

PREFACE

This issue of Forest Genetics focuses on cytogenetics and includes most of the papers in this field presented at the 20th IUFRO World Congress in Tampere, Finland in 1995. At the initiation of Scott E. Scharbaum and Želimir Borzan, IUFRO activity in cytogenetics was revitalized in 1992 with the initiation of Working Party S2.04–08. Cytogenetics had been an inactive field in IUFRO since 1974. Relatively little attention was directed toward this field during this period. Conifer karyotypes had been found to have little variation and polyploidy was non-existent in *Pinus*, the genus of the greatest interest at the time. Also, tree research at the cellular level was mostly directed to cell and tissue culture, somatic cell genetics and molecular genetics. Because cytogenetics research began long before the molecular structure of the plant cells had been investigated, its focus was primarily on chromosomes and chromatin. Although cytogenetics and cellular genetics are by definition the same, in practice the cellular genetics is primarily concerned with the molecular and biochemical aspects of cell structure and function. In view of recent advances in basic research on the cell and its components, it is relevant to consider the role of chromosome research at the optical level in relation to (1) other cell research and (2) the more applied aspects of forest tree improvement. This collection of papers provides information relevant to these questions.

The Cytogenetics Working Party has held two meetings since its restoration in 1992, one at Brijuni, Croatia in 1993 and a second during the 20th IUFRO World Congress in Tampere, Finland in 1995. The Brijuni meeting had 33 participants from 7 countries and included 18 papers on the cytogenetics of a variety of species of gymnosperms and angiosperms. The papers have not yet been published although it is hoped that funds can be found for this; editing has been completed.

The authors and the titles were as follows:

- BAVCON, J., DRUŠKOVIĆ, B. & GOGALA, N.: Effect of increased UV light upon mitosis in Norway spruce.
 BORZAN, Ž., PAPEŠ, D., KRSTINIĆ, A., ZOLDOŠ, V. & IDŽOJTIĆ, M.: Ploidy of some arborescent willow clones in relation to their production in field tests.
 BUTORINA, A.: Evolution of trees on chromosome level.
 CESAR, V.: The mitotic activity and the distribution of nuclei in the vegetative buds of spruce.
 DRUŠKOVIĆ, B.: Cytogenetic bioindication in Slovenia – 1986/1991. Results and their meaning.
 FUKUI, K.: Imaging techniques for cytogenetics.
 GREILHUBER, J.: The problem of variable genome size in plants (with special reference to woody plants).

- GUTTENBERGER, H.: Image analysis and pattern recognition for cytogenetic studies.
 KORMUŤÁK, A.: Cytological aspects of self- and cross-pollination in firs (*Abies* sp.).
 MÜLLER, M.: Effect of ozone on root tip chromosomes in spruce trees.
 MURATOVA, E. N.: Nucleolar chromosomes in *Pinaceae* family representatives.
 PAPEŠ, D., ZOLDOŠ, V., LITTVAY, T., BESENDORFER, V. & LORKOVIĆ, Z.: Preliminary assessment of cytological risk in oak decline woods in Croatia.
 SCHLARBAUM, S. E.: Cytogenetic potential and tree improvement in conifers.
 SCHLARBAUM, S. E., KNAUER, N. J. & WANN, S. R.: Isolation of chromosomes from cell suspension of loblolly pine, *Pinus taeda*.
 SEDELNIKOVA, T. S. & MURATOVA E. N.: Scots pine (*Pinus sylvestris* L.) Karyotype structure in extreme swamp conditions.
 STIPKOVIĆ, S., JELENIĆ, S. & JELASKA, S.: Cytogenetic analysis of black pine transgenic roots.
 ŠILJAK-YAKOVLEV, S., UGARKOVIĆ, Đ., JELENIĆ, S., CERBAH, M. & PAPEŠ, D.: Fluorescence and molecular analysis of *Picea omorika* (Pančić) Purkyně chromosomes.
 TODA, Y.: Intraspecific variation of the karyotype in conifers.

Nine papers were presented at the 20th IUFRO Congress sessions in Tampere, of which 7 are included in this issue of Forest Genetics.

The 7 gymnosperm cytogenetics papers in this issue are concerned with both technique and applications. The papers by BORZAN *et al.* and GUTTENBERGER *et al.* deal respectively with standardization of karyotypes and advanced instrumentation technique for chromosome identification. The other five papers are of interest to forest botanists, ecologists, silviculturists and tree breeders. Three of them are concerned with cytological damage resulting from air pollution, a problem of critical importance to forest regeneration and to tree breeding. BUTORINA and EVSTRATOV found disruption in mitosis that they believed could be traced to a combination of radionuclide contamination and motor vehicle emissions. KORMUŤÁK found meiotic irregularities and reduced pollen viability in trees in an area subject to air pollution, MÜLLER & GRILL developed a system for assessing cytological damage in spruce using root tip meristems. LUOMAJOKI used success or failure of male meiosis during microsporogenesis as a criterion for evaluating adaptability of exotic conifers to the climate in Finland. TODA's paper is concerned with the taxon-

omy of the family *Taxodiaceae* based on chromosome structure.

SCHLARBAUM (1991) pointed out some of the problems and needs in cytogenetic research. One, the need for greater accuracy on information in reporting cytogenetic investigations, can be ameliorated by the standardization proposed by BORZAN *et al.* and the improved methods by GUTTENBERGER *et al.* Another need is for more research on hardwood tree species. Although little is known about chromosomes variation in most hardwood species, we do know that there is polyploidy and variation in some important genera. Hardwood chromosomes should, therefore, be more amenable to manipulation for genetic improvement than conifer chromosomes. Further investigations are needed for some important genera. Research reported at the Brijuni conference but not yet published included papers on *Salix*, *Quercus*, *Populus* and *Alnus*.

Cytogenetics has an emerging role as a bioindicator of pollution, which may not always have visible effects on the tree. Changes in chromosome structure, meiosis and mitosis may reduce or eliminate the reproductive capacity of the tree or lead to offspring with a damaged genetic structure.

The members of the Working Party see an important role of the light microscope to help bridge the gap between the work of scientists in the "macro" fields of

ecology and physiology and that of scientists carrying on "micro" level research in molecular genetics at the population and individual tree levels. To understand the continuity of nature, a continuity of knowledge is necessary. Planning is already under way for future meetings of the cytogenetics group. The plan is to have a meeting between each IUFRO World Congress. The next meeting will be held in Graz, Austria, 12–16 September 1998, as detailed in IUFRO announcement of future meetings. Subsequent meetings are planned for the 21st IUFRO World Congress in Malaysia in 2000 and for Japan in 2002. At the end of this journal there is a copy of the First Circular Letter, with a form to be sent in by anyone with a possible interest in attending the next meeting in Graz. Please feel free to fill it out, send it in, and join us in Graz in 1998.

SCHLARBAUM, S. E. 1991: Cytogenetics of forest tree species. *In*: Chromosome engineering in plants: genetics, breeding, evolution. (ed. T. Tsuchiya & P. K. Gupta), pp. 593–613. Developments in Plant Genetics and Breeding. 2B. Elsevier, Amsterdam.

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