

Poplar and Willow News

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

Issue N° 7, March 2017



Editorial

Dear Reader:

Welcome to the 7th edition of the Newsletter of the International Poplar Commission (IPC) of the Food and Agriculture Organization (FAO) of the United Nations.

In this issue, you will find useful information on past and forthcoming conferences and meetings hosted by National Poplar Commissions of different countries, as well as other events of interest related to the production of, and research involving, poplars and willows.

The Newsletter also contains a section on scientific papers, abstracts and books related to the most recent research in the field of the family *Salicaceae*.

If you wish to contribute to the 8th edition of this Newsletter, send us topical articles, research and discussion papers, interviews or similar documents to salicaceas@gmail.com

**Editorial Committee,
International Poplar Commission**

Past events

25th Session and 48th Executive Committee Meeting of the International Poplar Commission

12 – 16 September, Berlin, Germany

The German Federal Ministry of Food and Agriculture and the International Poplar Commission of FAO hosted the 25th Session of the International Poplar Commission and associated events from 10-20 September, 2016 including three pre-conference study tours in and around Berlin and two post-conference study tours in Germany and Sweden. The study tours showcased the significance of poplars and willows for nature protection and biodiversity conservation, as well as the production of biomass for bioenergy, pulpwood and plywood.

More than 200 participants from over 40 countries attended the session from 13-16 September. This included policy makers, forest managers, forest scientists and academics from public and private institutions, as well as landowners and students with an interest in growing and using poplars



48th IPC Executive Committee Meeting



Participants of the 25th Session of the International Poplar Commission, Berlin 2016.

and willows. More than 180 technical papers and posters were presented in plenary and concurrent sessions of the six working parties. Three non-member countries, Kyrgyzstan, Moldova and Ukraine, requested information and support to become IPC members.

One day before the IPC Session began, the 48th Executive Committee Meeting on September 12 reviewed IPC and Working Party progress for 2012-2016 and decided on some strategic issues pertaining to proposed IPC Reform and the introduction of the new working parties in line with the decisions made at the 2014 Vancouver meeting.

At the September 12 meeting, the proposed IPC reform – which requires changes in the Convention text - was voted on by the IPC member countries but failed because the ballot fell two votes short of the required two-thirds majority. The result was attributed to the absence of some member states and the failure by others to appoint official country delegates. With 38 possible votes, a minimum of 25 were required to meet the two-thirds threshold and only 23 votes were cast in favour of the reform.



Participants meeting in plenary session

There were no votes opposed and no abstentions.

Given that strong mandate, the IPC Executive Committee and IPC Secretariat are expected to continue to pursue reform. The latter contributed significantly to the conference organization and IPC Secretariat staff also presented three technical papers in plenary sessions. Participants graded the event as earning an 8.8 score out of 10.

Important reference documents of the 25th IPC Session can be downloaded from the following websites:

- 1) Web portals for the six working parties¹: www.fao.org/forestry/ipc/69630
- 2) Outcomes, reports and summaries of the 25th Session are available at: www.fao.org/forestry/ipc2016/92288, including:
 - report of the 25th Session of the IPC and 48th Session of its Executive Committee (at present, available in English only, with French and Spanish coming soon)
 - compilation of key outcomes of the 25th IPC Session
 - take-home messages from plenary and concurrent sessions
 - presentations to the Session (links to the German host website)
 - synthesis of country Progress Reports
 - publications referenced in country Progress Reports
 - abstracts of submitted papers and posters
- 3) Photo gallery from the 48th Executive Committee Meeting, the 25th Session, the post-conference tour in Germany, and the post-conference tour in

¹ Your contribution to keep the working parties websites updated with new information would be much appreciated. If interested, please contact the IPC Secretariat at the following email: ipc-secretariat@fao.org



Jan Weger, NPC Czech Republic



Martin Weih, Chair, IPC

- Sweden (www.fao.org/forestry/ipc2016/92401)
- 4) Updated directories of the IPC governing bodies (www.fao.org/forestry/ipc/69986)

Czech Republic is the 38th member of the International Poplar Commission

The Czech Republic has become a new member country of the International Poplar Commission (IPC). Martin Weih, IPC Chair, announced the admission of the Czech Republic during the 25th Session of the IPC. To apply for membership, the Czech Republic established a National Poplar Commission and a Secretariat to support the cultivation of poplars, willows and other fast-growing trees, in close collaboration with the Ministry of Environment, the Ministry of Agriculture and the IPC Secretariat.

New Executive Committee of the International Poplar Commission

On 16 September, during the 25th Session of the International Poplar Commission, the new Executive Committee was elected for the period 2016-2020. Martin Weih of Sweden was re-confirmed as President and Barbara Thomas of Canada was elected Vice-President.

Executive committee members for the period 2016 – 2020 are:

Elected members	Country
Esteban Borodowski	Argentina
Joris Van Acker	Belgium
Barbara Thomas	Canada
Francisco Zamudio	Chile
Catherine Bastien	France
Georg von Wühlisch	Germany
Mirko Liesebach	Germany
Dinesh Kumar	India
Giuseppe Nervo	Italia
Ian Mclvor	New Zealand
Martin Weih	Sweden
Emile S. Gardiner	United States of America

The new committee members also invited four other officers to support the Executive Committee work, in view of their technical capacity and long experience with the International Poplar Commission. These are:

- Meng Zhu Lu from China
- Stefano Bisoffi from Italy
- Jim Carle from New Zealand
- Jud Isebrands from United States of America

The IPC-Secretariat recognized the commitment and hard work of the Executive Committee during the 2012 -2016 period as it supported and accompanied the IPC in the continuing reform process to renew, broaden and strengthen the Commission. The Secretariat also extended best wishes to the new Executive Committee with hopes for a fruitful work and reform period.

2nd Conference on Engineering of Wood Products based on Poplars and Willows in Spain

The 2nd Conference of the Engineering of Wood Products based on Poplars and Willow Wood was held from 8-10 September, 2016 in Leon, Spain. This event, held just before the IPC Session of Berlin, was jointly organized by the IPC Working Group on Sustainable Livelihoods, Land-use, Products and Bioenergy led by Joris van Acker and by the European Organization Pro-Populus. Conference proceedings are available on the IPC website at: www.fao.org/forestry/ipc/69631

The following link provides access to the webpage containing all presentations during the event: www.pro-populus.eu/en/news



4th International Conference of the International Union of Forestry Research Organizations was held in La Plata

The 4th International Conference of Forest Research Organizations (IUFRO) on Somatic Embryogenesis and Other Vegetative Propagation Technologies ran from 19-23 September, 2016 – the first event of the IUFRO in Latin America. The Faculty of Agricultural and Forestry Sciences of the University of La Plata was actively involved in event organization.

More than 120 people from 24 nations participated. More than 60 posters of technical works and 25 presentations were delivered at the conference which aimed to bring together researchers and practitioners involved in the development and application of vegetative propagation technologies as a tool to maintain the productivity of forest plantations to cope with climate and environmental change.

Participants were invited for a city tour in La Plata, a gala dinner and a field excursion to the Darwin Nursery with barbeque.

More detailed information can be found at: www.agro.unlp.edu.ar/novedad/iufro-la-plata-2016 (Spanish)

Conference website: www.iufro20902.org/ (English)

National Working Forum: Poplar and Willow Management for Environmental Benefits and Renewable Fuel Industries

The US city of Portland, Oregon hosted the National Working Forum on Poplar and Willow Management for Environmental Benefits and for the Renewable Fuel Industries from 11-13 April 2016. The aim was to develop key action points and recommendations to establish renewable energy markets for the biomass of environmental plantations. Topics presented



and discussed included: *phytoremediation; poplar and willow for water quality; bioenergy potential and bioproducts for industry and environmental and energy policies*. The forum included lectures, case studies, panel discussions, interactive working groups and field trips.

The forum papers can be viewed and downloaded at:

<http://hardwoodbiofuels.org/poplar-willow-forum-presentations/>

For more information on the Forum visit his website: <http://hardwoodbiofuels.org/poplar-willow-forum/>



Upcoming events



Salicaceae Symposium 2017

Fifth International Congress of Salicaceae, Talca, Republic of Chile.

“Opportunities for the productive and energetic development of poplars and willows”

November 13th – 17th, 2017

This international congress has become an important gathering, bringing together national and international experts from government agencies, academic, scientific and research fields, the private sector and non-governmental organizations; producers, technicians, university professors, and students of the forestry and agricultural sciences. The congress presents a unique opportunity for an exchange of experiences and debate on the main issues affecting poplars and willows.

The theme of Salicaceae Symposium 2017 is "Opportunities for the productive and energetic development of poplars and willows" and will feature distinguished speakers on such topics as genetics, forestry, protection, markets, industry and

other issues related to Salicaceae family at national and international levels.

This Symposium will take place in the University of Talca, in Talca -VII Region, Republic of Chile, from 16 to 20 October, 2017.

Researchers, technicians, producers and others related to Salicaceae are invited to submit papers to be published in text format in the corresponding Proceedings. Works that communicate research results will be received, as well as others that reveal projects, technical experiences, activities or extension programmes underway in issues related to production, exploitation, industrialization, markets and environmental aspects of Salicaceae afforestation. They will be evaluated by a Commission created for that purpose, and those accepted will be part of the congress.

Deadline for the submission of abstracts is May 2, 2017. These must be written in Spanish, Portuguese or English and sent in digital format (.doc or .docx) by email to: jornadasalicaceas@gmail.com

The guide for the presentation of papers to Salicaceae Symposium 2017 is available at: <http://jornadasdesalicaceas2017.blogspot.cl/p/comunicaciones.html>

For more information visit the web page of Salicaceae Symposium 2017 - V International Congress of Salicaceae in Chile: <http://jornadasdesalicaceas2017.blogspot.cl/> or write to: salicaceas@gmail.com

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Articles of interest

Bud mutated discolored poplar (Populus Deltoides)

R C Dhiman

ITC-PSPD (Unit:Wimco Seedlings)

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In India, *Populus deltoides* is the main commercially grown poplar in the northwestern plains located south of the Himalayas. Millions of saplings are grown through stem cuttings collected mainly from one-year-old saplings grown in nurseries to maintain them at a juvenile stage for ease in propagation. Reports on bud mutations are very rare in forest tree species. However, this study reports one such case of bud mutation in *P. deltoides* in which a sapling of clone Wimco-110 was discovered with some partially discoloured leaves - one out of over 20,000 saplings of the same clone grown in the production nursery at Rudrapur, Uttarakhand, India (Fig.-I). Wimco-110 is a female clone and was a selection from G48 half-sib population that was developed during 1997. This clone has a different architecture than many others, its apical growth is in the form of elongated current-year shoot with almost no lateral branches that differentiate this from others. It is now the leading clone with a 40 percent share in our production system. This sapling ortet has undergone four successive propagation cycles and after each cycle, ramet seedlings/saplings exhibited different variants of discoloured leaf/leaves and/or shoots. Saplings with excessive discoloration, partial discoloration, and no discoloration successively were propagated from original, partially discoloured ortet sapling and from a normal sapling reproduced



Fig.-I. A partially discolored ramet of bud mutant of clone Wimco-110 (left) and light discoloration due to sulfur deficiency (right-other clone).

through stem cuttings, root sprouts, and budded grafts which were closely observed for discoloration.

The general inferences drawn from the discoloured ortet sapling and its reproduced ramet seedlings/saplings after four successive propagation cycles are:

- 1 The first flush soon after bud break is normally of light green colour even if the cuttings are made from excessively discoloured shoots (Fig.-II); the intensity of greenness varies from very light green in discoloured shoots to normal green in normal shoots. Discoloration develops over time, sometimes with total/excessive discoloration even when leaves are not fully developed; partial discoloration at any stage soon after bud break till late in the summers; or no discoloration even in those reproduced from excessively discoloured plants.
- 2 This discoloration phenomenon is restricted to shoots/leaves originated from selective buds/tissues from the same ortet sapling. There have been cases of one shoot originated on flushing from a single bud as totally or partially discoloured, whereas, others appear normal originating from another bud(s) from the same cuttings (Fig.-III & IV).
- 3 Totally discoured plants die after some time and no pathogenicity was recorded on drying discoloured leaves. Discoloured leaves start drying from margins and soon the entire leaf or shoot or plant dies. Even in plants with partially discoloured leaves, drying follows the same pattern as totally discoloured plants.
- 4 Partial discoloration is of two types. In one case, some portion of leaf/leaves and in others some shoots may be discoloured. In both cases, drying of discoloured leaves/shoots is delayed compared



Fig.-II. A completely discoloured shoot (No. 11 marked as red in Fig.-III) gave initial light green flush but did not survive.

- 5 There is hardly any reference available on the response of successive propagation cycles of discoloured plants on reproduced plants. We have followed the originally spotted discoloured sapling for four successive propagation (annual) cycles. Every time there was segregation of ramet seedlings in three types viz., totally/excessively discoloured, partially discoloured and normal green ones. In most cases totally discoloured saplings remain stagnated in growth and died in the nursery. Excessively and partially discoloured saplings with part(s) of leaves and/or shoots left



Fig.-III. Eleven plants propagated in the fourth multiplication cycle from stem cuttings made from one of the excessively discoloured sapling. Plants with green numbers are still normal, partially discoloured leaves and/or shoots are yellow, and totally discoloured as red. Discoloured shoot in plant No. 4 and 7 dried and new normal shoots grew from other buds from same cuttings thereafter, whereas, in plant No. 3 both normal green and discoloured shoots still exit till April end, 2016.



Fig.-IV. Partially discoloured shoot sprouted from root cutting (left), longitudinal reddish groove from bud grafted shoot (central), and one shoot from a bud completely discoloured and another normal shoot from another bud from the same cutting (right).

behind the normal saplings in term of growth. We are also monitoring the normal ramet saplings produced from partially discoloured ortet but have yet to find reversal of their ramet plants to the discoloured types.

- 6 The literature is also silent on the response of propagation methods on the behavior of such discoloured plants. In an experiment where three kinds of saplings viz., excessive discoloration, partial discoloration and normal were propagated through stem cuttings, bud grafting and root sprouts, it was observed that all three methods of propagation reproduced some plants with symptoms of discoloration. In stem cuttings having multiple bud sprouts, some plants have shown a completely discoloured shoot and also normal shoot(s) sprouted from the stem cuttings. In a completely discoloured shoot, when placed for rooting, its sprouting gave a light green original flush but soon died and did not form roots (fig.-II).
- 7 Partially discoloured leaves show differentiated leaf morphology in the form of irregular margins, wavy surface and differentiated color. In those plants where discoloration appears late, their stem first develops a longitudinal patch of discoloration on the main stem which later forms a reddish groove (Fig.-IV).

There are a few schools of thought on such discoloration behavior in forest trees. One holds that the discoloration is due to environmental factors. Since this cultivar is grown over a very large geographical area in the entire region of intensive poplar culture in India, a single discoloured sapling was seen out of over 20,000 in one of the commercial nurseries, indicating it was a clear cut case of bud mutation.

Another suggests that the discoloration may be a case of reversal of the mutation to the parental type with successive propagation cycles. This does not appear to be the case in this bud mutant since we have been following ramets of successive ortets for five years and every time we get different variants.

Finally, a third school of thought holds that tissue culture plants may develop this behavior of discoloration. This may happen due to somaclonal variation that has been generally associated with some tissue cultured plants. Hundreds and thousands of tissue cultured poplar of five clones viz., G48, S7C15, G3, L34 and Udai have been grown in India. Though the tissue cultured plants did not have similar tree architecture, morphology and growth when compared with the traditionally

grown ones, none of them was discoloured. Further, this partially discoloured sapling was propagated from stem cuttings and its ramets were supposed to have similarity with ortet.

Partial discoloration in poplar has also been recorded due to deficiency of certain micronutrients. One example of partial discoloration in poplar saplings and plantations has been recorded due to deficiency of sulphur (Fig.-I) but in such cases, an entire population on a particular land may result in this kind of phenomenon.

It is inferred that this bud mutant is genetically unstable, which leads to repeated variability in the form of total/excessive discoloration, partial discoloration and normal plants from successive reproductions of discoloured saplings. The tissues having mutated genes leading to discoloration on sprouting are present in the entire plant including roots. What transforms these tissues to discoloration is a subject of further investigation. We continue to study and are ready to share this material with the scientific fraternity if there is interest in further research.

N-fixing endophytes of poplar and willow increase drought tolerance

Sharon L. Doty, University of Washington

Poplar (*Populus* sp.) and willow (*Salix* sp.) trees naturally grow in rocky or sandy riparian areas [1]. Subjected to multiple abiotic stresses including flooding, drought, ultraviolet light exposure, and limited nutrients, these plants likely rely on associated microorganisms for survival [2]. A key macronutrient required by plants is nitrogen. Using cuttings of wild poplar, N-fixation by the microbiota within plants, termed endophytes, was confirmed by two independent assay methods. The microbial population was remarkably diverse throughout the plant, both in terms of species richness and in numbers [3], providing an explanation for the variable amount of N-fixation in different cuttings. Unlike alder trees, a riparian tree species with root nodules containing N-fixing (diazotrophic) bacteria, poplar and willow do not have specialized external structures but rather have the diazotrophic microorganisms dispersed within the plant body, including leaves, stems, and roots.

We previously cultured a variety of diazotrophic endophytic species from wild poplar and willow [4]. When these were inoculated onto hybrid

poplar plants under greenhouse conditions, leaf greenness, overall growth, and N-fixation were increased [5]. These endophytes promoted growth under N-limiting conditions of a variety of other plant species, including grasses [6], maize [7], rice [8], fruit crops [9], and Douglas fir [10]. These results provide more evidence that the endophytes of poplar and willow provide fixed N to the host plant, not only helping to explain how these pioneer plant species colonize nutrient-poor sites but also providing a possible alternative to chemical fertilizers.

Hybrid poplar inoculated with the endophytes also had substantially increased drought tolerance [11]. Compared to mock-inoculated plants, those with the endophytes from wild poplar and willow had greater overall biomass, increased root biomass, and a significant reduction in the stress indicator, reactive oxygen species (ROS) [11]. Multiple mechanisms may be involved in the improved survival of drought-stressed plants. Many of the endophyte strains produce phytohormones known to be involved in the plant stress response and in root growth promotion. The increased N provided by the diazotrophic strains may have helped with the prolonged greenness of the leaves. Genomic analysis of the strains indicated that some are capable of producing the osmolyte, trehalose [12], and the volatile organic compounds, acetoin and 2,3-butanediol, also implicated in improving drought tolerance of the host plant [13]. It is likely through the actions of multiple pathways by the consortium of endophytes that the increased drought tolerance of the host plant was achieved.

Research on the microbiome of the early successional pioneer plants, poplar and willow not only provides a better understanding of the importance of symbiosis in natural systems, it has major practical implications. With the increased occurrence of drought due to climate change, it is imperative that we harness the power of symbiosis to improve plant survival and productivity naturally.

Press releases with links within to the open-access articles:

www.washington.edu/news/2016/05/20/bacteria-in-branches-naturally-fertilize-trees/
www.washington.edu/news/2016/09/19/microbes-help-plants-survive-in-severe-drought/

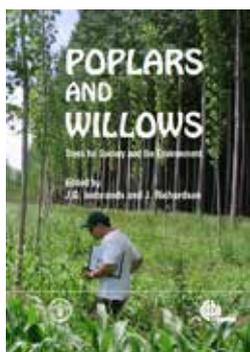
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General interest

The electronic version of the book *Poplars and Willows* is available for free download at the IPC website (www.fao.org/forestry/ipc/69946@158687). The book has more than 600 pages and is fully illustrated in black and white, with 3 sections of color plates. The 13 chapters were prepared by nearly 70 contributing authors from 15 countries worldwide. An outstanding feature of the book is its nearly 2500 references. This book is the culmination of a work that took years of effort and dedication.



Download the book at the following link. It is available only in English:
www.fao.org/forestry/ipc/69946@158687

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