses include soil stabilisation on slopes and along riverbanks, shelterbelts, wood products, and pollen production. New Zealand, like most countries, is experiencing an increase in the frequency and severity of both regional droughts and significant rainstorms, seasonal difficulty in establishing new trees vegetatively, and new incursions of insect pests. The most recent insect incursion is poplar sawfly, *Cladius grandis*, first detected in January 2019. Its effect has been limited so far. It follows the incursion of the

giant willow aphid, *Tuberolachnus salignus* first detected in 2014, and which has caused the death of a large number of mature willow trees protecting riverbanks (Sopow et al, 2017).

In Serbia: now is more focused on susceptibility to diseases and phytoremediation (Pilipović et al, 2020).

In Sweden: a new research program (Future Fit Salix) has started (2020 - 2023) for willows in collaboration between the Swedish university of Agricultural Sciences and the breeding company Lantmännen lantbruk. Within this program wood traits important for the conversion to biofuels are introduced as breeding goals. The aim of the program is also to develop selection models for use in genomic selection for willows. Since 2016 three new willow varieties have been released by the breeding company Lantmännen lantbruk that all are different types of hybrids between the species *Salix viminalis*, *S. schwerinii*, *S. eriocephala* and *S. aurita*. The company European Willow Breeding has also released three new varieties since 2016.

In Argentina: collection, diversity studies, and genotypes propagation of *Salix humboldtiana* are the first stages to domesticate and integrate the only one native South American willow species into the breeding program. The adoption of six poplars (*Populus deltoides* and *Populus x canadensis*) and seven willow clones is in process. Five of these willow cultivars are multipurpose (for structural uses of wood, pulp and paper and environmental applications): hybrids: *Salix matsudana x Salix alba; Salix matsudana x Salix nigra*, and individuals obtained by open pollination of *Salix matsudana, Salix alba* and *Salix nigra*. Another seven selected clones are in technology transfer processes (Cerrillo et al, 2019). Four willows were also selected for basketry (*Salix viminalis* and *Salix viminalis x Salix caprea*), planted for the first time in large plots, and the technology transfer process began.

Non-destructive methodologies are being developed by INTA researchers to study the structural characteristics of the wood of willows and poplar, to apply them as predictive strategies in the breeding programs.

Other comments:

<u>A) Concerning the activity of the WP</u>

The interaction of experts and researchers involved in genetics can be intensified and help connect them with benefits in their research and generate agreements. In this sense, the databases developed and in process by the WP can be useful. We hope to promote a closer

cooperation between WP and users of the improved material, in each country, as an effective alternative to improve and accelerate the application of clonal materials, through the exchange of experience and knowledge.

B) Concerning (domestication and conservation of genetic resources) breeding programs in the world:

- Some difficulties and challenges have been observed for several breeding programs:

1) Often, there are difficulties to have enough sources of financing to sustain the programs in the long term and reductions in technical human resources are reported, with insufficient renewal to contribute to the programs. Considerable time is committed to seek additional funding, but long term breeding programs find it difficult to be supported with continuity, and competition is intense between indigenous and exotic woody species for the current uses. Important efforts are made so that researchers can attend congresses and technical meetings, often with public-private collaboration; in this sense, the support provided by the organizations of the last three IPC sessions is very remarkable, since they allow the attendance of researchers and experts from member countries.

2) Adoption of new and improved material: adoption processes are often slow. In this sense, it is relevant to have an integrated work (and prior to the release of the improved material) with industries and other potential adopters, who could test improved materials for their processes on a larger scale. In addition, it is necessary to intensify the work of professionals dedicated to forestry extension together with researchers.

3) In several countries: limited adoption of poplars and willows, with use below the potential of what the wood can provide; in many cases, due to the low diffusion of the physical-mechanical properties. It is important to promote poplar and willow as valuable commercial species because of the wood and its products.

4) Clone adoption takes a long time, it is important to design propagation strategies at the same time that the new selected clones are achieved (when the material is released, there should already be propagated material on a certain scale already started).

5) Promotion of the improved material must be targeted at increasing biodiversity within the planted material as a buffer against climate change.

Program of work for the next two years 2020-2022

Continue with consensual activities: 1- Database on poplar and willow improvement programs. 2- Database of researchers and experts involved in domestication and conservation of poplars, willows and other fast-growing trees and genetic resources and 3 - Interaction with WP on Taxonomy, Nomenclature and WP Registry).

In keeping with the broader scope of the IPC, extended to other fast-growing species, WP2 will consider to include other breeding programs of those forest trees (so far poplars and willows) to update the database.

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