ARBORICULTURAL ABSTRACTS

POSSIBILITY FOR RECENT ORIGIN OF THE GYPSY MOTH (LEPIDOPTERA: LYMANTRIIDAE) FUNGAL PATHOGEN ENTOMOPHAGA MAIMAIGA (ZYGOMYCETES: ENTOMOPHTHORALES) IN NORTH AMERICA

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A model based on weather records and gypsy moth and pathogen developmental times was used to investigate environments favorable for development of the fungus Entomophaga maimaiga Humber, Shimazu & Soper, a pathogen of the gypsy moth, Lymantria dispar (L.), in the northeastern United States. The fungus was first noticed in 1989, and model results were obtained using data from that year from almost 400 weather stations from Pennsylvania and New Jersey to Maine. The most favorable areas in that year were parts of Connecticut, the northern third of Pennsylvania, and the southern half of New York State. The distribution of the fungus during that year, and the known ability of the fungus to spread, is consistent with an origin for the epizootic in Connecticut. When the model was run using weather records in Connecticut from 1969 to 1995, the most favorable weather conditions suggested that the fungus would also have been observed in 1971 if it had been present then. Also, model results using weather records in Massachusetts showed that the year 1945 was very favorable for development of E. maimaiga in that state. Because there is no evidence that the fungus was present at these times, it is probable that E. maimaiga became established in North America relatively recently. (Environ. Entomol. 1998. 27 (2): 171–177)

TIMING AND SEVERITY OF SUMMER PRUNING AFFECTS FLOWER INITIATION AND SHOOT REGROWTH IN SWEET CHERRY

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To examine the effect of timing and severity of summer pruning on flower bud initiation and vegetative growth, 4-year-old 'Bing' cherry trees (Prunus avium L.) were pruned at 31, 34, 37, 38, or 45 days after full bloom (DAFB) with heading cuts 20 cm from the base of current-season lateral shoot growth, or at 38 DAFB by heading current-season lateral shoot growth at 15, 20, 25, or 30 cm from the base of the shoot. The influence of heading cut position between nodes also was examined by cutting at a point (= 20 cm from the shoot base) just above or below a node, or in the middle of an internode. Summer pruning influenced the number of both flower buds and lateral shoots subsequently formed on the shoots. All of the timings and pruning lengths significantly increased the number of both flower buds and lateral shoots, but differences between pruning times were not significant. There was significantly less regrowth when shoots were pruned just below a node or in the remaining stub may inhibit regrowth somewhat. The coefficient of determination (r^2) between flower bud number and regrowth ranged from –0.34 to –0.45. In young, high-density sweet cherry plantings, summer pruning may be useful for increasing flower bud formation on current-season shoots. The time of pruning, length of the shoots after pruning, and location of the pruning cut can influence subsequent flower bud formation and vegetative re-growth. (HortScience. July 1998. Vol. 33(4))

ANALYSIS OF GYPSY MOTH (LEPIDOPTERA: LYMANTRIIDAE) POPULATION DYNAMICS IN MICHIGAN USING GEOGRAPHIC INFORMATION SYSTEMS

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We studied the 9-year (1986–1994) statewide gypsy moth, Lymantria dispar (L.), population distribution dynamics in Michigan using geographic information systems (GIS) based on an analysis of pheremone trap data of male moth catch from more than 3,000 permanent sites. A time series of male moth contour maps with 7 density categories (0, 1–25, 26–100, 101–200, 201–300, 301–400 and > 400 moths · $trap^{-1}$ · $year^{-1}$) was created using the GIS. The statewide gypsy moth population expanded in an alarming rate of 6,053 km^2/yr

with the largest area infested being 128,164 km^2 (85% of the state) in 1993. The population-weighted mean center stayed in the Lower Peninsula, but a low-density population was developing in the Upper Peninsula during the 9-year period. Map analysis showed that the statewide population gradually increased from 1986 to 1990 and then became relatively stable thereafter. Both the highest weighted average density (191 moths · trap^{-1} · year^{-1}) and the greatest coefficient of relative dispersion (307%) occurred in 1990. Linear regression slopes between successive years were > 1.0 before 1990 and < 1.0 thereafter, indicating an increasing and then decreasing population density change. Regression results between successive years indicate that the previous years' population map is a good linear approximation for the following (r^2 > 70%). In the 9-year study, 55% of the population cells stayed in the same density class in the following year. A general pattern of population density shifts was that increase prevailed over decrease. Research methodology, population distribution, temporal dynamics, and density shifts are discussed. (Environ. Entomol. 1998. 27(4):842–852)

EFFECTS OF PARASITOID STRAIN AND HOST INSTAR ON THE INTERACTION OF BACILLUS THURINGIENSIS SUBSP. KURSTAKI WITH THE GYPSY MOTH (LEPIDOPTERA: LYMANTRIIDAE) LARVAL PARASITOID COTESIA MELANOSCELA (HYMENOPTERA: BRACONIDAE)

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Field studies suggest a positive relationship between application of the microbial pesticide Bacillus thuringiensis Berliner subsp. kurstaki and use of the larval parasitoid Cotesia melanoscela (Ratzburg) against the gypsy moth Lymantria dispar (L.). Under controlled conditions, however, exposure of gypsy moth larvae to sublethal concentrations had effects on C. melaoscela that varied with parasitoid strain, parasitoid life stage, and host instar. Performance of French-strain wasps emerging from hosts exposed as second-instars was enhanced by host ingestion of B. thuringiensis subsp. *kurstaki*. Conversely, Korean-strain wasps showed lesser and inconsistent effects. Enhanced parasitoid performance was attributed to increased larval, as opposed to adult, emergence. In second-instar hosts, parasitoid survival decreased between larval and adult emergence. Experiments with third-instar gypsy moths showed negative effects on C. melanoscela. Although the mechanisms for these differences are not clear, these results suggest that judicious timing and strain selection can enhance integration of microbial pesticides and parasitoids. (Environ. Entomol. 1998. 27(1):137–147)

SEASONAL CHANGES OF LEAF SURFACE CONTAMINATION IN BEECH, OAK, AND GINKGO IN RELATION TO LEAF MICROMORPHOLOGY AND WETTABILITY

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The leaf surfaces of beech, oak, and ginkgo have been investigated with respect to contamination with particles during 1 growing season. Based on the observation that particles are removed from water-repellent leaves by rain (Lotus effect) the 3 species were selected because they differ in leaf surface micromorphology and wettability. Leaves of beech are smooth, lacked wax crystals and were + wettable. Those of ginkgo were rough because their cells were convex and were densely covered by wax crystals, resulting in permanent water repellency. Leaves of oak were covered by waxes and were water repellent when young, but a few weeks after leaf expansion had ceased the waxes were rapidly eroded. These differences in wettability resulted in different amounts of contamination. Ginkgo collected a very small number of particles during the whole vegetation period. In beech, the contamination was significantly higher but fairly constant, whereas oak leaves accumulated particles with age. (New Phytol. 1998. 138, 91–98)

SUSCEPTIBILITY OF FIVE LANDSCAPE PINES TO PITCH CANKER DISEASE, CAUSED BY FUSARIUM SUBGLUTINANS F.SP. PINI

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Pitch canker, caused by Fusarium subglutinans f.sp. pini, causes branch dieback and stem cankers in many species of pine. Monterey pine (Pinus radiata D. Don), one of the most widely planted pines in the world, is extremely susceptible to pitch canker. Four other pine species, which might serve as alternatives to Monterey pine in landscape settings, were found to be relatively resistant, based on the site of lesions resulting from branch innoculations under greenhouse conditions. Of these species, Japanese black pine (P. thunbergiana Franco) was the most resistant, followed by Canary Island pine (P. canaruensis Sweet ex K. Spreng), Italian stone pine (P. pinea L.), and Aleppo pine (P. haleoensis Mill.). Consistent with these findings, a field survey conducted in Alameda County, California, revealed Monterey pine to have the highest incidence of infection, with significantly lower levels in Aleppo, Canary Island, and Italian stone pines. Japanese black pine was not observed in the survey area. (HortScience. 1998. 33(5):868–871)

MICROSATELLITE DNA VARIATION AMONG ASIAN AND NORTH AMERICAN GYPSY MOTHS (LEPIDOPTERA: LYMANTRIIDAE)

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Four microsatellite DNA loci were used to assay allelic variation in 4 gypsy moth populations (Japan, Russia far-east, China, and North America). These loci were highly polymorphic, with up to 17 alleles per locus and heterozygosity values in the 3 Asian populations typically > 0.6. Consistent with earlier studies employing DNA markers, variation in the North American population was lower than in Asia, presumably because of the recent population bottleneck associated with the release of European moths in North America. An assignment test was developed to estimate the likelihood that a multilocus genotype is derived from the population from which it was sampled. Moths from North America and Japan assign to their respective populations with high likelihood, but some moths from Russia and China do not. This is consistent with our knowledge of the recent evolutionary history of these populations, and means that investigators must be alert to the potential of false negatives (true Asian moths that appear North American at multiple loci) in the assignment of suspect moths captured in North America. (Ann. Entomol. Soc. Am. 1997. 90(6):768–775)