BOTANY

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ABSTRACTS

Angelica atropurpurea **L. in Indiana.** PHILIP A. ORPURT, Manchester College, North Manchester, Indiana 46962.——Purplestem angelica is the largest and most striking native umbelliferous species in the state. It occurs in at least 25 counties north of the Wisconsin Glaciation boundary. A field reconnaisance this past spring and summer, which included visits to most of the locations where *Angelica* was collected by Deam, revealed that while at some sites the species has been exterminated, it is still widely distributed and well represented numerically. Several colonies consisting of hundreds to a thousand or more plants have been located. Two of these large colonies of more than a thousand plants are situated in Wabash County. Other large colonies exist in Fulton, Whitley and Huntington Counties. While *Angelica atropurpurea* cannot at this time be considered an endangered species in Indiana, it is nevertheless, because of its habitat requirements, a species which deserves our continued surveillance as potentially threatened.

Color of Plants in Relation to Natural Selection. WILLIAM J. TINKLE, Anderson College.——Every botanist knows the claim that natural selection was responsible for the added complex morphology of some plants over the very simple morphology of species at the beginning of the earth. Chance variation gave more complexity to some species than to others and this added complexity gave more vigor to the lucky individuals, increasing their life style and resulting in more numerous offspring. This paper deals with increase in degree and variety of color.

Botanists of the nineteenth century claimed that added size and greater vigor gave an advantage in the struggle for existence which is passed on to the next generation. Can the same be said of greater color? There is danger that color will attract grazing animals which will reduce the size of the plant, making it bear fewer or no seeds.

We think of the advantage of colored flowers in attracting polleniz-ers. However, peas, beans and other plants with colored flowers have structures such that they pollinate themselves. Another example is the cleistogamous flowers of violets which bear viable seeds without opening.

Many plants have color in their stems and leaves. Does this figure in natural selection. Raspberry canes often have a purple color which mankind considers beautiful; does this increase the life or produce more seeds? Maple trees in autumn replace the chlorophyll in their leaves with anthocyanin and mankind calls the resulting color beautiful.

Does this habit help the tree? Have the color and shape of the leaves given the world forests instead of mosses?

Charles Darwin observed the effective selection conducted by his neighbors and concluded that nature works with the same methods and caused the same results. This is only partly true. A person selects the plant that most nearly represents a certain ideal and from the offspring makes like selection for a number of years; the result is a plant that more nearly embodies the type desired, unless the limit of improvement has been passed. On the other hand, nature selects by eliminating diseased or crippled individuals, thus maintaining a standard.

Differences in the Anatomical Structure of Good and Unusable Clarinet Reed Material (*Arundo donax* L.). MARILYN S. VESELACK and JERRY J. NISBET, Ball State University.——The clarinet reed is the most replaced component of the tone generating system of the clarinet. Clarinetists, along with performers of other woodwind instruments, have experienced increased inconvenience in maintaining a supply of usable reeds for performance.

Earlier studies concerning woodwind reeds have investigated acoustical phenomena, measurements of the reed, and aspects of the reed-mouthpiece combination. These studies indicated the need for analytic studies of the reed material (*Arundo donax* L.).

The method of investigation was structured to compare the anatomy of good and unusable reeds as well as to ascertain developmental stages of cells and tissues of the *Arundo* culm. Sections of good and unusable reeds obtained from professional musicians were prepared with soak treatments and embedded in Paraplast. Transverse sections of the embedded tissue was microtomed, stained, and examined for 33 cell and tissue characteristics. Statistical comparisons of data collected from good and unusable reeds were made using the T-test for paired observations.

Nine cell and tissue characteristics were found to have statistical significance. Good reeds contained: more twisted vascular bundles in their fiber bands; vascular bundles with larger radial and tangential diameters, thicker fiber caps, and thicker fiber bases; vascular bundles with fewer incomplete fiber rings, especially located lateral to the xylem; cells in the ground parenchyma with smaller radial and tangential diameters; and cells in the cortex region with higher percentage of lignification.

All of the characteristics were growth-related except for the twisted vascular bundles in the fiber band. This study found that good reeds were made from older culm material than were the unusable reeds.

The Imperfect State of the Genus *Penicilliopsis*. EVERETT F. MORRIS, Purdue University Calumet.——The genus *Penicilliopsis* was erected by Solms-Laubach for a fungus collected in the botanical garden in Buitenzorg, Java. The fungus was growing on the fruits and seeds of *Diospyros macrophylla*. Both perfect and imperfect stages were present

and were described with the name *Penicilliopsis clavariaeformis* assigned to it. The perfect stage produced asci and ascospores similar to those of the perfect stages of *Aspergillus* and *Penicillium*. Therefore, the fungus was placed in the family Eurotiaceae. While the imperfect stage of *P. clavariaeformis* exhibited phialides as would be found in *Aspergillus* and *Penicillium*, the most striking structures were the hard and antler-like synnemata. Since the original species, six others have been described. Specimens received from the late Dr. Ralph Emerson of the University of California, Berkeley fit the descriptions of *Penicilliopsis*. However, only the imperfect stages are present. It is believed that these specimens constitute the only collections of the fungus reported from the western hemisphere other than from Brazil.

A Reevaluation of Three Similar Leaf Types, *Dryophyllum puryearensis* Berry, *Banksia saffordi* Berry, and *Banksia tenuifolia* Berry, from the Middle Eocene of Kentucky and Tennessee. JAY H. JONES and LEONARD I. GANZ, Ripon College, Ripon, Wisconsin and Indiana University, Bloomington.——As part of a study of the *Dryophyllum* complex we have reinvestigated a leaf type assigned to *D. puryearensis* Berry. We have also reexamined leaves assigned to *Banksia saffordi* Berry and *Banksia tenuifolia* Berry which intergrade with those of *D. puryearensis*. The goal of this research was to determine the taxonomic affinities of these leaf types and test the validity of these species as described by E. W. Berry.

Over three hundred specimens were collected from the Middle Eocene Claiborne Formation of Tennessee and Kentucky. Representative specimens were analyzed using modern methods of leaf architectural and cuticular analysis. The leaf shape, venation and cuticle were found to be quite variable in these species. All three species were found to intergrade and no character has been found which can be used to delimit these taxa. It is clear that these leaf types are closely related and that Berry's taxonomic treatment is at least partially in error.

A Reexamination of *Dryophyllum moorii* (Lesq.) Berry from the Middle Eocene Claiborne Formation of Western Kentucky and Tennessee. SUSAN LEIGH LANE and JAY H. JONES, Indiana University, Bloomington and Ripon College, Ripon, Wisconsin.——The species *Quercus moori* was established by Lesquereux in 1869 for wide serrate oak-like leaves. Berry (1916) transferred this species to the extinct genus *Dryophyllum* Debey. In the same paper Berry established the species *D. tennesseensis* for smaller leaves of similar morphology. These leaf forms were found to intergrade and no gross morphological character or combination of characters could be used to clearly separate them. The objective of this investigation was to reevaluate the classification of *D. moorii* with specific emphasis on the boundary between these two taxa.

About 25 specimens of *D. moorii* and many specimens of *D. tennesseensis* were collected from the Middle Eocene Claiborne Fm. of western Kentucky and Tennessee. The leaf architecture and cuticular morphology were analyzed using methods described by Dilcher (1974).

Leaf architectural analysis revealed no differences between leaves of these two species which could not be attributed to variations in size and length to width ratio. The cuticle of *D. moorii* however, differed from that of *D. tennesseensis*. Unlike *D. tennesseensis*, *D. moorii* possesses distinctly anomocytic stomatal complexes with darkly staining "subsidiary" cells, well defined cuticular ridges, and unicellular uniseriate trichomes. This provides some support for retaining both species. Comparative analysis indicated that this leaf form is similar to that of several modern species of Fagaceae. This leaf type conforms most closely to those found in the Castaneoideae but is also similar to several species of oak.

Period in Stratification Hastens Germination of Black Walnut Seed. ROBERT D. WILLIAMS, U. S. Forest Service, Bedford, Indiana.——Black walnut (*Juglans nigra* L.) seed collected from 8 local mother trees was placed in cold stratification for 0, 30, 60, 90 and 120 days before being sown in germination trays. Germination varied by period of stratification and by seed source. Seed from some sources may require stratification periods longer than 120 days, but 90 days appears adequate for most seed sources.

Establishment of Prairie Vegetation from Local Ecotypes in Marion County, Ohio. LARRY R. YODER, The Ohio State University, Marion Campus, Marion, Ohio 43302.——One of the major areas of disjunct tallgrass prairie in Ohio is in Marion County. Virgin tallgrass prairie, previously extensive in the county, is now restricted to a few railroad and roadside right-of-ways which continue to be endangered by spraying and further development. A prairie is presently being reconstructed on the Marion Campus using seeds from the Claridon Prairie, a railroad prairie rich in forbs and grasses. Sorghum-Sudangrass hybrid *(Sorghum bicolor sudanensis)* has been used as a holding cover and preseeding mulch. Sudangrass is planted July 1 and the resulting vegetation is finely chopped and shallowly disked into the soil after frost. This serves as mulch for prairie seeds which are collected and Fall seeded on the prepared seedbed. This procedure has successfully provided natural stratification and eliminated requirements for seed storage and stratification facilities. High mowing (30 cm) is used during the first growing season followed by annual spring firing and hand weeding during subsequent years. This procedure is successful in north central Ohio for establishment of prairie with a minimum of hand labor and storage capacity.

Cuticular Variation in Five Genera of the Apocynaceae. GARY E. DOLPH and JULIE YOUNG, Indiana University at Kokomo, Kokomo, Indiana 46901.——The cuticular structure of 23 North American species in 5 genera of the Apocynaceae (*Couma, Echites, Forsteronia, Lacmellea,* and *Mesechites*) was studied. Although the cuticular structure of all the species was similar, a number of significant differences were found. The cells of the upper epidermis were isodiametric in shape and pentagonal in arrangement. The basic anticlinal cell wall pattern was rounded, but an undulate wall pattern was found in *C. guyanensis*. The

anticlinal cell walls were thickened in *E. echites*, *E. tuxtlensis*, *F. corymbosa*, *F. peninsularis*, and *F. viridescens*. Minute striations occurred on the upper cuticle of *C. macrocarpa* and *E. tuxtlensis*, and papillae were found on the upper cuticle of *F. corymbosa*. The cells of the lower epidermis were also isodiametric in shape and pentagonal in arrangement. The anticlinal cell wall pattern was undulate in *F. peninsularis* and *C. utilis*. The lower cuticle of *F. corymbosa* was striate. Seven species bore trichomes on the lower leaf surface. Single, unicellular, pointed trichomes occurred on the lower leaf surface of *M. rosea*, *M. repens*, and *C. macrocarpa*. Single, unicellular, falcate trichomes occurred on the lower leaf surface of *F. spicata*. Trichomes identical to those on the lower cuticle were also found on the upper cuticle of *M. rosea*, *M. repens*, and *F. spicata*. *Echites yucatanensis*, *E. turrigera*, and *E. tuxtlensis* bore single, multicellular, pointed trichomes on the lower leaf surface. Stomates were confined to the lower epidermis. The subsidiary cell arrangement was either paracytic or brachyparacytic. The guard cells occurred level with or slightly sunken below the surface of the lower epidermis. Thickened T-pieces of cutin occurred at the poles of the guard cells in *L. arborescens*, *L. floribunda*, *L. panamensis*, *C. rigida*, and *C. guyanensis*. The outer stomatal ledge was thickened in *F. corymbosa*, *F. peninsularis*, and *F. viridescens*. In *F. floribunda*, the stomatal complex was surrounded by cuticular flanges.

Leaf Morphology of *Nyssa* I. A Description of the Modern Species. WILLIAM D. MACKLIN and DAVID L. DILCHER, Department of Biology, Indiana University, Bloomington, Indiana 47405.——Characterization of nyssaceous leaves was undertaken utilizing scanning electron microscopy, light microscopy, and studies of living and prepared leaf materials. The purpose of this investigation was to establish the leaf features of modern species of *Nyssa* in order to assess these characters in fossil leaves taken from several localities which have been previously assigned to the Nyssaceae. Because the only information preserved in fossil materials is cuticular anatomy and leaf architecture, the delineation of the modern leaves was restricted to these characters. The leaves of *Camptotheca* and *Davidia* (two monotypic genera that are assigned to the Nyssaceae) are easily distinguished from those of *Nyssa*. *Camptotheca* is best differentiated by the course of its secondary veins. These secondaries curve gradually upwards until they run parallel with the margin and with other secondaries, similar to the secondary vein pattern found in the genus *Cornus* of the Cornaceae. *Davidia* is distinguished by its strongly serrated leaf margins. The leaves of *Nyssa* (which contains 5 or 6 species) are simple, entire margined (with the exceptions of the irregularly dentate leaves of *N. aquatica* and an occasional dentate leaf of *N. sylvatica*) and generally oblanceolate. The venation is pinnate and brochidodromous. The primary veins are stout and straight. The secondary veins have a moderately acute divergence, are abruptly curved, and the loops join the superadjacent secondaries at moderately acute to right angles and are enclosed by 3° and 4° arches. The tertiary veins are percurrent and forked, and are oblique to the midvein, the angle decreasing upward and outward. The highest

order of venation is generally 6, the highest with excurrent branching is 5. Areoles are well developed, are oriented (versus random), and generally 4 or 5 sided. Veinlets are present and usually simple and curved, but quite variable. Tracheids and bundle sheath cells were found on the veins. Sclerids were found in older leaves, ranging from few and scattered to 3 or 4 per areole. From cuticular studies we have found that the epidermal cells on both the upper and lower surfaces are isodiametric, randomly arranged and sometimes have striated surfaces. The stomata are confined to the lower epidermis and are anomocytic with from 7 to 10 striated subsidiary cells. Stomatal development is perigenous, with the guard cells developing directly from a single mother cell. The guard cells are large and raised relative to the epidermal cells. Trichomes are present on both surfaces and are of two types. Both are single with peg-like bases, and the basal epidermal cells are modified radially. Both types are single celled, unbranched and with no conspicuous heads. The two types are different in that one is very short (0.05-0.1 mm) and club-like with a blunt tip and the other type is quite long (0.75-1.0+ mm) and hair-like with a pointed tip.

Whether these characters will adequately delimit the genus from all other extant leaf types is a key question and this is presently under investigation.