

BOTANY

Chairman: S. N. POSTLETHWAIT, Purdue University

T. R. MERTENS, Ball State University, was elected chairman for 1968

ABSTRACTS

Breeding Behavior and Vigor in Nullisomic and Monosomic *Avena sativa* L. FRED L. PATTERSON, Purdue University.—A naturally occurring nullisomic, discovered in Clintland 60 oats, is low in vigor and is male sterile in some environments but partially fertile in others. Seed set from selfing in glassine or cloth bags in the field at Lafayette, Indiana, ranged from 1.3% to 16.7% and averaged 9.6% for 4 years. Natural crossing ranged from 9.9% to 11.7% and averaged 11.0% for 4 years. Percent seed set in crosses in glassine or cloth bags was similar to that from natural crossing.

Monosomic plants appeared fully fertile under most conditions. Megaspores with 20 or 21 chromosomes were found in about a 3:1 ratio. Pollen grains with 20- or 21-chromosome gametes appeared equally competitive. The univalent chromosome is one with a submedian centromere.

The monosomic plants are nearly normal in phenotype but are not as productive as disomic plants under stress. In one year monosomic Clintland 60 was equal to Clintland 60 in yield and F_1 hybrid monosomics in five crosses were similar to the better disomic parent. Yields of F_1 hybrid monosomics have been observed in 2 drouth years in 10 crosses. The F_1 hybrid monosomics averaged only about 69% of the disomic parent mean in 1966 and 61% in 1967.

An Unusual Isolate of *Erysiphe graminis* f. sp. *tritici*. M. S. GHEMAWAT and JOHN F. SCHAFER, Purdue University.—A monoconidial isolate of *Erysiphe graminis* DC. f. sp. *tritici* Em. Marchal was obtained from greenhouse plants at Lafayette, Indiana, to provide a pure culture for experimental use. The German differential varieties used by Nover and other wheat varieties were inoculated. Carsten V, a universal susceptible check in the German differential set, proved resistant. It showed reaction types 0-1 with extensive chlorosis and necrosis. Rarely, pustules of reaction type 3 developed with little chlorosis and necrosis. Hence, this isolate is different from any reported on the German differential set. It differs in virulence on at least one other variety from any of the races reported by Leijerstam or Wolfe, and is designated race 50. Salzmünde and Hope selection were susceptible, and all other varieties of the German set were resistant.

This isolate appears important in breeding for powdery mildew resistance. It represents new virulence in that under some conditions it attacks seedlings of Purdue 5752C1-7-5-1, a derivative of *Triticum timopheevi*, previously completely resistant. With certain conditions, the response reached reaction type 4 with severity percentage up to 70.

Flag leaves of mature plants maintained their resistance in contrast to the seedlings. Seedlings of Suwon 92 C.I. 12666, another important resistance source, also proved susceptible.

A Noninfectious Lethal Leaf Spot in Maize. A. J. ULLSTRIP and A. FORREST TROYER, Purdue University and the Pioneer Corn Company, Mankato, Minnesota.—A necrotic leaf spot was observed in an F_2 population involving two proprietary Inbred Lines AEIHF6 and B4AMI. The necrosis was not observed in either of these inbred lines and it is presumed that the mutation was present, but in recessive condition, in one of the two plants used in making the original cross. The mutation may also have occurred in the F_1 .

Leaf lesions resemble those incited by Race 1 of *Helminthosporium carbonum*. It was not possible to isolate a pathogen or to demonstrate the presence of one in the affected tissues. Leaf lesions were first observed in seedlings about 3 weeks after emergence at a temperature of 20-25° C. The lesions rapidly enlarged from minute chlorotic flecks to necrotic areas 1 x 2.5 cm. in size. Leaves of affected plants become completely necrotic and the latter died at flowering or soon thereafter. Necrosis progressed from the older to younger tissue. Benzimidazole (40 ppm.) had no effect in delaying onset of necrosis or preventing it when the solution was fed to intact plants or to detached leaves. Ratios of affected to normal plants in F_2 and backcross progenies indicate that a single recessive gene controls inheritance of the necrosis.

Sexual Differentiation of the Lateral Buds of *Zea mays*. H. MURRAY and S. N. POSTLETHWAIT, Purdue University.—Lateral buds of maize can be induced to sprout if de-leaved stems are caused to undergo a geotropic curvature. This provides a new method for studying tassel and ear development.

All leaves were carefully removed from 2-3 month old *Zea mays* plants growing in pots in a greenhouse. Lanolin was smeared over the injured areas to prevent excess drying. The pots were placed in a horizontal position on a laboratory shelf for 3 days during which time they underwent a geotropic curvature due to the elongation of intercalary meristem cells on the basal side of several internodes. Lateral buds in the bending areas often sprouted. No sprouting occurred in similar plants left upright, i.e., not undergoing geotropism. Plants were placed under fluorescent lights. When the lateral buds had grown at least 5 cm., they were excised along with 2 cm. of the main stem. Four explants (from 3 different plants) were rooted in moist vermiculite, then transferred to soil in a greenhouse where they were grown to maturity. The plants produced a normal number of internodes before differentiating a terminal sexual structure. Two plants produced an ear at the apex and two produced a structure consisting of half tassel (topmost) and half ear. Except for some husklike leaves on one of the "ear-plants," the plants were vegetatively indistinguishable from plants grown from seed. The plants were fertile. It appears that sex expression in maize is influenced by a gradient of forces which extend from the base to the apex and can be maintained over a period of extensive vegetative growth before being expressed.

The Adherent Tassel Mutant of Maize. DIANE M. SHULTES and S. N. POSTLETHWAIT, Purdue University.—The normal maize tassel expands at anthesis to the familiar, freely dissociated branches of the panicle. The adherent tassel mutant, in contrast, remains in a compact, club-shaped form throughout anthesis. This may be caused by a "sticky" substance secreted by the tassel and which appears to harden while the tassel is still within its sheath and binds the tassel branches into the characteristic phenotype of the mutant.

The mutant condition is visible at the seedlings stage of development. At this time the first leaves adhere at their tips causing the newly emerging leaf to bend over with its tip stuck to the leaf below. Closer examination in the region where the tips are fused reveals a thickening in the cell walls wherever there is contact between them. The thickened walls seem to be cemented together by a hardened substance secreted by the cells. Since the cell walls experiencing no contact with other cell walls appear normal, contact between the two leaves, namely, contact between two cell walls, may be a stimulus for the secretion of the cement holding the walls together.

From the seedling stage until the emergence of the tassel the mutant plant appears normal. Even as the tassel begins to develop, the adhering nature is not evident. Later, as the growing tassel presses upward between the enclosing leaf sheaths its parts are forced into contact and it is at this time that the adhering nature is first seen. The same thickening of adjacent cell walls in the area of contact is evident in the tassel as it is in the leaves of the seedling, and the same cement-like substance seems to be secreted by these thickened cell walls. The mechanism for adherence appears to be the same for both phenotypic expressions of the mutant.

The Milk-weed Pod Mutant of *Zea mays*. DAVID D. HUSBAND and S. N. POSTLETHWAIT, Purdue University.—The Milkweed Pod (*mw*) gene causes several abnormal traits to develop beginning about 4 weeks of age. The base of the sheaths may have an extra layer of tissue growing from the epidermis, forming a flap of tissue with its two lateral sides free, but attached to the true sheath at the middle. Vascular bundles in this flap of tissue are oriented with the xylem toward the adaxial side of the sheath. Bundles in the juncture of the flap and the sheath are transitionally oriented and sometimes amphicribal. Sometimes the free lateral sides of this extra flap of tissue will continue to grow, curling inside itself and giving the appearance in cross-section of a fern crozier.

At the base of each leaf the intercalary meristem is much broader than in normal maize, producing two wide auricles. Some leaves have a light colored strip continuing distally from the intercalary meristem. Since these leaves often have folds and invaginations along these strips, it is possible that these cells continue some meristematic activity, and being surrounded by non-dividing cells, folds develop. The leaf blade also seems to be weak along these strips and tears often develop.

At the point at which the leaf blade departs from the stem there

is residual elongation in the stem, resulting in the node being extended above its normal position.

The ear is sharply tapered at each end and at maturity resembles a milkweed pod. The shucks also may exhibit the phenotypic expression of folds and invaginations as well as extra flaps of tissue.

There is often much pubescence associated with the various abnormal features. On the sheaths the pubescence has a sharp line of delination at the apex; just above this pubescence there may appear a growth of tissue resembling a ligule.

The tassel is normal in appearance.

The Use of Fluorescence in the Histopathology of Plant Tissues. HECTOR M. LEON-GALLEGOS, Purdue University.—Experiments were set up to examine the usefulness of a fluorescent dye (disodium salt of 4,4'-bis [4-anilino-6-bis (2-hydroxyethyl) amino-s-triazin-2-ylamino]-2-2'-stilbene-disulfonic acid) to detect fungi within maize tissues.

Fusarium moniliforme Sheldon and *Cephalosporium acremonium* Corda were used in these studies. For both fungi, 1% malt-extract proved to be a satisfactory medium for both sporulation and absorption of the dye. The concentration of the dye found most satisfactory was 0.2%. Hydrogen-ion concentrations in a range of pH 3 to 8 had no effect on absorption of the dye, but fluorescence was accentuated in hyphal tips and septa when cultures were incubated in darkness for 8 to 10 days at 26 ± 1 C. During spore germination, fluorescence was evident in the germ tubes and mycelium for two days. The fluorescence of spores used as inoculum enhanced their detection within the xylem vessels of the maize plants. This technique of tagging fungal structures with fluorescent dyes is useful in distinguishing and identifying fungi in the host tissues.

Cuticular Analysis of the Extinct Genus *Dryophyllum*. G. J. ANDERSON and D. L. DILCHER, Department of Botany, Indiana University.—The genus *Dryophyllum* is an abundant leaf form found in the Eocene clays of western Tennessee. *Dryophyllum* is the genus used to indicate relationship with the Fagaceae when no modern generic designation can be made. Two species of the seven proposed by E. W. Berry (1916, 1924, and 1930) are being studied in detail. An effort is being made in order to elucidate the true affinities of the possibly artificial genus *Dryophyllum* and to correctly speciate some members of this group. The fossils are found as leaf compressions and good cuticle and some mesophyll remains are still preserved. Gross morphological characters and leaf epidermal characters, evident in cuticular preparations, have been studied. The morphological characters proposed by Berry, especially venation, are consistent in discerning the two species studied from one another. However, many other gross morphological characters are quite similar between the two leaf types. Cuticular characters are also not totally partisan. Differences in and the lack of epidermal hairs seem to be a consistent speciating character. The stomatal apparatus has also been studied, but has yielded no conclusive discerning

evidence. Currently, comparisons are being made with extant members of the Fagaceae. Work supported in part by NSF GB-5166X.

NOTES

Wild Flowers of Indiana and Franklin County. LLOYD and ADELE BEESLEY, Cedar Grove, Indiana.—We have found and photographed in color over one hundred species of wild flowers not previously recorded in Franklin County and have around 500 species to date, including 9 of the 16 native genera of true orchids and 16 of the 39 species. We are also photographing the fleshy fungi, with quite a number to date.

The native orchids are: *Orchis spectabilis*, *Orchis spectabilis alba*, *Cypripedium reginae*, *Cypripedium candidum*, *Cypripedium parviflorum pubescens*, *Habenaria peramoena*, *Habenaria pycnodes*, *Pogonia ophioglossoides*, 3 species of *Spiranthes*, *Calopogon pulchellus*, *Corallorrhiza wisteriana*, *Liparis liliifolia* and *Aplectum hyemale*. However we are not finished with any of our studies.

Other papers read

Cell Differentiation in Volvox. RICHARD STARR, Indiana University (by invitation).