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MEETINGS OF THE ROYAL BOTANICAL SOCIETY OF THE NETHERLANDS

MEETING OF THE SECTION FOR PLANT TAXONOMY AND PHYTOGEOGRAPHY ON NOVEMBER 19, 1982

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Biosystematics of Taraxacum sect. Taraxacum (= sect. Vulgaria) in Central Europe: preliminary results

Until recently European records of diploid sexual plants of *Taraxacum* sect. *Taraxacum* (= sect. *Vulgaria*) have been scarce. Den Nijs & Sterk (1980, and in preparation) found that sexual dandelions are numerous in Central Europe, where two main areas with an abundance of diploid plants can be distinguished (Jenniskens & Den Nijs, in preparation).

Morphologically and ecologically different, sexual individuals hailing from these two areas have been used in crossing experiments. The results show that:

- F_1 seeds germinate readily;
- the morphology of the F_1 hybrids is intermediate between that of the parents;
- the F_1 pollen sterility usually equals that of the parents, but may be higher in some cases;
- after bee pollination, the F_1 seed set is 70% up to 100%, which indicates and undisturbed female meiosis in the offspring;
- after selfing, F_1 plants produce vigorous F_2 seedlings.

All diploid and sexual parent plants studied in these experiments, gave rise to viable F_1 generations when crossed. The possible incidence of an ecological and/or geographical barrier in nature requires further investigation.

Crossing experiments between sexual, diploid plants (female) and agamospermous triploids (male) have shown that gene flow between plants of a different ploidy level is possible, but only on a small scale. The results are as follows:

- the morphology of the F_1 is intermediate between that of its parents;
- the F_1 pollen type varies from regular to irregular;
- the F_1 pollen sterility ranges from 0% to 66%;
- the F_1 chromosome number is usually $2n = 2x = 16$; occasionally $2n = 17$ chromosomes have been found; chromosome sets with $2n = 3x = 24$ are of rare occurrence;
- the F_1 seed set after bee pollination varies from 0% to 100%.

Gene flow from asexual triploids into sexual populations implies a *de novo* advent of new 2x taxa in nature.

Seed set in possibly partially sexual (= facultatively agamospermous) individuals has been studied in stands of *Taraxacum* in two pastures in Upper Bavaria. In population 1, the pollen was of a rather regular size and the seed set of caged-in, not insect-pollinated flowerheads was 72–99% (mean: 88%). In population 2 the pollen was of irregular size and the seed set of caged-in, not insect-pollinated, flowerheads ranged from 88% to 99% (mean: 96%). Conceivably, partially sexual triploids were present in population 1. One may assume, among other things, that gene flow between triploids and from diploids into triploid populations is likely to occur.

Jenniskens, M. J. P. J. & J. C. M. Den Nijs (in preparation): The cytogeography of Taraxacum sect. Taraxacum and the occurrence of facultative agamospermy in south-eastern Germany and northern Austria.

Nijs, J. C. M. den & A. A. Sterk (1980): Cytogeographical studies of Taraxacum sect. Taraxacum (= sect. Vulgaria) in Central Europe. *Bot. Jahrb. Syst.* **101**: 527–554.
Nijs, J. C. M. den & A. A. Sterk (in preparation): Cytogeographical studies of Taraxacum sect. Taraxacum in France.

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Historical plant geography of the North-Andine forests and páramo's

Will be published shortly in *Acta Botanica Neerlandica*.

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Systematics of the Penianthea (Menispermaceae)

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The use of ultrastructural features in the classification of green algae (Chlorophyta)

During the last decade ultrastructural studies on the mitosis-cytokinesis mechanism and on the flagellar root system in motile reproductive cells have led to a provisional reclassification of the green algae into three classes, Charophyceae, Chlorophyceae and Ulvaphyceae. The Charophyceae lack a phycoplast and have subapically-inserted flagella and a unilateral flagellar root system which is proximally associated with a multilayered structure (MLS). The classes Chlorophyceae and Ulvaphyceae have in common motile cells with apically-implanted flagella and a cruciate flagellar root system (formula X-2-X-2, X > 2). In the detailed fine structure of the flagellar apparatus, the Ulvaphyceae differ from the Chlorophyceae by the presence of a non-striated distal connecting fiber, a system II-fiber and a terminal cap which coats the proximal end of the basal bodies. However, the separation of the Ulvaphyceae from the Chlorophyceae has been based primarily on the absence of a phycoplast in the Ulvaphyceae. As a consequence of this, the traditional ulotrichalean genera *Ulothrix, Uronema* and *Klebsormidium* are tentatively assigned to the Ulvaphyceae, Chlorophyceae and Charophyceae, respectively. The revelation of the flagellar root system and the mitosis-cytokinesis mechanism in *Urospora* gives rise to dispute the correctness of the separation of the class Ulvaphyceae from the Chlorophyceae. The flagellar root system in *Urospora* is related to the ulvaphycean basic type, but the cell division in this genus, which occurs by furrowing, is associated with a cytokinetic microtubular system, typical of Chlorophyceae. In this respect it is proposed to modify the definition of the term phycoplast so that it also comprises the microtubules allied with cytokinesis in some coenocytic green algae, viz. *Acrosiphonia, Cladophora* and *Urospora.*

It is suggested that for the moment the advanced green algae can at best be subdivided into two main natural groups, the Chloropyceae and Charophyceae sensu Stewart and Mattox. The micromorphology of the flagellar apparatus of motile reproductive cells and biochemical features are fundamentally different in both groups. Although the Ulvaphyceae embraces a monophyletic group, it is suggested to recognise this group now as a "ulvaphycean-line of evolution" within the Chlorophyceae. This line including a cluster a closely related order is characterized by features of the flagellar apparatus like the 11/5 o'clock arrangement of the basal bodies and the presence of a rhizoplast.

The mitosis-cytokinesis mechanism is an additional useful characteristic for the ordinal subdivision within the Chlorophyceae and within the Charophyceae. The number and composition of the microtubular roots and the diversity of the number of flagella are distinctive features for the rank of family, for example within the Chaetophorales. The pyrenoid ultrastructure has proven to be a diagnostic criterion in the genera *Ulothrix* and *Monostroma.*

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The phylogeny of green algae and land plants: possible clues to a comprehensive cladistic classification of green plants

There exists a number of multicellular green algae which are considered more closely related to archegoniate land plants than other green algae. Examples include, amongst others, the Zygnematales, the Charales, *Klebsormidium,* and *Coleochaete.* This group (the "Charophyceae" *sensu* STEWART & MATTOX 1975) is characterized as a whole by a comparatively long persisting mitotic nuclear spindle (a character forming a transition series towards a phragmoplast system in advanced Charophyceae), and by motile cells which (if produced) contain a unilateral microtubular root system with two inequal roots, one of which associated with an anterior "Vierergruppe", or multi-layered structure (MLS). The distribution of these characters, in addition to those to be identified below, are indicative of the existence of transition series that extend well beyond the line separating charophycean green algae and land plants. 1. In addition to *Chara* and *Coleochaete,* a phragmoplast occurs in all somatic cell divisions in land plants. 2. A "charophycean" root system has been demonstrated in spermatids of a hornwort, two liverworts, and a moss, even with identical 3-D configurations as in *Coleochaete* and Charales (SLUIMAN 1983). 3. The special type of sexual reproduction occurring in *Coleochaete* and Charales is fundamentally the same as in archegoniates. 4. The similarities in early ontogeny of antheridia in Charales, in Anthocerotatae and in certain Marchantiatae are more striking than the dissimilarities (which become more evident in later ontogenetic stages). 5. Vegetative growth by means of a dividing apical cell is found only rarely in non-charophycean green algae but is typical of Charales, *Coleochaete,* and sporophytes of Bryatae, Psilotatae, and Equisetatae. The marginal growth as found in discoid species of *Coleochaete* and in gametophytes of Anthocerotatae, Marchantiatae, Bryatae, and ferns can be regarded as a specialized form of apical growth (cf. HAGEMANN 1978). 6. Discoid species of *Coleochaete* are the only green algae thus far known to have evolved parenchymatous tissue that could possibly be considered homologous to that of land plants (GRAHAM 1982). 7. Charales are the only multicellular green algae known to possess cells containing multiple chloroplasts – a condition typical of photosynthetic cells of land plants (exception: Anthocerotatae). 8. The exclusive occurrence among land plants of pyrenoids in Anthocerotatae is reminiscent of (green) algae. Moreover, the pyrenoid substructure in Anthocerotatae belongs to a type characteristic of *Klebsormidium* and two other filamentous, probably charophycean green algae (*Ulothrix crenulata* and *U. verrucosa*). 9. Callose (or a callose-like substance) has now been demonstrated in setae of *Coleochaete,* in walls of Charales and Zygnemataceae, and in young zygospores of the desmid *Closterium.*

In a formal cladistic approach, a classification of green plants is proposed, based on a synthesis of modern ideas on green algal phylogeny, and elements of two recent cladistic analyses of land plants (PARENTI 1980; BREMER & WANNTORP 1981). This classification includes, *inter alia,* a taxon Viridiplantae *sensu* CAVALIER-SMITH (1981), embracing all plants containing chlorophylls a and b (exclusive of euglenoids), and a taxon Anthocerotophyta to replace the oftentimes confusing name Charophyceae *sensu* STEWART & MATTOX (1975).

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