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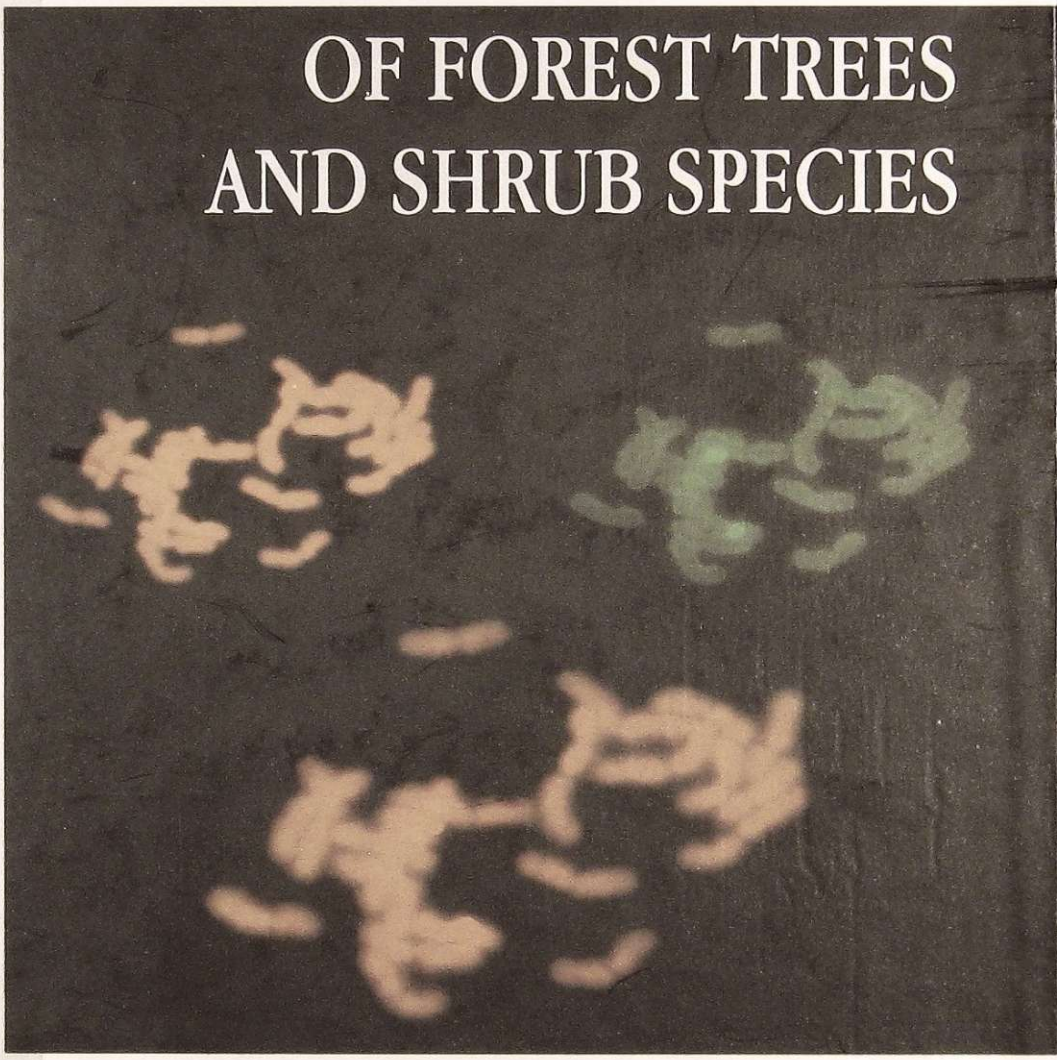
CYTOGENETIC STUDIES OF FOREST TREES AND SHRUB SPECIES



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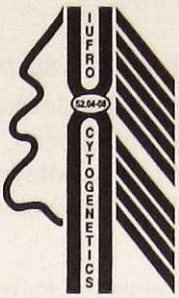

Cytogenetic studies of forest trees and shrub species

Contributions by members of the IUFRO Cytogenetics Working Party

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Foreword

Cytogenetic studies of forest tree and shrub species began to appear in the scientific literature early in the twentieth century. The first studies were reports of chromosome counts and primitive karyotype analyses, sometimes based on tissue sections. As better techniques and staining protocols were developed, more in-depth studies were published. Cytotaxonomy, induction of polyploidy, effects of mutagenesis, detection and manipulation of natural polyploid were popular areas of study during the approximate period of 1940 through 1960. Unfortunately, tree cytogenetic did not flourish as in certain agronomic crops. The inherent nature of many tree species to have a relatively long juvenile stage, dormancy cycle, and large physical size were barriers to rapid progress in basic and applied research. By the late 1960's, the majority of few cytogeneticists still working with tree species were preoccupied with karyotypic studies of conifers, in particular *Pinaceae* species. The era of genetic studies based on plant biochemistry was dawning and support for cytogenetic studies began to diminish. Tree cytogenetics suffered an additional disadvantage when the newly developed chromosome banding techniques had only limited application with conifers due to the chromosome architecture. Banding studies with angiospermous tree species were generally unsuccessful, as the chromosomes are too small to exhibit meaningful banding patterns. The IUFRO Cytogenetics Working Party of that era held a final meeting in 1976 and was combined with the Biochemical Working Party, due to the diminished number of active cytogeneticists.

In 1980, a group of molecular geneticists published a paper that would redefine molecular genetic studies for plants and animals. This paper proposed a new method for rapidly mapping genomes by a technique that detected polymorphisms in DNA fragments from restriction endonuclease reactions. The probability for using this technology to detect and map quantitative genes that were critical to crop production was high. Molecular geneticists began to see the value of cytogenetics, particular in the cytogenetic stocks of various plants that contained chromosomal aberrations or aneuploid changes. Used in conjunction with molecular analysis, these abnormalities provided a quick method to concentrate mapping efforts on particular chromosomes or chromosome regions. As a consequence, cytogenetics has not diminished into the archives of science, but has reemerged and integrated into areas of science that are currently emphasized.