INTRODUCTION

Interpretive Summary of Proceedings

These Proceedings present a wealth of information on virus and mycoplasmalike organismal (MLO) diseases of maize (*Zea mays* L.) worldwide. Subjects covered include: the viruses and MLO's; their vectors and hosts; symptomatology; identification, including serology; geographical distribution and economic importance of the diseases; and disease etiology, epidemiology, and control. These Proceedings report numerous significant findings from which we have selected those we believe to be of greatest interest. An interpretive summary of these findings and a discussion of some of their attendant issues are presented in the following. (For this introduction, author names not followed by year of publication refer to the manuscripts in these Proceedings.)

The importance of these findings, particularly as they relate to increased maize production, may be realized in light of projections by the U.S. Agency for International Development (USAID) on human population increase and the increases in agricultural output required to meet the needs of the world's rapidly expanding population (Smith). The importance of maize in meeting the future needs for food is expressed in Dr. Norman E. Borlaug's estimate that, "in the decades ahead, maize is destined to become the most important cereal crop and this crop will be the salvation of increasing millions of people by the year 2000" (Havener). It is estimated (Smith) that a modest reduction in crop losses due to virus diseases worldwide would result in a dramatic increase in maize output.

An important value realized from the Colloquium and Workshop and these Proceedings was that they have allowed us to share our findings through personal contact, to expand our understanding of maize virus diseases, to define the problems concerning these diseases, and to make arrangements for cooperative plans for future work to investigate these problems (Schertz).

Importance of Maize Dwarf Mosaic Worldwide

Unquestionably, the most widely distributed and important virus disease of maize is maize dwarf mosaic (Ammar, Autrey, Castillo, Conti, Exconde, Greber, Klinkong and Sutabutra, Kitajima and Costa, Lastra and Carballo, Lockhart and Elyamani, Sharma and Payak, Signoret, Teyssandier *et al.*, Tosic, Uyemoto, von Wechmar, Zhu *et al.*). In spite of this obvious importance and considerable research, beginning with the discovery of the virus in Italy in the late 1930's (Conti), our information is inadequate for resolving several fundamental issues. Among these are the relationships between the many isolates and strains of the maize dwarf mosaic virus (MDMV), including those of sugarcane mosaic virus (SCMV) to which MDMV is related. A tentative grouping of many of these strains and isolates (Tosic, Tosic and Ford), based on host preferences and symptomatology among selected sorghum [*Sorghum bicolor* (L.) Moench] genotypes, has been proposed in a preliminary study of these relationships (Tosic and Ford). The suitability of these groups needs to be tested by study of relationships based on other viral properties, particularly serology.

Another issue concerning these strains and isolates is the inconsistency or non-uniformity in their nomenclature. A synonomy is presented (Tosic) which promises to eliminate some of the confusion in the literature wherein different virus names have been used for the same virus. However, this nomenclatural problem would best be resolved by a consensus among researchers to use a standard, universally accepted nomenclature.

Important subjects of inquiry currently attracting considerable interest and research effort are the epidemiology (Knoke *et al.*, Madden *et al.*) and genetics of resistance (Scott) of maize dwarf mosaic. The extensive review (Knoke *et al.*) of information on MDMV aphid vectors provides fundamental information needed for understanding the vector's role in the epidemiology of the disease. This review also covers similar information relevant to the epidemiology of maize chlorotic dwarf, a disease which frequently is found juxtaposed to maize dwarf mosaic in the U.S.

Identity of Rhabdoviruses Infecting Maize Worldwide

The identities of the rhabdoviruses infecting maize worldwide (Autrey, Castillo, Greber, Kitajima and Costa, Jones, Lastra and Carballo, Lockhart and Elyamani, Sharma and Payak, Signoret) have not always been clearly resolved. Maize mosaic virus (MMV) is presumed to be the principal rhabdovirus of maize worldwide (Autrey, Castillo, Kitajima and Costa, Jones, Lastra and Carballo, Sharma and Payak). However, MMV is apparently limited in occurrence to tropical and subtropical regions where moisture is adequate for maize cultivation. Since MMV's host range is limited to maize and only a few other plant species, survival of the virus between seasons is very restricted, mainly limited to where maize is planted continuously.

Another factor restricting MMV's geographical distribution is its planthopper vector, *Peregrinus maidis* (Ashmead), which is also limited to the tropics and subtropics for year-round survival. Although *P. maidis* is migratory and is found in temperate climates during the growing season, it cannot survive freezing temperatures.

Occurrences of rhabdoviruses infecting maize other than in the tropics or subtropics (Gordon, *unpublished*; Signoret) suggest that viruses other than MMV are involved. Further, recently several rhabdoviruses found infecting maize in the subtropics have been shown to be distinct viruses unrelated to MMV (Greber, Lockhart and Elyamani). In some instances these distinct viruses have been extensively characterized and named as new viruses (Greber). In other cases characterizations have been insufficient to warrant new names (Lockhart and Elyamani, Signoret). In some cases, it is questionable whether rhabdoviruses of maize designated as MMV are correctly named (Gordon, *unpublished*).

Status of the Etiologies of Some Maize Virus Diseases

Several presumed virus-caused diseases have yet to have their etiologies demonstrated. Prominent among these are maize stripe (Gingery), maize mottle chlorotic stunt (Rossel and Thottappilly), and maize chlorotic dwarf (Gordon, Knoke, and Nault, *unpublished*). Resolution of the etiology of maize stripe seems close at hand and research on this subject has led to the description of a new group of plant viruses (Gingery). Likewise, the etiology of maize mottle chlorotic stunt seems virtually resolved (Rossel and Thottappilly). However, the etiology of maize chlorotic dwarf is unresolved and for some time has been an intractable problem (Gordon, Knoke, and Nault, *unpublished*), causing considerable consternation for maize breeders concerned with breeding resistance to the disease (Scott).

One reason for the consternation is that maize chlorotic dwarf virus (MCDV) infection is associated with two types of symptoms, a mild and a severe type. Corn breeders in breeding for resistance to the disease are faced with questions of whether both types are caused by MCDV and whether resistance should be bred to both types (Scott). Maize mottle chlorotic stunt shows a similar dual symptomology which clearly seems attributable to differences in genotype (Rossel and Thottappilly) and not in disease etiology as suggested for maize chlorotic dwarf (Scott). Resistance has been bred into maize to both the mild and severe symptoms of maize mottle chlorotic stunt (Rossel and Thottappilly).

Other less prominent diseases, presumably virus caused, have unresolved etiologies or virus identifications. These diseases are enumerated by several authors (Ammar, Autrey, Exconde, Johnston, Jones, Klinkong and Sutabutra, Lockhart and Elyamani, Louie *et al.*, Sharma and Payak, Signoret, von Wechmar).

Study of the etiology of maize stripe has involved identification of the morphology of maize stripe virus (MStpV), and these studies have provided conflicting evidence (Autrey, Gingery, Greber, Jones, Lastra and Carballo). However, it now seems apparent that MStpV has a slender filamentous particle unique among viruses except for rice stripe virus (Gingery), rice grassy stunt virus (H. Hibino, *personal communication*), and rice hoja blanca virus (Morales and Niessen, 1983). A puzzling aspect of maize stripe is its dramatic increase in importance very recently in Venezuela, displacing maize mosaic as the most important maize virus disease (Lastra and Carballo). In fact, maize mosaic has virtually disappeared from areas of Venezuela where only recently it was the most prevalent maize disease. This apparent displacement of maize mosaic by maize stripe is unexplained.

In an unusual turn of events regarding the etiology of a maize virus disease, maize wallaby ear disease, frequently believed to be caused by a virus and even "demonstrated" as such in the literature, has been shown to be incited by the feeding of *Cicadulina* leafhoppers (Greber). No virus has been implicated in the disease. Maize leaf gall in the Philippines, a disease which has gradually increased in importance over many decades, resembles maize wallaby ear disease (Exconde) and to a lesser degree maize rough dwarf. The agent of maize leaf gall is transmitted by a Deltocephaline leafhopper, a species of *Cicadulina* associated with maize wallaby ear disease, whereas maize rough dwarf virus (MRDV) is transmitted by Delphacid planthoppers.

In light of the findings for maize wallaby ear disease, it seems possible that maize leaf gall might be incited by leafhopper feeding, especially since a *Cicadulina* sp. is involved in this disease. Possibly the same or different pathogens have gone undetected in both leaf gall and wallaby ear disease. Diseases resembling maize wallaby ear also have been reported from Egypt (Ammar) and India (Sharma and Payak). For Egypt the occurrence of maize rough dwarf seems more likely than wallaby ear disease, since MRDV occurs in other Mediterranean countries (Conti) and MRDV vectors occur in Egypt (Ammar). However, the *Cicadulina* sp. which induces wallaby ear disease also occurs in Egypt (Ammar), keeping open the possibility that maize wallaby ear is present.

New Maize Virus Diseases

Several authors have reported the occurrence of unidentified virus or viruslike diseases which may be manifestations of diseases known elsewhere or of diseases not previously described. One virus very recently described is maize subtle mosaic virus (MSMV) (Louie *et al.*). The virus is transmitted mechanically and through the soil and has a flexuous rod particle of indeterminant length. Serologically the virus reacts with MDMV-A antiserum in some assays but not others (Louie *et al.*), leaving the question of its relationship to MDMV unresolved. For the moment, MSMV appears to differ enough from all known strains of MDMV and other maize viruses to be considered a distinct virus. So far it has been found only in the U.S.

Another new maize virus, as yet unnamed, occurs in Thailand (Klinkong and Sutabutra). It has an isometric particle (27 nm in diam), is mechanically transmitted, and causes mosaic and severe stunting. A unique feature of this virus among maize viruses is that it reacts strongly with antisera to rose mosaic and prunus necrotic ringspot viruses. It also reacts serologically, but less strongly, with MCMV antiserum, and not at all with antisera to brome mosaic virus (BMV) and several other Gramineae-infecting viruses with isometric particles. What may be a similar virus has been reported from South Africa (von Wechmar). This latter virus has an isometric particle, is seed-transmitted, and also does not react with BMV antiserum.

Several authors in studies of infected maize from Africa have reported isometric, viruslike particles (40-45 nm in diam) from infected tissue (Ammar, Autrey, Jones, Rossel and Thottappilly). One such study involved maize mottle chlorotic stunt virus (MMCSV) which is transmitted by *Cicadulina triangula* Storey. While the mottle phase of the disease, as seen in African adapted maize, is not a new disease, the severe phase (chlorotic stunt), seen in exotic maize genotypes, is new. This disease may also occur in Zimbabwe (Johnston) and other East African countries (Rossel, *personal communication*) and in Nigeria (Rossel and Thottappilly).

Other reports of 40-45 nm diam isometric particles relate to MStpV and/or maize line virus (MLV) as originally described by Kulkarni (Ammar, Autrey, Jones) or a recently named disease, maize chlorotic stripe (Autrey). However, more recent tests show the latter to be a manifestation of maize stripe (Autrey, Gingery, and Jones, *personal communication*). Since MStpV has been shown to be associated with a filamentous rather than an isometric particle (Gingery) and MLV with MMV, a rhabdovirus (Autrey), these isometric particles may be of a new virus distinct from others characterized from Africa. This virus is possibly transmitted by *P. maidis* or a related Delphacid species (Ammar, Autrey). However, at this time the identity of this (or these) isometric particle(s) is unknown and this uncertainty causes some confusion.

Virus Diseases of Recent Increased Importance

Since the 1976 International Maize Virus Disease Colloquium and Workshop, several maize virus and MLO diseases have expanded geographically and achieved greater importance. Mention has already been made of the dramatic increase in incidence of maize stripe with a corresponding decrease in maize mosaic in Venezuela (Lastra and Carballo).

Maize chlorotic mottle virus at the time of the 1976 Colloquium and Workshop was known only in Peru where it caused significant crop loss in maize (Castillo). Since then it has become a major maize virus in two U.S. states (Eberhart, Uyemoto) and has been reported from Argentina (Teyssandier *et al.*) and Mexico (Gordon, *unpublished*). A serologically related virus has been reported from Thailand (Klinkong and Sutabutra). In the U.S., it has been associated principally with strain B of MDMV in synergistic interactions causing the corn lethal necrosis disease (Uyemoto), a major concern to commercial maize breeders (Eberhart) and growers.

The recent demonstration of MRDV in Argentina (Teyssandier *et al.*) and the report of its occurrence in China (Conti; J. H. Tsai, *personal communication*) is evidence of its recent increased importance as a maize pathogen worldwide. In Argentina MRDV has become the most damaging maize virus (Teyssandier *et al.*) and in Italy it has recently become again an important pathogen due to changes in maize cultural practices (Conti).

Maize white line mosaic virus (MWLMV) is another virus which has increased in importance on maize since 1976. In 1976 it was known only from France where it was called "Nanisme et anneaux foliaires du Mais" (maize dwarf ringspot) (Signoret). Since then it has been detected in maize during one season (1978) in Italy (Conti) and in the U.S. every year since 1979 (Louie *et al.*). For the U.S., MWLMV has been reported from eight northeastern and north central states where in some it has notably decreased yields. MWLMV is the only non-mechanically transmitted maize virus which is soil-borne and for which no vector has been demonstrated (Louie *et al.*). The lack of a known vector and the inability mechanically to transmit MWLMV have prevented demonstration of Koch's postulates for the virus (Louie *et al.*).

Barley yellow dwarf virus (BYDV) is another virus which has increased in prominence among maize-infecting viruses in recent years. It has been reported from maize in France (Signoret), Italy (Conti), Morocco (Lockhart and Elyamani), and the U.S. (Gordon, *unpublished*). In the epidemiology of BYDV, maize may serve principally as an alternate host between seasons during which susceptible grains [barley (*Hordeum vulgare* L.), oats (*Avena sativa* L.), and wheat (*Triticum aestivum* L.)] are cultivated, rather than as an economic host in which BYDV causes major crop loss.

The corn stunt spiroplasma (CSS) is yet another maize pathogen that has been found occurring in new areas since 1976, having been recently identified in the U.S. states of California and Florida (Davis, *personal communication*; Davis and Lee). Previously it had been identified only in Texas, Louisiana, and possibly Mississippi. Although there had been numerous references to corn stunt occurring in many southern U.S. states, most reports lacked proof that CSS was involved (Gordon and Nault, 1977). The original claim that the spiroplasma isolated from maize with a corn stuntlike disease in California was not CSS has apparently been successfully challenged (Davis and Lee). CSS appears to have been the most likely pathogen for disease occurrences in 1981 and 1982 (Davis and Lee). Thus, CSS still appears to be the only spiroplasma infecting maize in nature.

Although of minor importance, both BMV and barley stripe mosaic virus (BSMV) were reported to have been identified recently naturally infecting maize in South Africa (von Wechmar). Natural infection of maize by BSMV has not been reported previously, although maize is a well-known experimental host of the virus. Another noteworthy finding was that BMV was transmitted by aphids (von Wechmar); aphids were previously unknown as vectors of the virus.

Maize Streak Virus

The importance of maize streak, well known in subsahara Africa for many years, is attested by the number of participants presenting findings relating to the disease or to maize streak virus (MSV) (Ammar, Autrey, Johnston, Ndegwa, Rossel and Thottappilly, von Wechmar, von Wechmar and Milne). Among the noteworthy reports was the description of a new method of MSV purification which yielded a four-fold increase in purified virions (von Wechmar and Milne). This improvement in yield may be important to researchers interested in MSV as a geminivirus and as a potential eucaryotic cloning vector. Noteworthy for epidemiological studies was the detection of MSV in single leafhopper vectors by the enzyme-linked immunosorbent assay (ELISA) (von Wechmar and Milne).

Vectors of Maize Viruses and MLO's

The number of vector species of the principal maize viruses and MLO's is relatively small and various authors in these Proceedings present findings for most of them. These vectors and the viruses or MLO's they transmit are: *P. maidis*, vector of MMV and MStpV (Nault); *Dalbulus* spp., vectors of maize rayado fino virus (MRFV), CSS, and maize bushy stunt mycoplasma (MBSM) (Gámez, Nault); *Cicadulina* spp., vectors of MSV, CSS (experimental), and MMCSV (Markham and Alivizatos, Rossel and Thottappilly); *Graminella nigrifrons* (Forbes), vector of MCDV (Knoke *et al.*); *Rhopalosiphum* spp. plus numerous other aphid species, vectors of MDMV (Knoke *et al.*); *Laodelphax striatellus* (Fallen), vector of MRDV (Conti); and *Diabrotica* spp., vectors of MCMV (Krysan and Branson, Uyemoto). Particularly noteworthy is the report of the experimental transmission of CSS by *Cicadulina mbila* (Naude), the African corn leafhopper, as well as two other leafhopper species also found on continents of the Eastern Hemisphere (Markham and Alivizatos) where CSS is not known to occur. Since CSS susceptible hosts occur in moist tropics and subtropics of the Eastern Hemisphere, these findings suggest that CSS could become disseminated in these areas if introduced.

Epidemiology of Maize Virus Diseases

The epidemiologies of MRFV (Gámez), MCMV (Uyemoto), and MDMV (Knoke *et al.*, Madden *et al.*) represent three contrasting types differentiated primarily by means of virus survival between maize crops, vector life cycles, and virus-vector relationships. Among these, only that of MRFV appears sufficiently understood to account for known disease occurrences within fields and over broad geographical regions. However, a complete statistical analysis of these epidemiologies (*e.g.*, as initiated by Madden *et al.*) needs to be done for each of them and for other major maize virus diseases in order for us to have a precise understanding of each epidemiology and to be able to predict the intensity of disease occurrence (*e.g.*, as in Madden *et al.*). Earlier, the epidemiology of maize rough dwarf had been extensively studied (Conti) and this information has permitted insight into how changes in maize cultural practices in Italy have brought about a recent resurgence of the disease in the Piedmont region (Conti).

The close relatives of maize, the teosintes and gamagrasses (*Tripsacum* spp.), play a vital role in the epidemiology of several maize virus and MLO diseases in the tropics and subtropics of the Western Hemisphere (Doebley, Nault). Specifically, these relatives serve as hosts for these pathogens and/or their vectors.

Among the important alternate hosts of maize viruses, johnsongrass [*Sorghum halepense* (L.) Pers.], host of MDMV and MCDV (Knoke *et al.*), and itchgrass (*Rottboellia exaltata* L.), host of MMV and MStpV (Autrey, Nault), are particularly significant weed grass species. Recently, downy chess (*Bromus tectorum* L.) has been implicated as an overwintering host of the B strain of MDMV in the Great Plains of the U.S. (Uyemoto) and in northwestern China (Zhu *et al.*). These reports provide an answer to the long-standing question of how MDMV-B survives between seasons to become the source of the virus for primary infections of maize.

In the previous section on virus diseases of recent increased importance, mention was made of several pathogens (MCMV, MRDV, MWLMV, and CSS) which had recently expanded geographically beyond natural geographical and geophysical barriers. The means by which these pathogens achieved these expansions are unknown. However, potential means include transmission of virus through seed (Damsteegt) or by means of vectors carried beyond these barriers (Damsteegt, Nault). MDMV (Tosic), already widely distributed as previously noted in the section on its importance, and possibly MWLMV (Louie *et al.*) are seed transmitted. Most of the leafhopper and planthopper transmitted viruses and MLO's are persistent in their vectors and if the latter were transported by man, the pathogen could be introduced into new geographical regions.

Soil transmission as demonstrated for MCMV (Uyemoto), MWLMV (Louie *et al.*), and MSMV (Louie *et al.*) may provide another way to transverse the barriers (Damsteegt). Infected tissue of MCMV, an unusually stable virus which is transmissible by vector beetles from debris, could be a means of dissemination for this virus. Speculations (Nault) on the means of dissemination of MMV and MStpV between continents provide detailed accounts of how these pathogens might have become distributed worldwide in the past.

Control of Maize Virus Diseases

Recommendations on control of maize virus and MLO diseases have emphasized planting of resistant genotypes (All, Eberhart, Havener, Scott). The efficacy of other control strategies has been demonstrated for MDMV and MCDV (All) and for MCMV (Uyemoto). For the control of MDMV and MCDV, an integrated pest management concept has been employed (All). While control of maize dwarf mosaic and maize chlorotic dwarf have been achieved by an integrated program of six or seven measures, economic realities have limited control practices recommended to growers to use of resistant hybrids and early planting (All). For MCMV, crop rotation is the recommended practice (Uyemoto).

Maize Improvement and Breeding for Resistance

Maize breeding for virus disease resistance has been done against a background of considerable effort to improve maize production through breeding programs involving many agronomic and insect-resistance factors (Duvick). These efforts have met with considerable demonstrable progress (Duvick). Breeding programs for resistance to maize viruses and MLO's highlighted in these Proceedings have been for resistance to MDMV (Eberhart, Scott), MCDV (Eberhart, Findley, Scott), and MCMV (Eberhart) in the U.S.; for CSS in the developing countries of the Western Hemisphere through the CIMMYT program (Havener); and for MSV and MMCSV in the developing countries of Africa through CIMMYT and IITA programs (Havener, Rossel and Thottappilly). National programs in developing countries are also contributing to resistance breeding as described for the programs in Kenya on MSV resistance (Ndegwa).

Current breeding programs have utilized only a relatively small portion of the genetic variability which exists in maize (Goodman). This is true even of CIMMYT's program which has a relatively broad genetic base (Havener). Further, the genetic diversity in teosinte has been utilized very sparingly in maize genotype improvement (Doebley). Currently, contrary to this trend, MCDV resistance genes from *Zea diploperennis* Iltis, Doebley and Guzman are being incorporated into maize genotypes for improvement of resistance (Findley *et al.*). Further potential sources of MDMV resistance, so far not utilized worldwide, are the old Australian genotypes which are highly resistant or immune to isolates of MDMV strain A in that country (Greber).

Cooperative Work on Various Aspects of Maize Virus and MLO Diseases

Work on maize genotype improvement within the developing countries by CIMMYT (Havener) and IITA (Rossel and Thottappilly) and within the U.S. between government and company scientists (Eberhart, Scott) are prime examples of cooperative efforts which have been highly successful in providing resistant genotypes to maize growers. Another example of international cooperation to deal with maize virus diseases involves virus identifications by scientists in developed countries working cooperatively with scientists in the developing countries (Castillo, Jones). The work in Peru (Castillo) is particularly noteworthy in that through this cooperation the major virus and MLO pathogens of maize were identified in a relatively short time (less than 1 year), whereas such identifications generally take considerably more time (many years) when cooperation is not pursued.

Serological techniques have been particularly important in identifying these pathogens (Castillo, Jones). The presentation of a variety of serological methods useful for making these identifications (von Wechmar *et al.*) should serve workers lacking experience with such techniques in attempting to use them for pathogen identification. Antisera have been prepared to most of the maize viruses and to CSS, but supplies are restricted and allow for only limited testing (Gordon, *unpublished*).

International Working Group on Maize Virus Diseases

To further communication and cooperation among scientists working on maize virus diseases, an International Working Group on Maize Virus Diseases (IWGMVD) was established at the 1982 International Maize Virus Disease Colloquium and Workshop. Membership was extended to those active in maize virus disease research and scientists with international responsibilities for maize and its diseases.

Functions of the IWGMVD are: 1) to publish an annual newsletter; 2) to publish proceedings of international meetings of the group, such as the 1982 Colloquium and Workshop; 3) to foster cooperative projects, to provide assistance to scientists in developing research projects, and to provide assistance to scientists in developing countries for dealing with maize virus diseases; 4) to assist in the publication of "A List of References: Maize Virus and Mycoplasma Diseases," published under the auspices of The Ohio State University (OSU), Ohio Agricultural Research and Development Center (OARDC); 5) to schedule and hold meetings of the group at regular intervals; and 6) to make available the education, training, and research opportunities workers need to realize research duties and interests and to gain professional development.

To provide leadership to this group, a six-member executive committee was elected by the participants at the Colloquium and Workshop. The members of the executive committee are: Drs. D. T. Gordon (USA), chairperson; R. Gámez (Costa Rica), vice chairperson; L. R. Nault (USA), secretary; and M. Conti (Italy), R. S. Greber (Australia), and H. W. Rossel (Nigeria-IITA), advisory committee. In addition, Dr. L. J. C. Autrey (Mauritius) was appointed editor of the group's newsletter.

At a meeting of the executive committee, four subject matter committees were formed and chairpersons were designated to deal with issues related to: 1) maize virus nomenclature, Dr. L. J. C. Autrey, chairperson; 2) maize virus detection, identification, and relationships, Dr. E. W. Kitajima (Brazil), chairperson; 3) maize virus vectors and epidemiology, Dr. L. R. Nault, chairperson; and 4) maize virus disease crop loss and resistance (chairperson to be appointed). Membership of these committees has been designated.

The Maize Virus Information Service

As mentioned in the preceding section, the OSU-OARDC Maize Virus Information Service (MAVIS) publishes annually a bibliography entitled "A List of References: Maize Virus and Mycoplasma Diseases." The publication contains a list of pertinent articles, a key word index, and an author list. The present policy on annual distribution of the publication is that it is free to any scientist, institution, or library requesting it. For assembling this list of references, R. M. Ritter, the editor of the publication, reviews 59 research and 5 abstracting journals for relevant articles. He prepares the key word list from original articles or, if not available, from abstracts of the articles. The quality of the publication and especially the key word list depends on the authors of relevant publications supplying copies to the editor. Authors are encouraged to send relevant articles which are not in the MAVIS collection.

ACKNOWLEDGMENTS

The success of the second International Maize Virus Disease Colloquium and Workshop was due to the efforts of many people and the financial support of several organizations and institutions. The editors wish to acknowledge those individuals and the organizations and institutions which contributed to this success.

First, we thank the participants for their splendid cooperation and their notable scholarly contributions as evidenced by their papers in these Proceedings. Second, we acknowledge The Ohio State University, Ohio Agricultural Research and Development Center, as the host institution and in particular Dr. Charles Johnston, the institution's liaison person. We also acknowledge the Agricultural Research Service of the U.S. Department of Agriculture for the contributions of its scientists, Drs. W. R. Findley, R. E. Gingery, and R. Louie, in planning and implementing plans for the Colloquium and Workshop.

We are especially grateful to the U.S. Agency for International Development (USAID) for its financial support of the Colloquium and Workshop and for the publication of these Proceedings. In particular, we thank Dr. Mark A. Smith, USAID, for making arrangements for these funds. We are also grateful to the following companies for their financial contributions in support of the Colloquium and Workshop: Pioneer Hi-Bred International, Inc.; Monsanto Agricultural Products Co.; Funk Seeds International; Ciba-Geigy Corp.; and The Upjohn Co.

We also thank the following individuals for serving as chairpersons of Colloquium sessions: Drs. Charles Johnston, Rodrigo Gámez, R. E. Ford, L. E. Williams, George Thottappilly, and J. H. Tsai. We also thank the following individuals for their assistance during the Colloquium and Workshop: N. H. Gordon, Susan Heady, Keenan Keller, Jeff LaFever, Brenda Ogden, Amy Rubink, Annie Stofer, Bill Styer, Gary Szatmari-Goodman, and Bruce Triplehorn. We also thank Lois Zimmer, Maxine Johnson, and Jo Hershberger for typing the manuscripts of the Proceedings. We especially thank E. H. Roche for his considerable assistance in preparing the manuscripts for publication.

Finally, for the workshop sessions, we acknowledge the following companies for equipment loaned for demonstrating various procedures: The Microscope Company, Inc., New Castle, PA 16105; Bio-Tek Instruments, Inc., Burlington, VT 05401; and Dynatech Laboratories, Inc., Alexandria, VA 23314.

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