

BOTANY

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ABSTRACTS

Vegetative morphology and anatomy of Cacao, (*Theobroma cacao* L.). ERWIN R. BROOKS, Purdue University.—Cacao, the source of chocolate, is a small evergreen tree, native to the American tropics. It is of special morphological interest due to its dimorphic shoot, chupon and orqueta formation, the occurrence of flowering cushions on the main trunk, and the basal and apical pulvini on the leaf petioles.

The main stem terminates in a five branched orqueta. These five branches differ morphologically from the main stem and chupons in that the branches have a phyllotaxy of $1/2$ while the main trunk and chupons have a $3/8$ phyllotaxy. Only chupons are produced on the trunk below the orqueta. Some chupons are formed on the branches, usually after injury or pruning. The chupons again terminate in a five-branch orqueta.

One of the most interesting anatomical features is the abundance of mucilaginous material throughout the plant. It occurs as single cell strands in the root tip and fills occasional cells and in the more mature root. In the stem it is found in the pith and cortex in lysigenous cavities.

The metaxylem of the primary root is hexarch and that of the secondary or lateral roots is tetrarch. However, the main trunk, chupons, and branches are anatomically similar. Anatomical examination of the five-branched orqueta shows a lack of internode elongation between the branches.

There is only one bud to a leaf axil. This bud may form a branch or a flowering cushion. The flowering branch is dichotomous and rudimentary except for the terminal internode and the pedicels.

Regular, brick-shaped, cortical cells, which contain very small starch granules, appear to be responsible for movement in the pulvini.

A technique for the study of *Oenothera* chromosome morphology. CATHERINE GARDELLA and RUBY VALENCIA.—Although *Oenothera* has been studied genetically and cytologically for a considerable number of years, little is known regarding the morphology of *Oenothera* chromosomes. This is due to the small size and difficulty of staining mitotic chromosomes of this plant. A technique is described which has been used to study the morphology of chromosomes of the generative cell in pollen tubes grown *in vitro*. These chromosomes are larger than those in other mitotic cells. An additional advantage is the fact that the

nucleus is haploid. This makes possible, with the selection of suitable plant material, the analysis of chromosome morphology of the different complexes found in *Oenothera* races.

The action of certain inhibitors upon the respiration of excised maize roots. RAYMOND E. GIRTON, Purdue University.—The influence of certain respiratory inhibitors on the O_2 consumption of detached, sterile, primary roots of germinating hybrid maize grains was studied. Both cyanide and azide resulted in rapid and marked inhibitions of respiration. Using M/1000 concentrations, 50% and 40 % inhibitions respectively were obtained followed by apparent recovery. The copper inhibitor, potassium ethyl xanthate, in M/1000 concentration produced no inhibition even when a second addition was made. The iron inhibitor o-phenanthroline, however, at M/1000 concentration produced a gradually increasing inhibition amounting to approximately 75% in 19 hours. This effect was obtained at both pH 5.8 and pH 7.6.

The occurrence of the genus *Callixylon* in the Lower Mississippian. J. H. HOSKINS, University of Cincinnati, and A. T. CROSS, University of W. Va.—*Callixylon* is a well known genus of the family Pityaeae of the order Cordaitales, its several species ranging essentially throughout the vertical range of the Upper Devonian to the extent that the genus has been considered a fairly reliable indicator of rocks of that age. The best known species, *Callixylon Newberryi*, common in the black shales of Indiana, Ohio and Kentucky, is apparently restricted to a single upper Devonian horizon. Studies of phosphatic petrifications from the basal Mississippian of Indiana, Kentucky and Illinois indicates that *Callixylon* is represented in these younger beds by more than one new species. This conclusion is based primarily on the occurrence in radial sections of secondary wood of a radial alignment of discontinuous pit groups, characteristic insofar as known, of but the single genus *Callixylon*.

An anatomical study of the roots of seedlings of *Smilax hispida* Muhl. FANNIE MAE HURST, Purdue University.—Seedlings which were collected near Lafayette, Indiana, were used in an anatomical study of this species of *Smilax*. Preliminary investigation of the roots showed that some of these possessed few xylem strands and no pith instead of a polyarch siphonostele which is considered characteristic of *Smilax*. This condition has been found and further studied in greenhouse seedlings. The seed were successfully germinated after a 60 day period of low-temperature stratification.

The *in vitro* effect of various forms and concentrations of nitrogen on the morphology of *Verticillium albo-atrum* R. et B. ROBERT L. JOHNSON, Purdue University.—*Verticillium albo-atrum* has an extremely wide host range and when cultured under varying environmental conditions is apt to present misleading morphological characteristics.

When the nitrogenous constituent of a synthetic medium was manipulated in both form and concentration the appearance of the fungal

mat was also changed. The use of peptone, urea, ammonia, nitrate and nitrite at equivalent concentrations of nitrogen presented growths ranging from a white floccose pellicle to a black carbonaceous appearing type of colony. Growth also ranged from floating to submerged.

Such evidence indicates that extreme caution in the selection of a cultural medium is necessary before a positive identification of the organism can be made. Standardization of the cultural medium is also recommended as a means of preventing species nomenclature which is not warranted.

Attempts at isolating *Verticillium albo-atrum* B11B from the soil.

J. V. LUCK, *Purdue University*.—Information about the survival in the soil of the fungus *Verticillium albo-atrum*, B11B which causes a serious wilt disease of *Mentha piperita* L. is important since methods of control of the disease must be directed at the fungus. Resistant cross breeds of this male sterile mint plant have been developed, but the oil is not acceptable.

The soil dilution plate method rather than the host indicator plant method was used to index the degree of soil infestation. The problem here consisted in finding a cultural medium upon which *Verticillium* would not be crowded out by the more rapidly growing molds of the muck soils. Different inhibitive agents including penicillin, streptomycin, crystal violet and oxgall were used in preparing the isolation media. In addition, different concentrations and combinations of several minor elements were used as inhibitory agents.

The chances of obtaining *Verticillium* from the soil were greatly enhanced by the presence of plant debris in the soil sample.

As far as methods are concerned, the best results were obtained by flooding with soil dilutions the surfaces of previously poured plates of Czapeks medium which contained antibiotics.

Vascular Flora of the Recently Acquired Ross Biological Reserve.

CHESTER W. MILLER, *Purdue University*.—A preliminary inventory of the vascular vegetation of the Ross Biological Reserve is nearing completion. In this report, the system of classification used is that of Engler and Prantl. This survey thus far shows a total of 84 families, 222 genera, 353 species, 31 varieties, and 5 forms. The division Pteridophyta is represented by two species of class Articulatae and eight species of two families of class Filicinae; division Spermatophyta by 343 species from 81 families; subdivision Gymnospermae by a single species, *Juniperus virginiana* L.; subdivision Angiospermae by 80 families, 213 genera, 342 species, 31 varieties, and 5 forms; 60 species, 3 varieties, and 2 forms of which represent 39 genera from nine families of the class Monocotyledoneae; 282 species, 28 varieties, and 3 forms represent 174 genera from 71 families of the class Dicotyledoneae. In the class Dicotyledoneae, 49 species are trees, 16 are shrubs, and 314 are herbs. The families most abundantly represented in order of their abundance are: Compositae—46 species, Graminae—32 species, Leguminosae—22 species, Rosaceae—18 species, Labiatae—14 species, and Lilia-

ceae—12 species. There are 46 families represented by a single genus 36 of which are represented by a single species.

Since protection from grazing was put in effect just before this study began, the inventory will be of value for future comparisons.

Present status of botanical and agricultural research in India. C. MERVIN PALMER, Cincinnati, Ohio.—A number of agricultural colleges and experiment stations as well as botanical laboratories were visited by the writer during 1947-1949. In part this was done under the auspices of the UNESCO Science Cooperation Office for South Asia. Institutions visited included the Indian Agricultural Institute at Delhi, the cereal rust laboratories at Simla and Agra, the Gandhian agricultural center at Sevagram, the paleobotanical Institute at Lucknow, the botanical gardens at Calcutta and Ootacamund, and the agricultural experiment stations at Kanpur, Allahabad, Coimbatore, Agra, Coonoor, Trivandrum, Nagpur, Kalimpong and Bangalore.

In botany the emphasis has been on work in the fields of morphology, paleobotany, phycology and economic botany. Widespread interest in taxonomy is hampered by lack of available manuals, while physiology is retarded by lack of laboratory equipment. Encouragement is being given to agricultural research as a part of the program to make India self sufficient in food stuffs. The great majority of the scientific laboratories are sponsored by the central or provincial governments.

Interest is high in the various scientific societies, such as the All India Science Congress, the Indian Academy of Science, the Indian Botanical Society and the Botanical Society of Bengal.

The Beech line in Northwestern Indiana. J. E. POTZGER and CARL O. KELLER, Butler University.—The westward extension of beech was determined on basis of survey records from the original U. S. Land survey. The border line is approximately crescent-shaped running from Porter County in the north to Warren County. The counties where beech disappeared are Porter, LaPorte, Marshall, Fulton, Cass, Carroll, Tippecanoe, Fountain and Warren. Percentage abundance of beech decreases progressively as one compares ranges of townships from east to west. In Warren County only three southern townships had beech.

Forest and prairie in three Northwestern Indiana Counties. FRED W. ROHR and J. E. POTZGER, Butler University.—The original vegetation of Lake, Jasper and Newton counties was reconstructed from the survey records of the original U. S. Land Survey field notes. Prairie conditions were expressed as wet, or dry prairies and oak openings. Central Lake County was wet prairie while southern portions of Jasper and Newton counties were dry prairie. The trees recorded in Jasper and Newton counties were primarily species of oak while in Lake county there was an oak-hickory association.

Chromosome numbers in *Claytonia*. NORMAL ROTHWELL and C. B. HEISER, Jr., Indiana University.—Chromosome counts for the genus *Claytonia* have not previously been published. Counts of $n=8$ have been

obtained for *C. lanceolata* from Colorado, *C. rosea* from Arizona, and *C. caroliniana* from Montreal. *Claytonia virginica* has been found to include both diploid ($n=8$, from Iowa, Wisconsin, Indiana, Ohio, and Kentucky) and tetraploid ($n=16$, from Missouri, Indiana, Pennsylvania, and Ohio) races. Although much morphological overlapping between the two races occurs, preliminary comparisons indicate that "giant" forms are more frequent and that pollen is slightly larger in the tetraploids. Great diversity in *C. virginica* exists in Indiana and this region should furnish rich material for the study of variation in this species.

Microclimates of four adjacent areas in the chaparral of San Dimas Canyon, California. C. FRANCIS SHUTTS, Purdue University.—The microclimates of a grass meadow, scrub oak-toyon chaparral, coastal sage, and chamise chaparral in San Dimas Canyon, California, were investigated from April 1 to July 28, 1950. A control climatic station for correlating data to weather records, and five field stations consisting of Six's type air thermometers at three inches and five feet heights, Six's type soil thermometers at one-half inch and six and one-half inches depths, and paired white and black spherical atmometers were maintained at the site. In addition, soil moisture determinations were made periodically. The data indicate that "frost pockets" may be formed through the restriction of air movement by dense vegetation; that the decrease of air temperature means with increase in height above the ground may be reduced by vegetation; that the seasonal changes in the angle of insolation causes a greater seasonal variation of soil temperature and evaporation on north slopes than on south slopes, suggesting that the more rigorous soil conditions of south slopes may be due to a longer period of severe insolation; and that the determination of vegetative climaxes in southern California is due principally to the soil moisture factor.

***Tragopogon* in Indiana.** DALE M. SMITH, Purdue University.—The three introduced Goat's Beards, *Tragopogon porrifolius*, *T. pratensis*, and *T. dubius*, are becoming common in central Indiana. Several anomalous specimens were found during the early summer of 1950. Evidence from morphological characters and pollen fertility studies indicates that some of these plants are hybrids of *T. porrifolius* x *T. pratensis*. A key to the species is given which is based on achene characters. New county records are reported for the species and the hybrid.