

Palynotaxonomic Investigation of *Fagus* L. and *Nothofagus* Bl.: Light Microscopy, Scanning Electron Microscopy, and Computer Analyses

SHARON L. HANKS* and DAVID E. FAIRBROTHERS

Department of Botany, Rutgers University, New Brunswick,
New Jersey, U.S.A.

Abstract: This study of *Fagus* L. and *Nothofagus* Bl. (Fagaceae) describes in detail the pollen morphology of 41 species using the scanning electron and light microscopes. Representatives of all four pollen types recognized for these two genera were studied: *Fagus*, *Brassi*, *Fusca*, and *Menziesii*. The *Fagus* species not distinguishable with the light microscope could be separated easily with the SEM.

The obtained palynological data were used to produce computerized diagnostic keys. The computer was found to be a useful tool in formulating keys where the species have great variability, and identifications were based on combinations of characters. The light microscope data were used to produce pollen descriptions, and a dendrogram based on similarity coefficients.

The palynological data were combined with morphological, anatomical, cytological, and fossil record data to determine the taxonomic relationships among the species exhibiting the four pollen types. This research indicated that the *Fagus* pollen type possessed characteristics which are considered to be less advanced than the *Brassi*, *Fusca*, and *Menziesii* types; and that the *Brassi* type was most similar to the *Fusca* type. The origin, migration, and systematic relationships of *Fagus* and *Nothofagus* were hypothesized.

History	3
Introduction	3
Materials	5
<i>Fagus</i> species—Herbarium Materials	6
<i>Fagus</i> species—Slide Materials	6
<i>Nothofagus</i> species—Herbarium Materials	7
<i>Nothofagus</i> species—Slide Materials	8
Methods	9
Scanning Electron Microscopy	9
Preparation of Materials for Analyses	9

* Present address: Department of Science, William Paterson State College, Wayne, New Jersey.

Methods for Obtaining Measurements	11
Statistical Analyses	11
Ultrasonification	13
Preparation of Materials for Analyses	13
Methods for Obtaining Measurements	13
Light Microscopy	14
Preparation of Materials for Analyses	14
Method for Obtaining Measurements	14
Statistical Analyses	15
Results and Discussion	19
Scanning Electron Microscopy	19
Fagus Pollen Type	19
Fagus Type	19
Nothofagus Pollen Types	21
Brassi Type	21
Fusca Type	22
Menziessi Type	22
Unknowns	23
Ultrasonification	26
Fagus Pollen Type	26
Fagus Type	26
Nothofagus Pollen Types	26
Brassi Type	26
Fusca type	27
Menziesii Type	27
Light Microscopy	28
Fagus Pollen Type	28
Fagus Type	28
Nothofagus Pollen Types	33
Brassi Type	33
Fusca Type	38
Menziesii Type	44
Unknowns	46
DSCRBE and KEY Computer Programs	47
Fagus Type	47
Brassi Type	47
Fusca Type	49
Menziesii Type	49
TAXON Computer Program	59
Comparison of Data from Diverse Disciplines	64
Summary	70
References	73
Plates	78
Appendix	134