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ABSTRACTS

ASSESSMENT OF THE 1986 WINTER WHEAT SCAB EPIDEMIC IN NEW YORK.
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E. Harman, and C. Saminy. Departments of Plant Pathology,
Agronomy, and Horticultural Science (NYAES), Cornell
University, Ithaca, NY 14853.

An epidemic of scab, incited primarily by Fusarium
graminearum, caused yield reductions estimated conservatively
at 10% of the 1986 New York soft white winter wheat crop.
Premature spikelet senescence averaged 5% of spike area with
maximum severity of 25% in 32 fields inspected at soft dough
stage. None of five fungicides applied at late boot stage
gave significant scab control. Deoxynivalenol (DON) at levels
up to 15 ppm was detected in a few random grain samples; the
extent of DON contamination is unknown. An emergency
reduction in germination requirements for certified seed was
enacted because many seedlots had reduced germination due to
Fusarium infection. Several fungicides applied to 1986 scabby
seed resulted in significant increases over nontreated seed in
stand and yield in 1987.

IMPACT OF IPM ON APPLE DISEASE MANAGEMENT. L.P. Berkett,
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Burlington, VT 05405

A random survey of Vermont apple growers was conducted in 1986
to: (1) gain information on current pest management practices;
(2) determine whether these practices have changed since the
introduction of IPM programs; and (3) evaluate the impact of
IPM on apple pest management practices. Sixty-one orchards
were surveyed representing 15% of ha or 83% of the total hectares
planted to apples in the State. Ninety percent of those sur-
veyed said that they practiced IPM. Respondents rated apple
scab, caused by Venturia inaequalis (Cke.) Wint., as the most
important pest problem. Eighty-three percent of IPM users
collect weather data to determine apple scab infection periods.
Forty-one percent of IPM users have seen a decrease in the use
of fungicides while 60% reported improved timing of applica-
tions since their involvement in IPM.

Genetic diversity among double-stranded RNA (dsRNA) sequences
found in isolates from 5 anastomosis groups (AG) of Rhizoctonia
solani. M. Bharathan and S.M. Tavantzis. Department of Botany
and Plant Pathology, University of Maine, Orono, Maine 04469.

The relatedness of dsRNA present in 29 naturally occurring iso-
lates of R. solani was examined by Northern blot (RNA-RNA)
hybridization. The dsRNA's studied were purified from members
of AG 1, AG 2, AG 3, AG 4 and AG 5 differing in virulence and
degree of somatic incompatibility. DsRNA's were fractionated
on agarose gels, transferred electrophoretically to Hybond
membranes and hybridized with 32P-endo-labeled fragments of
denatured dsRNA. Probes were individual dsRNA segments
selected on the basis of AG, virulence, and somatic incompati-
bility. The data show that considerable sequence homology
exists among dsRNA's within each AG. In contrast no relation-
ship was found among dsRNA species occurring in different AG's.
Finally, it appears that sequence homology exists among
isolates with varying degrees of somatic incompatibility and of
diverse geographic origin.

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Division. The abstracts are not edited or typed in the APS
headquarters offices.

HYPOVIRULENCE, DEBLITATION AND DOUBLE-STRANDED RNA IN
SCLEROTINIA SCLEROTIORUM, C.J. Roland. Department of
Environmental Biology, University of Guelph, Guelph, Ontario,
Canada. NIC 2W1.

A debilitated isolate of Sclerotinia sclerotiorum with a slow
growth rate and discolored mycelium was compared with five
healthy isolates for virulence and the presence of double-
stranded RNA (dsRNA). Lesions caused by the debilitated
isolate on celery petioles and bean leaves were 0-25% as wide
as lesions caused by healthy isolates. The debilitated isolate
contained six dsRNA segments whereas no dsRNA was detected in
healthy isolates. Transmission of the disease to healthy
isolates by hyphal anastomosis was associated with transmission
of the dsRNA segments. Disease and dsRNA also were
transmitted by sclerotia.

USE OF HOST RESISTANCE IN MANAGING THE GOLDEN
NEMATODE. B. B. Brodie, USDA, ARS, Department of Plant
Pathology, Cornell University, Ithaca, NY 14853.

Host resistance was investigated as a management tactic for varying
population densities of the golden nematode (GN), Globodera
rostochiensis. Four different cropping systems utilizing GN resistant
and susceptible potato cultivars and a nonhost crop were followed for
3 years. Field plots (9x15 m) naturally infested with GN at densities
of <1 eggs/cm², 1-4 eggs/cm², 4-15 eggs/cm², and >15 eggs/cm² of
soil were established for each cropping system. Changes in nematode
population densities, were determined from soil samples taken each
year after harvest (October). Planting a resistant cultivar in alternate
years effectively managed GN when initial nematode densities
were <1 egg/cm² of soil. Initial densities of 1-4 and 4-15
eggs/cm² of soil required 2 successive years of a resistant cultivar or
2 years of resistance followed by a nonhost, respectively. Initial
densities of >15 eggs/cm² of soil required more than 2 successive
years of a resistant cultivar to successfully manage GN. These data
indicate that the frequency of host resistance required to manage GN
depends upon initial nematode density.

BLUEBERRY STEM CANCER INCIDENCE AND ITS EFFECT ON YIELD IN NEW
JERSEY. L.M. Carris and A.W. Stretch, Dept. of Plant
Pathology and USDA-ARS, Rutgers University, Blueberry and
 Cranberry Research Center, Chatworth, NJ 08091.

During 1986-1987, blueberry stem cancer (caused by the fungus
Botryosphaeria corticis) was found on 13 commercial highbush
blueberry cultivars in southern New Jersey. Two fields of cv.
Collins surveyed in 1981 had an increase in stem cancer
incidence in 1987 from 11 and 31% to 94 and 91%, respectively.
A cv. Bluecrop field showed a modest increase in stem cancer
from 52 in 1981 to 18%. Field observations indicate that
infected canes are more susceptible to winter kill. A study
on the effect of stem cancer on winter hardiness, flower
number, fruit set and yield was initiated in March, 1987 on
cvs. Bluecrop and Collins. Results indicate no significant
difference in fruit set and total yield between pairs of
cancered and cancer-free canes. There was an increase in
berry size on cankered canes over canker-free canes in both
cultivars, but only cankered Bluecrop canes had a significant
reduction in numbers of flowers/bud.

THE RELATION OF INCUBATION TEMPERATURE IN THE DIAGNOSIS OF
CRANBERRY FRUIT ROT. F.L. Caruso, Cranberry Experiment
Station, University of Massachusetts, East Wareham,MA 02538

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At least twelve different fungi are capable of causing field or storage fungi in cranberries. Individual berries have occasionally been shown to harbor five separate fungi when plated out on culture media. Proper diagnosis of the primary causal agent is dependent on the temperature at which the same berries are incubated. Cranberries (cultivars Early Black and Crowley) with typical red rot symptoms were sampled in July, August, September (field collection) and October (while in storage). Individual berries were cut into thirds, surface-sterilized, and placed on three acidified corn meal agar plates. Plates were incubated at 15, 22, and 30°C. Results of this study and their implications to rot diagnosis will be discussed.

EFFECTS OF OXYTETRACYCLINE, PENCILLIN, AND STREPTOMYCYCIN ON MLO POPULATION IN WHITE ASH TREES. B. Cha and T. A. Tattar. Shade Tree Labs., Dept. of Pl. Path., UMAS, Amherst, MA, 01003.

Forty five white ash (Fraxinus americana) average dbh 30cm naturally infected with ash yellows (AY) MLO were injected in July, 1987 with oxytetracycline, penicillin, and streptomycin using the Mouget system at three dosage levels: average dosages of OTC were 1.0g, 1.3g, and 1.9g, penicillin were 0.08g, 0.18g, and 0.16g, and streptomycin were 0.01g, 0.013g, and 0.019g. Fluctuations of MLO population in AY-MLO infected ash trees were monitored by DAPI staining. Only OTC affected MLO population. In OTC-trees, staining decreased in number and intensity or disappeared entirely one week after injection. At higher dosages, the effect was stronger and lasted about 2 weeks longer. However, OTC-trees showed no difference in MLO population from non-injected trees 1 month later. In 20 non-injected control trees, staining was constant during the study. Yellows agents appeared to be MLO, since the agent was sensitive to OTC but not to penicillin and streptomycin.

DEVELOPMENT OF A GENE PROBE FOR IDENTIFICATION AND DIFFERENTIATION OF SPIROPLASMA CITRI OR OTHER SPIROPLASMAS IN SEEDGROUP I. E. H. Chen and T. A. Chen, Department of Plant Pathology, NJAES, Rutgers University, New Brunswick, NJ 08003.

A library of genomic sequences from S. citri strain C189 was constructed. Hind III partial digestion fragments from S. citri C189 were ligated to the pBR322 vector and used to transform Escherichia coli strain HB101. Recombinants were screened for expression of S. citri antigens by ELISA using polyclonal antiserum raised in mice against strain C189. One of the transformants was deemed positive for expression. The recombinant plasmids in two of the clones contain a 6.7 kb DNA fragment. Dot hybridization, using biotinylated cloned DNA as a probe, shows that this fragment is specific to S. citri. In this test, weak hybridization with DNA from two other spiroplasmas from honey bee and corn (Cust Stunt spiroplasma) was evident.

COMPARISON OF POWDERY MILDEW EPIDEMICS ON WHEAT CULTIVARS WITH DIFFERENT DISEASE RESISTANCE. B. B. E. Huisman. Departments of Plant Pathology and Agronomy, The Pennsylvania State University, University Park, PA 16802.

Five cultivars of wheat were assessed starting at growth stage 10.4 (Peek's scale, Large 1954) for severity of powdery mildew. Tyler, Redcoat and Tawn are susceptible, partial resistant and resistant cultivars, respectively, while resistance in Littlefield and 2553 is known to progress on 2555 and 2550 followed the pattern of Tyler and Redcoat, respectively. There was no significant difference in mildew severity among these four cultivars. Trace amounts of mildew were found on Tawn which indicates that the pathogen population is changing for increased virulence matching the resistance gene in Tawn.

TESTING A FIELD TECHNIQUE TO MEASURE APPLE TREE CANOPY DENSITY. C. C. Clarke, K. D. Hickey, and J. W. Travis, Dept. of Plant Pathology, Penn State Univ., University Park, PA 16802

Three tree canopy density levels were established by pruning to approximate heavily pruned, moderately pruned, and unpruned situations in a commercial block of York Imperial apples. Trees were ca. 16 ft high, 24 ft wide with 32 ft between rows and spherical in shape. Each density level was replicated 4 times and canopy density was measured using a light meter on an overcast day. A total of 10 measurements were taken under each tree at a height of ca. 1 meter. Mean percentages of light penetration for heavily, moderately, and unpruned situations were 18.3, 7.5, and 5.2, respectively. The largest variation in measurements occurred in the heavily pruned situations. Coincident with these measurements was an experiment evaluating tree canopy density and its effects on spray deposition. This technique for measuring canopy density is both simple and reproducible and may be useful in commercial and research applications.

DEVELOPMENT OF AN EXPERT SYSTEM TO DIAGNOSE AND ADVISE TREATMENT FOR APPLE TREE ROOT DISORDERS. D. Cooley, P. Cohen & T. Gruber. Dept. of Plant Pathology, UMAS, Amherst, MA, 01003.

Computer-based decision support systems (DBS) can be a valuable tool for plant disease diagnosticians and agricultural consultants. So-called expert systems are being developed for use in several commodity areas, for use in IPM and other Extension programs. We developed a system which diagnoses and advises treatment for apple root disorders, including disorders from root and other stresses. Early prototypes were developed on LISP machines (Texas Instruments "Explorer") using Mu, an inference engine and developer interface originally developed for medical diagnostics and biological computer models. The LISP Edge Base was then used to develop a microcomputer-based system using the commercial shell, Personal Consultant Plus (Texas Instruments). This system was satisfactorily tested against theoretical problems, and will be tested in the field in 1988. It is anticipated that the root disorder expert system will be part of a microcomputer-based DBS for apple production.

INFLUENCE OF HOST RESISTANCE ON THE INITIAL APPEARANCE OF FOLIAR LATE BLIGHT OF POTATO FROM INFECTED SEED TUBERS. M. A. Doster and W. E. Fry, Dept. of Plant Path., Cornell University, Ithaca, NY 14853.

Seed tubers of susceptible and resistant potato cultivars were inoculated with Phytophthora infestans and planted in fields in New York State during 1983-1987. Plants emerged from only 37% of the infected tubers, but 95% of the non-inoculated tubers. Blight was observed first on foliage of susceptible cultivars in 1983 and 1984, but on the resistant cultivar Russet in 1985. These results suggest that for some resistant cultivars prediction of the initial appearance of foliar blight may be similar to that for susceptible cultivars. Blight was first observed 5, 6, 9, and 11 days after the culmination of 18 severity values (five replicates) in 1983, 1984, 1985, and 1986, respectively. In 1983 and 1984, the severity the initial appearance of foliar blight could be predicted accurately. Only in one year did initial blight occur during the period 7-14 days after the culmination of 10 rain-favorable days (as predicted by Bitestac).

FUNGI ASSOCIATED WITH A NEEDLE BLIGHT OF PINUS STROBUS IN THE NORTHEAST. T. Dreierbach, W. Marrill, and J. H. Skelly, Dept. of Plant Pathology, Penn State University, University Park, PA 16802.

Needle blight of Pinus strobus, characterized by tip dieback and necrosis of first- and second-year needles, occurs from WV to ME, and is widespread in Acadia N. P., ME. Symptomatic needles collected in Acadia N. P. in May '87 bore fruiting bodies of the following fungi: B. adusta, B. graminis, P. pinicola, septoria sp., Hemipholadum sp., Leptosphaeria sp., and Truncatella sp. Symptomatic '86 needles collected in VT, NH, and ME in July '87 yielded these additional species: Lophodermium sp., Cryptocylindria sp., Meloderma deamessleri, and Siroccrosum strobilinus. Necrotic '87 needles collected in VT, NH, and ME in July '87 yielded B. pinicola, and Septoria sp. Symptomatic needles from WV and PA yielded M. deamessleri. These results indicate that numerous needlecast and needle blight fungi, as well as fungi of unknown pathogenicity, are associated with needle blight of P. strobus in the Northeast. Some of these fungi are established in needles <2 months old.

HETEROENTHALMIC AND PATHOGENIC SPECIALIZATION IN UNCINULA NECATOR. David M. Gaddy and Roger C. Pearson, Department of Plant Pathology, Cornell University, Geneva, New York 14456.

At least two mating types occurred in a collection of single-spore isolates of Uncinula necator from 10 Viizs and 2 Parthenocissus species. Isolates from Viizs spp. sporulated within 5-6 days on the tissue culture plant when cultured in specific hybrid cultivar Chancellor in vitro. However, only 16 of 35 grape isolates sporulated on tissue culture plants of Parthenocissus quinquefolia, with latent periods of 10 to 41 days. Isolates from P. quinquefolia and P. tricuspidata also sporulated in 5-6 days at 20°C on tissue culture plants of P. quinquefolia and P. tricuspidata, respectively, but grew poorly or not at all on Chancellor or Viizs labrusca 'Concord'. The pathogenic specialization of grape isolates, although not evident on Chancellor, may be evident on other Viizs cultivars and should be considered in selection of cultivars for resistance to powdery mildew. Further research will involve the selection of differential hosts to determine the nature of pathogenic specialization in U. necator, i.e., whether specialization is in the form of pathogenic races, formes speciales, or both.

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SITUATION/FUSARIUM/COLD HARDINESS INTERACTION IN ALFALFA. Alan R. Gotlieb, Norman E. Pellet, and Bruce Parker, Plant & Soil Science Dept., University of Vermont, Burlington, VT 05405.

Over the past 10 years, alfalfa stand longevity has decreased in many fields in Vermont from 6 years to 3 years. In 1983 we found several 2-year-old stands in southern Vermont dying out in the fall of the second year. Root examination revealed feeding injury from Sclerotinia homoeocarpa which resulted in root infection and severe root rot. The predominant fungus isolated was Fusarium oxysporum f. Sitona injury first appears in June to the field after establishment. At first, Sitona damage to alfalfa was observed only as the radicle of the root by late June 3rd and 5th instar larvae penetrate into the root and cause deep feeding wounds (DFW). The number of DFW per root will directly correlate with the severity of root rot which increases through the summer and fall. As DFW and vascular discoloration increase, alfalfa cold hardiness is reduced (measured by electrolyte leakage after laboratory freezing). Alfalfa stand reduction due to the Sitona/Fusarium complex has now been found throughout Vermont.

INTESTATION OF WOUNDED ROOTS OF PINE STUBS BY BURSAPHELENCHUS CHYLUS PISUM FROM CONTAMINATED WOOD CHIPS MIXED IN SOIL. S. Halik and B.R. Bergdahl. Department of Forestry, The University of Vermont, Burlington, VT 05405

White pine (Pinus strobus) wood chips were inoculated with an isolate of Bursapheleschus xylophilus from that host and incubated at 30°C for 8 weeks. After incubation, the average wood moisture content (MC) was about 130% based on oven dry weight (ODW) and the weight reduction was about 50%. Uninoculated wood chips (130% MC) were used as a control. For each treatment, approximately 150 g of wood chips were mixed with soil each of 12 one liter pots. Wounds were made at 3 locations on the roots of 29 (12-15 cm) five-year-old white pines by scraping the bark to expose xylem tissue. Seedlings were potted in these chips-soil mixtures and maintained in the greenhouse up to 12 weeks at 16-29°C. Seven of 12 seedlings treated with nematode-infested wood chips wilted and B. xylophilus was extracted from roots and stems. Histological studies showed B. xylophilus only in tissues of inoculated seedlings.

BEECH BARK DISEASE: ASSOCIATION OF NECTRIA OCHROLEUCUS IN W. VA., PA., AND ONTARIO. David R. Housen and Elleen M. Mahoney, USDA Forest Service, S1 Mill Pond Road, Hamden, CT and Bruce H. McAuley, Dept. of Parks and Recreation, 2450 McDougall St., Windsor, Ontario N8K 3R6.

Beech bark disease (BBD) occurs when bark, fed upon by the beeche scale (Cryptococcus fagisuga), is invaded and killed by Nectria cococeae var. Faginata (NCF) and/or N. gallicena (NGA). In 1987, in several stands from the Allegheny in western Pa., the Monongahela Nat’l Forest, W. Va., and in woods north of Toronto, Ontario, a third Nectria, N. ochroleucus (NOL) was found associated with dead trees and dying scale-infested trees. NOL sporophora and perithecia occurred in abundance, in some stands alone, in others along with NGA. On inoculated dormant beech logs, NOL was significantly less pathogenic than NGA or NCF. Pathogenicity trials on scale-infested trees are underway. This is the first report of (1) NOL associated with trees dying of BBD anywhere, and (2) of NGA associated with BBD in Ontario.

FUSARIUM SPECIES PRESENT IN SOILS OF THE TRANSEK, SOUTHERN AFRICA. N. Jeschke and P. E. Nelson, University of Massachusetts, Suburban Experiment Station, Waltham, MA 02154; Department of Plant Pathology, The Pennsylvania State University, University Park, PA 16802

While Fusarium species present in soils of North America and Europe have been well studied, few studies exist determining the species present in African soils. This study reports the occurrence of Fusarium species present in grassland soil collected at different altitudes in the Trancek, Southern Africa. The species most commonly isolated were F. oxysporum (32%), F. avenaceum (24%) and F. culmorum (8%). Others identified include F. equiseti (9%), F. semitectum (9%), F. solani (7%), F. chlamydosporum (4%), and F. meridiforme (4%). Fifteen other species, including three unidentified species, accounted for 0.1% to 2% of the total isolates.

PRODUCTION AND CHARACTERIZATION OF MONOCLONAL ANTIBODIES AGAINST THE PEACH EASTERN X-DISEASE AGENT. T. P. Jiang, T. A. Chen, and L. N. Chiykowski, Dept. of Plant Pathology, NJAES, Rutgers University, New Brunswick, NJ

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Monoclonal antibodies (Mabs) against the peach Eastern X-disease agent (EX), a mycoplasmalike organism (MLO), were produced by using a partially purified EX-MLO from infected celery plants as an antigen. Nine hybridomas, secreting Mabs that reacted with EX-MLO in diseased celery, were selected by enzyme-linked immunosorbent assay. The Mabs produced by the nine hybridomas reacted with three different protein bands of EX-MLO. Western blot and indirect immunofluorescence tests showed that four of the nine Mabs reacted with surface epitopes of EX-MLO. The cell membrane-specific Mabs will be used in affinity chromatography to attempt to highly purify the EX-MLO.

POTENTIAL USE OF BACTERIA FOR BIOCONTROL OF ALFALFA FOLIAR DISEASES. M. E. Jones, F. L. Lukesic, Dept. of Plant Pathology, Penn State Univ., K. T. Leath and R. R. Hill, Jr., ARS-USDA, University Park, PA 16802

Bacteria isolated from greenhouse or field-grown alfalfa, or obtained from other laboratories were tested in vitro for antagonism against the following pathogenic bacteria. Thirty-two isolates reduced conidial germination below 25%. In greenhouse trials, only two of the antagonists consistently reduced the incidence of disease. ViaPlaventum bacteria isolated from alfalfa leaves in the field, reduced Phoma leaf spot only slightly in field tests. An antibiotic marker strain of this isolate was tested for survival on alfalfa. Uniformly treated alfalfa was sampled at 0, 1, and 12 hours, and also 11 days after inoculation, yielded 1.3 x 10^7 CFU/ml when plated on antibiotic media. In-vitro antagonism was not a good indicator of efficacy under greenhouse or field conditions. Factors other than survival and antagonism may be limiting the development of successful antagonists.

NUTRITIONAL DISTURBANCES OF NORWAY SPRUCE IN THREE NORTHEASTERN STATES. J. Ke, J. M. Skelly, and D. Karasevich, Dept. of Plant Pathology, Penn State University, University Park, PA 16802

Twelve major and trace nutrient elements were determined in needles of Norway spruce (Picea abies (L.) Karst.) during the 1987 summer. Needles were collected from 7 plots (3 plots in Pennsylvania, and 2 plots each in New York and New Hampshire). Two branches from each of 15 trees in each plot were removed from the upper and lower crown. By yearly intervals were washed with CHC13 for 1 minute, rinsed with distilled water for 30 seconds, and then immersed 3 times in each of two successive beakers containing UltraPure, ion-free, organic-free water. Needles were dried, ashed and analysed with a spectrometer. The Mg content of most of the 2nd to 6th needle year complements, especially for the symptomatic trees, was 0.02% to 0.05%, levels below the deficiency threshold value for this species. The yellowed needles of the current year's green needles of the symptomatic trees were green. Mg nutrient content of soil as collected and analysed from under the symptomatic trees was likewise deficient.

EFFECTS OF INOCULUM DENSITY OF Streptomyces scabies AND POTATO CULTIVAR ON SCAB SEVERITY AND RHIZOZOPOPOPULATION DENSITY. A. P. Keimath and R. Lorita, Dept of Plant Pathology, Cornell University, Ithaca, NY 14853

The inoculum density-disease severity relationship for common scab of potato was determined under greenhouse and field conditions. The cultivars Chippewa (scab-susceptible), Superior (scab-resistant), and NY64 (moderately susceptible) were inoculated with 2 rizalin-resistant isolates of S. scabies, each at 3 inoculum densities, in 2 greenhouse experiments. Disease severity and rhizosphere population density increased with inoculum level. However, rhizosphere population density was not related to cultivar resistance. NY64 supported a significantly lower rhizosphere population density than the other cultivars in one greenhouse experiment. In a field trial with 3 cultivars, NY64 also had the lowest rhizosphere population density for malonan-producing actinomycetes, a population which includes wild-type S. scabies. Disease severity was not consistently related to rhizosphere population density in any experiment.

FUNGICIDES FOR ORANGE RUST CONTROL ON BLACK RASPBERRY. W. C. Kleiner, J. W. Travis, and K. D. Hickey, Dept. of Plant
Larval feeding by the clover root curculio, Sitona hispidulus (F.), causes severe injury to roots of alfalfa. _Pusarium_ species are frequent colonizers of such sites. The fungal populations were characterized in feeding sites in alfalfa roots during the same field during a 3-year period. Fungi were isolated from three sites on each of 100 roots in the spring and fall each year. Isolations were made on acidified water agar following surface sterilization of the root plate. Additional isolations were made from root tissue cements to the feeding site to determine the internal spread of the fungi. _Pusarium_ spp. were the fungi most commonly isolated, and _F. oxysporum_ constituted 65% of all fungi isolated. _F. solani_ and _F.avenae_ were also frequently isolated. Colonization of root tissue adjacent to the feeding site occurred slowly.

**INFECTION OF APPLE PROTOPLASTS WITH TOBACCO MOSAIC VIRUS**
A. H. Li, G. N. Agris, and M. E. Walker. Department of Plant Pathology, University of Massachusetts, Amherst, MA. 01003.

Apple protoplasts obtained from callus were inoculated with tobacco mosaic virus (TMV) in the presence of poly-L-lysine (PLL). In vitro protoplast cell lineages, plants infected with TMV at 10-100ug/ml and PLO at 5-20ug/ml. The best protoplast infection results were obtained when 5 x 10^6 protoplasts/ml were inoculated with initial TMV concentrations ranging from 20 to 200ug/ml, while PLO at 0.1-5ug/ml. The inoculum and the inoculum were mixed for 10 minutes. The protoplasts were then washed to remove excess TMV and incubated for 42-72 hours at 22-25C. Inoculum results were monitored by ELISA. An increase of TMV antigen in apple protoplasts could be detected as early as 6 hrs after inoculation and reached a maximum concentration 24-36 hrs after inoculation. A 10-fold increase in ELISA readings (absorbance at 405 nm) was obtained under the above conditions at 24-36 hrs compared to the readings at the completion of inoculation.

**STEM AND LEAF RUST ALTER THE RATE AND DURATION OF WHEAT GRAIN GROWTH**
M. T. McGrath and S. P. Pennypacker, Dept. of Plant Pathology, Penn State University, University Park, PA 16802

Grain growth of winter wheat infected after anthesis by stem and leaf rust fungi during the 1987 growing season. Disease gradients were established from spreader rows that were artificially inoculated with _Puccinia graminis_ f. sp. tritici and naturally inoculated with _P. recondita_ f. sp. tritici. At 5 days post inoculation and 24 days after disease and grain samples were collected from fungicide-treated and non-treated plots differing in date of disease onset and AUDPC. Piecewise linear regression models fit to square root transformation data in the 9 x 4 gradient plot, and fitted with disease and grain yield analysis of variance (ANOVA) and pathogen rust growth rates were inversely related to disease pressure and ranged from 0.04 to 0.16 mg/g grain/day. Severe stem rust infection (AUDPC for peduncle >370 percent-days) also reduced the duration of grain growth from 30 to 25 days.

**CLONING AND EXPRESSION IN E. COLI OF AN ERWINIA ANTHOPODOA GENE WHICH ENCODES A SPECIES-SPECIFIC ANTIGEN**

Hind III restriction fragments of chromosomal DNA from _E. amylovora_ strain 477 were ligated into _plasmid pBR322_ and used to transform _E. coli_ strain _HBP 4_ and _HBP 6_. Transformants were screened for the _E. amylovora_ strain 477 antigen by ELISA using a cocktail of eight species-specific monoclonal antibody bodies. Of 1300 transformants screened, two clones were found to contain a 5 kb fragment which has a gene that encodes for expression of an _E. amylovora_ antigen. Indirect immunofluorescence microscopy showed that the clones express the antigen on the outer cell surface, as does _E. amylovora_. Two of the eight monoclonal antibodies used in an additional clone collection react with the antigen that is expressed for the monoclonal antibodies. Each of these monoclonal antibodies are of different sub-isotypes (IgG1 and IgG2b).

**CHARACTERIZATION OF MONOCLOBAL ANTIBODIES THAT ARE SPECIES-SPECIFIC AGAINST ERWINIA ANTHOPODOA ANTIGENS**
A total of eight monoclonal antibodies (MA's), specific against P. amylovora strains in ELISA tests, were sub-isotyped and characterized as to type of antigen they were against. Three of the MA's were directed against an outer cell surface antigen of group IgC, four as IgG2b, and one as IgG2a. In ELISA tests with each MA, loss of titer was evident ater treatment of whole cell sonicates with Pronase or heat (100 C, 15 min). All of the MA's were directed against outer cell surface antigens, as shown by indirect immunofluorescence microscopy. Specific reactivities were also evident in Western blots of whole cell lysates of P. amylovora, which enabled separation of the MA's into three groups. Results of these tests indicate that all of the MA's are directed against outer surface proteins and that at least six of the eight MA's are directed against unique epitopes.

**BIOLICAL CONTROL OF GRAY MOLD FRUIT ROT OF STRAWBERRY**

M.A. Mclean and J.C. Sutton. Dept. of Environmental Biology, University of Guelph, Guelph, Ontario. NIG 2M1

Yeasts and bacteria were isolated from the strawberry phyto- plate and evaluated in the laboratory for inhibition of Botrytis cinerea on strawberry leaf discs. Two yeast isolates (B26G, G33C5) and one bacterial isolate (B24C4), which significantly suppressed sporulation of B. cinerea on the discs, were tested for suppression of the pathogen on strawberry in the field. All isolates were applied at 10 g/ml in water with surfactant and water control was also tested on each of the 16 distinct nutrient solutions (2% sucrose and 0.1% yeast extract) with surfactant. The foliage, flowers and fruit of the strawberry plants were sprayed to runoff with the various suspensions, twice in the autumn of 1986 and 5 to 8 times in the spring of 1987. Isolates B24G4 and G33C5 (in water or nutrient solution) significantly reduced the incidence of B. cinerea on both petals and calyxes from 60% to 10% but were ineffective on leaves. We conclude that the 25 agents tested suppressed B. cinerea when applied to blossoms.

**ENDOCRINALINUM RUST GALLS ON SCOTS PINE FAVOR PREFERRED FEEDING SITES OF PAWLEWILLIS**

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Enocronarium barkmeli is causing stunting, branch dieback, witches' broom, and mortality of Scots pine Christmas trees. Pawsawillet (Hyllobius pales) feeds on bark of young stems and twigs, often girdling them. Pawsawillet feeding damage was noted primarily on rust galls on second-year internodes of infected trees. Eight twigs were selected at 1.4 m on each of 10 severely galled (≥300 galls/tree) trees 2-2.5 m tall spaced along a 0.25 km transect through the plantation. Lengths and diameters of galled and non-galled portions, and numbers and diameters of pawsawillet feeding sites on the second-year internodes were measured. Feeding sites involved 8.4 times more of the area of galled than non-galled portions of twigs (F = .02). Feeding on galls girdled the twigs. Branch dieback in galled Scots pine should not be attributed solely to the rust fungus.

**NEEDLE BLIGHT OF PINUS STROBUS IN THE NORTHEAST**

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Blighting of first-year needles of Pinus strobus (BNP), attributed to ozone or "semi-mature tissue needle blight," has been widespread in Acadia National Park, ME for several years. Surveys in June and July 1987 showed similar appearing trees at widely separated upland and lowland sites in ME, NH, VT, WV and PA. Affected BNP in all areas showed chlorosis of some first-year needles as early as July by necrosis of needle tips or entire needles. Usually, however, not all needles in a single fascicle were affected, as would occur if the blighting was caused by an abiotic agent. Re-examination of plots in Maine in Late August 1987 showed only traces or no symptoms of ozone injury on sampled trees. NEEDLE BLIGHT symptoms included necrosis, Rubus alboheleniumis, and Asclepias syriaca. These preliminary studies suggest that biotic agents are associated with this needle blight syndrome.

**DETECTION OF DOUBLE-STRANDED RNA FROM SQUASH INFECTED WITH TOMATO RINGSPOT VIRUS (TomRSV)**

S. Mohan and T.A. Chen, Dept. of Plant Pathology, Cook College, Rutgers University, New Brunswick, NJ 08903

Squash plants (Cucurbita pepo var. melopepo, cv. 'Elite') were either infected or left uninfected with TomRSV. Fourteen days after inoculation, preparations were made from symptomatic leaves using standard rDNA isolation techniques. Double-stranded RNA was eluted from a 10 cm CP-11 cellulose column in STE buffer (0.1 M NaCl, 0.05 M Tris, 1mM EDTA, pH 7.0). Double-stranded RNA species were detected in infected squash plants but not in healthy plants. Four double stranded DNA (dsDNA) bands were resolved by agarose gel electrophoresis. The plant material to get any detectable amounts of dsRNA. Mini-preparations for the isolation of dsRNA did not result in recovery of detectable dsRNA. Electrophoresis in polyacrylamide and agarose gels showed three dsRNA species. These dsRNA species were resistant to treatments with DNase and RNase A.

**ABSENCE OF 3' POLYADENYLATION IN THE RNA OF A TOMATO RINGSPOT VIRUS (TomRSV) ISOLATE**

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Polyadenylation of tomato ring spot virus and other NPMO viruses was reported as early as 1979 (Mayo et al., J. Gen. Virol. 43:603-610). We report here the unusual absence of a poly(A) tail at the 3' end of the RNA of a TomRSV isolate. After the sucrose density gradient centrifugation, the viral RNA was purified from the nucleic acid-rich middle and bottom components using the SDS-phenol procedure. The RNA was precipitated twice with ice-cold ethanol and the pellet was dissolved in the oligo(dT) loading buffer (10 mM Tris, pH 7.5; 0.5 M NaCl; 1.0 mM EDTA; 0.1% SDS). This RNA was then passed through an odata(dT) cellulose column pre-equilibrated with loading buffer. After several washings of the column with loading buffer, the bound RNA was eluted out with elution buffer (10 mM Tris, pH 7.5; 1.0 mM EDTA; 0.05% SDS). Most of the viral RNA was eluted from the column in the loading buffer, indicating absence of poly(A) region in the viral genome.

**SYMPTOM OCCURRENCE OF VERTICILLIUM DISEASE OF AGARICUS BISPORUS AS RELATED TO INOCULUM CONCENTRATION AND THE STAGE OF SPOROCHORIAL DEVELOPMENT**

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A disease of the button mushroom, Agaricus bisporus, Verticillium spot, caused by Verticillium funicola, is characterized by necrotic lesions on the pilei. Neither the amount of inoculum nor the relationship between inoculum density and time for lesion development is known. Use of a model 4710 Eppendorf pipette allowed quantified amounts of aqueous inoculum to be positioned on pilei at three growth stages: primordial (1), immature sporophore (4) and mature sporophore (11). Mushroom pileei received 5 μl droplets of inoculum and were observed until a lesion developed. Lesions developed before harvest with inoculum at 10 x 10⁵, and on mature stage I and II sporophores when inoculated at 2 x 10⁶. Lesions failed to develop before harvest at 2 x 10⁵, although lesions developed following 12 to 48 hr incubation. The role of inoculum and growth stage in symptom development should be included in epidemiological and crop loss studies with this disease.

**DISTRIBUTION OF FUSARIUM SPECIES ON MILLET FROM NIGERIA, LESOTHO AND ZIMBABWE**

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Fusarium species cause post-harvest deterioration of cereal grains and, produce mycotoxins that pose serious threats to human health. Seeds of pearl millet, Pennisetum typhoides; prosonimit, Panicum miliacum and foxtail millet, Setaria italica were collected from Nigeria, Lesotho, and Zimbabwe. The samples were ground and placed in petri dishes and grown on Czapek-Dox agar, potato dextrose agar, Trypticase soy agar, nutrient agar, species were identified using standard mycological keys. The predominant species on millet seed from Nigeria were F. moniliforme, F. equesti, F. semitectum, F. nygamai and F. chlamydosporum. The predominant species on millet seed from Lesotho were F. nygamai and F. moniliforme while F. moniliforme, F. equesti and F. semitectum were predominant in Zimbabwe. F. equesti was the only Fusarium species associated with millet in Lesotho. Strains of these Fusarium species have been reported to be toxicogenic.

**INCIDENCE OF WHITE PINE BLISTER RUST IN MAINE IN AREAS WITH AND WITHOUT RIBES CONTROL**

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Direct control of White Pine Blister Rust in Maine by Ribes eradication was initiated in 1917. A statewide survey was conducted in 1987 to assess the long-term impact of this control effort. A total of 100 white pine trees in each of 90...
stands was randomly selected and examined for infection by Cercospora ribicola. Three age classes (reproduction, sapling, pole and three half-century classes (low, middle and high) of Ribes control (none, control for more than 50 years) were each represented by five stands. Averaged over all stands, blister rust incidence is 3.8% in the areas with Ribes control, and 9.1% in areas with no control. Incidence, averaged within size classes, is lowest in reproduction stands (2.4% with, 7.9% without control) and highest in pole stands (3.9% with, 11.1% without control). Rust incidence did not reflect hazard zone ratings. Results provide a basis for making an economic evaluation of disease impact, and control program adjustments.

EFFECT OF OZONE AND SIMULATED ACID RAIN ON SUGAR AND STARCH IN ROOTS OF RED AND WHITE OAKS. Roy L. Patton, USDA Forest Service, 359 Main Rd., Delaware, OH 43015

One-year-old oak (Quercus rubra and Q. alba) seedlings were treated with simulated rain solutions of high (pH 3.0) and low (pH 2.1) and fumigated with ozone at 0.0, 0.07, or 0.15 oz. The seedlings were fumigated with ozone for 8 hr on each of 3 consecutive days and treated with 1.25 cm of rain on the fourth day of each week. This regimen was repeated for 18 weeks. Eight seedlings of each species were harvested from each treatment after 6, 12, and 18 weeks for measurement of sugars (antherone reagent) and starch (enzyme digestion followed by assay of glucose) in the roots. In general, sugar content remained stable and starch content increased in both species with successive harvests. The effects of ozone and rain treatments on root sugar and starch were variable over the harvests.

INCIDENCE AND SEVERITY OF BLACKLEG IN ONTARIO WINTER RAPSEED. R. Peters and R. Hall. Department of Environmental Biology, University of Guelph, Guelph, Ontario, Canada, N1G 2W1

Blackleg of winter rapeseeded, caused by Leptosphaeria maculans, is a significant disease in Ontario. In 1986, of 72 fields sampled, 66 (91.7%) had at least some level of blackleg whereas all 49 fields (100.0%) sampled in 1987 had blackleg. The disease incidence of diseased plants was 31.8% in 1986 and 69.1% in 1987. The mean disease severity rating (based on a 0-4 scale) was 0.67 in 1986 and 1.53 in 1987. The mean incidence of severely-cankered plants (category 4) was 8.6% in 1986 and 20.5% in 1986. The most severely diseased fields in 1986 and 1987 had blackleg incidences of 82.5% and 100.0% and contained 50.0% and 75.0% severely-cankered plants respectively. Average losses in yield were estimated to be 5.0% in 1986 and 7.5% in 1987. The most severely diseased fields in 1986 and 1987 suffered yield losses of 29.2% and 27.3% respectively.


Preliminary ELISA and immunosorbent electron microscopy (ISEM) tests suggested that the fleuxous rod virus found associated with Sheep Pen Hill disease of highbush blueberries (SPHV) was serologically related to blueberry scorch virus, a tentative member of the Carlavirus group. The serological relationships of SPHV to ten known members of the carlavirus group was examined by ISEM. Purified virus was applied to gold particles previously sensitized with the test antibodies diluted 1:2000 in Sorenson's buffer. Serological reactions were determined by the presence or absence of decoration of trapped virus particles after treatment with a 1:10 dilution of anti-IgG and negative staining. Immunosorbent staining of SPHV with several of the carlavirus antibodies tested supports its tentative placement in the carlavirus group.


A fruit rot of grape in New York, caused by Phomopsis viticola Sacc., was associated with heavy rains (24.7 cm) during bloom. Our goal was to determine if fruit rot resulted from infection at bloom. A suspension of 1x10⁵ alpha spores/ml was sprayed onto flowering (50% 90%) calyptra fall) grape (Vitis labrusca 'Concord') clusters on 2 June 1987. Clusters were then enclosed in plastic bags for 24 hours. Inoculated vines were protected from rain during the growing season by plastic tents. Symptoms first appeared two weeks prior to veraison. One month after veraison, 73% of the clusters had fruit rot and 98% had rachis lesions. Inoculated fruit showed a brown discoloration that enveloped the stylar or pedicel end of the berry. Berries with advanced symptoms had a rough texture due to subaerial, immature pericarp. Rachis lesions were characterized by sunken, black areas which caused the rachis to be brittle. Some rachis lesions had girdled portions of the cluster resulting in the dehydration of berries distal to the infection.


Studies during the growing seasons of 1984-87 revealed that the host ranges of CMV and BBWV near commercial lettuce fields in Oswego County, NY, included legumes and crucifers. Roots and rhizomes of Linaria vulgaris harbored both CMV and BBWV through the winter months. The winter reservoir of CMV also included roots and rhizomes of Anetepsis seriana, roots of Rorippa islandica, and rhizomes of Barbarea vulgaris. Both viruses were significantly (P = 0.05) more common in weeds growing within 10 m of lettuce fields than in weeds growing between 20 and 30 m from the same fields. Incidences of the two viruses in weeds growing within 10 m of lettuce fields early in the growing season were strongly correlated with incidences of the viruses in lettuce later in the season (r = 0.93 for CMV and 0.88 for BBWV).


The role of Phoma medicaginis var. medicaginis as a root rot pathogen of alfalfa was investigated using inoculations to the roots of plants grown in test tubes, in the slant board soilless culture method and in the greenhouse. The root system of asymptomatic plants grown in test tubes showed an infection when inoculated with a spore suspension of the fungus. Phoma medicaginis var. medicaginis penetrated and caused discoloration and tissue disintegration in roots of plants grown in the slant board systems. Wounds were not required for fungal entry, but more extensive rot occurred when roots were wounded. Inoculations to the lateral roots yielded larger lesions than those induced in the main roots. Dry weight of foliage and roots of alfalfa grown in the greenhouse was significantly reduced by infection with this fungus. Phoma medicaginis var. medicaginis has the ability to act as a primary root pathogen of alfalfa.

POPULATION STUDIES OF PHYTOPHthora CINNAMOMI IN CRANBERRY BOGS SUFFERING FROM ROOT ROT. E.A. Rosenberg and F.L. Garnsey, Cranberry Experiment Station, University of Massachus- setts, East Wareham, MA 02538.

Approximately 12% of Massachusetts cranberry bogs are infected by the soil-borne fungus Phytophthora cinnamomi. Recommendations for those bogs showing small discrete dead areas have been to spot-treat twenty feet outward from these areas with Ridomil ZE. A study was initiated in order to determine whether the fungus was found throughout the bog or whether it was confined to the low spots. Transects were set up in two or three directions from the center of the dead areas. Soil cores (10 cm) taken at various locations. Azalea leaf disks were incubated in a soil/water mixture for 5-8 days and plated on PARM medium. Results of these samples will be discussed.

APPLICATION OF OXYTETRACYCLINE IN PEACH ORCHARDS USING MAUGER MICROINJECTION. J. Schiefer, T. Tattar, D. Cooley, Shreve Tree Labs., Dept. Plant Pathology, UMASS, Amherst, MA 01003.

Oxytetracycline (OTC) has a history of successfully inducing symptom remission of X-disease in peach. However, methods of injecting the antibiotic tend to be time consuming, cumbersome, or detrimental to tree health. Maugert microinjection, used to deliver chemicals to trees with shade damage or tree wound injury, was considered for application of OTC in orchards. In Oct., 1986, peach trees in 4 orchards were rated on a 0-4 scale according to severity of X-disease symptoms. In Oct. 1986, pressurized capsules (one 4 ml capsule/5 cm trunk diameter) were used to deliver 42 OTC to selected trees. In Sept. 1987, symptoms on OTC-treated trees were absent or less severe while untreated
controls either remained unchanged or worse compared to previous year's ratings. Injections were most effective if symptoms occurred on 503 or less of the tree. Mungut UTC microinjection was found to be an effective X-disease therapy in commercial peach orchards.


In 1987, 29 fields of soft white winter wheat in central and western New York were surveyed at three growth stages for the incidence and severity of fungal leaf and spike diseases. Among leaf diseases, powdery mildew (Erysiphe graminis) and leaf rust (Puccinia recondita) ranged in severity from low to moderate, whereas leaf spots were moderate to severe in 75% of the fields. Based on laboratory identification, blue mold (Sclerotinia sorci) was the predominant leaf spot organism at early and Sagospora nodorum at late growth stages; Dreschlera triticirepentis and Stagonospora nodorum were prevalent in some fields. Three spike diseases were scab (Fusarium graminearum) and blight (Sphacotheca nodorum), and loose smut (Ustilago tritici), occurred at low levels of severity. Loose smut was detected in 23 fields, indicating widespread seed infection. In addition to fungal diseases, barley yellow dwarf virus infection was widespread and considered to be a major yield reducing factor.

INFECTION OF APPLE PROTOPLASTS WITH APPLE MOSAIC VIRUS BY ELECTROPORATION. P. J. Shiels and G. N. Agris. Dept. of Plant Pathology, UMass, Amherst, MA. 01003.

Protoplasts of 'Golden Delicious' and 'Yatsu' apple were inoculated with apple mosaic virus (20 ug/ml) using electroporation. The electroporation device consisted of a series of capacitors powered by a Buchler 3-1500 electrophoresis power supply, providing an electric field of 15 volts/cm. The protoplasts were isolated from cultured apple twig callus by treatment with 2% Cellulysin and 0.5M Mucose and were adjusted to 1 x 10^6 cells/ml in 0.01M K-PBS buffer pH 7.0 containing 0.05M mannitol and 0.02M 2-mercaptoethanol. The protoplasts were then placed in the cuvette and subjected to electroporation by discharging capacitors of 20 uF at 400 volts at 0°C. Titration of virus antigen was detected by ELISA after 24 hr incubation and approximately two to three times the level detected in protoplasts immediately after inoculation. Infection was facilitated when virus was added to protoplasts within a minimum of 30 minutes, rather than during electroporation.

RHIZOSPHERE COMPETENCE OF TRICHODERMA HARZIANUM AND ITS POSSIBLE ROLE IN BIOLOGICAL CONTROL OF FUSSARIUM OXYSPORUM. A. Sivan and I. Chet. Dept. of Plant Pathol. and Microbiol. The Hebrew Univ. of Jerusalem, Faculty of Agric., Rehovot, 76100 Israel.

Trichoderma harzianum (T-35) applied as a seed coating proliferated successfully in the rhizosphere of melon, cotton and tomato. Population densities were higher at the root base and root tip and lower in the middle segments. When treated seeds were planted in soil infected with Fusarium oxysporum f. sp. melonis and F. oxysporum f. sp. vasinfectum, T-35 colonized the rhizosphere and colonization of the roots by Fusarium was decreased, especially at the root tip. Trichoderma T-35 affected Fusarium only in the rhizosphere; when applied either as a seed coating or soil inoculum, T-35 had only minimal effect on F. oxysporum survival in natural soil. Root colonization by T. harzianum reduced germination of F. oxysporum clamydospores in the rhizosphere soil of melon and cotton.

EVALUATION OF PLANTATION NORWAY SPRUCE IN THREE NORTHEASTERN STATES. J. M. Skelly, J. Ke, and D. Karasevitz. Dept. of Plant Pathology, The Pennsylvania State University, University Park, PA 16802.

Fifteen trees each of seven Norway spruce, [Picea abies (L.) Karst.], plantations were evaluated during 1987 with two plantations each in New Hampshire and New York and three in Pennsylvania. Five trees were evaluated in each of three symptom categories (healthy, moderate and severe symptoms) when possible. Foliage discoloration and defoliation ratings were made using the American Forest and Paper Association system. Both systems indicate that trees are experiencing slight off-coloration and defoliations of <10%. The predominant symptom found on trees in all plantations was needle blight. This symptom was not usually in evidence via ground observation and was observed following removal of two branches from the top and mid-point of the live crown. Older needles were most symptomatic. The symptom was most severe in plantations located in the Tug Hill area of New York.

EFFECT OF LEAF AGE AND INOCULATION METHOD ON SYMPTOM EXPRESSION IN ANGULAR LEAF SCORCH OF GRAPE. François J. Smith and Roger C. Pearson. Department of Plant Pathology, Cornell University, Geneva 14456.

Mature apophaecia of Pseudopezicula tetraspora, which causes grape angular leaf scorch (ALS), were produced on 2.5% malt agar overlaid with grape leaf pieces 10-14 days at 26°C in 16:8 light:dark. Grape leaves from two cultivars were infected on un inoculated malt agar. Cultures from single conidiospores produced apophaecia, indicating homothallism, or secondary homothallism. Potted vines were inoculated with conidiospore suspensions (AS), mature apophaecia, ag lar plugs with mature apophaecia (AP) or apophaecial releasers, cultures suspended in 32°C, held in mist at 20°C for 72 h and returned to the greenhouse. The percentages of leaves showing typical symptoms of ALS, 30 days after AS inoculation, beginning at the youngest leaf present at inoculation and proceeding basipetally were 42, 75, 73, 58, 25, 17, and 8%, respectively. Only the 7 youngest leaves present at inoculation became infected. P. tetraspora was isolated from symptomatic tissue. Similar results were obtained with other inoculum sources, but AS and AP inoculations resulted in symptoms more typical of ALS in vineyards. This was the first fulfillment of Koch's postulates in ALS and the first report of infectious apophaecia in vitro. Phenological susceptibility of leaves explains the distribution of ALS at widely spaced nodes following widely separated periods of wet weather.

EFFECT OF PTEROSPHERIA AVENAE AND BARLEY YELLOW DWARF VIRUS (BYDV) INFECTIONS, SINGLE AND IN COMBINATION, ON A. BARLEY COMPONENTS OF NOISIE ORYS. M. L. Sommerfeld, J. A. Frank and F. E. Gillow. Dept. of Plant Pathology and USDA-ARS, The Pennsylvania State University, University Park, PA 16802.

In field experiments conducted in 1986 and 1987, inoculations with BYDV-PAV-NY were made at growth stages 3 or 7 (Feekes's scale, large 1994) with viruliferous aphids (Rhopalosiphum padi). Inoculations with P. avenae were made with a 5% redissent and follow virus inoculations by two weeks. Plants were then placed in the cuvette and subjected to electroporation by discharging capacitors of 20 uF at 400 volts at 0°C. Accumulation of virus antigen was detected by ELISA after 24 hr incubation and approximately two to three times the level detected in protoplasts immediately after inoculation. Infection was facilitated when virus was added to protoplasts within a minimum of 30 minutes, rather than during electroporation.


Austrofus$t$ or mutants of strains of Trichoderma harzianum, T. hamatum, T. koningii, T. viride, and T. virens (= Gladiocidium virgense) were combined by protoplast fusion. When two different autotrophs of a single strain were fused, rapidly growing, fully prototrophic, stable hybrids were formed at frequencies of 1 - 10 %, and segregation of parental types by conidiation indicated these were balanced heterokaryons. In contrast, intra- and interspecific fusions resulted in various levels of incom- patibility. However, prototrophic colonies differing in morphology from the parental strains were obtained at low frequencies. These slowly growing colonies frequently were imbalanced heterokaryons as indicated by analysis of sex segregation of types by conidiation. More rapidly growing, stable, nonparental sectors developed from these. Taxonomic position was not an indication of degree of compatibility; a T. harzianum X T. viride fusion was among the most compatible tested.

PROTECTION OF DOUGLAS-FIR SEEDLINGS BY LACARIA BICOLOR AGAINST ROOT ROT CAUSED BY FUSSARIUM OXYSPORUM IS CONDITIONED BY TEMPERATURE AND AGGRESSIVENESS OF THE PATHOGEN. N. E. Stredel and A. Sinclair. Department of Plant Pathology, Cornell University, Ithaca, New York 14853.

Douglas-fir (Pseudotsuga menziesii) seedlings grown in Petri dishes containing an agar rooting medium were evaluated for incidence and severity of root rot caused by F. oxysporum (FO) as conditioned by temperature, aggressiveness of FO isolates, type and inoculum dose of the primary roots to the ectomycorrhizal fungus Laccaria bicolor (LB). Three isolates of FO displayed differential aggressiveness when inoculated to root tips or to differentiated tissue at 1:1, 10:1, and 100:1, respectively. All isolates caused extensive root decay and hyphomycetous at 22°C. Prior exposure of roots to LB suppressed the incidence and extent of root colonization by the least aggressive isolate of FO at 17°C but not at 22°C and did not affect colonization by the other isolates.


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The nature of the hyphal interactions among naturally occurring isolates of R. solani was studied. Vegetative incompatibility (VI) appears to affect the extent of cytoplasmic extrachromosomal DNA and therefore the transmission of hypovirulence-causing agents such as viruses or plasmids. In conjunction with microscopic studies the macroscopic appearance of hyphal interactions of vegetative incompatibility pairs were classified into 4 groups. These were: merging (M), merging line (ML), barrage (B) and barrage line (BL). Subsequently, eighty-five isolates from 5 anastomosis groups (AG) were paired in all possible combinations and their hyphal interactions were characterized. Depending on the AG, 3-17% of the reactions showed vegetative compatibility (M), whereas the rest of them displayed a varying degree of VI, i.e. 52-91% (ML), 0-24% (B), and 0-25% (BL).


Twenty-three isolates of P. infestans from The Netherlands were analyzed by Feulgen-DNA (F-DNA) cytometry. Of those isolates which bore the AI mating allele, the distribution of ploidy values (as determined by the analysis of F-DNA content) was 3 diploid, 3 triploid and 5 tetraploid. The distribution of ploidy values for the A2 isolates was 7 diploid, 4 triploid and 3 tetraploid. The DNA content for the AI isolate was 2.28 pg, and for the A2 isolates was 0.821. Analysis of data from mating experiments were consistent with our ploidy estimates from F-DNA cytometry. The distribution of mating types and ploidy values may be relative to the evolution and population biology of this species.

RELATIONSHIP OF PRECIPITATION PROBABILITY TO INFECTION POTENTIAL OF Botrytis SQUAMOSA ON ONION. P. C. Vincelli & J. W. Lorbeer. Department of Plant Pathology, Cornell University, Ithaca, NY 14853.

An infection index for B. squamosa was developed which uses temperature and leaf wetness duration to categorize leaf wetness episodes as insignificant, slight, moderate, or severe potential infection periods, given the presence of inoculum. Using this infection index, it was found that the frequency and severity of infection periods of B. squamosa in Orange County, NY increased as the National Weather Service forecast of precipitation probability (PP) increased. Severe infection periods occurred in 0%, 19% and 23% of the 36-hr forecast periods in which the maximum PP for the forecast period was <30%, 30-40%, 50-60% and >70%, respectively. It was concluded that a PP > 30% can be used in combination with a model for forecasting sporulation to forecast severe infection periods of B. squamosa up to 36 hr in advance.


Onion integrated pest management in New York includes a recommendation to apply a fungicide program when B. squamosa lesions average 1.0 lesion/leaf. A predictive system was developed for timing subsequent fungicide applications to infection periods of B. squamosa. The system consists of two components: (1) a model that forecasts the production of conidia of B. squamosa based on temperature and relative humidity, and (2) National Weather Service forecasts of precipitation probability, which predict conditions favoring severe infections. In field experiments in 1985-87, acceptable disease control and a savings of 1-3 applications each season compared to a weekly spray program were achieved with the predictive system. The model for estimating fungicide shortages was evaluated, which permitted the system to respond to weather favorable for fungicide washoff.

INOCULATION OF SCOTS PINE TO COMPARE TWO INOCULUM SOURCES OF ENDODONCARIUM HARKNESSII. N. C. Wommer and W. Merrill, Dept. of Plant Pathology, The Pennsylvania State University, University Park, PA 16802.

Potted 2-0 Scots pine seedlings were inoculated in May 1986 with Endocordarium harknessii spores collected from galls on Scots or ponderosa pine. By August 1987, two different types of symptoms were evident: ectomycorrhizal cracking with or without swelling. Although inoculations with the two spore sources resulted in equal numbers of infected stems (P<0.05), the proportions of symptom types differed significantly (P<0.005). Inoculum from ponderosa pine caused 15% fewer trees to develop obvious galls and 13% more trees to develop stem cracking with or without swelling.

EFFICACY OF BENODANIL IN CONTROLLING ENDODONCARIUM HARKNESSII ON SCOTS PINE CHRISTMAS TREES. N. C. Wommer and W. Merrill, Dept. of Plant Pathology, The Pennsylvania State University, University Park, PA 16802.

Fifty galled trees, 2-2.5 m tall, were selected in a commercial plantation severely infected with Endocordarium harknessii in Tioga Co., PA. Half of the trees were sprayed on 23/3/86 with Benodanil at the rate of 0.5 kg ai/ha. The control treatments were sprayed on 20/8/87 by determining the ratio of galls/cm on the 1986 internodes, 1.4-1.7 cm from the ground, on each of four shoots/tree. Benodanil significantly (P<0.0005) reduced the average infection ratio on the four shoots of trees from 1 gail/3.4 cm shoot length to 1 gail/14.3 cm on the treated trees. This level of control, however, is not commercially acceptable. Further, 23% of the treated trees held infection ratios not significantly different from those of the checks. These trees probably broke bud after the fungicide had deteriorated. Although benodanil was effective in preventing E. harknessii infection, either a higher rate or a second application will be needed to provide adequate control.

DETERIORATION OF ALFALFA SPROUTS BY PSEUDOMONAS SPECIES DURING PRODUCTION. R. L. Wick and N. J. Johnson. University of Massachusetts, Suburban Experiment Station, 240 Beaver St., Waltham, MA 02154.

Several New England producers of alfalfa sprouts routinely experience bacterial deterioration of sprouts during production. Usually, discrete patches, 1 to 15 cm in diameter, of colored and discolored sprouts occur randomly on sprouting trays. Occasionally, large portions of the sprouts are uniformly affected. Individual discolored sprouts are yellow to brown, appear gummy, and are often shriveled. Several different isolates of Pseudomonas, most of them fluorescent, have been recovered from diseased sprouts and shown to be pathogenic. Physiological and biochemical tests of the isolates will be discussed.

PSEUDOMONAS SYRINGAE LEAF SPOT OF PELARGONIUM X HORTORUM. Robert L. Wick and Karen R. Kane. University of Massachusetts, Suburban Experiment Station, 240 Beaver St., Waltham, MA 02154.

A leaf spot disease of geranium (Pelargonium X hortorum) was found in a commercial greenhouse in Massachusetts. Within two weeks, several plants died, and plant beds became blighted. The initial symptoms were small, water-soaked lesions, which quickly enlarged to 3 to 5 mm in diameter. Leaves with several spots became entirely chlorotic, and were later dry and papery. Affected leaves remained attached to the plant. Bacteria associated with the lesions were identified by LOPAT tests as Pseudomonas syringae var. Hall. Koch's postulates were completed by foliar-spray inoculation. Water-soaked lesions developed in 3 days, and symptom progression occurred as in naturally infected plants.

Evaluation of Epococcum purpurascens for biological control of white mold of bean. Ting Zhou and R. D. Reede. Department of Plant Science, Macdonald College of McGill University, Quebec, Canada H9X 1C0.

The ability of Epococcum purpurascens (EP) to control white mold of bean, caused by Sclerotinia sclerotiorum (SS), was assessed in two field plots during 1987. Treatments were applied during the flowering period and were followed with one application of ascosporous of SS at 4, 8, and 16 months after the first trial, treatments included three and five applications of EP (105 spores/ml) alone, two applications of EP plus iprodione (1R, 1 kg/ha), and two applications of 1R alone (1 kg/ha) significantly reduced disease incidence (DI). DI values for two treatments were 34.8, 31.0, 29.7 and 30.5%, respectively, as compared to 70.2X in control plots (plants inoculated only with ascosporous). In the second trial, plots with EP applied four times, plus 1R (0.5 kg/ha), and 1R (1 kg/ha) alone, had significantly lower DI values than control plots.
SUSTAINING ASSOCIATES

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AGRI-SCIENCES, INC., Long Beach, CA
ALF CHRISTIANSON SEED CO., Mount Vernon, WA
AMERICAN CYANAMID CO., Princeton, NJ
BASF CORPORATION, Parsippany, NJ
BUCKMAN LABORATORIES, INC., Memphis, TN
CALGENE, INC., Davis, CA
CARGILL HYBRID SEEDS, Aurora, IL
CHEVRON CHEMICAL CO., Richmond, CA
CHEVRON CHEMICAL CO., San Francisco, CA
CIBA-GEIGY CORP., Agricultural Division, Greensboro, NC
DEKALB-PFIZER GENETICS, DeKalb, IL
DEL MONTE CORP., San Leandro, CA
DEPARTMENT OF AGRICULTURE—AUSTRALIA, Northfield, Australia
E. I. DU PONT DE NEMOURS & CO., Newark, DE
ELI LILLY & CO., Greenfield, IN
FERMENTA PLANT PROTECTION CO., Mentor, OH
FERRY MORSE SEED CO., Modesto, CA
FUNK SEEDS INTERNATIONAL, INC., Bloomington, IL
GREAT LAKES CHEMICAL CORP., W. Lafayette, IN
GRiffin AG PRODUCTS CO., Valdosta, GA
GUSTAFSON, INC., Des Moines, IA
HARRIS MORAN SEED CO., Rochester, NY
HARTMAN'S PLANTS, INC., Sebring, FL
H. J. HEINZ CO., Bowling Green, OH
HOECHST ROUSSEL AGRI VET CO., Somerville, NJ
ICl AMERICAS, INC., Goldsboro, NC
ILLINOIS CROP IMPROVEMENT ASSOCIATION, INC., Urbana, IL
ILLINOIS FOUNDATION SEEDS INC., Champaign, IL
ISTITUTO DI FITOVIROLOGIA APPLICATA, Torino, Italy
ITESM, Queretaro, Mexico
JANSSEN PHARMACEUTICA, Piscataway, NJ
LOXTON RESEARCH CENTRE, Dept. of Agriculture, Loxton, S. Australia
MERCK & CO., INC., Rahway, NJ
MILES LABORATORIES, INC., Elkhart, IN
MOBAY CORP., Kansas City, MO
MONSANTO AGRICULTURAL CO., Chesterfield, MO
NOR-AM CHEMICAL CO., Wilmington, DE
NORTHRUP KING CO., Woodland, CA
O. M. SCOTT & SONS, Marysville, OH
PENNWALT CORP., Philadelphia, PA
PETOSEED CO., INC., Woodland, CA
PFIZER, INC.-TEKCHEM, Chemical Division, New York, NY
PIONEER HI-BRED INTERNATIONAL, INC., Johnston, IA
RESEARCH SEEDS-KALO, St. Joseph, MO
RHONE POULENC AG CO., Research Triangle Park, NC
ROHM & HAAS CO., Philadelphia, PA
ROTHAMSTED EXP. STATION, Harpenden, England
SAKATA SEED AMERICA, INC., Salinas, CA
SANDOZ CROP PROTECTION CORP., Des Plaines, IL
SIERRA CROP PROTECTION CO., St. Louis, MO
UNIROYAL CHEMICAL, Bethany, CT
USDA FOREST SERVICE, Ogden, UT
WINDMILL PVT. LTD., Harare, Zimbabwe
W-L RESEARCH, INC., Highland, MD
W. R. LANDIS ASSOCIATES, INC., Valdosta, GA