

REPORT

Portland,
Oregon, USA,
24-28 September
2000

**21st session of the
International Poplar
Commission
and 40th session
of its Executive
Committee**

INTERNATIONAL POPLAR COMMISSION

Report of the 21st Session of the Commission
and of the 40th Session of its Executive Committee

Portland, Oregon, USA, 24 - 28 September 2000

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TABLE OF CONTENTS

		Page
PART I REPORT OF THE 40TH SESSION OF THE EXECUTIVE COMMITTEE OF THE INTERNATIONAL POPLAR COMMISSION		
I	Organization	1
II	The Session	1
III	Post-session Informal Meeting of the Executive Committee	2
PART II REPORT OF THE 21ST SESSION OF THE INTERNATIONAL POPLAR COMMISSION		
I	Organization	3
II	Opening of the Session	3
III	The Session's Admission of New Member Nations	3
IV	Poplar and Willow Culture: Meeting the Needs of Society and the Environment	3
V	Synthesis of National Reports on Activities Related to Poplar and Willow Areas, Production, Consumption and the Functioning of National Poplar Commissions	4
VI	Poplar and Willow Identification and Varietal Control	6
VII	Concurrent and Joint Meetings of the Working Parties	7
VIII	Poplar and Willow Protection	7
	(a) Report of the Working Party on Poplar Diseases	7
	(b) Report of the Working Party on Poplar Insect Pests	8
IX	Logging and Utilization	8
X	Breeding and Selection of Poplars and Willows	9
XI	Biomass Production Systems for the Salicaceae	10
XII	Recommendations of the Commission	10
XIII	Election of the Executive Committee 2000-2004	13

XIV	Date and Place of the Next Session	13
XV	Closing of the Session	14

ANNEXES

I	Agenda	
	(a) Agenda of the 40th Session of the Executive Committee	15
	(b) Agenda of the 21st Session of the IPC	16
II	List of Participants	17
III.A	List of Papers Presented at Meetings of Subsidiary Bodies	40
III.B	List of Posters	47
IV	National Reports	56

PART I REPORT OF THE 40TH SESSION OF THE EXECUTIVE COMMITTEE OF THE INTERNATIONAL POPLAR COMMISSION

I ORGANIZATION

1. The 40th Session of the Executive Committee of the International Poplar Commission (IPC) was jointly hosted by the Governments of Canada and USA in Portland, Oregon, USA, on 24 September 2000 at the kind invitation of the Government of USA. Mr V. Steenackers, Chairman of the Executive Committee, chaired the meeting. It consisted of a closed session of 10 members, 7 heads or secretaries of Working Parties and the Secretary of the Commission.

II THE SESSION

2. The Session was opened by the Chairman of the Committee. The provisional agenda was adopted.

3. The Chairmen of the Working Parties presented their reports. All reported that their members had maintained contacts with one another both through the internet and informal meetings at the time of sessions of other bodies such as IUFRO, the EU Poplar project and the IEA. Contacts had been continued with the EUFORGEN group. The importance of these links and of the co-ordination of activities was stressed.

- The Breeding Working Party reported an improvement in coordination and the provision of linkages between national poplar commissions and the Working Party. It reported the improved organisation of scientific meetings, especially on genetics, but no progress had been made on joint activities.
- The Logging and Utilisation Working Party reported that several countries have taken part in the programme adopted at the last session of the IPC, and that a start has been made on the drafting of technical leaflets
- The Working Party on Poplar Diseases reported that there continued to be major problems of poplar diseases worldwide but that there was a shortage of qualified pathologists specialised in poplar diseases. A global review of poplar diseases had been prepared, which was available on the IPC website. The interaction of poplar diseases with insect pests was noted, as was the need to strengthen collaboration with tree breeders.
- The Working Party on Insect Pests reported that a global survey of poplar insect pests had been prepared and had been placed on the IPC website.
- The Working Party on Production Systems reported that the proceedings of a meeting on biomass and bio-energy had been produced.
- The Sub-committee on Nomenclature reported that the Register had been updated to May 2000. It now contained details of 330 cultivars, including six new cultivars from India and six from Italy. A new version of the registration form and the summary description had been prepared, as well as a new synthesis of the rules of nomenclature. The information had all been placed on the IPC website.
- The Secretariat reported on the development of the new IPC website.

4. The Secretariat informed the Committee of the names of the candidates proposed by member countries from which its members would be elected for the period 2000-04.
5. The Secretariat informed the Committee that no offers to host the 41st Session of the Executive Committee had been received.
6. The responsibilities of the Working Parties were discussed, with reference to subjects that were presently not covered by the existing Parties. Criteria for topics for discussion in the Working Parties were developed, with a view to strengthening recommendations to the plenary session.
7. The Secretariat informed the Committee of the satellite meeting to mark the 50th anniversary of the IPC that had been held during the XI World Forestry Congress (Antalya, Turkey, October 1997).
8. The members of the Committee recorded their thanks to the Director of the *Istituto de Sperimentazione per la Pioppicoltura* (Casale Monferrato, Italy) for the continued support of his Institute towards the compilation of the Directory of Poplar and Willow Scientists, which had been placed on the IPC website.

III POST-SESSION INFORMAL MEETING OF THE EXECUTIVE COMMITTEE

9. The newly elected members of the Executive Committee for 2000-04 met informally on 28th September 2000 to elect the Chairman and Vice-chairman of the Committee and to discuss general business.
10. Dr Stefano Bisoffi (Italy) was elected Chairman and Dr Jud Isebrands (USA) was elected Vice-chairman of the Executive Committee, both unanimously. It was agreed that Ing. Teresa Cerrillo (Argentina), Dr Eui Rae Noh (Korea), Mr J. Richardson (Canada) and Mr V. Steenackers (Belgium) should be co-opted to the Executive Committee. Dr Bisoffi was appointed Chairman of the Sub-committee on Nomenclature.
11. Dr Bisoffi made a presentation on his vision for the IPC in the coming four years and chaired the following discussion. He identified the challenges as being the need to:
 - broaden membership;
 - stimulate the work and activities of national poplar commissions;
 - encourage the activities of the Working Parties;
 - increase visibility of the IPC;
 - broaden participation at the meetings of the IPC to include the private sector and policy-makers.
12. The offer of Dr Isebrands to maintain the website opened for the 21st session as a website for future meetings was gratefully accepted.

PART II REPORT OF THE 21ST SESSION OF THE INTERNATIONAL POPLAR COMMISSION

I ORGANIZATION

1. The 21st Session of the International Poplar Commission (IPC) was jointly hosted by the Governments of Canada and USA in Portland, Oregon, USA, from 24-28 September 2000 at the kind invitation of the Government of USA.

2. The Session was attended by delegates and advisers from 25 member countries of the Commission: Argentina, Belgium, Bulgaria, Canada, Chile, China, Croatia, Egypt, Finland, France, Germany, Hungary, India, Ireland, Italy, Korea (Republic of), New Zealand, Romania, Spain, Sweden, the Netherlands, Turkey, UK, USA and Yugoslavia. Observers attended from Brazil, Greece, Kenya, Nigeria, Singapore and Ukraine. A total of 258 delegates, advisers and observers participated.

II OPENING OF THE SESSION.

3. The Session was opened by the Chairman of the retiring Executive Committee, Mr V. Steenackers.

4. Participants were welcomed by the guest of honour, the Mayor of Portland, Mr J. Pollard, by Dr Isebrands and Mr Richardson on behalf of the co-hosts and by Mr R. Hall and Mr John Doorenbos representing the Poplar Councils of the USA and Canada respectively.

5. Mr J.B. Ball, Secretary of the IPC, in welcoming participants on behalf of the Director-General of FAO, drew attention to the role of the IPC, a Statutory Body of FAO, in providing a neutral forum for the discussion of technical and policy issues related to poplars and willows; advice and technical support from a wide range of disciplines; and access to the network of 180 member countries of the Organization.

6. Mr Jim Richardson (Canada) and Dr Jud Isebrands (USA) were elected joint Chairmen.

7. The Provisional Agenda was adopted without amendment.

III THE SESSION'S ADMISSION OF NEW MEMBER NATIONS

8. Delegates were advised that Finland, as a member of FAO, had applied to join the IPC under Article II (1) of the Convention governing the IPC. Finland had lodged its formal acceptance of the Convention with the Director-General of FAO and was accordingly now a member of the IPC.

IV POPLAR AND WILLOW CULTURE: MEETING THE NEEDS OF SOCIETY AND THE ENVIRONMENT

9. The following keynote addresses were delivered in support of the theme:

- *Poplars: trees of the people, trees of commerce, trees of the future.* J. Gordon.
- *The role of plantations in the world's future timber supply.* R. Sedjo.

- *Management of natural aspen and aspen-mixedwood forests for sustainable production.* A. David.
- *Future role of forest plantations in meeting people's needs for forest goods and services.* J. Ball
- *Poplars and Willows in the 21st Century: what research can do to meet the needs of society.* V. Steenackers.
- *Conservation of natural ecosystems of poplar and willow.* S.M.G. de Vries.
- *Global climate change, carbon sequestration and short-rotation woody crops production: where is the US?* J.Tuskan, G. Marland, M. Walsh.
- *Willow vegetation filters for waste treatment and soil remediation combined with biomass production.* P. Aronson, K. Perttu.
- *Genetically modified poplars: state of the art and perspectives on the public controversy.* S. Strauss, R. Meilan, S. DiFazio.
- *Achievements in the utilization of poplar wood-guideposts for the future.* J. Balatinecz, A. Leclerq, D.E. Kretschmann.
- *Willows: An underestimated resource for environment and society.* T. Verwijst.

10. Dr Jud Isebrands presented the synthesis of responses on the theme of the 21st Session, Poplar and Willow Culture: meeting the needs of society and the environment. The synthesis was based on 17 responses to a questionnaire that had been circulated to all member countries.

V SYNTHESIS OF NATIONAL REPORTS ON ACTIVITIES RELATED TO POPLAR AND WILLOW AREAS, PRODUCTION, CONSUMPTION AND THE FUNCTIONING OF NATIONAL POPLAR COMMISSIONS

11. National Reports were received from the Poplar Commissions of 24 member countries, including Finland (see annex IV). The contents of the National Reports were synthesised in a separate report and were incorporated in the Keynote Address *Future role of forest plantations in meeting people's needs for forest goods and services*.

12. Inventory data of areas of poplars were available for most countries which reported, some with information about areas of natural-occurrence. Canada reported the largest natural area of poplars: approximately 17.8 million ha of mixed-stands, where poplar was the main component; the USA reported 8.75 million ha of aspen and cottonwood plus millions of hectares growing outside the surveyed area of forest. In China, natural stands, represented by 53 species, were estimated to be about 3 million ha (1996 1.34 million ha). China reported 6 million ha of poplar plantations. France reported (1998) 253 700 ha of poplar plantations (in 1993, 245 000 ha); Hungary: 156 700 ha (almost the same as in 1996), of which 47 400 ha were native stands and 109 300 ha were hybrid stands; Turkey: approximately 145 000 ha (1996 157 000 ha); Italy: 118 825 ha (of which 70 000 ha were situated in the Northern Italian plains); Romania: 113 556 ha (native poplars: 60 732 ha and cottonwood: 52 824 ha); Spain: 102 830 ha (1995); Belgium: 40 000 ha; India: approximately 40 000 ha (26 400 ha reported in 1996); USA 30 000 ha (20 000 ha in 1996); Bulgaria: 25 645 ha; Croatia: 19 535 ha (of which 5 366 ha were natural stands); Chile 15 000 ha, of which 7 000-8 000 are plantations, the rest rows.

13. Information on standing volume was given by some countries. Canada: 3.7 billion m³ in the mixed-stands, of which 1.6 billion m³ were in "poplar stands", where *Populus* sp were the main component and 2.1 billion m³ were in "non poplar stands", where species other than *Populus* formed most of the stands; USA 707 million m³; France: 23.8 million m³ (in 1993 27.3 million

m³); Romania: 14.2 million m³ (7.56 million m³ of which were natural stands); Italy: 4 million m³; Belgium: the total standing in pure block plantation for Walloon Region was estimated as 1.84 million m³; Croatia: 2.3 million m³ (742 824 m³ of which were natural stands); Bulgaria: 1.1 million m³ (1999); Chile 900 000 m³.

14. Exports and imports of poplar wood had relevance mainly in Europe. The countries that had most imports were: Italy, mainly from France (50%) and Hungary (30%); Belgium; France; Finland, mainly from the Baltic states and Russia; Croatia. The main exporting countries were: Belgium to France, Italy, the Netherlands; Morocco and Egypt; France: mainly to Italy; Croatia mainly logs to Italy; Romania; and Spain to France. Several of these countries import and re-export poplar wood, either as roundwood or in semi-processed form.

15. Regarding willows, few countries reported inventory data. Romania: 43 030 ha, of which 18 557 were native stands; Croatia: 10 778 ha, of which 6 634 ha were natural stands. Romania reported 3,8 million m³ (of which 1.15 million m³ were in natural stands) of willow standing volume; and Croatia reported 1.05 million m³ (742 824 m³ in natural stands). Although limited information was supplied on the cultivation and use of willows, several countries showed a great interest in willows, mainly for bio-energy and new industrial uses (e.g. Chile reported the export of canework furniture made from *Salix viminalis*). The need to protect willow genetic resources by *in-situ* and *ex-situ* means, was reported by various countries.

16. Environmental issues and public concern strongly affected policies and practices in both poplar and willow culture in many countries in North America and Europe.

17. Some changes in national policies and legislation, mainly concerning new regulations for forest reproductive material, the registration of new clones, natural forest protective projects, financial incentives and measures to preserve the quality of the environment were reported. The application and development of a new regulation will mean that poplar cultivation will be financially supported in the European Union until 2006.

18. In East Europe the forestry sector, as with other economic activities, has continued to adapt to free market conditions. Some countries, as Hungary, Romania and Bulgaria, regulated the restitution of agricultural and forest lands to their former owners.

19. Research in various topics was carried out by most countries. In general, interest in genetic engineering and marker-aided selection programmes increased. Poplar genetic maps were available or in an advanced stage of development in some countries.

20. Most European countries reported their participation in the EUFORGEN Programme for the conservation of native stands of *Populus nigra*, with valuable progress made.

21. Interest in the use of poplar and willow for energy was strongly maintained in countries such as Sweden (mainly willows), Yugoslavia, Croatia and the United Kingdom (where an energy crop scheme for poplar and willow planting has been carried out).

22. Several National Commissions carried out activities such as: meetings, technical presentations, preparation of web sites, study tours, etc. Canada, which continued to be one of the most active, has actively developed the potential of electronic communication and dissemination of information. On occasions, National Commissions have had important roles in

official discussions of strategies for poplar and willow cultivation. In general, good communication and co-operation in joint activities related to the exchange of information and materials were observed, particularly between countries of the same geographical region.

VI POPLAR AND WILLOW IDENTIFICATION AND VARIETAL CONTROL

23. An application for the registration of six new cultivars of *Populus* was received from India and all the clones proposed were included in the Register: ‘Kamal’, ‘Akbar’, ‘Shiv’, ‘Raj’, ‘Jagdish’, and ‘Baldev’.

24. An application for the registration of six new cultivars of *Populus* was received from Italy; all the clones proposed were included in the Register: ‘Brenta’, ‘Lambro’, ‘Mella’, ‘Soligo’, ‘Taro’ and ‘Timavo’.

25. An updated version of the *International Register of Populus L. cultivars* was produced in May 2000 for the 21st Session of the International Poplar Commission (Portland OR, USA). It will be made available to the National Poplar Commissions of Member countries.

26. The Register now holds information on 330 cultivars. The current version of the Register is available at the IPC Web site <http://www.agro.ucl.ac.be/efor/ipc/>

27. Other documents produced included a new version of the “Registration form and summary description” (along with guidelines for its preparation) which was made available on the Web. For the moment, only the English version was available.

28. A synthesis of the “Rules of nomenclature of *Populus L. cultivars*” was also prepared (and made available on the Web) that collects the main directives contained in the latest edition of the “International Code of Nomenclature for Cultivated Plants” and “International Code of Botanical Nomenclature”.

29. It was noted that even in its current version, the Register was not complete and a considerable effort would have to be made in the near future for its improvement. The difficulties derived from the need to incorporate cultivars whose origin dates back to the early decades of the twentieth century and to check the reliability of available information.

30. Future activities planned included:

- Raising the awareness on the importance of the Register among the National Poplar Commissions, Statutory Plant Registration Authorities, Professional organizations, Research institutions with the most appropriate case-by-case approach.
- Re-inforcing the Sub-Committee with a network of Contact persons, however informally established, that would act as a link between the Chair (who holds the responsibility for the maintenance of the Register) and Institutions/Professionals of Member and non-Member countries. The first task for the network of Contact persons would be to provide reliable information for filling the many gaps in the records of the database.
- Launching a project for the coordination of living collections in order to ensure the maintenance of all the cultivars included in the Register.
- Launching a project for the establishment of a standard portfolio of pictures for each cultivar as an aid to approximate description and group identification.

- Following the progress of molecular biology and related subjects on the development of means of identification (fingerprinting) of *Populus* cultivars.

VII CONCURRENT AND JOINT MEETINGS OF THE WORKING PARTIES

31. Concurrent and joint meetings were held of all the Working Parties with the following themes. The papers presented are in Annex III.A.

Concurrent meetings:

- Integration of new tools into long-term breeding strategies
- Environmental role of poplars and willows
- Conservation of genetic and environmental resources
- Willow improvement and production

Joint meetings:

- Breeding for resistance (Breeding, Insects and Diseases Working Parties)
- World breeding and production perspectives (Breeding, Production Systems and Logging & Utilization Working Parties)

VIII POPLAR AND WILLOW PROTECTION

a) Report of the Working Party on Poplar Diseases

32. An informal session of the Working Party discussed its function. It was agreed that the Working Party on Poplar Diseases should be regarded as the source for expert information on pest management in plantations and forests, and on forest health in general. It was proposed that there should be a merger with the Working Party on Insects reflected in a name change to: “Working Party on Insects and Disease” but this was subsequently not agreed by the other Working Party.

33. In formal session the following activities were agreed for the period 2000-2004:

- Updating the Membership List of active researchers in the pathology and entomology of *Populus* and *Salix*. It would be maintained on the IPC web site and in the “IPC Directory of Poplar and Willow Researchers”. Researchers in this area will be asked to submit not only their contact information, but also a list of their current projects, and relevant links.
- The Working Party will attempt to meet in conjunction with the IUFRO rust group between IPC meetings.
- Active researchers will be asked to contribute to IPC web pages on ‘Methods in the Pathology and Entomology of the Salicaceae’ and ‘WP News’.
- ‘Subject Areas’ for focus and discussion at the next IPC meeting should continue to be considered. The following suggestions were made: (a) continuation of reports and discussions of microevolution of poplar and willow rust fungi and practical attempts to combat these developments; (b) active reconsideration of the common perception that species of *Cytospora* and *Discosporium* are always secondary pathogens; (c) discussion on the risk of spread of exotic pathogens of the Salicaceae; (d) development of early-screening methods for under-researched pathogens such as *Discosporium*.

34. The following were elected as officers of the Working Party on Poplar Diseases for the period 2000-2004:

Mike Ostry (USA), Chair.

Marijke Steenackers (Belgium), Vice-Chair.

George Newcombe (USA), Technical Secretary.

(b) Report of the Working Party on Poplar Insect Pests

35. Thirty four people attended the session of scientific presentations at which 5 oral communications were presented. 5 posters were also presented in the visual poster session. 2 invited papers were presented in the joint session on Breeding, Diseases and Insects. 10 persons from 8 different countries (Argentina, Canada, China, France, New Zealand, Sweden and U.S.A.) attended the business session.

36. The recommendations from the 20th Session concerning the usefulness of, and the interest in, the publication "The damaging insects of poplars" were endorsed and the periodic updating of this electronic work was proposed.

37. The amalgamation of the groups "Insect pests" and the "Diseases" Working Parties was discussed, but was not accepted by the majority of the participants. The title "Working Party on Insects and other animal pests" seemed more appropriate for the immediate future. It was felt that the scientific disciplines of entomology and plant pathology were sufficiently different to justify the separate existence of the two working parties. However, all participants agreed that close collaboration between the two working parties, and the Poplar and Willow Breeding Working Party, was valuable and should continue. Joint sessions of Working Parties were seen to be a good way of showing how collaboration worked in practice. All the participants agreed on the timing of the meeting once every 4 years.

38. The following were elected as officers of the Working Party on Poplar Insect Pests for the period 2000-2004:

Sylvie Augustin (France), Chair

John Charles (New Zealand), Co-chair.

IX LOGGING AND UTILIZATION

39. The Working Party held three technical meetings attended by the participants from 16 countries. During these meetings 15 scientific/technical papers were presented and discussed, ranging from fundamental properties to processing and utilization, as well as pulping and economics of poplar wood. Six poster/visual presentations were also made.

40. Participants discussed certain priorities for research both within and outside the working party. These included the following topics:

- Stain (its incidence, causes and impact on value) in poplar wood.
- The potential application of biotechnology to enhance wood quality and natural durability of poplar wood.
- Include economic analyses in future activities of the working group.

- Encourage the development of flexible, high-value conversion technologies (such as the portable veneer lathe, presented by Mr Doug Erickson of the USA).

41. During the business meeting, participants agreed to the nomination and election of the following individual as the new executive of the working party:

André Leclercq (Belgium), Chair
 Paul Cooper (Canada), Vice-Chair
 David Kretschmann (USA), Vice-Chair
 Ilona Peszler (Hungary), Technical Secretary

John Balatinecz (Canada) would serve as past-Chair to assist the new team during the transition.

42. Participants emphasized the useful role of IPC in fostering international interdisciplinary cooperation.

X BREEDING AND SELECTION OF POPLARS AND WILLOWS

43. The members of the Working Party approved a proposal to change the name of the group to “**Working Party on Genetics, Conservation and Improvement**”, for consideration by the next Session of the IPC. The new definition seemed better adapted to the broader scope that the Working Party has adopted over the years; breeding is still a very important subject, vital for the economic and social development of many areas of the world, but other activities have gained a central role as well. The preservation of biodiversity, the maintenance of genetically dynamic riparian ecosystems, the study of gene flows between cultivated and spontaneous poplars and willows, the development of entirely new technologies for genetic improvement based on non-sexual gene transfer, the progress in molecular genetics, indicate that breeding alone does not give a fair description of the interests of the Working Party.

44. Members of the Working Party Terms of reference made proposals regarding membership and participation in the work and activities, the convening of formal and informal meetings, the officials and the functions, of the Working Party. It was proposed that the subject areas should include all matters that relate, directly or indirectly, to the exploration, conservation and use of genetic resources of poplars and willows. More specifically: i) Conservation of natural genetic resources and ecosystems; ii) Genetic improvement by different means: a) Conventional breeding. b) Application of molecular genetics tools and techniques. c) Recombinant DNA technologies.

45. The following activities were suggested for the period 2000-2004:

- Data-base of clonal collections maintained by scientific and extension centres and network of maintenance arboreta (with the Sub-Committee on Nomenclature and Registration).
- Inventory of poplar and willow breeding programmes.
- Inventory of pollen collections.
- Photographic portfolios of poplar (and willow) cultivars (with the Sub-Committee on Nomenclature and Registration).
- Production of leaflets/booklets:
- Pollen and seed conservation
- Experimental design with poplar and willows

- Publication of a Working Party Newsletter (via Internet); creation of a newsgroup; creation of a web site.
- Coordination of cooperative seed collection campaigns.

46. The following officials of the Working Party were elected by acclamation for the period 2000-2004:

Teresa Cerrillo (Argentina), Chair

Lindsay Fung (New Zealand) and Sasa Orlovic (Yugoslavia), Vice-Chairs

XI BIOMASS PRODUCTION SYSTEMS FOR THE SALICACEAE

47. The working party on biomass production systems for poplars and willows held two technical sessions, attracting more than 40 and 80 people respectively, from at least 20 countries. Fourteen papers were presented while other papers were presented in joint sessions and in poster sessions. It was felt that there had been keen interest in the activities of the working party and participants had paid attention to both poplars and willows.

48. The scope and the name of the Working Party were discussed. There was general consensus regarding the scope which should continue to stress that production systems not only produce biomass, but also provide a large number of environmental services. The scope should continue to encompass social, technical, economic and ecological aspects of production systems, whether designed to provide biomass or other products and services to society.

49. Given the importance of environmental functions to be addressed in the Working Party, and given the general public perception of the word 'production', it was proposed to extend the name to PRODUCTION SYSTEMS AND ENVIRONMENTAL APPLICATIONS FOR POPLARS AND WILLOWS.

50. With regard to the frequency of meetings, it was suggested to maintain good coordination with the meetings at the IPS (International Poplar Symposium) to ensure regular meetings every second year.

51. It was felt that the IPC would benefit from a wider exposure of its activities. Technically this might be achieved by obtaining more links to the IPC web-site, which also should be used more intensively by the working parties, for instance by creating an open discussion forum on the web with an open mailbox system. In connection to this, the already existing address list of experts on poplar and willow should be updated and given a wider exposure.

52. The following officials of the Working Party were elected for the period 2000-2004;

Theo Verwijst (Sweden), Chair

Sara Hurst (New Zealand), Tim Volk and Don Johnsson (USA), Technical Secretaries

XII RECOMMENDATIONS OF THE COMMISSION

53. Delegates reviewed the recommendations formulated by the subsidiary bodies and, after discussion, adopted the following recommendations:

Nomenclature and Registration

54. The International Register of *Populus* L. Cultivars was a fundamental instrument for the exchange of correct information at both scientific and commercial level. The appointment that the IPC received from the International Society for Horticultural Sciences as International Registration Authority for the genus *Populus* is extended on the whole World and not limited to its Member countries. This responsibility towards a wider and to a large extent unknown audience must be fully perceived by the Executive Committee.

55. The recommendations from the Working Party on Nomenclature and Registration were as follows:

- Appointment of a Registrar: The role and responsibility of the *pro-tempore* Chair of the Sub-Committee as Registrar for the genus *Populus* should be formally recognized by the Commission and the International Society for Horticultural Sciences officially informed thereof.
- Awareness: Since an IRA did not have the power to enforce the use of officially approved cultivar names, clarity and uniformity of rules must be felt as a need by breeders and public/private research and commercial organization. At present the awareness of the importance of the Register was not satisfactory even among the National Poplar Commissions. Every effort should be made to convey information on the Register to Statutory Plant Registration Authorities, Professional organizations and Research institutions with the most appropriate case-by-case approaches, whether formal or informal.
- Reinforcement of the Sub-Committee: The Sub-Committee should be assisted by (or made up of) a network of Contact persons, even if informally established, that could act as a liaison between the Chair and Institutions/Professionals of Member and non-Member countries. The first tasks for the network of Contact persons should be to provide reliable information for filling the many gaps in the records of the database and to provide for a capillary distribution of information on the Register.
- Activities: The Executive Committee should give full support to the activities of the Sub-Committee, with particular reference to the coordination of living collections in order to ensure the maintenance of all the cultivars included in the Register and to the establishment of a standard portfolio of pictures for each cultivar as an aid to description and group identification.

Poplar and Willow Protection

a) Diseases

56. The following recommendations were made by the Working Party on Poplar Diseases to the Executive Committee:

- The IPC should encourage member nations to increase funding for research and training of new scientists. The establishment of international fellowships and scholarships would be particularly beneficial.
- Detailed studies of worldwide pathogen populations and pathogen variation and host range were needed. To this end, living collections of insects and pathogens of the Salicaceae were required, and as establishment and maintenance of such collections were expensive, possibly funded by the IPC.

- The IPC should make available on its web site, full-text versions of archived, published material that is currently unavailable, and that in the future, Proceedings of IPC meetings appear on the web site.

b) Insect Pests

57. The Working Party on Poplar Insect Pests made the following recommendations:

- Re-affirmed the recommendations made at the 20th session in Budapest dealing with the improvement of methodology for pest control, the safe exchange of germplasm among countries, and the exchange of experiences among scientists.
- The need for continued collaboration and cooperation among members of the working party and other entomologists working on poplar and willow insects, and the promotion of all aspects of the study of insects living in poplar and willow environments.
- Research should continue to focus on all aspects of insect pests of poplars and willows, including breeding for pest resistance. It will also include the appropriate research interests in broader areas of the environmental and conservation, and international 'biosecurity'.
- At future IPC meetings there should continue to be joint sessions between the Insects and Diseases Working Parties and the Breeding Working Party where appropriate. More time should be allowed for scientific presentations.
- Activities for the next 4 years should include:
 - updating the electronic publication "The damaging insects of poplars" by de Tillesse and Nef to include international data; expand the publication to include Salix insects; request the establishment of a Poplar and Willow Insect webpage on insects on the IPC website.

Logging and Utilization

58. The following priorities were recommended by the Working Party on Logging and Utilization for research both within and outside the working party:

- Stain (its incidence, causes and impact on value) in poplar wood.
- The potential application of biotechnology to enhance wood quality and natural durability of poplar wood.
- Economic analyses.
- The development of flexible, high-value conversion technologies.

Breeding and Selection

59. The following recommendations were made by the Working Party on Breeding and Selection:

- The exploitation of genetic resources must be based on the principle of sustainability. Whenever possible and compatible with vital economic and social needs of rural communities, poplar and willow cultivation must be carried out in respect of existing natural populations, their territorial integrity, their ecological balance and their dynamic genetic evolution. Wherever native genetic resources exist, their use in genetic improvement programmes should be preferred to broad use of a restricted, however selected, number of clones. Genetic diversity should be achieved in commercial plantations.
- With the above proviso, the cultivation of poplars and willows on agricultural land is to be encouraged. Plantations in agricultural environments fulfil multiple goals: a) producing a commodity whose demand is rapidly increasing while reducing the pressure on natural ecosystems; b) fix CO₂ while producing wood; c) diversifying the environment with cultures

that are often less intensive than agricultural crops and provide shelter and food for a wider spectrum of animals; d) providing new sources of income of rural communities.

- International Conventions recognize the potential of plantations to meet environmental goals: the International Poplar Commission and the FAO should make every effort to ensure that the principle be fully perceived by Member countries and given proper consideration in the development of national and international policies. Fast growing trees must be considered an essential component of the sustainable management of the global environment.
- A wise use of gene technologies is recommended. The benefits should be balanced against potential hazards and the benefits and hazards of currently available technologies. Decisions must be based on sound scientific evidence. Where information is insufficient research activities are to be strongly encouraged.
- The awareness on the risks of diffusion of pests and diseases, as a consequence of international movement of people and goods, should be raised among member and non-member countries. Strict control and quarantine measures should be implemented.
- The adoption of conventions on the protection of breeder's rights should be stimulated, in order to facilitate the exchange of superior cultivars.

Biomass Production Systems

60. The recommendations from the Working Party on Production Systems for Poplars and Willows were as follows:

- To proceed with a general call for papers and a general scientific committee, in the same way as has been done for the current session.
- To proceed with a mixture of technical WP-sessions and joint sessions of working parties, also as has been done during the current session.
- To consider a change in the name of the Working Party, adding the words 'and environmental applications' to production systems.
- To stimulate interaction between experts in all aspects of willow and poplar cultivation since willow and Poplar cultivation need to benefit still more from each other.

XIII ELECTION OF THE EXECUTIVE COMMITTEE, 2000-2004

61. Sixteen candidates were proposed by thirteen member countries for election to the Executive Committee for the Executive Committee for the period 2000-2004. An election was held by secret ballot involving twenty country delegates authorised to represent their respective governments (Argentina, Belgium, Bulgaria, Canada, Chile, China, Croatia, Egypt, Finland, France, Germany, Hungary, Ireland, Italy, Korea (Republic of), New Zealand, Spain, Sweden, UK and USA).

62. The following were elected to the Executive Committee for the period 2000-2004: S. Bisoffi (Italy), J. Isebrands (USA), M. Steenackers (Belgium), G. Miller (Canada), A. Sanhueza (Chile), Weilun Yin (China), H.J. Muhs (Germany), I. Bach (Hungary), M. Bulfin (Ireland), L. Fung (New Zealand), A. Padró (Spain), T. Verwijst (Sweden). The collection and counting of the votes was scrutinised by J. Balatinecz (Canada) and I. Peszlen (USA).

XIV DATE AND PLACE OF THE NEXT SESSION

63. Delegates were advised that no formal invitations had been received but an informal invitation had been received from Chile and Argentina to jointly host the 22nd Session of the IPC

in 2004. FAO was requested to approach Chile, Argentina and other countries, and on the basis of their responses, to decide the venue of the next Session.

XV CLOSING OF THE SESSION

64. The session was closed by the co-chairs, with grateful thanks to the hosts for organising a most successful meeting.

INTERNATIONAL POPLAR COMMISSION
FORTIETH SESSION OF THE EXECUTIVE COMMITTEE
Portland, Oregon, United States of America, 24 September 2000

AGENDA

1. Opening of the Session
2. Adoption of the Agenda
3. Activities of the Working Parties and Sub-Committee on Nomenclature and Registration of Poplars since the Thirty-ninth Session of the Executive Committee in Rome in September 1998
4. Proposals for the composition of the Executive Committee for the period 2000-2004
5. Proposals for the date and place of the next session of the Executive Committee
6. Responsibilities of Working Groups
7. Other matters

INTERNATIONAL POPLAR COMMISSION
TWENTY-FIRST SESSION AND RELATED SESSIONS
Portland, Oregon, United States of America, 25-28 September 2000

AGENDA

1. Adoption of the Agenda
2. Election of Officers
3. Admission of New Member Nations
4. Poplar and willow culture: Meeting the needs of society and the environment
5. Poplar and Willows: Summary of Statistics and Economics, Cultivation and Silviculture, Policy and Legislation and Operation of National Poplar Commissions
6. Poplar and Willow Identification and Varietal Control
7. Poplar and Willow Protection
8. Poplar and Willow Logging and Utilization
9. Breeding and Selection of Poplars and Willows
10. Production Systems for Poplars and Willows
11. Election of Members of the Executive Committee for the four-year period (2000-2004)
12. Date and place of next Session
13. Other matters

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LIST OF PAPERS PRESENTED AT MEETINGS OF SUBSIDIARY BODIES ¹Keynote Addresses

Poplars: Trees of the people, trees of commerce, trees of the future. J. Gordon.

The role of plantations in the world's future timber supply. R. Sedjo.

Management of aspen and mixed aspen forests for sustainable production. A.J. David.

Conservation of natural ecosystems of poplar and willow. S.G.M. De Vries.

Global climate change, carbon sequestration and short-rotation woody crops production: Where is the U.S.?. G.A. Tuskan, G. Marland, M. Walsh.

Willow vegetation filters for waste treatment and soil remediation combined with biomass production. P. Aronsson, K. Perttu.

Genetically modified poplars: state of the art and perspectives on the public controversy. S. Strauss, R. Meilan, S. DiFazio.

Achievements in the utilization of poplar wood – guideposts for the future. J. Balatinecz, A. Leclercq, D.E. Kretschmann.

Willows: An underestimated resource for environment and society. T. Verwijst.

Future role of forest plantations in meeting people's needs for forest goods and services. J. Ball

Poplars and willows in the 21st century: what can research do to meet the needs of society. V. Steenackers.

Joint Sessions

The challenge of durable resistance to pests and diseases in forest trees. M. Villar, C. Bastien, P. Faivre Rampant, J. Pinon.

Recent advances in poplar resistance to insect pests in Europe (1992-1999). G. Allegro, S. Augustin.

Insect resistance to poplar species in East Asia. Han YF, Fang JJ.

¹ Copies of papers may be requested directly from authors.

Field trials of transgenic hybrid cottonwoods demonstrate high levels of resistance to Chrysomelid beetles and glyphosate herbicide. R. Meilan, C. Ma, S. DiFazio, J. Eaton, L. Miller, R. Crockett, S. Strauss.

Breeding for resistance to leaf beetles attacking biomass willow in Europe. I. Ahman.

Actual situation of poplar resistance to *Melampsora larici-populina* in Belgium. M. Steenackers, B. Michiels, J. Van Slycken.

Pathogenic and genetic diversity within *Melampsora* spp. causing poplar rust in Europe. P. Frey, M. Gatineau, S. Miot, C. Foulon, N. Feau, C. Husson, A. Schipfer, J. Pinon.

Poplar breeding and testing strategies to meet current trends in utilization. D. Riemenschneider, J. Tuskan, C. Mohn, R. Hall, G. Stanosz, D. Dickmann, J.G. Isebrands.

The Minnesota Hybrid Poplar Research Cooperative Program. B. Berguson.

Poplar silviculture: the European model applied to American poplar farming. J. Eaton.

Breeding of poplars in the section Leuce DUBY at the Poplar Research Institute in Novi Sad. V. Guzina, S. Orlovic, B. Kovacevic.

The importance of aspen and hybrid aspen in Finnish forestry. E. Beuker, M. Haapanen, J. Hynynen, P. Pulkkinen, L-G. Stener.

Sustainable development of poplar genetic resources in Turkey. K. Tunçtaner.

Breeding and conservation of poplars in Ukraine. R. Volosyanchuk, V. Rudenko.

Logging and Utilisation of Poplar Wood

<u>Number</u>	<u>Title</u>
FO:CIP:N/00/1	Wood quality and utilization perspectives of selected poplar clones for biomass energy in Hungary. I. Peszlen, B. Marosvölgyi, R. Tamás.
FO:CIP:N/00/2	Structural lumber properties of Wisconsin-5 hybrid poplar. D.E. Kretschmann, J.G. Isebrands, G. Stanosz.
FO:CIP:N/00/3	Genetic modification of poplar wood physical and chemical properties. R.J. Dinus.
FO:CIP:N/00/4	Comparison of basic density and longitudinal shrinkage in tension wood and opposite wood in young stems of poplar (<i>P. euramericana</i> cv “Ghoy”) when subjected to a gravitational stimulus. B. Jourez, A. Riboux, A. Leclerq.

- FO:CIP:N/00/5 The influence of polyclonal poplar management on veneer and plywood quality. R. Van de Velde, J. Van Acker, M. Stevens.
- FO:CIP:N/00/6 Kraft pulping opportunities from Canadian aspen clones. K. Hunt, W. Gee, A. Hussein, S. Reath, P. Watson.
- FO:CIP:N/00/7 Evaluation of CTMP from nine aspen clones growing in northeast British Columbia. S. Johal, K. Hunt, B. Yuen, P. Watson.
- FO:CIP:N/00/8 Economic evaluation of intercropping with annual crops associated to poplar plantations. C. Covarrubias, F. Walls, G. Bascur.
- FO:CIP:N/00/9 The adoption of internal rate of return in evaluation of poplar plantation investments. S. Kocar.
- FO:CIP:N/00/10 Calcium accumulation in the wood of short rotation cottonwood species: effect on pulp properties. S. Potter.
- FO:CIP:N/00/11 A survey of poplar utilization in China. Hua YK, Zhou DG.
- FO:CIP:N/00/12 Poplar wood as raw material for sawnwood and peeled veneer manufacture. B. Klasnja, S. Kopitovic, S. Andrasev.
- FO:CIP:N/00/13 Main characteristics of poplar and willow wood as raw material for fibre and energy production. S. Kopitovic, B. Klasnja, J. Markovic.
- FO:CIP:N/00/14 Morphological investigation on aspen (*Populus tremula* L.) naturally growing in Turkey. M. Saribas.
- FO:CIP:N/00/15 Tree growth and properties of wood from a poplar stand affected by acid rain and air pollution. Zhou DG, Ma LX.

Poplar Diseases

- FO:CIP:D/00/1 Influence of temperature and leaf wetness duration on the monocyclic components of the poplar rust in Brazil. De Mio, Amorim, Filho.
- FO:CIP:D/00/2 An overview of *Melampsora* on *Populus* in Argentina. S. Cortizo, S. Romero.
- FO:CIP:D/00/3 *Sphaerellopsis filum* on *Melampsora* on *Populus* in North America. G. Newcombe.
- FO:CIP:D/00/4 Influence of elevated atmospheric [CO₂] on natural pathogen infection on poplar. N. Anselmi, M. Nasini, A. Vannini, M. Sabatti.

- FO:CIP:D/00/5 Investigation into prevention against disease caused by *Cytospora chrysosperma* (Pers.) Fr. in poplar in Turkey. K. Uluer, M. Gurer, N. Guler.
- FO:CIP:D/00/6 Poplar clone susceptibility to the fungus *Dothichiza populea* Sacc. et Br. G. Avramovic, V. Guzina, B. Kovacevic, L. Poljakovic-Pajnik, P. Pap.

Poplar Insects and Pests

- FO:CIP:I/00/1 Relations among the site, the plague (*Platypus sulcatus* Chapuis) and the trunk disease in a commercial plantation of *Populus deltoides* cv Catfish-2 located in the low delta of the Paraná river (Argentina). E. Casaubon, G. Cueto, K. Hodara, A. González.
- FO:CIP:I/00/2 Aphids (*Aphididae*, *Homoptera*) on poplars in Serbia. L. Poljakovic-Pajnik, P. Petrovic, S. Orlovic.
- FO:CIP:I/00/3 Bioassay on *Anoplophora glabripennis* larvae with phenolic glycosides of *Populus deltoides*. Fang JJ, Han YF, S. Augustin, Zhao J, Wu RL.
- FO:CIP:I/00/4 Cottonwood leaf beetle defoliation impact on *Populus* growth. D.R. Coyle, J.D. McMillin, R.B. Hall, E. Hart.
- FO:CIP:I/00/5 Insecticidal activity and expression of *Bacillus thuringiensis* toxin gene in transgenic poplar (*Populus deltoides* Bartr. X *Populus simonii* Carr.). Rao YH, Wu NF, Chen Y, Huang MR, Fan YL, Wang MX.
- FO:CIP:I/00/6 Cross protection of transgenic and non-transgenic poplar (*Populus nigra* L.) clones in field tests for insect tolerance. F. Sala, Hu JJ, Zheng YZ, S. Castiglione, Han YF.
- FO:CIP:I/00/7 Selection and application of poplar varieties resistant to *Anoplophora glabripennis* Motsch. Yan YH, Yan JJ, Wang ZG, Huang DZ, Ji DR.

Poplar and Willow Breeding

- FO:CIP:BR/00/1 Phylogenetic analysis yields insights into genetic complexity in *Salix*. S.J. Brunsfeld, C.K. Anttila, R. Drew.
- FO:CIP:BR/00/2 The genetic architecture of *Salix laevigata* as a result of clonal site occupation under a range of hydrologic conditions. V. Douhovnikoff.
- FO:CIP:BR/00/3 Studies of population genetics through microsatellite analysis of *Populus nigra* L. growing on Ticino river banks. S. Castiglione, T. Fossati, F. Grassi, S. Bollotta, S. Bisoffi, F. Sala.

- FO:CIP:BR/00/4 Phylogenetic analysis of *Populus euphratica* based on the divergence of chloroplast DNA. Lu MZ, Xie HL, Zhang H, Tang Q, Liu YR, Wang SJ.
- FO:CIP:BR/00/5 From gene isolation to genetic modification in poplar: the use of a poplar floral homeotic gene for genetic engineering of reproductive sterility. J.S. Skinner, C. Ma, R. Meilan, S.H. Strauss.
- FO:CIP:BR/00/6 The revised EU-Directive on the marketing of forest reproductive material and the draft of the new OECD-Scheme on the certification of forest reproductive material with reference to transgenic poplars. H-J.Muhs.
- FO:CIP:BR/00/7 Parental line improvement and breeding of elite cottonwood hybrids in an industrial tree improvement program. M.M. Payne, L.K. Miller.
- FO:CIP:BR/00/8 Presentation of the new poplar selection programme by the French scientific consortium AFOCEL/Cemagref/INRA. M. Villar, H. Van de Sype, A. Berthelot, V. Breton, C. Ginisty, P. Monchaux, J. Pinon.
- FO:CIP:BR/00/9 Integration of new tools into long-term breeding strategies. W. Boerjan.
- FO:CIP:BR/00/10 Genetic engineering of reproductive sterility: The promise and problems of developing methods for commercial application. A. Brunner, J. Skinner, R. Meilan, S. Strauss.
- FO:CIP:BR/00/11 Detection of genes and QTL related to rust resistance in poplar. P. Faivre Rampant, M. Villar, D. Prat, M-C. Lesage, C. Bastien.
- FO:CIP:BR/00/12 Analysis of repetitive DNA elements in *Populus* species and their use in study of phylogenetic relationships. J. Rajagopal, D.K. Khurana, P.S. Srivastava, M. Lakshmikumar.
- FO:CIP:BR/00/13 Chromosome doubling and triploid breeding of *Populus tomentosa* Carr. and its hybrids. Zhang ZY, Zhu ZT, Kang XY, Li FL.
- FO:CIP:BR/00/14 Poplar as a potential model for gene resource conservation in forest ecosystems. D. Kajba, B. Heinze, P. Rotach, S. DeVries, F. Lefèvre.
- FO:CIP:BR/00/15 Diversity and potential of poplar species in China – a promising enrichment for international breeding activities. H. Weisgerber, Han YF.
- FO:CIP:BR/00/16 Genetic impacts of hybrid poplar plantations on black cottonwood populations. S. DiFazio, S. Leonardi, W.T. Adams, S. Garman, S.H. Strauss.
- FO:CIP:BR/00/17 Biodiversity and forest management in *Populus*-dominated forests of North America. W.J.A. Volney, J.R. Spence.

- FO:CIP:BR/00/18 Winter raptor use of a hybrid poplar plantation. B.W. Moser.
- FO:CIP:BR/00/19 Better willow varieties for biomass plantations. S. Larsson.
- FO:CIP:BR/00/20 Genetic improvement of *Salix* for the northeast and north-central United States. R.F. Kopp, L.W. Smart, L.P. Abrahamson, C.A. Maynard, J.G. Isebrands.
- FO:CIP:BR/00/21 Ecological clone characterisation for the purpose of increased biomass production. M. Weih.
- FO:CIP:BR/00/22 A willow breeding program for timber and paper industries. T. Cerrillo.
- FO:CIP:BR/00/23 Identification of selected willow (*Salix* L.) clones based on morphological, biochemical and molecular data: a comparative analysis. F.A. Aravanopoulos, D. Lin, L. Zsuffa, M. Hubbes.

Production Systems for Poplars and Willows

- FO:CIP:BS/00/1 Phytoremediation potential of poplar and willow: differences in cadmium accumulation between poplar and willow species. T.M. Mills, B. Robinson, S. Green, B. Clothier.
- FO:CIP:BS/00/2 Response to salinity in *Populus*. H. Sixto, J.M. Grau, A. Ferrer, F. González-Antoñanzas.
- FO:CIP:BS/00/3 Western Minnesota poplar plantations show consistent positive response to fertilization. M. Coleman, D. Tolsted, T. Nichols.
- FO:CIP:BS/00/4 Uptake and accumulation of radio-caesium in *Salix* plantations on contaminated agricultural soils. Y. Von Fircks, K. Rosen, L. Sennerby-Forsse.
- FO:CIP:BS/00/5 Renaturalization of abandoned agricultural land using woody plantations. M. Sabatti, Kuzminsky, G. Scarascia-Mugnozza.
- FO:CIP:BS/00/6 Cultivation of American poplars in Sweden. L. Christersson.
- FO:CIP:BS/00/7 Allometrics and growth potential of hybrid poplar and h. aspen in Sweden. A. Karacic.
- FO:CIP:BS/00/8 Stand development and biomass yield in an eight-year old willow (*Salix* spp) clone trial. N-E. Nordh.
- FO:CIP:BS/00/9 Development of land suitability maps for hybrid poplars. B. Schroeder.

- FO:CIP:BS/00/10 A free air CO₂ enrichment experiment on a short rotation, intensive poplars plantation: growth dynamics and leaf area over a two-year period. G. Scarascia-Mugnozza, C. Calfapietra, M. Sabatti, P. De Angelis, R. Ceulemans, B. Gielen, F. Miglietta.
- FO:CIP:BS/00/11 Beneficial reuse of landfill leachate with hybrid poplar. J. Smesrud, J. Dickey, S. Asare, A. Cox, A. Lanier, J. Jordahl, M. Madison.
- FO:CIP:BS/00/12 Selection of *Salix* varieties for specific uses – phytoremediation of heavy metal contaminated land and nutrient rich wastewaters. D. Riddell-Black.
- FO:CIP:BS/00/13 Timberbelts: Windbreaks that enhance production and produce profitable wood products. G.A. Kuhn, S.J.J. Josiah.
- FO:CIP:BS/00/14 Ten lessons from ten years of research in *Populus* production systems. D.S. DeBell, C.A. Harrington.
- FO:CIP:BS/00/15 Response of hybrid poplar clones to fertilization applied at planting on a Vancouver Island site. R. Van den Driessche.
- FO:CIP:BS/00/16 Effects of first-year weed control strategies on weed levels and tree growth in two hybrid poplar plantings in northern Minnesota. T. Nichols.
- FO:CIP:BS/00/17 The biomass of intensive and extensive cultured poplar plantation. Zhu CQ, Liu XD, Zhang Q, Lei JP, Wang SJ.
- FO:CIP:BS/00/18 Alternative methods of site preparation for willow and poplar biomass crops in the northeastern United States. T.A. Volk, D.J. Robison, L.P. Abrahamson.
- FO:CIP:BS/00/19 The effect of widely spaced poplar trees on sward growth and soil characteristics in New Zealand pastoral hill country. S. Hurst, G. Douglas, A. Walcroft.
- FO:CIP:BS/00/20 Towards a growth model for poplar: relation between soil properties and growth of poplar. J. Van Slycken, L. Meiresonne, T. Thomas, R. Whitaker.

LIST OF POSTERS

Integration of new tools into long-term breeding strategies

- ABD EL-DAYEM. Evaluation and genetic identification of some *Populus* species by using polyacrylamide gel electrophoresis separation of total soluble proteins.
- ALBA, AGUNDEZ, ALIA. Genetic variation in *Populus alba* L. A comparison of isozyme markers and quantitative traits.
- ALVAREZ, CERVERA, AGUNDEZ, ALBA, ZAPATER, GRAU. Identificaiton of different commercial clones of *Populus* using AFLPs.
- AUGUSTIN, FAIVRE RAMPANT, DELPLANQUE, LESAGE, VILLAR, BASTIEN. Quantitative trait loci linked with resistance in hybrid poplar to *Chrysomela tremulae*.
- BENEÀ, COROS. Performances of 'ex situ' genetic resources of multiconal *Populus alba* L. vitroplants.
- CHUNG, CARRASCO. Micropropagation of *Salix* spp. for foliate meristems.
- CONFALONIERI, SPARVOLI, BALESTRAZZI, CALLIGARI, BOLLINI. Transformation of elite white poplar (*Populus alba* L.) with stilbene synthase-encoding gene using *Agrobacterium tumefaciens*.
- FAIVRE RAMPANT, LESAGE, VILLAR, PRAT. Molecular genetic maps of *Populus deltoides* and *P. trichocarpa*.
- LU H, LI J, WANG SS, LI Y, JIANG XN, LI FL. Cloning of xylem-specific-expression promoter of glycine-rich-protein (GRP1.8) gene from *Populus tormentosa* and induced expression in teheroorganism *Escherichia coli*.
- MERTENS, ETIENNE. Aromatic fingerprinting of *Populus*.
- MOFIDABADI, MODIR-RAHMATI. Interspecific hybridization between *Populus alba* Oliv. and *P. euphratica* L. using ovule and ovary culture.
- MUHS, KALDORF, FLADUNG. Expression and stability in transgenic aspec clones under field conditions at Grosshandsdorf.
- QIANG ZH, YIN TM, HUANG MR, WANG MX, WU RL. Molecular evolutionary relationships in the *Populus* genus.

- SU XH, ZHANG XH, LI JH, ZHANG QW, ZHENG XW. Identification of RAPD molecular markers for resistance against *Alternaria alternata* in *Populus*.
- YIN TM, HAUN MR, TU ZM, ZHANG XY, WANG MX, WU RL. A composite linkage map for *Populus* based on RAPD, AFLP and microsatellite markers.
- YIN WL, DUAN LS, HE ZP. Studies on immunological analysis and expression of Bt (*Bacillus thuringiensis*) toxin protein in transgenic poplar.
- ZHANG TZ, WANG CS, HU XL. Tissue culture on triploids of Chinese white poplar.

Environmental role of poplars and willows

- FANG SZ, XU XZ, YU X, LI ZC. Poplar in agroforestry: a case study for its ecological benefits, site productivity and economics.
- LICHT. Ecolotree Systems – poplar-based environmental engineering.
- MATTHEI. Salicaceae in the recovery of the state of balance in the tideland. The Potrerada flowing with sedimentary characteristics in the table of sand in the basin of the Bio Bio River, Chile.
- RIDDEL-BLACK, BERTHOLDSSON. Phytoremediation of heavy metal contaminated land using willow practical reality or impossibility?
- RIDDELL-BLACK, MARSHALL, FERGUSON. *Salix* as a means of cost effective, onsite management of landfill leachate.

Conservation of genetic and environmental resources

- BACH, BAGAMERY, BORDACS, GABNAI, BOROVIK, GERGACZ. Active gene preservation program for black poplar (*Populus nigra* L.) in Hungary.
- CASTIGLIONE, FOSSATI, GRASSI, BOLLOTTA, BISOFFI, SALA. Studies of population genetics through microsatellite analysis of *Populus nigra* L. growing on Ticino river banks.
- KAJBA, VRATARIC. Conservation of European black poplar (*Populus nigra* L.) genetic resources in Coratia.
- OBALLA. Genetic diversity and regeneration studies of *Populus ilicifolia*.
- ORLOVIC, GUZINA, KOVACEVIC. Genetic variability of the physiological characters of black poplar clones and their importance for breeding.

- VANDENBROECK, VANSLYCKEN, HALFMAERTEN, DEPRAETER. Isozyme polymorphism in the Belgian and Hungarian *Populus nigra* gene bank and the Euforgen *Populus nigra* core collection.
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Canada

Chile

China

Croatia

Egypt

Finland

France

Germany

Hungary

Iraq

Italy

Korea, Republic of

Morocco

New Zealand

Romania

Spain

Sweden

Turkey

United Kingdom

United States of America

Yugoslavia