Dreux de Nettancourt

Incompatibility and Incongruity in Wild and Cultivated Plants

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Incompatibility and Incongruity in Wild and Cultivated Plants

Second, totally revised and enlarged edition

With 41 Figures in 67 separate Illustrations and 19 Tables

Springer

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Cover illustration: Cross section of an incompatible pollen tube in the intercellular space of the stylar conducting tissue of *Lycopersicum peruvianum* (courtesy University of Siena). The endoplasmic reticulum shows a concentric parallel configuration (de Nettancourt et al. 1973 a)

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To Gabrielle, my wife,
for her encouragement, patience
and everlasting guidance
regarding the word processor

Preface

The aim of this book is to provide a picture, as complete as possible, of the current state of knowledge of pollen-pistil barriers in flowering plants and of the ability of man to silence, mutate or transfer the genes that control them. The work was conducted in two phases. The first one essentially consisted of a review of early work, such as it had been summarized in a monograph I wrote in 1977 regarding the main features, origin and classification of self-incompatibility systems, their distribution among the angiosperms, the modalities of their inheritance at the scale of individuals and populations, the mutability of SI genes, and their possible involvement in the control of barriers between species. The major part of this information was derived from the 1977 monograph and systematically enriched (when material was available) by an account of more recent or contemporary research on the distribution, genetics and population genetics of SI. The second phase, by far the most challenging, consisted of the description and review of the very impressive and abundant research results that have accumulated, since the early 1980s, on the cellular and molecular biology of pollen-pistil interactions. The nature of this research, although the ultimate objectives (understanding and control of pollen-pistil barriers) remained unchanged, was radically modified by the new ability of man to perform analyses of life at the molecular level and to exploit all the techniques of modern biology to study the structure, action, function, mutation, reconstruction and evolution of the genes and mechanisms that participate in the recognition and rejection of incompatible pollen grains and pollen tubes.

A major difficulty in the preparation of a book of this type, which covers the interactions of many different disciplines, deals with the classification and distribution of information. It is necessary to compromise between repetition and overlap, essential if each chapter is to be considered separately, and cross-referencing, required for the unity of the work. Furthermore, I have not been able to avoid the creation of an opening chapter

devoted to a general presentation of pollen-pistil barriers; it is not intended to summarize the book but to provide the perspective necessary for direct access to the matter covered by the other chapters. Again, I had to choose between cross-referencing and the duplication of information.

The Role of Professor Linskens

The person to blame is Professor H.F. Linskens. Not only did he suggest the first edition of this book approximately 25 years ago, he proposed this "*bis repetita placent*" episode of pollen-pistil tribulations. However, he meant well. I must say that Professor Linskens tried to make up for his impulses through his constant support and the regular transmission of a very impressive amount of information. I not only owe him the text of articles by Correns (1913), Sutton (1918), Brieger (1930) and Sears (1937) but also articles discussing the latest state of the art (to the end 1999) of pollen-part mutations, the dimer hypothesis, pollen-tube-directed differential ovule development and the biochemistry of haplotype dominance. Through him, from several of his six working addresses in Europe and America, I received extensive collections of abstracts from recent papers that dealt with all possible aspects of pollen-pistil interactions. None of my mistakes, misinterpretations or omissions can be attributed to him, but he must be credited for his support and the suggestions that enabled me to improve my work.

Help from the Scientific Community at Large and from Colleagues at Louvain-la-Neuve

Other people, in addition to Professor Linskens, gave advice and information. Dr. V.E. Franklin-Tong kindly provided explanations of the functional significance of the interaction between stigmatic S-proteins and SPB, a pollen protein, in the field poppy (Jordan et al. 1999, but unpublished at the time). She informed me, on this occasion, of the discovery, by a Birmingham group (N.N. Jordan and co-workers), of the first evidence that programmed cell death was involved in the rejection phase of SI. Professor B.A. McClure kindly commented on the research results at his laboratory and provided unpublished information and an illustration (Fig. 5.3) regarding work dealing with unilateral inter-species incompatibility. Professor Wehling

described the results of his attempts to test the Bm2 probe of *Phalaris coerulescens*, supplied by Professor Langridge, as a candidate for the S-gene in rye. Professor M. Cresti contributed the unpublished micrographs of incompatible pollen tubes, which are now Fig. 3.1 and Fig. 5.1.

I thank all of them wholeheartedly, and I also express my deep gratitude to the scientists and the publishers who so kindly contributed photographs, drawings or tables from early or recent work and authorized me to use them in my book. Their very kind cooperation is acknowledged in the captions of figures and tables.

Finally, I want to thank the University of Louvain and the Unit for Physiological Biochemistry (FYSA) for the hospitality and the help that was generously and kindly given to me. My gratitude goes, in particular, to Professor A. Goffeau, former director of FYSA, and to Professor M. Boutry, who replaced him after his retirement. I appreciate the instructive discussions I had with them on the expression, cloning, sequencing and reconstruction of genes from yeast and higher plants.

Mr. Philip Menier competently advised and participated in the treatment and harmonization of 1200 references from several bibliographies, which Mrs. C. Durand reconstituted in part and which, at a later stage, Mrs. M. Rochat processed, checked and finalized with admirable patience. They cannot be blamed, of course, for flaws in the raw material provided to them. Mrs. A.M. Faber skillfully prepared the assembly of microphotographs and the computer drawing of diagrams.

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