

BOTANY

Chairman: ROBERT E. SIMPERS, R.R. 3, Crawfordsville, Indiana 47933

JAMES REES, Biology Department, Anderson College,
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ABSTRACTS

Long Term Chlorophyll Fluctuation in an Evergreen—*Juniperus virginiana*. WILLIAM J. BRETT and ARTHUR C. SINGER, Department of Life Sciences, Indiana State University, Terre Haute 47809, and Wyeth Laboratories, Philadelphia, Pennsylvania.—A single mature juniper plant, maintained under normal changing environmental conditions, was utilized in this study. The chlorophyll a and b concentrations of a gram of leaf matter were determined weekly over a 2-year period (November 1967 to October 1969). Chlorophyll was extracted in 80% (v/v) acetone and concentration determined spectrophotometrically. A multiple regression analysis was performed to determine relationships between chlorophyll a and b concentrations and temperature, precipitation, cloud cover and dry weight (second year only).

A positive correlation of 0.987** was found between chlorophyll a and b concentrations. Chlorophyll showed a negative regression association with temperature significant at the 5% level for the 2 years of data and significant at the 1% level for the second year of data. A positive regression between chlorophyll b and precipitation significant at the 5% level was determined for the second year's data, but the regression of chlorophyll a on precipitation did not prove significant at this level. A positive regression relationship between dry weight and chlorophyll a** and chlorophyll b* was found. Comparison of the mean monthly values for total chlorophyll concentration for each of the 2 years showed similar fluctuations for the period April through October, but almost reverse fluctuations from November through March. The data for November 1968 through October 1969 showed a high in February falling to a low in July followed by a rapid increase during the rest of the year. The data for November 1967 through October 1968 differed by exhibiting a low in March and a high in April. There was some suggestion that the difference in the product of day length and sky cover during the winter months for the 2 years may partially explain these changes. (** = significant at the 1% level; * = significant at the 5% level)

***Philodendron* Leaves from Eocene Sediments in Tennessee.** CHARLES P. DAGHLIAN and DAVID L. DILCHER, Department of Botany, Indiana University, Bloomington 47401.—Two clay pits in Henry County, Tennessee, have yielded several fragments of large *Philodendron* leaves. The leaf fossils in these pits are in clay sediments of middle Eocene age. Numerous fragments and a few larger pieces of leaves have been found in which the cuticle and fine venation are well preserved. From these remains we have been able to relate this fossil material to the

genus *Philodendron* and suggest its affinities with the section Meconostigma which is now restricted to subtropical areas in South America. This is the first fossil record of the genus in the western hemisphere and suggests a long history of evolution of the genus *Philodendron* and family Araceae.

***Puccinia berberidis-trifoliae*, a Species Correlated with *P. graminis*.** JOE F. HENNEN, Department of Botany and Plant Pathology, Purdue University, Lafayette, Indiana 47907.—*Puccinia berberidis-trifoliae* Diet. and Holw. is a microcyclic rust fungus (Uredinales) from Mexico and Guatemala. It is parasitic on species of *Mahonia*. An hypothesis was presented that it is derived from a macrocyclic species, *P. graminis* Pers., following Tranzschel's law.

Interaction of *Verticillium albo-atrum* and *Pratylenchus penetrans* under Controlled Inoculum Densities. J. J. CONROY and R. J. GREEN, JR., Department of Botany and Plant Pathology, Purdue University, Lafayette, Indiana 47907.—The synergistic relationship between *Verticillium* spp. and the root lesion nematode *Pratylenchus* spp. has been demonstrated. The influence of *Pratylenchus penetrans* on infection levels of *Verticillium albo-atrum* on tomato var. 'Bonny Best' under critically controlled inoculum densities of the fungus and controlled environmental conditions was considered. Levels of infection of *V. albo-atrum* on tomato plants were correlated with critically controlled inoculum densities. Infection levels of 100 per cent occurred at the inoculum density of 200 propagules per gram soil and infection levels were progressively lower at inoculum densities of 100, 75, 50 and 25 propagules per gram. Consistent increases in infection were found at all inoculum densities in the presence of the nematode compared to infection with the fungus alone. The influence of infection of roots by *V. albo-atrum* on final root populations of *P. penetrans* was also demonstrated. The number of nematodes extracted from roots of tomato plants infected with *V. albo-atrum* was significantly lower than the number extracted from roots grown in soil with the nematode alone. The role of the nematode in affecting a change in the host plant that increased susceptibility to *V. albo-atrum* was considered using a split-root technique. Slightly higher levels of infection were found when the fungus and the nematode were placed on opposite sides of the split root system compared to the fungus alone on one side. However, when both *P. penetrans* and *V. albo-atrum* were combined on the same side of the split root system, a further increase in the level of infection was found, suggesting a host physiological response to the nematode which makes the plant more susceptible to infection by *V. albo-atrum*.

The Epidemic of Southern Corn Leaf Blight in 1970. A. J. ULLSTRUP, Department of Botany and Plant Pathology, Purdue University, Lafayette, Indiana 47907.—Southern corn leaf blight is incited by *Helminthosporium maydis*. The pathogen appears to be composed of two physiological races that are morphologically alike. Race "O" has been extant for many years but has rarely caused any economic loss.

It attacks the corn containing *normal cytoplasm* and that bearing *Texas male-sterile cytoplasm* with equal facility. Race "T" differs from Race "O" in its high virulence on corn containing *TMS cytoplasm*; it is only mildly pathogenic on corn with *normal cytoplasm*. Ears as well as leaves and stalks of *TMS cytoplasm* corn are attacked. The first evidence of Race "T" in the United States was in localized areas in Iowa, Illinois and Indiana in the fall of 1969. Early in 1970 the disease caused by Race "T" appeared in Florida and moved northward. By July it was in the Corn Belt. Warm, humid weather, the presence of a virulent pathogen, and a highly susceptible host—corn containing *TMS cytoplasm* acted together to bring about the epidemic. Southerly winds plus favorable weather hastened northward movement of the pathogen. Reports indicate that the Race "T" has been in the Caribbean area and is recognized there only where corn with *TMS cytoplasm* is grown. About 80% of the corn in the continental United States carries *TMS cytoplasm*. Control will probably be through use of *normal cytoplasm* or a resistant type of *male-sterile cytoplasm*.

Ceric Ammonium Sulfate. Use of a Chromatographic Reagent in Fresh Tissue Studies of *Vinca rosea* L. LARRY R. YODER and PAUL G. MAHLBERG, Department of Botany, Indiana University, Bloomington 47401.

—Ceric ammonium sulfate dissolved in phosphoric acid will react with fresh tissue of *Vinca rosea* to yield pink to purple colors distinctive of particular tissues. No other plants tested showed this color reaction except for *Vinca minor*. Aerial portions of the plant produced a pink reaction, while roots formed a purple reaction product. Embryos and endosperm failed to react as did very young seedlings. Based on earlier chromatographic work by Farnsworth *et al.*, the color reaction is most probably due to the alkaloids present. The reaction is localized in cortical parenchyma and mesophyll tissue, and it is not associated with the contents of the laticifer cells. Color intensities did vary among the plants tested, but no consistent difference was observed between red and white varieties. It is suggested that this spot test with fresh tissue may be useful to those involved in the production of *Vinca* alkaloids for checking the productivity of new sources and for monitoring the effects of age and environment on alkaloid production.

Development of the Hypocotyl and First Internode of Soybean. CHARLES T. HAMMOND, Department of Botany, Indiana University, Bloomington 47401, and RICHARD A. POPHAM, The Ohio State University, Columbus.—The hypocotyl and first internode of Biloxi soybean (*Glycine max*) were remarkably similar in their pattern of extension growth despite differing embryonic origins. Growth in length as ascertained from marking experiments initially occurred throughout young hypocotyls and internodes, but later, cessation of growth occurred first in the lowest segment and then in successively higher segments. In the fully elongated hypocotyl and internode the topmost segment was thus longest while lower segments were successively shorter. The pattern of cell division and cell elongation in epidermal, hypodermal, and pith cell files was similar in both the hypocotyl and first internode.

A region of rapid cell elongation closely followed by a cessation of extension growth occurred first in the lowest segment and later in successively higher segments. Although cell division also became restricted to higher and higher segments with the acropetal cessation of growth, the number of divisions was always greatest in upper regions. The pattern of extension growth of the hypocotyl and first internode was dissimilar in one respect. Cell division and cell elongation occurred throughout development of the internode, but cell division ceased in the hypocotyl when it became one half its final length. Further extension growth of the hypocotyl was due entirely to cell elongation.

Detection of Southern Corn Leaf Blight in Indiana by Remote Sensing Techniques. MARVIN E. BAUER, PHILIP H. SWAIN, and RICHARD MROCZYNSKI, Purdue University, Lafayette, Indiana 47907.—

Multispectral photographic and scanner data were collected over western Indiana in August and September, 1970, to determine if various degrees of infection of southern corn leaf blight (*Helminthosporium maydis*) could be detected by remote sensing techniques. Spectral measurements in the range of 0.4 to 14 microns were made using an airborne optical-mechanical scanner at altitudes of 3000 to 9000 feet. Photographic data, including color, color infrared, black and white, and black and white infrared, were collected at altitudes from 3000 to 60,000 feet.

The test site for the study consisted of a north-south flightline running the length of Indiana, with six intensive study areas in which ground truth information was collected. Ground truth consisted of rating each corn field with respect to degree of disease infection and stage of maturity of the corn. Six levels of infection based on the amount of leaf damage were identified in the fields.

Three levels of infection were detectable from the aerial photography by standard photo-interpretative techniques; however, early maturing fields could not be separated from severely blighted fields. Five or six levels of infection were detectable by applying automatic pattern recognition techniques to the multispectral scanner data. Again, however, mature corn fields could not be discriminated from severely blighted fields.

These results illustrate the potential application of remote sensing techniques to the detection of crop diseases.