BOTANY

Chairman: THOMAS R. MERTENS, Ball State University

ROBERT L. KENT, Indiana Central College, was elected chairman for 1969

ABSTRACTS

A Study of the Factors Controlling Variation of Cuticular Characters. D. L. DILCHER and C. A. ZECK, Indiana University.—In this study we examined three factors which we thought might cause variation in the cuticular characteristics of leaves. These factors were leaf shape, leaf maturity, and the amount of sunlight that reached the leaf. The purpose of this study was to help resolve some of the controversy surrounding the use of cuticular analysis as a means of plant identification. The species investigated for differing morphology was *Quercus alba*, White Oak. *Fagus grandifolia*, American Beech, and *Quercus rubra*, Red Oak, were used for the study of sunlight versus shade leaves. Young leaves of these trees were later examined in order to understand the development of the epidermis. The cuticular characteristics looked for were the following: shape and size of the epidermal cells and stomata, presence and density of hairs, density of stomata, and pattern of the accessory cells. We found that neither the shape of the leaf nor the position on the leaf from which a cuticular sample was taken hindered the identification of the leaf cuticle. There were slight variations observed, however the variations were not severe enough to raise any doubts as to the species from which the cuticle had been obtained. Both of the species studied as sun versus shade leaves showed definite cuticular variations. There were many more stomata and the cells of the lower epidermis were much less lobed on the leaves that grew in the sunlight. The cells of the upper epidermis of the beech were more lobed on the shade leaves while the upper epidermis of the oak was the same in both sun and shade leaves. The other cuticular characters were similar on both sun and shade leaves. Upon studying the development of the epidermis in young leaves it was found that the mature situation of guard cells and stomata can be seen early in the development of a leaf while the development of the epidermal cells may follow different paths as the leaves mature. (Work supported by NSF GB5166)

An Eocene Discovery of Dendropanax. G. E. DOLPH and D. L. DILCHER, Indiana University.—Leaves of *Liquidambar*, *Sterculia*, *Oreopanax*, and *Artocarpus* were the only lobed forms reported from the Wilcox of Tennessee by Berry (1916, 1924, 1930). In addition to these forms, a form similar to *Dendropanax* (formerly placed in the form genus *Aralia* by Berry on the basis of a single specimen from Hardy Mills, Arks.) of the Araliaceae has been discovered. This form has the following characteristics: (1) three to five lobes; (2) shallow sinuses between the lobes; (3) size similarity between the main lobes; (4) entire margin; (5) acuminate to ovate lobes; (6) decurrent, truncate, or cordate base; (7) comptodrome secondary venation; and (9) papillate lower epidermis with

randomly orientated anisocytic stomata. This form differs from *Liquidambar* which lacks an entire leaf margin, *Artocarpus* which lacks palmate venation, and *Sterculia* which lacks anisocytic stomata (fossil forms of *Sterculia* have anomocytic stomata) and reticulate tertiary venation. The distinction between *Oreopanax* and *Dendropanax*, both members of the Araliaceae, would be impossible if only the external morphological features of the leaves could be utilized. However a separation of these genera can be made by a study of the leaf cuticle. The lobed forms of *Oreopanax* have paracytic stomata while members of the genus *Dendropanax* have anisocytic stomata. Since the fossil form also has anisocytic stomata in addition to the external features associated with *Dendropanax* an assignment to the genus *Dendropanax* was possible. The assignment of the fossil form to a living species of *Dendropanax* cannot be made due to evolution that has taken place within the genus. Although modern forms are similar to the fossil in external and stomatal features, most living species differ in their possession of sinuous upper epidermal cells and lack of papillae on the lower epidermis. (This work was sup) ported by NSF GB-5166.)

Effects of Selenium on the Respiration of Excised Root-tip Segments of Maize. RAYMOND E. GIRTON, Department of Soils and Plant Nutrition, University of California.—This study deals with the effects of Na_2SeO_3 on the respiratory gas exchange of 1 cm root-tip segments cut from 3 day germinated grains. Phosphate buffers were used to maintain a pH of 4.5 to 5.

Typical Q_{O_2} values for control (–Se) root segments were ca 5.6 ul/hr/mg dry wt. and 5.0 for Q_{CO_2} values. A $5x10^{-6}$ M Na_2SeO_3 concentration appeared to give a 3 to 4% stimulation in O_2 uptake over periods of 2 hours. High concentrations progressively decreased O_2 uptake: 11% with 10^{-3} M Na_2SeO_3 and 30% with 10^{-2} M. Carbon dioxide output was somewhat depressed at lower selenite concentrations. High concentrations gave marked stimulation averaging about 30% above the controls. Respiratory quotient values here averaged 1.26 in contrast to *ca* 0.9 for the controls. Roots at high selenite concentrations turned light yellow to brown during the experiments; those at the lower concentrations and the control roots remained white.

Oxygen uptake by submerged roots in equilibrium with N_2 containing traces of O_2 was decreased to less than 1% of the controls, regardless of the presence or absence of Na_2SeO_3. Similarly, the rate of CO_2 production by selenite-treated roots in equilibrium with N_2 plus traces of O_2 was of the same magnitude as in the absence of selenite, viz. 81 and 83% of the air controls. Fermentation/Respiration ratio values averaged 0.83 in the absence of, and 0.70 in the presence of selenite and indicated a definite Pasteur effect. The lower (+Se) value reflects the aerobic stimulation of CO_2 output by Na_2SeO_3.

Time-course studies demonstrated a gradual decrease in O_2 uptake and CO_2 output rates for both the control and the 10^{-4} M selenite-treated roots in equilibrium with air. Roots treated with 10^{-2} M selenite indicated

a modest immediate stimulation in O_2 uptake over the controls, followed by a steady decline to ca 50% of the initial value during the 3 hours of treatment. Carbon dioxide output rates of the controls and the 10^{-4} M Na_2SeO_3 treated roots also declined with time. In contrast, the 10^{-2} M selenite-treated roots showed a very strong immediate stimulation in CO_2 output reaching an average of 153% of the initial value. This was followed by a rapid decline which continued to the end of the experiment. Respiratory quotient values ranged from a normal of ca 0.90 to a maximum of 1.84 for the 10^{-2} M Na_2SeO_3 treated roots. This doubling of the R.Q. reflects both the stimulation in CO_2 output and the depression in O_2 uptake due to high concentrations of Na_2SeO_3.

Some Disappearing Plant Species. ARTHUR T. GUARD, Purdue University. —While in the very early history of the United States biologists were very much engaged in discovering new species of plants and animals, we may now be approaching an era in which the disappearance of species and conditions under which they disappear will hold the center of attention. Two species that seem excellent subjects for this type of study are *Franklinia alatamaha* Marsh. and *Elliottia racemosa* Muhl.

These two species were first observed by John and William Bartram during their travels through Georgia about the year 1775. *Franklinia alatamaha* was discovered by these two botanists in the region of Fort Barrington, Georgia. It is no longer extant in nature, but has been preserved as a cultivated ornamental. The other species, *Elliottia racemosa,* is still present, but it is found in only seven very limited areas in Georgia. Attempts to bring it into cultivation have been almost completely unsuccessful.

In view of the fact that other sympatric species observed by the Bartrams in this area are still abundant, the question arises as to why these two species have been almost completely unsuccessful.

Weather and Corn Diseases in Indiana in 1968. A. J. ULLSTRUP, Purdue University.—Common corn smut caused by *Ustilago maydis* (D. C.) Cda. was more prevalent in 1968 than in any of the past 30 years. In June, 6-week-old seedlings showed large galls beneath, or at, the soil line. Such early symptoms haven't been reported in Indiana prior to this year. Corn planted in late May and early June after excessive rain in May showed neither the seedling galls nor the high prevalence of smut infection on adult plants. The unusually cold weather in May which slowed corn growth and thus held the meristematic tissues in a vulnerable state for a protracted period is believed responsible for the increased incidence of smut.

Crazy top, a disease characterized by a condition of phyllody in the tassel as well as other bizarre symptoms, was also unusually prevalent in Indiana this year. Corn planted in late April and early May was, in many areas, subjected to heavy rains with consequent waterlogging of the soil. This condition is requisite for infection of corn by the causal agent *Sclerophthora macrospora* (Sacc.) Thirum., Shaw, & Naras. Corn planted in late May and early June didn't show evidence of this disease.

Buggy-whip or onion leaf is a non-infectious malformation apparently caused by excessive absorption of 2, 4-D. This condition, while observed in isolated instances almost every year, was widespread in much of the northern half of Indiana. In some fields the incidence reach 90%. The malformation is identified by the envelopment of upper portions of the plant in a tapering tube which often prevents tassel emergence. The predisposing conditions leading to this condition in corn are not fully understood, but the low temperatures in May are suspected. Corn showing this injury from over-absorption of 2, 4-D often had a high incidence of smut infection.

Induced Resistance of *Phaseolus vulgaris* to Bean Anthracnose. J. E. RAHE and J. KUC', Purdue University.—Etiolated hypocotyls of *Phaseolus vulgaris* respond hypersensitively to *Helminthosporium carbonum* or *Alternaria* sp. within 24 hr. after inoculation. A similar response occurs at 60-72 hr. after inoculation with a non-pathogenic race of *Colletotrichum lindemuthianum*, the causal agent of bean anthracnose. Necrotic lesions develop 72-96 hr. after inoculation of bean hypocotyls with a pathogenic race of *C. lindemuthianum*. Induction of hypersensitivity in bean hypocotyls by inoculation with *H. carbonum*, *Alternaria* sp., or a non-pathogenic race of *C. lindemuthianum* predisposes the inoculated tissues to resistance to a pathogenic race of *C. lindemuthianum*.

Extracts of phenolics of hypocotyls inoculated with *H. carbonum*, *Alternaria* sp., or a non-pathogenic race of *C. lindemuthianum* are inhibitory to both pathogenic and non-pathogenic races of anthracnose. This inhibitory property appears 6-24 hr. following inoculation with *H. carbonum* or *Alternaria* sp., and 6-24 hr. and again at 72-120 hr. after inoculation with a non-pathogenic but not a pathogenic race of *C. lindemuthianum*. The production of inhibitory concentrations of phenolic materials in response to infection by non-pathogenic races of *C. lindemuthianum* is suggested to account for the varietal resistance of bean plants to anthracnose.

Lobelias of Franklin Co. and Indiana. LLOYD and ADELE BEESLEY, Cedar Grove, Ind.—In the Flora of Indiana, Chas. Deam states that there are six species of *Lobelia*. In searching for Franklin County's and Indiana's wild Flowers, we have found all six species: *Lobelia cardinalis*, *L. siphilitica*, *L. puberula*, *L. kalmii*, *L. inflata* and *L. spicata*. However, we have not found the white flowered form of *Lobelia cardinalis f. alba* which, according to Deam, has been reported from the Dunes by Peattie. Neither do we have all four well defined phases of *L. spicata*.

Daily Variation in Chlorophyll Content of Corn Seedlings. KAREN KAY CURTIS and DAVID E. SMITH, Indiana State University.—Two groups of corn seedlings were grown for fourteen days under either normal day-night conditions of a greenhouse or a sixteen hours light-eight hours dark cycle in a growth chamber. The chlorophyll a and b concentrations of the first true foliage leaf were determined daily. Determination was based on the specific absorption coefficients of chlorophyll a and b in 80% (v/v) acetone. Although there was a difference in the degree of

variation of the chlorophyll concentration of the plants grown under the two conditions, there was a striking similarity in the overall daily variation of both chlorophyll a and b. The range of variation of total chlorophyll content was from a minimum of 1.0 mg. of chlorophyll/ml. to a maximum of 1.8 mg. of chlorophyll/ml. Plotting either the daily variations of chlorophyll a and b or total chlorophyll content resulted in graphs with maxima at 4, 8, and 12 days and minima at 3, 6, and 10 days. The minima were shown to be significantly related statistically to the number of leaves unfurled at the 1% level.

Other papers read

The Origins of the Cultivated Peppers (*Capsicum* spp). CHARLES HEISER, Indiana University (by invitation).