



Food and Agriculture  
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# Poplar and Willow News

*Newsletter of the International Poplar Commission  
"Poplar and Willow News"*

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## Editorial

### Dear Readers,

Welcome to the newsletter of the International Poplar Commission (IPC). Below, you will find information on international conferences hosted by the National Poplar Commissions of the different member countries, as well as other events of interest related to the production of and research in poplar and willow. This bulletin also informs and reviews the main activities of the IPC and other organizations in order to circulate useful information that may be of interest to the whole community working on Salicaceae. Likewise, it contains a selection of publications of various types, including papers, abstracts, books and new reference work.

We invite you to participate by submitting your articles, papers, research reports, interviews and so on. Contributions can be sent to [salicaceas@gmail.com](mailto:salicaceas@gmail.com). We also take this opportunity to welcome Dr. Benjamin Caldwell to the editorial committee, as he began work with the FAO IPC Secretariat in June 2018.

### The editorial committee



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Martin Weih, IPC Chairperson.

## Past events

### 49th Session of the Executive Committee of the International Poplar Commission

The 49th Session of the Executive Committee of the IPC was held in Rome, Italy on July 18, 2018. During the Session, the various IPC Working Groups presented their reports. A summary is provided below.

#### Working Party One: Taxonomy, Nomenclature and Registration

Four activities were planned during the 48th Session of the IPC Executive Committee, in Berlin September 2016:

- 1) Continue the update of *The International Register of Populus Cultivars* and *The Checklist for Cultivars of Populus*;



Catherine Bastien, Executive Committee Member, France

- 2) Initiate *The International Register of Salix Cultivars* and continue the update of *The Checklist for Cultivars of Salix*;
- 3) Raise breeder awareness of the importance of cultivar registration;
- 4) Maintain a network and update the IPC web portal.

Progress:

**Activity 1:** An update of the international register of *Populus* Cultivars was completed in 2017 and will be published on the IPC website by the end of 2018. The checklist for cultivars of *Populus* was updated with two new cultivars (it currently includes 473 cultivars and 93 experimental cultivars), and an annual report providing data on *Populus* cultivars was submitted to the Special Commission for Cultivar Registration of the International Society for Horticultural Sciences in March 2017.

**Activity 2:** Work to revise the *Salix* cultivar checklist commenced, in February 2018 and which should be completed by November 2018. At time of writing, no cultivar registrations have been received by the Working Party during the 2016-2018 period to open the International Register of *Salix* Cultivars.

**Activity 3:** In November 2016, 150 poplar and willow breeders and researchers were contacted by email and invited to review the IPC website and submit new registrations.

**Activity 4:** In November 2016, a mailing list was compiled and the portal was updated. In 2018, a new series publication - comprised of seven publications entitled 'Name Changes Alerts' - was prepared.

Challenges and corrections: few registrations were submitted after 2016. Pursuing arrangements with National Poplar Commissions to encourage applications should be explored.

Over the next two years Working Party will continue Activities 1 and 2. In furtherance of Activity 3, the group will focus on obtaining formal registrations from breeders and guide breeders on naming conventions. For Activity 4, the group will continue to maintain the portal, including by uploading the second version of *The Checklist for Cultivars of Salix* and the updated *International Register of Populus Cultivars*. A database may prove more attractive than a spreadsheet and this option will be explored.

## Working Party Two: Domestication and Conservation of Genetic Resources

Four activities were planned during the most recent IPC Session:

- 1) Collaborate with researchers and experts to create a data platform on the domestication and conservation of poplar genetic resources;
- 2) Update the database on breeding programs and pollen collection;
- 3) Develop a database of clones and gene banks;
- 4) Improve interaction with the other working parties.

The Working Party reported they now have updated information on experts and breeding programs (activities 1 and 2) obtained via questionnaire. This information was current as of October 2017. Updating these resources was undertaken as part of the Fifth International Conference on Salicaceae in



Giuseppe Nervo, Executive Committee Member, Italy.



Talca, Chile.<sup>1</sup> Some initial work has been undertaken to develop a database of clones and gene banks in collaboration with the Working Party on Taxonomy, Nomenclature and Registration (Activity 3). As part of work on Activity 4, the Working Party consulted colleagues from 14 member countries (Argentina, Belgium, Bosnia, Canada, Chile, China, Croatia, Italy, Spain, Germany, Greece, France, Netherlands and the United States) to obtain information on new and relevant activities. The Working Party received responses from seven countries. Notable activities from each country were:

- In Argentina, the Fifth International Conference on Salicaceae was held in November 2017. Further advances were made in the collection and molecular characterization of *Salix humboldtiana* Willd (the only native species of Salicaceae in South America). A project for technical collaboration on Salicaceae between (Estación Experimental Agropecuaria Delta del Paraná, Argentina) and CREA (Unità di ricerca per le produzioni legnose fuori foresta (PLF), Casale Monferrato, Italy) was developed and will be signed shortly.
- In China, the National Review Committee approved 14 poplar varieties for use. Technical meetings on poplars and willows were held at Zhejiang Forestry University in September 2016 and at Baoding, Hebei, in September 2017.
- In Italy, in addition to ongoing clonal testing trials, a new project has been initiated on the adaptation of improvement and selection programs to meet anticipated needs in light of climate change.<sup>2</sup>
- In New Zealand, trials of 13 poplar and nine willow clones are ongoing. Two technical meetings were held between researchers and extension officers.
- In Sweden, the Lantmännen/SWseed company and European Willow Breeding AB company (EWB) released five new *Salix* varieties. Two projects, OPTUS (Optimized Utilization of *Salix*)<sup>3</sup> and CLAP (Climate adapted poplars),<sup>4</sup> are ongoing.

1 See (<http://jornadasdesalicaceas2017.blogspot.com/2016/11/jornadas-de-salicaceas-2017.html>)

2 See B4EST, [https://cordis.europa.eu/project/rcn/214319\\_en.html](https://cordis.europa.eu/project/rcn/214319_en.html)

3 <https://www.slu.se/en/Collaborative-Centres-and-Projects/optus/>

4 <https://www.slu.se/en/departments/crop-production-ecology/research1/forskningsprojekt/clap/>

- In Serbia, four new poplar clones were released and one technical meeting was held in December 2016.

The Working Party committed to the following over the period 2018 to 2020: completing the work proposed during the last IPC Session (i.e. completing the data platform including researchers and experts involved in domestication and conservation); updating the database on breeding programs and pollen collections; and preparing a database of clone collections and gene banks.

### Working Party Three: Plant Health, Resilience to Threats and Climate Change

The goals for this Working Party, agreed during the last IPC session, were to assist the development and exchange of disease resistant breeding stock in willows and poplars. In order to achieve these objectives, the Working Party undertook to create opportunities for experts in plant health to interact and attract younger researchers.

The Working Party has begun compiling a list of active researchers in plant health, which will be posted on the IPC website once completed. It has also commenced a report on poplar and willow selection and breeding for sustainable resilient plants. The report, which is complete for Europe, requires updating to cover additional countries. During the next session of the International Poplar Society in 2018, Buenos Aires, the Working Party will hold a side meeting to discuss activities and next steps for the period 2016-2018.



Ian McIvor, Vice-Chair of the Working Party on Domestication and Conservation of Genetic Resources.

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The IPC Executive Committee and Secretariat.

### **Working Party Four: Sustainable Livelihoods, Land-use, Products and Bioenergy**

As part of ongoing IPC reforms, this Working Party is currently in the process of reorganization, transitioning from previous working parties on production systems and harvesting and utilization of wood. To this end, the Working Party has developed an action plan for the next two years.

Key actions items are as follows: first, the Working Party will prioritize networking with industry and new countries. Second, it intends to organize itself around regional network managers. Third, the Working Party plans to hold topic conferences on poplar wood products. Fourth, it proposes to develop a database on wood products and initiate new research conducted by young scientists using small grants. Fifth, it intends to explore whether other species located in the tropics can achieve objectives similar to Salicaceae. Finally, the Working Party intends to update its webpage to reflect this work. It concluded by noting that, since the topics and geographic breadth for which the Working Party was responsible were quite varied, it would be necessary to increase membership and specialization.



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Joris Van Acker, Chair of the Working Party on Sustainable Livelihoods, Land-use, Products and Bioenergy

Members thanked the Working Party. They noted that since wood producers and users were often not one and the same, and could be geographically dispersed, there was an opportunity for the Working Party to help evaluate and anticipate the type of tree crops best suited for users' respective needs.

### **Working Party Five: Environmental and Ecosystem Services**

Since the IPC's last meeting, this Working Party has made progress on its agreed work program. First, it led a meeting during the International Phytotechnologies Conference in Montreal in 2017. It also intends to hold meetings at both the 2018 Woody Crops International Conference in Rhinelander, Wisconsin and the 2018 International Phytotechnologies Conference in Serbia. Second, it has created information sheets on green technologies, which will be uploaded to the IPC website. Third, it has contributed several articles to the IPC newsletter. A series of articles on rapidly connecting phytotechnology research in greenhouses to work in the field is also forthcoming.

### **Working Party Six: Communication and Outreach**

The Chair reached out to IPC members to seek their assistance in increasing the Working Party's membership base. Based on the response to that outreach, positions in the Communication and Outreach Working Party could be allocated either geographically or thematically. The Chair also intends to engage the National Poplar Commission in Argentina during the IPS VII meeting in Buenos Aires in October-November 2018.

Following discussions, the Executive Committee agreed that it would be useful to produce a



series of short videos detailing the purpose of each Working Party. The Secretariat undertook to ascertain relevant costs and other necessary arrangements before reporting to the IPC and Executive Committee.

The full report of the most recent Executive Committee of the International Poplar Commission is available at <https://bit.ly/2IBOVRx>

## Upcoming events

### International Poplar Symposium VII, IUFRO

“New bioeconomics: Exploring the role of Salicaceae plantations.” October 29 to November 4, 2018. Buenos Aires, Argentina.

Poplar and willow plantations and indigenous areas cover approximately 102.1 million hectares worldwide, providing the raw materials for wood products such as paper, reconstituted wood panels, plywood, veneers, sawn timber, packaging boxes, pallets, furniture and wood products for food. They are also cultivated for bioenergy production, soil and water conservation, recovering degraded sites, rehabilitation of fragile ecosystems, carbon sinks, crop protection and many other purposes.

As previous IUFRO meetings (Seattle 1995, Orleans 1999, Uppsala 2002, Nanjing 2006, Orvieto 2010 and Vancouver 2014) have done, this symposium will provide an excellent opportunity for scientists and managers of forest plantations to present and discuss recent advances in genetics, genomics, physiology, tolerance to pests and stress conditions



Silvopastoral system. Forestal el Sol SA



Laminated poplar beams.

and production systems that facilitate a better use of genetic resources.

We invite researchers and experts from universities, research institutions, government agencies and relevant industries to attend and participate in the International Poplar Symposium VII to explore and enhance the role of Salicaceae in the bioeconomy.

The meeting is organized by the National Board of Forest Industry Development of the Ministry of Agro Industry, the National Institute of Agricultural Technology (INTA), the Faculty of Agronomy of the University of Buenos Aires (FAUBA), the Faculty of Agricultural and Forestry Sciences of the National University of La Plata (UNLP) and Working Party 2.08.04 under the auspices of the International Union of Forestry Research Organizations (IUFRO).

A technical visit to industries and forest plantations will be held on October 29 in the Paraná Delta, Argentina's primary poplar and willow plantation located 80 km north of Buenos Aires. The tour will also include a visit to Paraná Delta Agricultural Experiment Station, which leads the Salicaceae breeding program.

The working sessions will take place from 30 October to 1 November and will include guest lecturers and speeches by prestigious scientists.

Time has also been allocated for debate and networking. Guest lecturers include Dr. Ronald Zalesny from the Northern Research Station, Institute for Applied Ecosystem Studies, United States; Reinhard Ceulemans from the Centre of Excellence on Plant and Vegetation Ecology of the University of Antwerp, Belgium; Joris Van Acker from the Laboratory of Wood Technology of the Ghent University, Belgium; Martín Weih from the Department of Crop Production Ecology of the Swedish University of Agricultural Sciences (SLU), Sweden; Deqiang Zhang from the Laboratory of Genetics and Breeding in Forest Trees and Ornamental Plant of the Beijing Forestry University, China; and Dr Yousry El-Kassaby from the Department of Forest Resources Management at UBC and the holder of the NSERC Industry Senior Research Chair (IRC) in Applied Forest Genetics and Biotechnology & Coordinator of IUFRO Division 2, Canada.

Following the sessions, post-conference tours to Patagonia's Alto Valle region will be held. This will include visits to field trials, industrial plantations for the production of solid wood, crop protection and recovery of degraded areas, wood transformation industries and natural willow populations.

We have also organized a program of visits to several places of historical and cultural interest for those who accompany participants.

For further information, please contact Silvia Cortizo by email: [ips7ba@gmail.com](mailto:ips7ba@gmail.com)

Blog: <https://poplarsymposium.blogspot.com.ar>  
<https://www.facebook.com/poplarsymposium/>

## Articles of interest

### Some endophytes from willows assist other species under stress

#### Broccoli in space: How probiotics could help grow veggies in microgravity

While astronauts at the International Space Station are spending more time away from Earth, they still need their daily serving of vegetables. In the quest to find a viable way for the crew to grow their own



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Students at Valley Christian High School in San Jose, California, prepare their experiment. Deborah Rigg



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A new experiment will test whether microbes can improve broccoli growth in challenging conditions in space.

veggies while orbiting Earth — and possibly one day on the moon or Mars — student researchers are sending broccoli seeds coated with a healthy dose of probiotics to space.

Six broccoli seeds were aboard the Orbital ATK Cygnus spacecraft that launched from Wallops Island, Virginia, as part of a space station cargo resupply mission. Three of the seeds are traveling to space as is, while the remainder were coated with two different species of bacteria, developed at the University of Washington, that can live inside crop plants and improve their growth. These “beneficial” microbes, also called endophytes, may also help plants to grow better in extreme low-gravity environments, where nutrients or water could be lacking.

The goal of the experiment, conducted by students at Valley Christian High School in San Jose, California, is to learn how to grow vegetables in the challenging, microgravity conditions of the space station — and eventually on the moon and Mars — as human space exploration expands. Developed by a team of 11 students, the initial

ground experiments proved successful: the broccoli grew faster and significantly larger than the control study.

"It would be ideal if we could grow crops for astronauts at the space station or who are lunar or Mars-based without needing to ship potting mix or fertilizer," said Sharon Doty, a UW professor at the School of Environmental and Forest Sciences and a plant microbiologist who isolated and characterized the microbes used in this experiment. "We would like to be able to get plants to grow in what is available with a minimum input."

The students are participating in the Quest Institute for Quality Education's "Quest for Space" program and are mentored by David Bubenheim of the NASA-Ames Research Center's Biospheric Science Branch and John Freeman of Intrinsyx Technologies. The experiment was prepped in a flight laboratory located at the NASA-Ames Research Center in California.

Freeman has test-grown many plants aboard the International Space Station and has also used these same microbes to enhance the growth of crop plants such as tomatoes, lettuce, soybeans, wheat, corn and broccoli. Freeman has found that these plants thrive, even when given less water and essential nutrients such as nitrogen and phosphorus.

Freeman's work also confirms a 2016 study in which Doty and her co-authors found that plants can better tolerate drought and other environmental stressors with the help of natural microbes that provide nutrients to their plant partners. These specific endophytes and broccoli plants were chosen for the space flight experiment because they performed well together in greenhouse tests under growing conditions similar to Mars, where nitrogen and phosphorus are limited, Freeman said. While a number of different vegetable growing experiments have been conducted aboard the International Space Station, this is the first to study natural microbes that could help plants grow under nutrient limitations and in microgravity, he said. "In space, plants are very stressed and don't grow or reproduce well," Freeman explained. "We want plants to grow better. We are trying broccoli because it's considered an anti-carcinogenic food source that is a good dietary candidate for deep-space explorers."

The microbes are first encapsulated inside a coating that covers the broccoli seeds, which protects them from dehydration and allows for safe dry storage before the seeds are hydrated and grown in orbit. When the endophyte-coated broccoli seeds reach the space station, they will be hydrated in a small plant-growth chamber that provides constant light to promote photosynthesis. Cameras will take images of the seedlings at regular intervals, which will help the high school researchers and their mentors to track overall seedling growth.

After the plants return from space, the students will measure their growth and chlorophyll content and compare the inoculated broccoli to those grown without microbes. Separately, Doty and her team will receive plant samples to investigate how well the two microbe species colonized the broccoli in space, and whether they were as effective as when grown on Earth.

"We want to know whether the microbes still find their way inside the plant even in microgravity, and if any of the required plant signals are terrestrial-based," Doty said. "We need to test if they are still functioning the way we would expect when growing in a different environment like microgravity." Doty and her UW team isolated the microbes used in this experiment more than a decade ago from wild willow plants growing on nutrient-deficient land among the rocks and sand along the Snoqualmie River. The plants had already selected the best microbes to help them grow in harsh conditions, so the researchers tapped into these key microbial strains and used them to help crop plants, grasses and trees grow in difficult environments. These microbes can benefit plants of all kinds, helping



Willow and poplar trees growing along the Snoqualmie River.

© University of Washington / Sharon Doty



them convert nitrogen from the air into essential plant nutrients, reducing the need for synthetic fertilizer in the case of crop plants such as broccoli.

In separate projects, Doty and her lab, along with Bubenheim and Freeman, are starting to test whether plants given natural willow and poplar microbes can grow in conditions that exist on the moon and on Mars. To do so, they use regolith simulant — ground-up rocky material with no organic matter — that mimics extraterrestrial conditions in both locations to see whether microbes can help plants grow in otherwise harsh conditions. The work is also part of the UW Astrobiology Program, which was the first university program of its kind when it launched 20 years ago.

“This is the first step in what I hope becomes a long-term research program to develop habitation on Mars and on the moon in an efficient way using natural symbiosis instead of trying to bring chemical fertilizer to those environments,” Doty said.

For more information, contact Doty at [sldoty@uw.edu](mailto:sldoty@uw.edu) and Freeman at [jfreeman@intrinsyx.com](mailto:jfreeman@intrinsyx.com).

*This educational research flight opportunity was made available to the Valley Christian High School of San Jose, California, via a partnership with the Quest Institute for Quality Education, and by Space Tango via its Space Act Agreement with NASA's U.S. National Lab on the International Space Station.*

## The ancestors of new frost resistant poplar varieties in Russia

Anatoly Tsarev, Raisa Tsareva and Vadim Tsarev | All-Russian Research Institute of Forest Genetics, Breeding and Biotechnology

### Introduction

According to state registration data (Federal Forestry Agency of Russia, 2011), Russia's total forest area is 770 621.2 thousand hectares, with a total wood stock of 79 888.85 million m<sup>3</sup>. Forest distribution is, however, uneven: about four-fifths of Russia's total forest area is in Siberia (608 081.8 thousand ha), with only one-fifth (162 539.4 thousand ha)

located in European Russia, where more than three-quarters of the country's total population is concentrated. Moreover, due to low infrastructure density in taiga forests, about half of the forest area in Siberia is inaccessible.

To reduce local wood shortage, Russian forest researchers have been breeding fast-growing forest trees since the 1930s. First among these were poplar breeding programs. The works on this topic of Berezin (1939); Albensky (1959); Ivannikov (1959); Yablokov (1963); Konovalov (1963); Bogdanov (1965); Besschetnov (1969); Veresin (1974); Bakulin (1986) and other Russian forest tree breeders are well-known (Tsarev, 2017; 2018). These and other researchers obtained dozens of hybrids and hundreds of thousands of hybrid seedlings, from which some new cultivars were selected. However, only a few are registered by the State as a variety.

To be registered in accordance with the Law of the Russian Federation (No. 5605-1 from 06.08.1993), varieties must satisfy the following requirements:

- Novelty – the variety must be new.
- Distinctiveness – the variety must differ from others.
- Stability – the variety should retain its features after reproduction.
- Homogeneity – the variety should have uniform features.

In recent years, some of the selected poplar hybrids have been registered as a variety. To date, however, forest cultivars occupy an insignificant share of the many thousands of agricultural, fruit, medicinal and ornamental state-registered varieties in the Russian Federation.

Of the 16 varieties of forest trees patented in Russia in 2018, half were produced in the Central Chernozem region. Of the seven registered poplar varieties, four ('Bolide,' 'Veduga,' 'Steppe Lada' and 'Breeze') were bred in the All-Russian Research Institute of Forest Genetics, Breeding and Biotechnology. In addition, a new variety ('Surprise') has been submitted for state registration (Bulletin of Variety..., 2017; Plant varieties..., 2017).

This article provides a brief description of registered new poplar varieties and their parent trees, as well as an account of the submitted variety 'Surprise' (breeders Tsareva and Tsarev).



## Materials and methods

All five of the above noted poplars were obtained by hybridization. Three ('*Steppe Lada*,' '*Veduga*' and '*Bolide*') were obtained by full-sibs crosses, while the remaining two ('*Breeze*' and '*Surprise*') were achieved from half-sibs. Seed collection was carried out from the cut branches.

For full-sibs, winter-resistant crosses and fast-growing female trees were selected from local green plantations and from the samples collected by investigators. The male parents were selected with some differences in their morphological features. In particular, the selected trees had a pyramidal crown: *Populus bolleana* from the Astrakhan region and an A.V. Albensky hybrid, '*Pyramidal-Osokorevy Kamyshinsky*,' from the Volgograd region. While the *P. bolleana* has a beautiful pyramidal crown, it is not frost resistant and did not, therefore, meet the objective of creating a frost-resistant, male hybrid with a pyramidal crown in the Central Chernozem region.

To obtain the parent of the '*Breeze*' cultivar, seeds were collected from the frost-resistant and quick-growing A.S. Yablokov hybrid '*Pioneer*.' Following field tests, the best male variety was selected from that half-sib hybrid family.

The '*Surprise*' cultivar's parent tree was selected from the Italian female cultivar '*I-455*.' The cultivar '*I-455*' had good growth but was not frost-resistant.

With the exception of one that produced seed before dying, all of its trees perished with the Russian frost. We believe that one of the frost-resistant poplars from our collection of 300 clones was the male parent. Tsareva collected these seeds and had a half-sib family. The next field-testing of that family permitted selection of the best male tree, which was cloned and tested as a variety.

## Results and discussion

As a result of these studies, we obtained new poplar genotypes, their primary requirement being high winter resistance. The actual characteristics of the registered varieties' parent trees are provided in Table 1.

As can be seen from Table 1, the ancestors of the white poplars were more frost tolerant than their male parent but they inherited its pyramidal crown. The ancestors of black poplar cultivars were frost tolerant and fast growing. Other specific data on these varieties is provided below.

**The '*Steppe Lada*' poplar variety** is fast growing and highly tolerant to the winter conditions of the Central Chernozem region. At the age of five years, the hybrid family showed a height of 7.2 m; a diameter of 11.3 cm; trunk volume of 0.026 m<sup>3</sup>; and wood stock of 10 m<sup>3</sup>/ha. At the age of 15 years, this hybrid family had reached an average height of 18.2 m; diameter of 31 cm; trunk volume of 0.464 m<sup>3</sup>; wood stock of 174 m<sup>3</sup>/ha; and an

**Table 1: Statistics for parent tree varieties and their controls to date**

Varieties	Sex	Age (years)	Height, (m)	Diameter(cm)	Trunk Volume (m³)	Volume increase	
						dm³/ year	% against control
White poplars section							
‘Bolide’	♀	37	25.5	30.9	0.75	20	–
‘Veduga’	♀	37	23.5	41.4	1.21	32	–
Control to the white poplars							
P. bolleana	♂	It perished from the frost					
Black poplars section							
‘Steppe Lada’	♀	37	25.0	48.1	1.72	46	127
‘Breeze’	♂	32	25.0	43.3	1.43	48	130
‘Surprise’	♂	30	23.5	43.6	1.37	46	124
Control to the black poplars							
‘Pioneer’	♀	30	22.9	27.9	1.12	37	100

increment of more than 20 m<sup>3</sup>/ha/year. The growth of the parental variety at the age of 18 years was 1.7 times greater than the control (Fig. 1).

This variety could be used to create plantations, shelterbelts, other agroforestry reclamations' plantings and in planting greenery. The use of this variety in field-protective plantations could reduce the payback period.

**The 'Veduga' poplar variety** was obtained by A.P. Tsarev by crossing *P. alba* with Voronezh with *P. bolleana* from Astrakhan. It has a pyramidal crown, white stem, beautiful silver leaves and high winter resistance to the conditions of the Central Chernozem region.

The variety is intended for decorative purposes, or for use in field-protective forest cultivation and other forest-reclamation plantings. Because of its pyramidal crown, it is a beautiful variety for

landscaping purposes. The growth of the variety at 18 years of age was 85 percent greater than the control sample.

**The 'Bolide' poplar variety** was selected from the same hybrid family. It also has a pyramidal crown and high resistance to winter conditions in the Central Chernozem region. It is intended for decorative and shelter-belt forest cultivation. In view of its extremely narrow pyramidal (cypress) crown, it is of particular value in the planting of greenery in human settlements. The growth of the variety at the age of 18 was significantly superior to the control by 18 percent.

Sue to its fast growth and high winter resistance, **the 'Breeze' variety** is appropriate for the establishment of plantations, including the production of renewable energy resources. The cultivar was bred by R.P. Tsareva and V.A. Tsarev as a half-sib of the female 'Pioneer' variety. It was subsequently propagated and tested under a variety of growth conditions. The use of this variety in shelterbelt plantations can reduce their payback period. It can be used in greenery planting and landscaping. At the age of seven, this variety had a height of 10.8±0.46 m; a diameter of 14.9±0.78 cm; a trunk volume of 0.073±0.0096 m<sup>3</sup>; and wood stock of 45.26 m<sup>3</sup>/ha. At the age of 14 years this variety reached an average height of 16.5±0.75 m, a diameter of 26.3±0.74 cm, a trunk volume of 0.359±0.05 m<sup>3</sup>; and wood stock of 219 m<sup>3</sup>/ha, with an average increment of 15.6 m<sup>3</sup>/ha/year. It has subsequently reached an average increment of 24.8 m<sup>3</sup>/ha/year (Fig. 2). Volume growth of the variety is significantly superior to the control at the 5 percent significance level.

The 'Surprise' poplar variety was selected as a fast growing and frost resistant tree, effective for the creation of plantations and the production of renewable energy resources. The cultivar was bred by R.P. Tsareva and V.A. Tsarev as a half-sib of the female euramerican variety 'I-455.' It was subsequently propagated and tested under various growth conditions. The use of this variety in the shelterbelt plantations can reduce their payback period. Because the variety is male, it can be used for greenery and landscaping purposes. At the age of seven years, the hybrid family from which was

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Figure 1. Ancestor of the 'Steppe Lada' poplar variety obtained by A.P. Tsarev from crossing *P. deltoides* × 'Pyramidal-Osokorevy Kamyshtinsky'. The tree is 37 years old. The patentee is the All-Russian Research Institute of Forest Genetics, Breeding and Biotechnology. Voronezh region. Semiluksky Forest nursery. Hybrid collection No. 1.





Figure 2. Ancestor of the 'Breeze' variety bred by R.P. Tsareva and V.A. Tsarev (half-sib of poplar variety 'Pioneer'), aged 32 years. The patentee is the All-Russian Research Institute of Forest Genetics, Breeding and Biotechnology. Hybrid collection No. 2, Semiluksky Forest nursery of the Voronezh region. Photo courtesy by A.P. Tsarev.



Figure 3. Ancestor of the 'Surprise' variety selected by R.P. Tsareva and V.A. Tsarev (half-sib of poplar variety 'I-455'), aged 30 years. Hybrid collection No. 2, Semiluksky Forest nursery in Voronezh region.

selected had a height of  $8.5 \pm 0.32$  m; a diameter of  $13.1 \pm 0.59$  cm; a trunk volume of  $0.041 \pm 0.0064$  m<sup>3</sup>; and wood stock of 27.68 m<sup>3</sup>/ha (Fig. 3).

At the age of 14, this variety attained an average height of  $16.0 \pm 0.60$  m, a diameter of  $26.1 \pm 0.62$  cm, a trunk volume of  $0.334 \pm 0.04$  m<sup>3</sup>, a wood stock of 200 m<sup>3</sup>/ha and an average increment of 14.0 m<sup>3</sup>/ha/year. Since that time, the average increment has increased to 24.5 m<sup>3</sup>/ha/year. This variety has demonstrated significantly higher growth by volume than the control. By 30 years of age, its volume was more than 24 percent greater than the control.

The above varieties were tested in Ukraine's Central Chernozem and Donetsk regions. Naturally, their growth rate may not be comparable to other varieties growing in the world's southern regions, particularly those that are irrigated. They nevertheless demonstrate a significant growth advantage over other local species. The average increment growth of aspen trees in the best aspen stands in Central Chernozem is about 7-10 m<sup>3</sup>/ha/year (Tyurin *et al.*, 1953). These poplar varieties are currently reproducing in the Forest Park section of the All-Russian Research Institute of Forest Genetics, Breeding and Biotechnology. They can be used in the forest industry, for plant greenery and in other sectors.

## Conclusions

- 1) The heterogeneity of soil and climatic conditions of different zones of vegetation growth requires different approaches to breeding and cultivation of forest wood plant varieties.
- 2) Creation of a number of new winter-tolerant, fast-growing and decorative varieties. Of these, the 'Steppe Lada,' 'Veduga,' 'Bolide,' 'Breeze' and 'Surprise' varieties are notable.
- 3) The first four varieties listed above have been registered in the State Commission of the Russian Federation on Variety Testing and have received the relevant certification documents and patents. The 'Surprise' cultivar is in the process of State registration.
- 4) The use of these varieties will reduce the local wood shortage; they can be used to reclaim disturbed lands, replenish an assortment of plant greenery in settlements and can be used for landscaping purposes in various regions of the country.



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## New Reference Work on Poplars and Willows

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As new cultivars of poplars and willows are selected, references to and detailed descriptions of these taxa must be established and maintained. The IPC Working Party 1, "Taxonomy, Nomenclature and Registration," which holds the International Cultivar Registration Authority (ICRA) for *Populus* and *Salix*, is charged with registering the cultivars' names. It produces and maintains the publicly available register and checklists of *Populus* and *Salix* cultivar names, making it freely available to the international community.

**Populus.** The first edition of the *International Register of Populus Cultivars* was published in 1992 and included more than 300 cultivars, of which 63 percent were of hybrid origin and 37 percent were selections of pure species. An updated version of the Register was produced in 2000 for the 21st Session of the IPC (Portland, United States) and included 332 cultivars. Another updated version of the Register was compiled in 2016 for the 25th Session of the IPC (Berlin, Germany) with the addition of 21 new cultivar epithets. This version is currently available on the IPC website.<sup>5</sup> The most

<sup>5</sup> <http://www.fao.org/forestry/ipc/69637/en/>

recent version of the Register, which included five new epithets, was compiled in 2017 and maintains 362 cultivar epithets. The next version will be made available on the IPC website by the end of 2018.

In addition, the Working Party has maintained and updated the *Checklist for Cultivars of Populus*, which includes commercial names, synonyms or experimental codes.<sup>6</sup> The Checklist contains all published cultivar names, while the Register contains only the cultivars for which a formal application has been submitted. At present, the Checklist is made up of 472 cultivar epithets and 93 cultivars with experimental codes only. It is therefore more comprehensive than the Register.

A compilation of recorded poplar cultivars for ornamental uses was completed in 2016 as a separate edition.<sup>7</sup> It contains 82 cultivars.<sup>8</sup>

**Salix.** When the IPC was appointed the International Cultivar Registration Authority (ICRA) for willows, the *Checklist for Cultivars of Salix* was compiled as the first step toward the promotion of a standardized registration process and the establishment of the *International Register for Cultivars of Salix*. The first version of the Checklist, completed in 2015, included 854 cultivar epithets with accompanying information.<sup>9</sup>

The discovery and selections of new *Salix* cultivars is ongoing, gradually increasing the number of valuable genotypes. In addition, modern molecular, morphological and nomenclatural studies are resolving taxonomical relationships while changing the ranking of some previously described taxa. A recent revision of the Checklist began in February 2018, and is expected to be completed by the end of 2018. The second version of the Checklist will include all-new epithets and the most up-to-date rankings at the species level. Many *Salix* breeders, who were contacted regarding the incomplete records of their cultivars, have submitted updated descriptions. The completion of the Checklist

<sup>6</sup> <http://www.fao.org/forestry/44982-0186a843525e482bc519cb1cfe5bcd12d.pdf>

<sup>7</sup> <http://www.fao.org/forestry/45009-07ee302cc41e6d2b06ed66fdc94ea3eca.pdf>

<sup>8</sup> <http://www.fao.org/forestry/45009-07ee302cc41e6d2b06ed66fdc94ea3eca.pdf>

<sup>9</sup> <http://www.fao.org/forestry/44983-0370ab0c9786d954da03a15a8dd4721ed.pdf>

provides the baseline for the formal registration process of new cultivars and composition of the *International Register for Cultivars of Salix* in the near future.

To register a cultivar name of *Populus* see the link <http://www.fao.org/forestry/ipc/69637@204260/>.

For *Salix*, see <http://www.fao.org/forestry/ipc/69637@204262>

These important initiatives will contribute to the nomenclatural stability of cultivated poplars and willows. A comprehensive compilation of international records requires effective outreach to all involved in cultivar development. The IPC members are encouraged to check all information related to cultivar descriptions in the updated versions of the Register and Checklists and to advise us of any discrepancies.

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## News from the International Poplar Commissions

### Farewell to Alberto Del Lungo

With the departure of Alberto Del Lungo from the IPC Secretariat, we would like to convey the gratitude of the Executive Committee for his work and commitment, which has been important for the entire IPC community.



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Mr Alberto Del Lungo, FAO IPC Secretariat, Ms Lorenza Colletti, Secretary NPC Italy, Ms Bisoffi and Mr Giuseppe Nervo, Director National Poplar Institute, entering the Municipality of Siyang, China, 2010

Alberto has undertaken extensive work within the IPC Secretariat, and has been critical to the development of relationships between technicians and professionals from the various countries making up the Commission. He has contributed to many of the IPC's recent achievements. Alberto leaves us having made strong friendships across the IPC and with a reputation for hard work. His presence will be missed.

We say an affectionate goodbye to Alberto and wish him every success in his future endeavors.



Mr Cristian Espinosa, National Poplar Commission Chile, Mr Alberto Del Lungo, FAO IPC Secretariat and Mr Esteban Borodowski, National Poplar Commission of Argentina. Fifth International Congress of Salicaceae, Talca, Chile, 2017.

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