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MEETING OF THE SECTION FOR FERTILIZATION RESEARCH IN PLANTS ON 22 FEBRUARY 1991

Organelle Distribution in Growing Pollen Tubes of *Nicotiana tabacum* L.

J. Derksen. Department of Experimental Botany, Catholic University Nijmegen, Toernooiveld, NL-6525 ED Nijmegen, The Netherlands

Pollen of *Nicotiana tabacum* L. were germinated *in vitro*. The distribution of various organelles was studied in serial sections of cryo-fixed, freeze-substituted pollen tubes and in living pollen tubes using video microscopy. The organelles show a typical zonal distribution. In the tip, Golgi vesicles accumulate. At various distances behind the tip the different organelles accumulate: mitochondria at 5–15 μm, rough endoplasmic reticulum at 15–25 μm and Golgi bodies at 25–30 μm, from the tip. Video microscopy shows that mitochondria generally follow the pattern of plasma streaming in these tubes, though they sometimes even occur in the extreme tip. The Golgi bodies that accumulate in the tip remain there for long periods, up to 20 minutes, while other Golgi bodies follow the pattern of plasma streaming. At the plasma membrane, 15–25 μm behind the tip, coated pits accumulate. They are probably involved in retrieval of excess membrane, which results from wall secretion at the tip. The distribution of the coated pits is related to that of the microtubules. Often coated pits are connected with the microtubules, either directly by short bridges or via putative actin filaments. It is suggested that coated vesicle transport may depend on microtubule based motor proteins.

Crossability of Potato (*Solanum tuberosum*) with Dutch Wild Relatives

R. Eijlander and W.J. Stiekema. Centre for Plant Breeding Research CPO, P.O. Box 48, 6700 AA Wageningen, The Netherlands

This study focused upon the biological containment of genetic information within the Solanaceous species *Solanum tuberosum* (potato). Reciprocal crosses were made between this potato and its two most related wild species in The Netherlands, Black Nightshade (*S. nigrum*) and Bittersweet (*S. dulcamara*). These species had a ploidy of 2*x*, 4*x* and 6*x* respectively, although other ploidy levels can be produced as well. Three species (6*x*, 4*x* and 2*x*) were added to determine the effects of ploidy. Flowers were emasculated before pollination to avoid spontaneous selfing. The pollination and fertilization processes were followed microscopically and assays were developed and adapted to attempt to bypass crossability barriers between the species.

The tuberizing species used here could not be crossed with *S. dulcamara*. Pollen would not germinate on foreign stigmata. Incongruity is likely.

The tuberizing species used (2*x*, 4*x*, 6*x*) are unilaterally compatible with *S. nigrum* when used as pollinators. Pollen germination and pollen tube growth are, however, inferior in quantity and speed compared to selfing of *S. nigrum*. Formed putative hybrid seeds were very small and non-viable. Development stopped prematurely and degeneration started within 2 weeks after pollination.

Embryo/ovule rescue was successful when performed before the 24th day. Four allopolyploid plants were obtained out of approximately 5400 early rescued seeds. Three plants were tested and proved to be hybrids. The 4*x* and 5*x* hybrids are male sterile, due to absence of pollen, premature bud abscission or formation of non-viable pollen. The third hybrid (6*x*) has to flower yet.

We conclude that gene flow between potato and black nightshade is highly unlikely, although theoretically not impossible.

Sequence Analysis and *in-situ* Localization of the Pollen Specific cDNA Clone pNTPc303 in Tobacco

K. Weterings. Department of Molecular Plant Physiology, University of Nijmegen, Toernooiveld, 6525 ED Nijmegen, The Netherlands

Pollen, as the carrier of the male gametophyte, has a crucial function during the sexual reproduction of higher plants. It represents a cellular system very suitable to studying gene expression. This study began with the isolation of a pollen-specific cDNA clone (pNTPc303). NTP303 transcription starts at the early binucleate stage. The NTP303 gene is also transcribed during pollen germination. This observation from Northern blot analyses was further supported by results from a *de novo* transcription assay. This assay uses in-vivo ^{3}H-labeling of newly formed RNA in combination with a liquid hybridization to an antisense pNTPc303 transcript to detect *de novo* formation of NTP303 transcripts.

Localization of the NTP303 transcripts by *in situ* hybridization showed that these transcripts are present in the vegetative cell in the mature pollen grain. During germination and pollen tube growth, NTP303 transcripts are localized in the whole pollen tube as opposed to the tube tip.

The complete nucleotide sequence of NTPc303 was determined. The largest open reading frame encodes a protein of 525 amino acids with a molecular weight of 65 kD and a pI of 9·5. The correct consensus translation start (A/GCCAUGG) and the correct codon usage in this frame make it highly probable this is the reading frame used by the plants translation machinery. The first 20 amino acids at the carboxyl terminus show the characteristics of a leader peptide targeting the putative NTP303 protein to the E.R. for excretion. The putative NTP303 protein shows a high homology to ascorbate oxidase from cucumber fruit and laccase from *Neurospora crassa*. Both enzymes are thought to be involved in cell wall formation. Homology is low at the copper binding sites of which four are present in both laccase and ascorbate oxidase. A high homology percentage is found in regions causing secondary structures like β-sheets, turns and α-helices.

From this we can conclude that NTP303 has an important function during germination and tube growth rather than during pollen development. The protein encoded by NTP303 probably has a function during cell wall formation as concluded from the homology to enzymes like laccase and ascorbate oxidase.

MEETING OF THE SECTION FOR PLANT MORPHOLOGY, ANATOMY AND CYTOLOGY ON 24 MAY 1991

Effects of Calcium Stress on the Cytoskeleton of Tobacco Pollen Tubes

B.H.J. de Graaf and J. Derksen. Department of Experimental Botany, Catholic University Nijmegen, NL-6525 ED Nijmegen, The Netherlands

The cytoskeleton is probably the main element controlling tip growth. Therefore, the known effects of calcium and its antagonists on tip growth may occur, at least partly, via the cytoskeleton. In this study, we examined the immediate effects of calcium stress on the organization of microtubules and actin filaments. Tobacco pollen tubes were grown in 10% sucrose with 0·01% boric acid. Calcium stress was imposed by adding EGTA to 90-min-old, rapidly growing cultures, with final concentrations of 0·05 mM and 0·1 mM. At these concentrations the percentage of germination is reduced from 90 to 50%. Growth is also significantly reduced. However, callose deposition seems to be unaffected. EGTA treatments were carried out for various periods and were eventually stopped by addition of an equimolar $CaCl_2$ concentration. Microtubules (MT) and actin filaments (AF) were visualized by means of fluorescence microscopy.

The organization of the MT appears to be hardly affected by the EGTA treatments. The AF organization, however, is severely affected. Within 15 minutes fluorescence in the apical and subapical region became diffuse; in the subapical part some fragmented AF remained. Occasionally, the entire tip and subapical region became completely devoid of staining. The generative cell seemed to detach from its surrounding AF and to approach the tip. Addition of calcium almost instantly restored the original situation. During the experiments effects on the pH were detected that may be associated with the observed changes.

Exudate Production and Pollen Tube Growth in *Lilum longiflorum*

J. Janson. Department of Plant Cytology and Morphology, Wageningen Agricultural University, Arboretumlaan 4, 6703 BD Wageningen, The Netherlands

The pollen tube pathway in *Lilium longiflorum* is lined with secretory cells which produce exudate. The traditional fixing methods for light or electron microscopy largely wash this exudate away. This is not the case when low temperature scanning electron microscopy (CRYO-SEM) is used. Exudate production starts before the flower bud opens. At the stigma, the production is initially not evenly spread out over the papillate surface. Once the flower opens, the top of the stigma papillae rise above the large amount of exudate. In the top of the style, the production of exudate starts earlier than further to the base. Directly underneath the stigma, the exudate at first gathers at the top of the secretion cells after which these accumulations merge into a continuous layer. After entering the style through a slit between the stigma lobes of a flower 2 days after anthesis, the pollen tubes meet a large amount of exudate. Here they are not in direct contact with the secretion cells but are separated from them by exudate. Further down the style there is far less exudate at this time. Once the pollen tubes arrive in the ovary, the placenta is covered with exudate as well. From the placenta, the pollen tubes grow towards the micropyle, a route completely filled with exudate.

After bud pollination, at the stage where the accumulations in the top of the style start to merge, the pollen tubes are closely packed in the exudate of the style. The distance between the pollen tubes is smaller compared with pollination of a flower.

Exocytosis in Embryogenic Suspension Cells of Carrot

A.M.C. Emons and J.W. Vos. Department of Plant Cytology and Morphology, Wageningen Agricultural University, Arboretumlaan 4, 6703 BD Wageningen, The Netherlands

A proliferating embryogenic suspension culture of carrot contains three types of cells. Clusters of isodiametric cells (i. cluster cells) in which localized cell divisions occur accompanied by only slight cell growth, give rise to pro-embryogenic masses (ii. PEM cells), while other cells from the outside of the cluster elongate considerably, lose cell-to-cell contact, and become free cells in the medium (iii. elongated cells). Apart from division and elongation rate, the three cell types differ in size, shape, cell-to-cell contact, relative vacuole size, number of starch grains, number of plasmodesmata, and texture of cellulose microfibrils. Cells remain in the proliferating stage, as long as the B5 medium contains the synthetic auxin 2,4 dichlorophenoxy acetic acid. In medium without this hormone the pro-embryogenic masses regenerate into plantlets, and no elongated cells are formed.

Exocytosis was studied during proliferation from day 0 (T_0) to day 14 (T_{14}) after subculturing, by means of freeze-fracturing material ultra-rapidly frozen by plunging in liquid propane. Exocytosis configurations of the plasma membrane measure 160–180 nm and horse-shoe configurations, such as reported by Staehelin & Chapman (*Planta* **171**: 43–57, 1987) occur. Density of exocytosis configurations rises in cluster and PEM cells on the first day after subculturing to 0·7 μm^2 and in elongated cells to 1·35/μm^2. From T_1 to T_{14}, density of exocytosis configurations drops in all cell types but to different degrees: in cluster cells from 0·7 to 0·25/μm^2, and in PEM cells from 0·7 to 0·55/μm^2 from T_1 to T_{14}, and in elongated cells from 1.35 to 0.1/μm^2 from T_1 to T_5 remaining constant at 0·1/μm^2 during the next 9 days. Morphology and size of exocytosis configurations do not change in time. It is hypothesized that the abundance of starch grains in PEM cells and to a lesser amount in cluster cells, renders them less susceptible to subculturing.

MEETING OF THE SECTION FOR VEGETATION RESEARCH ON 16 APRIL 1991

Vegetation Patterns in Thai Hill and Mountain Forests and their Ecological Explanation

I.S. Zonneveld, L. Vels and W. van Wijngaarden. International Institute for Aerospace Survey and Earth Sciences (ITC) 350 Boulevard 1945, Postbox 6, 7500 AA, Enschede

The aim of the study was to provide a descriptive base map for the management of the Nam Nao National Park and to explain the intricate vegetation/landscape pattern of the heavily dissected area.

The landscape ecological survey includes field observations guided by aerial photo-interpretation and interpretation of satellite images. The latter could be enhanced by computerized image processing, using the original tapes.

It could be assessed that the mosaics are caused by a combination of variation (gradients) in the following factors: temperature (varying from low to high altitude), moisture (also varying from low to high altitude, and edaphically by ground water supply), nutrient status of the soil (via geological, geomorphological and some soil descriptive evidence) and human impact (through cutting, burning, and mowing).

So, clearly, climatic and edaphic zones could be distinguished and mapped according to the vegetation, ranging from dry deciduous (Dipterocarpaceae) forest and some edaphically determined seasonal rainforest in the low lands to evergreen forests at high altitudes with a high percentage of *Fagaceae*. Bamboo forest with *Lagerstroemia* and many other species (mixed deciduous forests) occur, in between the warm/dry and the cooler/moist zones, on very steep naturally and constantly rejuvenated slopes. The Bamboo apparently reacts not only on the transitional climate character, but also on the relatively high nutritional state of the rejuvenating slope soils. In the hill zone the poor sandstone formation bears Pine-Dipterocarpus obtusifolius vegetation varying from *Pinus* and *Dipterocarpus* forests to very open savannas with *Cratoxylon* and *Carya* as dominants. It appears that savannas with almost the same composition but with an extra species *Pteridium aequilinum*, which is also abundant in the evergreen hill forest, occur in areas in the hill forest which have been cleared through anthropogenic activity on non-sandstone soils. Apparently, the anthropogenic stress has the same floristic result as the relative poverty of the sandstone, compared with the other, more favourable soil conditions elsewhere.

The savannas which grow on sandstone can easily revert to forest by overgrazing ('bush-encroachment') or stoppage of the fire. The savannas on the more

nutrient-rich rocks in the evergreen hill forest area, have an azonal character. Regeneration of the forest requires a considerable floristic change, and seems to go slowly.

The Influence of Snowcover on the Vegetation of the Monts Du Forez (Massif Central, France), Considered in a European Context

J.H.J. Schaminée. Research Institute for Nature Management, P.O. Box 46, NL-3956 ZR Leersum, The Netherlands

In the Monts du Forez, a low mountain range in the north-eastern part of the Massif Central, snowbeds are found at the eastern side of the central ridge of the mountain, at an altitude between 1480 and 1590 m. A comprehensive definition of the concept of snowbed has been used, based on three different aspects, namely a geomorphological, a phenological and a phytosociological aspect. The geomorphological aspect implies that snowbeds are solely found as bowl-shaped depressions of the mountain side, beyond the forest boundary. The phenological aspect is connected with the flowering time of the species *Anemone nemorosa* and *Narcissus pseudonarcissus*. The phytosociological aspect concerns the occurrence of a characteristic and repeated pattern of plant communities.

The research, carried out in 1985, was initiated to get more insight in the ecology and distribution pattern of communities in detail. Eighty-three relevés were made according to the Braun-Blanquet approach. The relevés are divided into two Tables, reflecting the situation in the field: a 'dry heathland' has been distinguished from a 'wet peatland'. The vegetation tables comprise 15 clusters, each representing a specific community.

The description of the snowbed vegetation in the Monts du Forez is discussed in a European context. Until now, phytosociological literature of snowbeds was concentrated on high mountains and Scandinavia, where snowbed communities are faced with a very short growing season, adapted to a snow cover of 8 to 11 months. Much less is known about snowbed vegetation in lower mountains. The variation of the chionophilous communities in the low mountain ranges is determined by at least three major factors, namely differences in macroclimate, in soil conditions, and in geomorphological features. These factors have been analysed consecutively. The macroclimate determines the duration of snowcover; this is the most important factor. In western Europe, prevailing oceanic features are relatively unfavourable for the occurrence of snowbed vegetation. Soil conditions and pedological variation influence the number of orophytes. The summit area of the Monts du Forez is quite uniform and covered by acid soils. All snowbed communities are strictly calciphobous, whereas in other European low mountain ranges neutral and even calciphilous species may occur. One of the most striking geomorphological features is the occurrence of deeply cut cirques, characterized by a prolonged snow cover, and containing specific snowbed communities. In the Monts du Forez, cirques can be found too, but their characteristics are less pronounced.

Mechanisms of Succession: A Case-Study on a Beach Plain

J. Huisman. Laboratory for Plant Ecology, University of Groningen, P.O. Box 14, 9750 AA Haren, The Netherlands

On the bare beach of the Dutch island Schiermonnikoog, a primary succession started after the building of a sand dike in 1959. From 1972 onwards, species composition has been studied by means of permanent transects. Soil development and vegetational structure during this successional series could be reconstructed, as several stages of this succession were present in the same part of the island. Salinity, moisture content and flooding are considered major determinants of the spatial variation, ranging from wet, saline plains to dry, fresh dunes, and are likely to be responsible for the year-to-year fluctuations of short-living species. However, these factors did not show a trend in time. From soil analyses it is argued that nitrogen limits total biomass. In about 16 years, the total amount of nitrogen in the organic layer of the soil increased from 7 to 50 g N m^{-2} in the plains and from 1 to 15 g N m^{-2} on the dunes, which may be mainly caused by natural processes. The accumulation of nitrogen during succession is accompanied by an increased biomass, an increased vegetation height, a decreased light penetration to the soil-surface, a decreased proportion of root, an increased proportion of stem and a decreased abundance of small, short-living species. During the first stage on the dry dunes sand-blowing is considered to prevent small species from establishing.

Nature Conservation in Forests which are under the Stress of Air Pollution

B.F. van Tooren, H. Piek & L.B. Berris. Vereniging tot Behoud van Natuurmonumenten in Nederland, Noordereinde 60, 1243 JJ, 's-Graveland

During the last 10–20 years Dutch forests have changed considerably. Not only have the vitality of the tree species decreased but also serious changes in other parts of the vegetation can be observed. Grasses,

especially *Deschampsia flexuosa*, *Molinia caerulea*, and *Rubus fruticosus* s.l. have increased markedly. On the other hand, *Melampyrum pratense* and many other characteristic woodland phanerogams decreased or even disappeared from many Dutch forests. Bryophyte species, e.g. *Leucobryum glaucum*, lichens and mycorrhiza-fungi have suffered the same fate.

Although air pollution is the most important factor causing these changes, and especially the emission of NH_4 from intensive husbandry, several other factors are important as well, e.g. draining of the soils.

The question which needs to be answered is whether there are management regimes which are able to prevent this damage or even to restore the woodland vegetation. Seven management regimes are discussed: (a) catching the incoming air pollution in the edges of the forest; (b) thinning the trees; (c) manuring the soil surface; (d) grazing by cattle; (e) removing the litter from the forest floor; (f) changing the water regime; (g) changing the species composition of the trees.

Catching the air pollution by forming a dense stand of trees and shrub at the edges of the forest seems to be an effective method but it is of limited effect. There are also some disadvantages. Thinning the trees is an effective measure to improve the vitality of the trees but is already in line with the present management of forests. Grazing by cattle can be effective in removing a thick grass layer on the forest floor and, consequently, improving the possibilities for the establishment of other species. However, in other situations, grazing prevents the establishment of a varied herb and shrub layer.

The other management regimes are all able to counteract some of the effects of air pollution but on the other hand, they have all strong disadvantages.

It is concluded that, in the absence of an effective means of managing air pollution in forests, nature conservation offers almost no answer to the prevention of the present changes in the woodland vegetation.

Vegetation Changes in the Speulderbos and Underlying Factors

P.W.F.M. Hommel. The Winand Staring Centre for Integrated Land, Soil and Water Research. P.O. Box 125. 6700 AC Wageningen, The Netherlands

Vegetation changes in the Speulderbos during the period 1958–1988 were studied by comparing vegetation maps (Hommel, P.W.F.M., E.E.J.M. Leeters & J.G. Vrielink, 1991. Veranderingen in bodem en vegetatie van het Speulderbos; kaartvergelijking 1958–1988. *Staring Centrum. Rapport* **104:** 1). The comparison was carried out with the computer system ARC–INFO. Using vegetation types as indicators of trophic levels, the pattern of change in trophic level was investigated.

It proved that the major trend of change is a general eutrophication of the forest environment. This conclusion holds even for the centuries-old cores of forest in which hardly any active management has taken place during the last decades.

Next, the relation between the pattern of eutrophication and several environmental factors was studied, also by comparing maps. Strong correlations were found between the degree of eutrophication on the one hand, and both soil type and distance to the nearest farmland on the other. Eutrophication is most pronounced on initially poor soils and in the vicinity of the forest edges.

No significant difference was found between the degree of eutrophication in the old forest cores and the older heathland afforestations (1832–1871). However, eutrophication is very pronounced in the younger heathland afforestations (1871–1885). This is partly due to the natural process of recuperation of the initial soil fertility of the latter sites.

It is concluded that the major cause of eutrophication is the atmospheric deposition of nitrogen, originating from nearby factory farming. The result is a considerable decrease in the original diversity of vegetation types.

MEETING OF THE SECTION FOR PLANT SYSTEMATICS AND GEOGRAPHY ON 26 APRIL 1991

The Archetype of the Crassulaceae

Henk 't Hart. Department of Plant Ecology and Evolutionary Biology, University of Utrecht, Padualaan 8, 3584 CH Utrecht, The Netherlands

The succulent Crassulaceae are not represented in the fossil record, but what the primitive Crassulaceae may have looked like has been inferred from recent taxa with the use of embryological (Mauritzon, J., 1933, *Studien über die Embryologie der Familien Crassulaceae und Saxifragaceae*, Thesis, Lund), ontogenetic (Wassmer, A., 1955, *Vergleichend-morphologische Untersuchungen an den Blüten der Crassulaceen*, Thesis, Zürich), and comparative morphological and anatomical studies. The following description of the archetype of the Crassulaceae is the sum of primitive character states occurring within the family. Plants perennial, herbaceous; secondary wood parenchymatous; leaves succulent, most probably flat, alternating (lower numbers of the Fibonacci series), entire; flowering shoots with a terminal cymose inflorescence (pleiochasium) consisting of several

monochasial branches arising from the axils of leaves immediately below the terminal flower; branchlets (paracladien) with two bracts each; flowers 5-merous, obdiplostemonous; sepals unequal, basally free (spurred), spirally arranged; petals free, quincuncial, spreading during anthesis; carpels sessile, with a broad base, free or slightly connate at the base; vascular bundles to the floral appendages in four independent whorls (Quimby, M.W., 1971, *The floral morphology of the Crassulaceae*, Thesis 1939, Mississippi); nectariferous scales at the base of the carpels quadrate or transversely oblong, small; carpels with numerous anatrope, crassinucellate ovules; tetrad normal, linear, with the basal spore developing into the embryosac (monosporic, 8-nucleate); endosperm compact; embryo with a short suspensor; ripe follicles dehiscent along the ventral suture; seeds small with a reticulate testa. Of all extant Crassulaceae only a small number of *Sedum* species by and large agrees with the above description. Among these are the well-known European *S. acre* and *S. anglicum*, and a few species from East Africa and Macaronesia. Furthermore, some American and Asian species of *Sedum* still possess various combinations of primitive characters.

Cupaniopsis Radlk. (Sapindaceae): Taxonomy and Phylogeny

F.A.C.B. Adema. Research Institute Rijksherbarium/Hortus Botanicus, P.O. Box 9514, 2300 RA Leiden, The Netherlands

Cupaniopsis species are usually shrubs or small palmoid, rarely large, trees with paripinnate leaves. The genus can be recognized by its 5-merous (in *C. glomeriflora* 4-merous) flowers. The outer two sepals are much smaller than the inner three. The petals always have appendages. The disc is always complete, annular. The stigma is closed even in fruit. An arilloid around the seed is always present. Macromorphologically *Cupaniopsis* shows a great variability (see Adema, F. (1991): Cupaniopsis Radlk. (Sapindaceae): A monograph, *Leiden Bot. Ser.* **15**.

A leaf anatomical study showed that secretory idioblasts and rhomboid crystals are very common. A continuous layer of hypoderm is found in a few species only. Glandular hairs usually consist of 1–3 stalk cells and one large glandular top cell, in *C. bilocularis, C. celebica* and *C. platycarpa* of 8–16 stalk cells and a small glandular head, and in *C. acuticarpa* of 4–7 stalk cells and a small glandular head. Scale hairs are found in a large group of Pacific species.

Pollen grains of *Cupaniopsis* are 3-colporate, oblate to spheroid, in equatorial outline triangular to orbicular. They are syncolporate, parasyncolporate or colporate, with a rugulate to reticulate, in *C. grandiflora* and *C. inoplaea* psilate perforate, ornamentation.

Cupaniopsis has no unique characters and no obvious synapomorphies. Most characters shared by all species proved to be plesiomorphous. The status of *Cupaniopsis* as a monophyletic group is only weakly supported.

An analysis with the program HENNIG86 resulted, even after weighting, in more than 100 cladograms. Only the simplest option (mhennig) gives one cladogram. This was, however, unacceptable for several reasons (e.g. low ci, large amount of homoplasy, closely related species placed in different subgroups). Van Welzens' enhancement method was used to improve the cladogram.

An historical biogeographical study proved to be almost impossible. It was concluded that the distribution patterns in *Cupaniopsis* developed through dispersal.

Revision and Cladistics of *Ania, Tainia, Mischobulbum*, and *Hancockia* (Orchidaceae)

H. Turner. Research Institute Rijksherbarium/Hortus Botanicus, P.O. Box 9514, 2300 RA Leiden, The Netherlands

A cladistic analysis was presented of the orchid genera *Tania, Mischobulbum, Hancockia* (tribe Collabiinae) and *Ania* (tribe Phajinae). In addition some representatives of the Collabiine genera *Nephelaphyllum, Collabium*, and *Chrysoglossum* were included in the analysis. The characters used were all macromorphological. None of the characters were ordered or weighted *a priori*. The analysis was carried out using the computer program HENNIG86, version 1.5, with the options mhennig and bb. If more than one cladogram resulted, character weighting was applied (xsteps w) and the weighted datamatrix re-analysed again with bb. This was repeated till only one cladogram was left or the weights of the characters changed no longer. First, *Mischobulbum* was analysed using different outgroups. This resulted each time in the same cladogram, which was therefore accepted. Next, *Ania* was investigated in the same way. Whatever the outgroup chosen, the resulting cladograms for *Ania* were also always the same. Finally, the complete datamatrix was analysed. Initially, 12 cladograms resulted (499 steps, ci = 0·39, ri = 0·49). After two rounds of character weighting, a single cladogram resulted which, however, was less parsimonious than the initial cladograms (510 steps, ci = 0·39, ri = 0·47). Nevertheless, this cladogram was accepted because (a) it is the result of *a posteriori* weighting of the characters, (b) the results for *Ania* and *Mischobulbum* are the same in the final cladogram as in the analyses of these genera alone, which was not the case with the initial results for the entire datamatrix, (c) the results are consistent with the geography of the area. The cladogram shows

that *Tainia* is paraphyletic; it can be divided into four monophyletic parts. The results for *Ania, Mischobulbum*, and the largest monophyletic part of *Tainia* (the other three parts consist of one or two species each) are generally consistent with an area of origin for these groups within continental SE Asia: during their history they all seem to have spread in an eastward direction over the Malesian area, followed by speciation.

Micromorphololgy of *Begonia* seeds from Africa and Madagascar

A. de Lange and F. Bouman. Hugo de Vries-Laboratory, University of Amsterdam, Kruislaan 318, 1098 SM Amsterdam, The Netherlands

The seeds of 120 species, representing about 90% of the African Begonias, were studied by means of SEM. The seeds provide an additional character set useful in taxonomy, especially at the sectional level and sometimes also at species level. Moreover, differences in seed morphology are clearly correlated with differences in seed dispersal.

In spite of the relatively low number of species, the African Begonias show the greatest diversity in seed size and micromorphology as compared with the American and Asiatic Begonias.

The seed characters do not provide arguments for the retention of separate sections *Augustia, Sexalaria* and *Rostrobegonia*. The seeds in these sections are the most ordinary ones in size, general morphology and cuticular ornamentation, resembling those of most American and Asiatic Begonias. Seed dispersal is anemochorous.

Seed morphology supports the establishment of a separate section *Peltaugustia* for *Begonia socotrana*.

In *B. thomeana* of the monotypic section *Cristasemen* the seeds have swollen and air-filled micropylar and chalazal ends.

The seeds of sections *Filicibegonia* and *Loasibegonia*/*Scutobegonia* are small with a mean seed length between 220 and 420 μm. In *Scutobegonia* the seeds have a very prominent cuticular sculpturing. The species of these sections grow on the floor of the African rain forest. Seed dispersal is probably by rain wash or epizoochorously.

Mezierea, Baccabegonia, Squamibegonia and *Tetraphila* are four interrelated sections. Their species have indehiscent or dehiscent fleshy fruits. Within the sections two main trends are visible: a reduction or loss of cuticular ornamentation and an increase in seed size. In section *Tetraphila*, the seeds are provided with an aril, their mean seed length varies from 530 μm up to 2240 μm. Seed dispersal is zoochorous.

The seeds of 36 species from Madagascar and neighbouring islands were studied. The majority of the seeds resemble in their general characters those of the continental sections *Augustia* and *Rostrobegonia*. In two groups the seeds show characters not encountered elsewhere. The only known relation between Begonias from the African continent and Madagascar exists in section *Mezierea*.