BOTANY

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ABSTRACTS

Poison Ivy Rust and Its Allies in North America. JOE F. HENNEN, Indiana State College and Purdue University.—This is a preliminary report of work done toward a proposed taxonomic monograph of the genus *Pileolaria* for the world. *Pileolaria brevipes* Berk. and Rav., poison ivy rust, is an autoecious, long cycled parasite of *Toxicodendron radicans* (L.) Kuntze and *T. diversiloba* (Torr. and Gray) Greene. It is coextensive with its hosts over much of North America and is the most common species of *Pileolaria* in North America. Unlike its polymorphic hosts, it shows little morphological variation. Other species and hosts of *Pileolaria* or related form genera in North America are as follows: *P. patzcuarensis* (Holw.) Arth. on *Rhus trilobata* Nutt., *R. schmidelioides* Schleckt. in the Southwestern United States and Mexico and on *R. aromatica* Ait. in Ontario; *Pileolaria effusa* on *Rhus glabra* L. and *Toxicodendron radicans* (L.) Kuntze in Arizona and Colorado; *Uredo mexicana* (Arth.) Cumm. on *Rhus choriophylla* Woot. and Standl. in Southwestern United States and Mexico; *Pileolaria standleyi* Cumm. on *Pistacia mexicana* H. B. K. in Guatemala; *Uraecium extensum* (Arth.) Cumm. on *Pistacia mexicana* H. B. K. in Mexico; *Pileolaria cotini-coggygriae* Tai and Cheo on *Cotinus coggygria* Scop. in Georgia; and *Pileolaria domingensis* Cif. on *Comocladia* sp. in Dominican Republic.

Botanical Investigation in the Great Slave Lake Area. ROBERT J. REICH, Indiana State College and Chicago Museum of Natural History.—The general aspects of the Northern Boreal Forest and the Tundra Transition Zone will be the main concern of the talk. Slides taken during June, July, and early August 1959 and 1961 will be shown to supplement the discussion. Emphasis will be on the major plant communities existing between the towns of Hay River, N. W. T. and Yellowknife, N. W. T. along the new Yellowknife Highway which half circles Great Slave Lake on its western side.

Gall Specificity in Relation to *Synchytrium*. JOHN S. KARLING, Purdue University.—*Synchytrium macrosporum* is a short-cycled member of the subgenus *Pycnochytrium* which parasitizes several hosts in central Texas. Under greenhouse conditions it has been transferred to more than 1,100 additional hosts species in over 700 genera of 157 plant families ranging from the Pinaceae to the Compositae. On many of these hosts the induced galls vary from composite to semi-composite and simple in structure. Not only do the galls vary on different hosts but also on different tissues or organs of the same host. Although the predominant type of gall is composite, this type is not constant and specific on all hosts which *S. macrosporum* is capable of infecting. Also, except for a few other

species of *Synchytrium*, the size, shape and structure of the galls caused by these fungi are not constantly characteristic and distinctive so far as they are known. Accordingly, present evidence indicates that the galls caused by most species are not specific. The type of galls produced is a reaction between host and parasite and not a microscopically discernable character of the pathogen. Hence, gall type and structure cannot be used effectively as primary taxonomic criteria in distinguishing individual species of this genus.

Aquatic Hyphomycetes from Wyoming and Indiana. JOHN W. BAXTER, Purdue University.—Surveys of streams in Wyoming and Indiana during 1959 and 1961 revealed the occurrence of 16 species of aquatic hyphomycetes, representing 12 genera, growing on submerged, decaying leaves, chiefly those of species of *Salix*, *Populus*, *Betula* and *Alnus*. This appears to be the first report of the occurrence of these fungi in Wyoming and Indiana. The results of the 1959 survey, conducted in Wyoming, have been published. The following species were identified from Indiana streams during 1961: *Tetracladium marchalianum* de Wild., *Anguillospora longissima* (Sacc. & Syd.) Ing., *Anguillospora crassa* Ing., *Alatospora acuminata* Ing., *Tricelophorus monosporus* Ing., *Lunulospora curvula* Ing. and *Heliscus tentaculus* Umphlett. A collection obtained in 1961 near Laramie, Wyoming appears to represent a new species of the aquatic hyphomycetes.

Shoot Development in *Glycine max*. R. D. DECKER and S. N. POSTLETHWAIT, Butler University and Purdue University.—The vegetative apex of *Glycine max*, var. Hawkeye has a distinct tunica-corpus organization. The corpus can be divided into a peripheral zone which gives rise to the provascular tissue and the cortex, and a central zone which gives rise to the pith.

Leaf initiation occurs in the inner layer of tunica cells near the base of the dome of the apex. As growth progresses the outer portion of the corpus becomes involved in the formation of the buttress while the remaining tunica layers continue anticlinal divisions. Leaflet initiation is similar to the initiation of the central primordium except the initiation site in the inner tunica layer is rapidly becoming disassociated from the apex proper. Leaflet initiation occurs at the base of the central primordium when the primordium is approximately two hundred microns high.

Lamina initiation begins when the primordium is approximately one millimeter high. The marginal initials give rise to the upper and lower epidermis. The submarginal initials are responsible for all the internal lamina tissue although some may not be formed directly by the submarginal initials but by intercalary activity.

The pulvinus region, present at the base of each leaflet, has a vascular cylinder while the remaining portion of the petiole has a ring of vascular bundles. The petiolules of the two lateral leaflets is composed entirely of pulvinus tissue. Pulvinus tissue is also present at the base of the petiole where the petiole is attached to the trilacunar node. The shape of the petiole as seen in transverse view is temporily altered at the point of attachment of the lateral petiolules.

Differential Embryo Infection of Wheat by *Ustilago tritici*. LOUIS W. T. HSU and JOHN F. SCHAFER, Purdue University.—Wheat has been

reported to express effective resistance to loose smut, caused by *Ustilago tritici*, by several different histological reactions: ovary resistance to penetration, embryo resistance, inhibition of penetration of growing points, reduction of growing point infection during subsequent growth, differential internode elongation, and death of infected seedlings. The same variety may react differently to various cultures of *U. tritici*. Highly resistant Hope-Hussar showed from 5.8 to 64.0% embryo penetration by 8 cultures of *U. tritici* in one test and from 1.6 to 31.3% from inoculations made another season. The same smut culture caused the highest infection by a wide margin in both tests. Susceptible Wabash ranged from 44.9 to 74.0% infection by the same 8 cultures in the second test. Although Hope-Hussar is resistant to all cultures tested, its histological mechanism of resistance must vary in respect to different smut cultures. Three Knox X Hope-Hussar selections, developed to combine loose smut resistance with superior agronomic characteristics, showed 12.6, 12.6 and 31.7% embryo infection by race 6 compared to 13.0 for Hope-Hussar.

The Identity and Control of Fungi Associated with Damping-off of Alfalfa (*Medicago sativa*, L.) Cuttings in the Greenhouse. PAUL G. ADDOH, Kansas State University.—Studies were made on damping-off alfalfa cuttings in the greenhouse. Various fungi were found associated with the sand beds used for a rooting medium and with the alfalfa cuttings. Important isolates were *Rhizoctonia solani*, *Pythium* spp., *Ascochyta imperfecta*, *Fusidium* spp., *Fusarium roseum*, *Fusarium solani*, *Fusarium* spp., and *Alternaria* spp., the most common of which was *A. tenuis*. Tests proved *R. solani* to be the most pathogenic. Satisfactory control of these organisms was obtained from a 300 ml/sq. ft. drench of Captan 75 (300 ppm), Panogen (3 ppm), Phaltan (commercial preparation 500 ppm), or PCNB (commercial preparation 500 ppm) or by surface sterilization of the cuttings with 1/1000 bichloride of mercury, followed by immersion in 1/1000 indole butyric acid for ¼ to 1 minute before planting. The latter procedure was preferred because of its ease, lack of phytotoxicity, and high percent of success (92%-95%). In addition, the following cultural practices were found necessary to successfully grow the cuttings: (1) use of young and vigorously growing plants, (2) adequate sanitation, (3) careful and ample watering once a day, (4) shading of cuttings from direct light during the first 10-14 days, and (5) spacing of cuttings ½ inch to 1 inch in the rows and 2 inches between the rows to prevent the rapid spread of pathogens among cuttings.

Temperature-Time Requirements for Flowering of Oriental Cherry Trees at Washington, D. C. ALTON A. LINDSEY, Purdue University.—Phenological records of 1924-1959 were obtained on the flowering of single and double varieties of oriental cherry trees in Washington through courtesy of the National Park Service. The duration-summation method of Lindsey and Newman was applied to the annual flowering dates in conjunction with daily maximum and minimum temperature records of the U. S. Weather Bureau over this period. By use of tables, coefficient of variation computation, and graphical analysis, time and temperature requirements for the trees' flowering were determined, and possibilities of improved prediction discussed.

The temperature threshold for flowering of the single-flowered trees was 42°F. Their normal time period of preflowering bud development in spring was 25 days, and a temperature-time duration sum of 4,749 degree-hours was needed. The double-flowered variety had a 42°F. threshold also, but required approximately 40 days and 9,297 degree-hours for coming into full flower in a normal season.

Effects of Manganese Deficiency Related to Age in Soybeans *(Glycine max)*. EUGENE E. COOPER and RAYMOND E. GIRTON, Argos Community School, Argos, Indiana, and Purdue University.—Soybean plants when grown in manganese deficient silica sand developed typical manganese deficiency symptoms of interveinal chlorosis and necrosis. Physiological effects including depression of photosynthesis, respiration, growth, and relative chlorophyll contents were studied. The depression of photosynthesis was frequently but not always proportional to reduced chlorophyll contents. This is taken to indicate the importance of manganese in reactions concerned in photosynthesis in addition to chlorophyll formation. Leaf position on the plant and actual aging produced different results when related to photosynthetic rates. Chlorophyll contents increased with age, except for a slight decrease after leaf maturity. For the most part, the effects of aging on photosynthesis, respiration, and chlorophyll contents were the same for soybeans as for other species reported in the literature.

An Analysis of Sexual Compatibility in *Eudorina* from Indiana. MELVIN E. GOLDSTEIN, Indiana University.—In the past three years 20 natural collections of *Eudorina* from the vicinity of Bloomington, Indiana have yielded the following clonal stocks: 4 homothallic stocks, 12 heterothallic pairs and 4 parthenosporic stocks. Two of the 20 collections yielded only males and one collection yielded a single female strain. Sexual strains can be characterized by their zygote arrangement: 1) the clumped type in which the fertilized eggs remain in the maternal matrix forming tight clumps and 2) the scattered type in which the maternal matrix breaks down after fertilization and the zygotes are released singly. The study of sexual compatibility included 11 heterothallic pairs, 2 males and one female strain which were mixed in all possible male-female combinations with the presence of zygotes used as an indicator of cross compatibility. There were 31 intercrosses between heterothallic strains of *Eudorina* representing 20% of the total possible intercrosses. In general, strains with like zygote arrangements intercrossed more freely with one another, and the greatest sexual isolation occurred between strains with different zygote arrangements. Comparison with a more extensive study including 22 heterothallic pairs, 3 males and one female strain of *Eudorina* from 8 states and Vancouver, British Columbia showed the same relationship between sexual compatibility and the zygote arrangement.

The Ultrastructure of *Astrephomene*. NORMA J. LANG, Indiana University.—The electron microscope is being used to investigate the fine structure of *Astrephomene gubernaculifera* Pocock in the Astrephomenaceae. In contrast to the Volvocaceae, this colonial green flagellate lacks

inversion of daughter coenobia in asexual reproduction. Each cell is surrounded by an individual gelatinous sheath and pyrenoids are lacking.

A current study of the Volvocaceae and the previous elucidation of the fine structure of *Chlamydomonas* by Sager and Palade allow comparisons. Electron micrographs of the cellular organelles are shown and discussed. It is concluded that these cells are basically "chlamydomonad" both in gross morphology and in ultrastructural characteristics. This study of vegetative fine structure will form the basis for further examination of the origin of organelles in sexual and asexual reproduction.

A Preliminary Investigation of the Origin of Branches in Fascicled Ear Corn. R. H. HESSLER, O. E. NELSON and S. N. POSTLETHWAIT, Purdue University.—Dr. Paul Weatherwax obtained corn ears, which exhibited an unusual type of branching, from a missionary in Mexico. He has provided the authors with seed for an investigation of the origin of these branches. The first planting at Purdue was made in the Spring of 1961, and a morphological study was begun in July 1961. By dissecting ears at different intervals during the growing season, the various stages of development were obtained. In developing from a single meristem to a many branched-ear, the apical meristem undergoes a series of dicotomous branchings. However, the number and extent of branching is not constant even in a single plant. The number of fertile grains exceeds that produced on normal ears. Tassel formation is normal except for a few dicotomous branchings that usually occur at the apex of the tassel. The inheritance of this abnormality is being investigated.

Developmental Anatomy of the Seedlings of Annonaceae. ARIF HAYAT, Indiana University.—The form of cellular differentiation in embryos of the various genera observed was generally in accord with the pattern that has been described for a wide range of other dicotyledons. Contrary to the situation in many other dicotyledonous seedlings, any visible indication of an epicotyl in examined annonaceous species is delayed in embryonic development. After germination there is a continuation of the growth patterns initiated during late embryogeny. The exarch xylem of the root is connected with the endarch xylem of the cotyledons and epicotyl through a so-called transition region. However, the change in orientation of vascular tissue is not accomplished by physical rotation or twisting of xylem elements, but instead, the character of the cellular pattern in this region is gradually changed due to the influences from the root and shoot meristems. The level of the region where the transition takes place is roughly correlated with the diameter of the hypocotyl axis. In general, the location of transitions nearest the "*collet*" are characteristic of hypocotyls of large diameter, transitions farthest from the "*collet*" with slender hypocotyls, and intermediate types are found in hypocotyls of intermediate diameter. The rate of growth of the hypocotyl determines in part the vertical extent of the transition region. More or less uniform patterns of cellular organization characterized all seedlings examined within the family. Colored photomicrographs of transections of various levels of the seedling axes were utilized in the present study.

The Photoperiod of Guar *(Cyamopsis tetragonoloba)*. PHILLIP SPARKS and S. N. POSTLETHWAIT, Purdue University.—Guar *(Cyamopsis tetra-*

gonoloba) was introduced into the United States in 1903. In recent years it has been considered seriously as a possible crop plant because of the potential uses of mannogalactin which it produces in the endosperm. Varieties grown in the United States require a long season and do poorly in Indiana. This report is the first of a series of investigations to determine the plant requirements and to seek ways of adapting it to the climate of the midwest. The interaction of photoperiod and temperature on vegetative growth, flower initiation, and fruit abscission has been studied.