

## BOTANY

Chairman: S. N. POSTLETHWAIT, Purdue University  
JOSEPH HENNEN, Indiana State Teachers College, was elected  
chairman for 1961

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### ABSTRACTS

**The Use of Maize Mutants to Characterize Normal Development.**  
S. N. POSTLETHWAIT and O. E. NELSON, Purdue University.—The investigation of biosynthetic pathways in an organism by analyzing the effect of mutants on various steps in the synthetic sequence has been extremely valuable. A comparable approach to the study of morphogenesis seems plausible and shows promise of being equally rewarding. The many mutants of *Zea mays* provide quantities of material for such a study. Specific mutants which are currently being considered are: knotted (Kn), liguleless<sub>1</sub> (lg<sub>1</sub>), liguleless<sub>2</sub> (lg<sub>2</sub>), liguleless<sub>3</sub> (Lg<sub>3</sub>), ramosa<sub>1</sub> (ra<sub>1</sub>), ramosa<sub>2</sub> (ra<sub>2</sub>), polytypic (Pt), branched silkless (bd), vestigial glume (Vg), and tunicate (Tu).

**An Anatomical and Morphological Study of a Sidebranchless Tomato.**  
JEANETTE N. CLEMENTS and A. T. GUARD, Purdue University.—A mutant known as sidebranchless which differs in that axillary buds are not produced was compared with the normally branching Rutgers tomato. It was found that growth during the vegetative phase of both plants is monopodial. In the normal plant, axillary buds first appear at the fifth youngest node with all nodes eventually developing buds. No indication of axillary buds appears in the sidebranchless during this phase. The floral apex first appears as a flattened enlargement which has arisen as a direct continuation of the main axis. Axillary buds are present between the enlargement and the embryonic leaves in both strains. The uppermost bud develops apical characteristics and appears to continue the vegetative axis of the plant. Though the sidebranchless and the normal are similar in regard to this phase, further bud production in the sidebranchless appears only in association with the formation of inflorescences.

**Oxygen Production in Some Lakes in Northern Indiana.** WILLIAM R. EBERLY, Manchester College.—During the summer of 1960, oxygen production was measured in Myers Lake (Marshall Co.), Shock Lake (Kosciusko Co.), McLish Lake and Taylor Lake (both in Lagrange Co.) in northern Indiana. All of these lakes do now or have in the past been known to possess a plus-heterograde oxygen profile, having what is known as a metalimnetic oxygen maximum. The light-dark bottle method was used to measure oxygen production. Methods of calculating data that can be obtained with this method are discussed. The relationship of the rate of production to the oxygen maximum as well as the influence of such factors as light intensity, temperature, phytoplankton composition, etc., are discussed for each lake.

**Effects of Oxygen Level and of Certain Inhibitors on the Respiration of Maize and Rice Root Tips.** RAYMOND E. GIRTON, Purdue University.—Respiratory rates in submerged one-centimeter root-tip segments were uniform at 25°C over 2½ hour periods with  $Q_{O_2}$  and  $Q_{CO_2}$  values of the order of 6-8  $\mu$ l/hr/mg. dry weight for both maize and “lowland” rice. Respiratory quotient values for maize were typically lower ( $0.9 \pm$ ) than those for rice ( $1.0 \pm$ ). Reduction in oxygen level from 21% to 5% reduced oxygen absorption in maize 60% and in rice 30%. Corresponding values for carbon dioxide evolution were 22% for maize and 26% for rice which resulted, in 5% oxygen, in doubling the R.Q. for maize but no change in the corresponding R.Q. for rice. Raising the oxygen concentration to 100% depressed the R.Q. values, 4% for maize and 14% for rice, by increasing oxygen absorption more than carbon dioxide evolution, which for rice remained essentially unchanged. The transfer of maize root tips from nitrogen to air produced a transitory stimulation in carbon dioxide production of approximately 75% over the average initial rate in nitrogen. When root-tip segments respired in moist air rather than submerged in an aqueous solution, the  $Q_{O_2}$  values increased appreciably: 22% higher for maize and 25% higher for rice. Two respiratory inhibitors, “dieca” and 2,2 dipyridyl greatly curtailed oxygen absorption in air, an average inhibition of about 50% for both maize and rice resulted from a 1 hour pretreatment with 0.001 M dipyridyl. The dieca inhibition was less and ranged from 11% to 27%. The effects of the two inhibitors, when applied simultaneously, were not additive. The inhibitory effect of dipyridyl could be reduced approximately 40%, with maize, by a pretreatment with M/30 sodium citrate solution.

**Problems Related to the Giant Saguaro Cactus.** ROBERT W. HOSHAW<sup>1</sup>, University of Arizona.—The massive columnar saguaro, *Carnegiea gigantea* (Engelm.) Britt. and Rose, forms conspicuous forests in southern Arizona and northwestern Mexico. The decline of this cactus in certain areas has stimulated considerable botanical research recently in an attempt to collect fundamental information about the species. Studies to date have included experimental work by several investigators on the problems of seed germination, seedling establishment, disease control, chemical composition of the plant and a means of age determination. Thus far, these studies have shown that the seeds are light-sensitive, seedling establishment is difficult and in certain regions the bacterium, *Erwinia carnegieana*, is infecting much of the population. Major problems related to saguaro repopulation must be solved to maintain the present limited population in the United States.

**The Isolation and Identification of Soil Fungi and Their Relation to Root Rot of Apple.** ZOFIA MACIEJOWSKA and E. B. WILLIAMS, Purdue University.—In studies on damping off of apple seedlings preliminary investigations on the relationships between soil fungi from the root environment were made. Four media, V-8 juice, PDA, corn-meal-agar, Ohio medium (fortified with antibiotics and sodium propionate), and two soil

1. National Science Foundation Science Faculty Fellow at Indiana University during 1960-61.

dilutions ( $10^{-4}$  and  $10^{-5}$ ) were used in every replication. In 1 mg. of fresh soil from a total sample of 50g soil, isolates from 52 genera were found. The isolate of *Sporomium* differed from the commonly described characteristics for this genus by the occurrence of 32 spores in the mature ascus. These arise as the result of fragmentation of four-celled ascospores. Also, the unusual fruiting body of an unidentified fungus was observed. This structure consisted of open apothecium-like cup with a compact, cylindric mass of spores formed inside. The identification of *Isaria* was possible only when the organism was cultured in the presence of *Phytophthora cactorum*. This stimulated spore production by the isolate of *Isaria*. The antagonistic properties of fungi isolated from soil were tested *in vitro* against *Rhizoctonia solani*, *Pythium ultimum* and *Prytophthora cactorum*. Isolates of eight genera, *Espergillus*, *Memnoniella*, *Penicillium*, *Spicaria*, *Scopulariopsis*, *Thielavia*, and two unidentified fungi, were strongly antagonistic to one, two, or the three damping off organisms. Three species, *Spicaria violacea*, *Thielavia sp.* and *Scopularopsis sp.*, excreted water soluble toxic compounds. The compound excreted by *S. violacea* was separated by means of paper-column chromatography in sufficient quantity for identification. The location of the compound on the chromatograph was determined by placing sterile paper strips in Petri dishes. Liquid PDA was poured over these strips and inoculated with *P. cactorum*. Activity was expressed as inhibition of *P. cactorum*.

**Studies on the Biochemical Response of *Malus atrosanguinea* to the Apple Scab Pathogen, *Venturia inaequalis*.** R. L. NOVEROSKE and E. B. WILLIAMS, Purdue University.—An investigation of the biochemical nature of resistance in apple to *Venturia inaequalis* is currently underway. *Malus atrosanguinea* 804 is immune to all known races of *V. inaequalis*. Under greenhouse conditions symptoms on this selection are expressed as minute depressions or pits resulting from the death of several epidermal cells at the point of germ tube penetration. These microscopic symptoms are produced within forty-eight hours. This type of reaction is a specific response to *V. inaequalis*, and is not initiated by other pathogens, such as *Podospaera leucotricha*, or by mechanical injury. Water extracts from heavily inoculated leaves contain a toxin highly inhibitory to germination of *V. inaequalis* spores, whereas water extracts from uninoculated leaves are not inhibitory. Studies on the characterization of this toxin are being conducted. When apple shoots uniformly labeled with  $C^{14}$  are inoculated with spores of *V. inaequalis*, a tremendous increase in labeled compounds occurs at the site of penetration. The relationship of these compounds with resistance to scab has not yet been determined.

**Stolon Decay of *Mentha* spp. in Commercial Mint Plantings.** RALPH J. GREEN, JR., Purdue University.—Peppermint (*Mentha piperita* L.) and the spearmints (*M. Spicata* L. and *M. cardicca* Baker) are propagated from stolons dug in the spring from existing plantings. One of the limiting factors in the production of these crops is variability in the vigor and survival of stolons. The effects of unfavorable winter environment are apparent but little attention has been given to possible fungal deterioration of the stolons in the soil. Surveys of numerous commercial plantings showed that the stolons were subject to extensive deterioration from

lesions of apparent fungal origin. Isolations made from infected stolons showed that *Rhizoctonia* sp. was the most common isolate from these tissues. The incidence of stolon lesions was often so great that few, if any, were completely free from infection. The infected stolons deteriorate in the soil and this undoubtedly is one of the contributing factors in production of stocks for planting purposes.

**Further Observations on Apple Virus Diseases in Indiana.** GAYLORD I. MINK and J. R. SHAY, Purdue University.—Ten *Malus* species were tested for their value as sensitive indicators of viruses latent in apple: *M. baccata jackii*, *M. hupehensis* (241-37), *M. micromalus* (245-38), *M. platycarpa* PI203277, *M. prunifolia* (19651), *M. prunifolia microcarpa* (782-26), *M. prunifolia xanthocarpa* (591-25), *M. sargentii rosea*, *M. sieboldii* (2972-72) and *M. zumi calocarpa* (StR1T11). Young trees were inoculated at bud break in the greenhouse by inserting buds or bark tissue into the seedling portion of test immediately below the test bud. The virus isolates used were known to contain chlorotic leafspot, stem pitting, common apple mosaic, dwarf fruit and decline, apple green mottle and Spy 227 lethal viruses, or a combination of certain of these. Species showing most promise as indicators were *M. hupehensis*, *M. prunifolia*, *M. prunifolia microcarpa*, *M. sieboldii* and *M. zumi calocarpa*. Leaf reactions were obtained on these species from 2 to 4 weeks following inoculation. *M. prunifolia microcarpa*, although found to contain the CLSV as a latent, developed discrete line-pattern type leaf symptoms when inoculated with virus cultures believed to contain only the CLSV. In general leaf symptoms incited by virus isolates known to contain CLSV on *M. hupehensis*, *M. prunifolia*, and *M. sieboldii* resembled those of the chlorotic leafspot disease on RI2740-7A. However, exceptions were noted and these are being studied in further detail.

**The Biology of *Scolecotrichum graminis* Fekl. Causing Leafstreak of Orchardgrass.** GLENN W. COBB and JOHN TUITE, Purdue University.—Research on leafstreak of orchardgrass and timothy has been handicapped by the inability to obtain consistent infection in the greenhouse with pure cultures of *Scolecotrichum graminis* Fekl. This work is primarily an attempt to find ways of increasing inoculum and to obtain successful artificial infection. In addition, aspects of taxonomy, epidemiology, and control of the organism was investigated. To explore morphological variation in the species and to determine if morphological differences were related to reported physiological differences, 16 collections from orchardgrass and timothy were studied for spore length, width and the number of septations.

**Vegetation and Environment Along the Wabash and Tippecanoe Rivers.** ALTON A. LINDSEY, ROBERT O. PETTY, WILLARD VAN ASDALL and DAVID K. STERLING, Purdue University.—The flood plains studied for 4 years extend through 230 miles of latitude; the resulting climatic difference, the larger size and more fluctuating flow of the Wabash, and the coarser soil texture along the Tippecanoe determine the vegetational differences. Soil is the most uniform environmental factor in the study area. Observations on 629 vascular plant species were recorded on punch cards

for analysis. Aquatic plants are more important in the Tippecanoe, and ruderals more so along the Wabash. Allogenic factors predominated in early seral stages. Detailed phytosociological analyses of 56 flood plain forest stands were made by sampling methods and intensities yielding less than 15% standard error for the dominants. Tolerance to flooding was used in computing vegetational continuum index. The species curves for the various stands showed that the continuum concept applied well to our flood plain latitudinal and ecological gradient. On the Wabash the dominance ranges from bald cypress or post oak in the south to beech—black maple in the north. Cottonwood is much more important on the Wabash, and river birch on the Tippecanoe. Submerging experiments during the growing season showed that second-year silver, red, and Drummond maples were not even defoliated by 8 weeks of continuous complete submergence during the growing period. The duration-summation method revealed the influence of summer heat and winter cold on plant range limits. Climate influences range limits by competitively encumbering certain species relative to others. Field work extended the known range of 7 southern species.