

MEETINGS OF THE ROYAL BOTANICAL SOCIETY OF THE NETHERLANDS

MEETING OF THE SECTION FOR WILD FLORA PROTECTION ON 28 APRIL, 1982

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Origin and decline of weed vegetations of arable fields in The Netherlands

Numerous segetal weeds have their origin in the flora of the Near East (SW-Asia). Between about 9000 and 7500 BC arable farming originated in SW-Asia. From the Middle East, one of the gene centers on earth, agriculture spread along three routes into SW-, NW- and NE-Europe. About 4400 BC on loess soil in the southern part of The Netherlands *Triticum monococcum*, *Triticum dicoccum* and several weeds are found in neolithic bandkeramic settlements. In Roman times several species of mediterranean origin immigrated into The Netherlands. The cultivation of root-crops on large scale is much younger.

Life forms, spectra of dissimulation, periodicity and the distribution of archeophytes and neophytes differ from vegetations under winter-cereals and root-crops (including summer-cereals) and of ruderal sites. Species with a limited atlantic area, e.g. *Galeopsis segetum*, are of special interest. Differences between weed vegetations under winter-cereals (Secalietea) and root-crops (Polygono-Chenopodietalia) are not determined by the cultivated crops but by agricultural measures (season of tillage of the land) and by soil conditions (fertility and moisture). Temperature determines the germination of winter or summer annuals. The associations of Secalietea and Polygono-Chenopodietalia can take each others place from year to year, but the associations of Secalietea are best developed when many years after each other winter-cereals are cultivated.

Until about 1950 all weed communities were well developed in The Netherlands. After 1950 flora and vegetation of arable fields declined strongly. Especially many acidophilous and calciphilous species have disappeared. Recognition of many associations is hardly possible actually. We meet chiefly basal communities now. The use of weed vegetations as environmental indicator, especially for soil conditions, becomes more and more difficult.

Former richness in species and flower richness on arable fields was determined by the traditional methods of extensive farming. It is unknown to which extent the three-course rotation has been practiced in The Netherlands. On plaggen soils continuous rye husbandry with sod manuring (heathland farming system) existed for about 1000 years.

The rapid decline of our weed flora and vegetation is mainly due to intensification and scaling up of modern agriculture, most of all the increase of fertilizing and the use of herbicides. The occasional occurrence of weed species in the verges of new-made roads is not important for long-term conservation of weed communities.

There are three ways for conservation of weed communities of arable fields and the equally threatened communities of ruderal sites:

1. in nature reserves and national parks; 2. in open-air museums, parks and gardens in recreation areas (visitor centers); 3. in alternative agriculture when the system is not too intensive. In The Netherlands about 25 small fields have the status of a nature reserve, mainly on poor acid soils. On rich soils the number needs to be increased.

The conservation or development of weed communities rich in species is depending on the choice of dry and warm sites, the cultivated crops and the use of extensive farming methods (without herbicides). A well-considered distribution of the fields over different phytogeographical districts and soil-types is important.

The cultural and natural values of the traditional agricultural systems, the traditional cultivated plants and the weed communities confined to those need more appreciation than they have got so far.

E. J. WEEDA (*Rijksherbarium, Postbus 9514, 2300 RA Leiden*)

Shifts in the occurrence of weeds of arable land in The Netherlands

Being preponderantly dependant on human action, many weeds of arable land show extreme changes as to their occurrence. Few of them have expanded, while a considerable number have almost or completely disappeared from the Netherlands flora. Major causes of changes in the distribution pattern of weeds are: 1° various methods of weed control (seed cleaning, use of weed-killers), 2° changes in kinds of manure in use (fertilizers, liquid manure), 3° changes in species under cultivation and in continuity of their culture on a certain plot, 4° changes in soil use and intensification of soil use (including fields hardly lying fallow any more).

A most striking decline is shown by species like *Arnoseris minima*, *Buglossoides arvensis*, *Hypochaeris glabra*, *Ranunculus arvensis*, *Scandix pecten-veneris* and *Veronica triphyllos*, all of them (at least locally) rather frequent in the past. They have been reduced to only a shade of their previous occurrence and several are virtually extinct. It should be noted that most severely threatened species of arable land are cornfield weeds.

Fairly resistant against modern agricultural practice are some *Gramineae* (especiallly *Panicoidae*), *Chenopodiaceae* and *Portulacaceae*. They are self-pollinating or are pollinated by wind and are of no interest to insects. Like grassland, arable land is converted into a desert from the point of view of pollinating insects.

Outside fields, some weeds have a refuge in other types of habitat, like disturbed road verges, cemeteries, and ruderalized spots in the dunes. Some other species appear to occur in plenty along railways.

Despite all kinds of impoverishment, some regions still have a rather varied weed flora. In particular the riverine area must be mentioned. It is urgent that arable land reserves should be established there.

P. ZONDERWIJK (*Onkruidkunde CABO, Postbus 14, 6700 AA Wageningen*)

Is there a future for the weeds of arable land?

MEETING OF THE SECTION FOR THE RELATION BETWEEN PLANTS AND ANIMALS ON 26 MAY 1984

C. J. KEIJZER (*Vakgroep Plantencytologie en -morfologie, Landbouwhogeschool Wageningen, Arboretumlaan 4, 6703 BD Wageningen*)

The functions of the endothecium

In most plant species with longitudinally dehiscent anthers the stomium opens when the flower bud is still closed (KEIJZER 1983). Although the anther is opened from that moment onward, the walls of the locules stay bent inwardly, thus holding the pollen in its position. This inwardly directed pressure of the locule walls is caused by the characteristic U-shaped wall thickenings in the endothecium cells, in conjunction with the turgor in the epidermis and endothecium which increases during the final stages of anther development. This centripetally directed pressure of the locule walls has some remarkable consequences:

1. The opening of the stomium itself. The centripetal force of two adjacent locule walls disrupts the epidermis in the stomium region mechanically, so that these two locule walls disconnect and the stomium is opened.

2. In spite of the opening of the stomium, in the still closed flower bud the pollen is prevented from leaving the anther by the inwardly bent locule walls. This may inhibit self-pollination, but in some species the anthers open completely inside the flower bud (owing to a precocious desiccation mechanism), by which process pollen is deposited on the stigma before the flower opens. 3. The pressure of the locule walls against the pollen grains after the stomium has been opened is a continuation of a pressure already acting before the stomium is open. This latter pressure was caused by the expansion of the pollen mass within the closed locules. In both cases the pollen grains push themselves into the *pollenkitt*-containing tapetum cells, after which the *pollenkitt* finds its way by capillary action into the spaces between the pollen grains and into the exine cavities. 4. As a result of 3, the *pollenkitt* sticks the pollen grains together and also makes them adhere to the whole inner surface of the locule wall. This leads to an optimal exposition of the pollen when the locule walls are turned inside out at dehiscence.

Anther dehiscence is brought about by a centrifugally directed force within the locule wall, opposite to the centripetal force mentioned before. When the flower opens, the relative humidity around the anther decreases and the epidermis and endothecium lose water by evaporation. As a result of this loss of water the wall thickenings of the endothecium cause the outwardly directed bending of the locule walls, i.e., anther dehiscence.

KEIJZER, C. J. (1983): The mechanism of anther dehiscence. *Acta Bot. Neerl.* **32**: 348.

M. DRIESSEN and R. MOELANDS (*Universiteits Centrum voor Longziekten/Dr. Van Spanje Kliniek, Nijmeegsebaan 31, 6564 CA H. Landstichting*)

Estimation of the commencement of the grass pollen season and its prediction by means of a phenological method

Owing to the lack of exact records of the beginning and the termination of the grass pollen season there is a considerable range of dates of commencements and cessations of prophylactic hay fever medications applied to comparable groups of sufferers.

Frequently one selects as the beginning and the end the dates on which 5% and 95%, respectively, of the annual total of gramineous pollen is recorded. This time-span, within which the incidence of very high maxima of aerial grass pollen may be anticipated, is often called the principal pollen period. It usually lasts from the 3rd of June till the 15th of July.

It appears, however, that some patients have complaints attributable to contact with grass pollen as early as April. Even if one allows for a very wide variation in the principal pollen period, such "April patients" are treated too late if one applies the prophylaxis against hay fever during this period.

The present study was intended to pinpoint as accurately as possible the actual onset of the grass pollen season and, in addition, to attempt a forecast of the beginning of that season, so as to arrive at a more exact assessment of the period within which prophylaxis should be applied. The average initial date was found by means of aerial pollen counts from Helmond (1975–1982) and from Leyden (1977–1982). As limit-deciding methods two different approaches were used, viz., the so-called 1% method and Mullenders's method. It was subsequently tried to predict the commencement of the grass pollen season by means of the temperature total and phenological methods.

Finally the phenology of early-flowering grasses (in April) and of late-flowering ones (from July onward) was traced and also that of those species exhibiting a secondary flowering in autumn. Apart from some meteorological factors (such as the amount of precipitation) also edaphic and other ecological ones (such as dunging and the mowing regime) proved to be of importance for an incidental secondary flowering of certain species of grasses.

W. BOSMA (*Vakgroep Morfologie en Anatomie van Hogere Planten, Biologisch Centrum, Postbus 14, 9750 AA Haren (Gn)*)

Some aspects of the pollination biology of two *Scrophularia* species

During the summer of 1983 anthecological studies were made of *Scrophularia nodosa* L. in hortus "de Wolf", Haren (Gn), The Netherlands, and of *S. umbrosa* ssp. *neesii* (Wirtgen) E. Maier in the "Friescheveen", a pool formed by the cutting of peat near Haren.

The most frequent visitors of *S. nodosa* were *Apis mellifera* L., *Bombus pascuorum* Scop., *B. pratorum* L. and, from about the middle of July, the social wasp *Dolichovespula saxonica* Scop. The average number of pollen grains attached to the stigma as the result of one visit by one of these visitors was 389, 128, 150 and 580, respectively. Early in the morning the number of flowers visited per minute was low (5–9) to increase till about 12.00 a.m., remaining rather constant afterwards (15–21). The average length of time a flower was visited, however, showed the opposite trend: early in the morning a flower visit lasted longer (3–6 sec.) and decreased fast later on. From 10.00 a.m. onward it remained fairly constant (1.5 sec.).

The most frequent visitors of *S. umbrosa* ssp. *neesii* were *B. pascuorum* and *D. saxonica*, the average numbers of pollen grains attached to the stigma as the result of one visit amounting to 29 and 475, respectively. At one location the sterile, fifth stamen (staminodium) was removed from all the flowers of *S. umbrosa* ssp. *neesii*. This resulted in a decrease of the average number of pollen grains transferred to the stigma by the visit of wasps from 475 (in intact flowers) to 265 (in manipulated flowers). By the removal of the staminodia the throat of the flowers became enlarged, which reduced the zone of contact between the wasp and the stigma and the anthers. This warrants the conclusion that during the floral evolution the sterile stamen is maintained because of its effect on the efficacy of pollen transference.

Another aspect of the behaviour of the visitors is the way in which they visit the flowers of the same inflorescence. All above-mentioned visitors of the inflorescences of both *Scrophularia* species preferred to move in an upward direction once they had landed on an inflorescence (in 49–60% of the total number of changes of position).

M. T. M. WILLEMSE (*Vakgroep Plantencytologie en -morfologie, Landbouwhogeschool, Arboretumlaan 4, 6703 BD Wageningen*)

Pollenkitt: a glue?

Pollenkitt is a coating around the pollen wall originating from the tapetal cells. It is mainly composed of lipids and pigments and contains proteins. The quantity and composition depend on the plant species and on the mode of pollen transport. One of the determining factors is its origin from plastids and/or cytoplasmic lipids in a fluid form mixed with other cell components and possibly sieved by the tapetal membrane. Inside the locules the *pollenkitt* is smeared over the pollen wall, but it can also participate in the wall formation (WILLEMSE & REZNICKOVA 1980).

In pollination the *pollenkitt* has different functions, in particular in entomophilous transportation. In the opened anther, in conjunction with the pollen wall, it protects the pollen against UV radiation and prevents the desiccation of the pollen. It keeps the pollen stuck together as well as to the locule wall, thus preventing it from dropping out and promoting mass transportation. The rate of sticking diminishes gradually from the moment of anther opening onward (HESSE 1979). If an animal visitor touches the pollen, the *pollenkitt* makes the grains stick to the animal's hairs or body. In addition, the *pollenkitt* functions as a strong attractant, especially for bees and it is also a component of the pollen diet of certain flies and beetles.

The pollen adheres to the stigma mainly by mechanical spreading and possibly also by electrostatic forces (CORBET et al. 1982). In wet stigmas the lipophilous *pollenkitt* is decomposed by the hydrophilous exudate. In dry stigmas it adheres to the pellicula, surface tension being the most important force in sticking (WOITTEZ & WILLEMSE 1979). In the *pollenkitt* recognition substances are present controlling the uptake of water from the stigma. On a dry stigma *pollenkitt* promotes a local uptake of water and prevents desiccation of the pollen.

In pollination the *pollenkitt* has a multiple function, not only as a transient glue but also as a protective and recognition substance. In phylogenetic studies this multiple function has to be considered (STELLEMAN 1984).

CORBET, S. A., J. BEAMENT & D. EISIKOWITCH (1982): Are electrostatic forces involved in pollen transfer? *Plant, Cell and Environment* 5: 125–129.

HESSE, M. (1979): Entwicklungsgeschichte und Ultrastruktur von Pollenkitt und Exine bei nahe verwandten entomo- und anemophilen Angiospermen: Polygonaceae. *Flora* 168: 558–577.

STELLEMAN, P. (1984): The significance of biotic pollination in a nominally anemophilous plant: *Plantago lanceolata*. *Proc. Kon. Ned. Akad. Wet.*, ser. C, 87: 95–119.

- WILLEMSE, M. T. M. & S. A. REZNICKOVA (1980): Formation of pollen in the anther of *Lilium*.
1. Development of the pollen wall. *Acta Bot. Neerl.* 29: 127-140.
- WOITTEZ, R. & M. T. M. WILLEMSE (1979): Sticking of pollen on stigmas: The factors and a model.
Phytomorphology 29: 57-63.

J. H. F. KERP (*Laboratorium voor palaeobotanie en palynologie, Heidelberglaan 2, 3584 CS Utrecht*)
The evolution of Palaeozoic and Mesozoic pteridosperms, with particular emphasis on the Peltaspermeaceae

MEETING OF THE SECTION FOR PLANT MORPHOLOGY AND -ANATOMY ON 8 MAY 1984

M. M. A. SASSEN (*Botanisch Laboratorium, Katholieke Universiteit Nijmegen, Toernooiveld, 6525 ED Nijmegen*)

Microfibril deposition in root hair tips of *Limnobium stoloniferum*

In the primary wall of root hairs the microfibrils are oriented at random, but in the secondary walls two types of texture have been found namely a fiber texture in root hairs of terrestrial plants and a helocoidal texture in those of aquatic plants. The precise way in which the microfibrils are deposited, especially in the case of a helocoidal texture, is still unknown.

In order to study the newly formed microfibrils at the inner surface of cell walls of root hair tips, a slightly modified dry cleaving method was used. We have studied the microfibril deposition in root hair tips of *Limnobium stoloniferum*, an aquatic plant with a helocoidal textured secondary wall. The diameter of this root hair is about 70 μm and the tip is dome shaped.

In the center of the dome the microfibrils on the inner surface are oriented at random, but at a distance of about 20 μm from this center the microfibrils have an orientation perpendicular to the long axis of the root hair. Still further away the microfibrils form a Z-helix, the angle of which decreases until, at about 75 μm , the microfibrils run parallel to the long axis of the root hair. In the region distal from the dome shaped tip the pattern of microfibril deposition is less uniform in the examined root hairs. It is suggested that in the growing tip the shift in orientation of microfibrils from perpendicular to longitudinal with respect to the cell axis is partly caused by a passive reorientation of the microfibrils according to the multi-net growth hypothesis of Roelofsen.

J. W. M. DERKSEN AND J. A. TRAAS (*Botanisch Laboratorium, Katholieke Universiteit Nijmegen, Toernooiveld, 6525 ED Nijmegen*)

The cytoskeleton in plant cells

The cytoskeleton in plant cells was studied using immunofluorescence techniques (WICK et al. 1981). For electronmicroscopical investigations dry cleaving was applied (TRAAS 1984). Cells from the meristematic zone, the root cap, the elongation zone and the cortex were studied mainly in roots of *Raphanus* seedlings. Root hairs were studied in various species. In the meristematic zone dividing cells in all stages were observed. Root cap cells show a highly variable morphology. Large globular cells, at the end of their differentiation show random patterns of microtubules (mt). In other cells the orientation of the mt seems to be perpendicular to the direction of cell expansion. In the meristematic and the elongation zone the mt are found perpendicular to the direction of elongation (the root axis). In cortical cells the mt are always parallel within one cell, but the orientation between cells varies from perpendicular to the long axis to almost axial. Since these cells show various directions of cell expansion, here too the mt are probably perpendicular to the direction of cell expansion (TRAAS et al. 1984).

Root hairs show a rare type of growth, namely tip growth. The root hairs of all species of *Equisetum*, *Ceratopteris*, *Limnobium*, *Raphanus*, *Lepidium* and *Urtica* showed axial mt. In *Allium* various orientations are found. In hairs with a strong plasma streaming also large bundles of filaments

are observed, e.g. in *Limnobium*. In root hairs mt are not necessarily oriented parallel to the nascent microfibrils in the cell wall.

TRAAS, J. A. (1984): Visualization of the membrane bound cytoskeleton and coated pits of plant cells by means of dry cleaving. *Protoplasma* 119: 212–218.

—, P. BRAAT & J. W. M. DERKSEN (1984): Changes in microtubule arrays during the differentiation of cortical root cells of *Raphanus sativus*. *Eur. J. Cell Biol.* accepted for publication.

WICK, S. M., R. W. SEAGULL, M. OSBORN, K. WEBER & B. E. S. GUNNING (1981): Immunofluorescence microscopy of organized microtubule arrays in structurally stabilized meristematic plant cells *J. Cell Biol.* 89: 685–690.

R. BAKHUIZEN, L. GOOSEN-DE ROO, P. C. VAN SPRONSEN and K. R. LIBBENGA (*Botanisch Laboratorium, Nonnensteeg 3, 2311 VJ Leiden*)

Polarly organized membrane maturation of Golgi vesicles “en route” to the plane of division in phragmoplasts of periclinally dividing fusiform cambial cells of *Fraxinus excelsior* L.

The polar arrangement of large cell organelles in the cytoplasm surrounding the phragmoplast microtubules of the fusiform cambial cells of the ash is comparable to organel distribution in case of tip growth:

- 1) an apical region which is relatively empty of large organelles,
- 2) a middle zone with many mitochondria interspersed with some dictyosomes and
- 3) a basal zone with mainly dictyosomes.

Phragmoplast microtubules also show a polarly organized distribution in their assemblage and disassemblage. They reach their greatest length (3–4 μm) at the level of the apical zone, where microtubules are assembled from the equatorial plane. The microtubules gradually shorten next to the middle zone and have completely disassembled next to the basal zone.

It is generally assumed that phragmoplast microtubules play a role in guiding Golgi vesicles to the plane of division. The difference in membrane thickness between vesicles at the secretion site of a dictyosome (± 5 nm) and vesicles that have reached the plane of division at the level of zones 1 and 2 (see above) of the phragmoplast, show a maturation process of the vesicle membrane up to 8 nm during transport.

In the basal zone where vesicles fuse with the cell plate without microtubule intervention, vesicle membrane maturation does not occur.

There is a close correlation between the length of the phragmoplast microtubules and the Golgi derived membrane contribution to the cell plate in the different zones.

A. A. M. VAN LAMMEREN AND H. KIEFT (*Vakgroep Plantencytologie en -morfologie, Landbouwhogeschool, Arboretumlaan 4, 6703 BD, Wageningen*)

Detection of microtubules in cells of *Zea*, *Gasteria* and *Allium* by immunofluorescence

In order to study the relation between cytodifferentiation and changes in the cytoskeleton in developing caryopses of *Zea mays*, a procedure was developed to visualize microtubules (MTs) by immunocytochemical techniques on semi-thin sections.

Several plant tissues were fixed in a mixture of 3% paraformaldehyde and 0.25% glutardialdehyde in phosphate buffered saline (PBS), pH 7.2. Both the antigenicity and the composition of the MT complexes were well preserved in the various tissues tested, e.g. the embryo, endosperm and carpels of maize, the developing anthers of *Gasteria verrucosa* and the root tips of maize and *Allium cepa*.

Antiserum was raised in rabbit against tubulin which was purified from calf brain, essentially according to SHELANSKI et al. (1973). The IgG fraction was isolated with DEAE column chromatography. Further a second antibody, raised against rabbit immunoglobulines and conjugated with fluoresceinisothiocyanate (FITC), was applied.

To permit antibodies to penetrate the cells, the tissues were sectioned directly by hand or they were frozen in liquid nitrogen and sectioned at minus 18°C with a cryostat microtome, or tissues

embedded in polyethyleneglycol (PEG) were sectioned with an ultramicrotome. With the latter technique the production and mounting of semi-thin sections ($5\ \mu\text{m}$) was most successful. The sections were mounted on poly-L-lysine coated slides and washed in PBS to remove the PEG. Antisera were applied successfully in dilutions up to 1:50 in PBS. The specificity of the detection of microtubules was confirmed by proper control experiments.

Throughout the cell cycle microtubules were detected in various and reproducible configurations. In dividing cells the MTs of the preprophase band as well as the MTs of the spindle and the phragmoplast were conspicuously labelled. During interphase a variety of cytoskeletal arrangements was demonstrated. Some correlations between cell shape and the structure of the cytoskeleton were noticed, as part of the ultimate goal of the studies.

SHELANSKI, M. L., F. GASKIN & C. R. CANTOR (1973): Microtubule assembly in the absence of added nucleotides. *Proc. Nat. Acad. Sci.* 70: 765–768.

J. KOSTER (*Botanisch Laboratorium, Nionnensteeg 3, 2311 VJ Leiden*)

The apex of adventitious shoots on leaf explants of *Nautilocalyx lynchii* (Gesneriaceae)

From the abaxial side of the midrib of a *Nautilocalyx lynchii* leaf explants were taken, consisting of unspecialized epidermal cells with glandular hairs and uniseriate hairs and some underlying collenchyma layers; the explants were cultured on agar medium with zeatin as phytohormone. After several cell divisions in the epidermis, concentrated round the hairs, meristems arose which turned green and which subsequently generated shoots. The first leaf primordia of a shoot were not formed on a dome, and sometimes the two or three first leaf primordia and the area between them were generated by different original epidermal cells. Transverse sections showed that there was not a tunica-corpus structure present in the meristems before the first leaf primordia were formed. The meristems were studied in detail in surface view in an attempt to answer the following question: Is it possible to indicate the position of the shoot apex before the leaf primordia are formed?

When the meristems turned green, often a central zone with small cells, not arranged in a regular pattern, kept the pale colour. These pale zones were mostly formed by one original epidermal cell or by one cell and a part of another cell; basal cells of glandular hairs or cells bordering the uniseriate hairs were nearly always involved. Shoots were only formed by meristems with pale zones. Often the first leaf primordia of shoots originated from the pale zones, but sometimes they were formed by green areas bordering the pale zones. The area between the first leaf primordia, i.e. the new shoot apex, always originated from the pale zone, particularly from its central part. This most meristematic part, mostly formed by a cell in direct contact with a hair, can be regarded as an organizing centre which influences the position and orientation of the first leaf primordia, even when these originate from different original epidermal cells.

VENVERLOO, C. J., J. KOSTER & K. R. LIBBENGA (1983): The formation adventitious organs IV.

The ontogeny of shoots and leaves from epidermis cells of *Nautilocalyx lynchii*. *Z. Pflanzenphysiol.* 109: 55–67.

P. M. ESSER, M. E. T. VAN DER WESTEN and P. BAAS (*Rijksherbarium, postbus 9514, 2300 RA Leiden*)

Wood anatomy of the Oleaceae

The results of a study of the systematic and ecological wood anatomy of c. 100 species belonging to 22 genera of the Oleaceae is summarised below. A more elaborate account will be published elsewhere.

Based on a combination of the most important anatomical characters four groups can be recognised:

I. Vessels mainly solitary, parenchyma very scanty or absent.

a. Ground tissue composed entirely of fibre-tracheids (*Abeliophyllum*, *Fontanesia*, *Forsythia*, *Jasminum*, *Menodora*, *Myxopyrum* and *Syringa*).

b. Ground tissue composed of fibre-tracheids and libriform fibres; the latter often septate (*Ligustrum*).

II. Vessels mainly in multiples or clusters; parenchyma scanty paratracheal to confluent and often marginal. Ground tissue composed entirely of libriform fibres.

- a. Vessels diffuse (wood rarely ring-porous), mostly in radial multiples (tropical species of *Chionanthus*, *Comoranthus*, *Forestiera*, *Fraxinus*, *Haenianthus*, *Noronhia*, *Nyctanthes*, *Olea*, *Schrebera*, and *Tetrapilus*).
- b. Vessels in an oblique to dendritic pattern and embedded in vasicentric tracheids (temperate species of *Chionanthus*, *Nestegis*, *Notelaea*, *Osmanthus* and *Phillyrea*).

A comparison of the above classification with earlier subdivisions of the family reveals several discrepancies and conflicts especially with the traditional boundaries of the subfamilies Jasminoideae and Oleoideae.

Within the wide and ecologically diverse distribution area of the Oleaceae, several wood anatomical traits are correlated with climatic factors. Previously reported latitudinal trends in for instance vessel frequency, diameter and element length also apply to the Oleaceae: at higher latitudes (i.e. in temperate regions) vessel frequency is higher, and diameter and element length are less than in tropical species. Helical vessel wall thickenings are largely restricted to temperate taxa. The characteristic features of group IIb are confined to taxa with a warm temperate or subtropical distribution; this might point to parallel development of dendritic vessel patterns and vasicentric tracheids in relation to climate in genera which are all closely related to tropical taxa, especially to species of *Chionanthus* and *Olea*.

F. M. ENGELS* and R. E. BRICE** (**Vakgroep Plantencytologie en -morfologie, Landbouwhogeschool, Wageningen*; ***Hannah Research Institute, Ayr, Scotland, U.K.*)

Digestion of cell walls of grasses as revealed by LM and EM techniques

The parenchymal cell walls of stems of straw (*Hordeum vulgare*) contain high amounts of a polysaccharide-lignin complex. Ammonia-treated and untreated straw stems have been digested in vivo in rumen liquid and the cell wall breakdown was followed by LM lignin and cellulose staining methods. Parenchymal cell walls show a decrease in lignin stainability. The increase in cellulose staining is due to a better penetration of the stain into the partly digested cell walls.

SEM observations show the attachment of bacteria and fungi to the cell walls and the digestion is observed by the depressions of different morphology caused by digestive action of bacteria and fungi.

TEM replica's revealed the cell wall digestion on cellulose fibrillar level. Ordered layers of cellulose fibrils are exposed at the borders of the depressions suggesting a layer by layer breakdown of the cell wall.

Thin sectioned material stained for lignin and polysaccharides did show the layered ultrastructure of the cell wall. A close attachment of bacteria to the cell wall was found and digestion was observed by typical removal of cell wall material. The degree of lignification is limiting the area of action of specific bacteria.

Ammonia-treated straw shows a higher rate of digestibility and a total digestion of cell walls.

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The presence of extended phragmosomes containing cytoskeletal elements in fusiform cambial cells of *Fraxinus excelsior* L.

To be published in *Protoplasma* (in press).

W. A. VAN HEEL (*Rijksherbarium, postbus 9514, 2300 RA Leiden*)

Comparative anatomy and systematics of *Berberidopsis* and *Streptothamnus* (Flacourtiaceae)

To be published, together with two papers on the same subject by P. BAAS and J. F. VELDKAMP, in *Blumea* (1984) 30.

J. F. C. MAGENDANS (*Botanisch Laboratorium, Landbouwhogeschool, Arboretumlaan 4, 6703 BD, Wageningen*)

Light-microscope structure and variability in structure of the vein endings in the leaf of *Hedera canariensis*.

Published in: J. F. C. MAGENDANS (1983): Anatomy of vein endings in *Hedera* leaves; influence of dry and wet conditions. *Meded. Landbouwhogeschool Wageningen* 83-6.

R. W. DEN OUTER (*Vakgroep Plantencytologie en -morfologie, Arboretumlaan 4, 6703, BD Wageningen*)

Wood anatomy of *Buxus madagascariensis* Baill. in relation to ecology.

Published in *Acta Bot. Neerl.* 34 (1):11-113 (this issue).

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Functional interpretations of the morphology and anatomy of sepal nectaries

Published in *Acta Bot. Neerl.* 34 (1985): 125-128 (this issue).