ARBORICULTURAL ABSTRACTS

PERFORMANCE OF THE MICROSPRAYER, WITH APPLICATION FOR PHEROMONE-MEDIATED CONTROL OF INSECT PESTS

R. Isaacs, M. Ulczynski, B. Wright, L. Gut, and J. Miller

An electronically controlled device has been designed to provide reliable, precise, season-long release of insect pheromones without the need for maintenance, refilling, or component replacement. The operational performance of this dispenser technology was evaluated under laboratory and field conditions throughout the summer of 1998 in orchards of Michigan apple (Malus spp.). A simple electronic circuit controlled the opening of an automotive fuel injector connected to a pressurized canister containing pheromone solution. By controlling the duration and frequency of pheromone release and the concentration of pheromone within the canister, this device, referred to as the Microsprayer, dispensed a desired quantity of pheromone to achieve mating disruption. Containment of multiple pheromones within the light- and oxygen-free environment provided release of active ingredients throughout the growing season for disruption of mating by >1 pest insect species. The volume released increased linearly with canister pressure, and this increase was positively correlated with ambient temperature. The spatial pattern of primary pheromone deposition was measured in still air the largest volume deposited was 380 cm from the point of release. Release from increasing heights above a target surface caused an exponential reduction in the volume of liquid reaching the surface because of solvent evaporation. In orchard trials, microsprayers powered by single 0.5 A hr, 9 V lithium batteries released pheromone every 170 seconds for 5 months without appreciable voltage drop. Weight loss from the microsprayers was steady, and predictable and canister pressure remained above 50 psi for the duration of the season. This device shows promise for practical control of insect pests amenable to pheromone mating disruption. (J. Econ. Entomol. 1999. 92(5):1157–1164)

EFFECTS OF MYCORRHIZAL COLONIZATION ON BIOMASS PRODUCTION AND NITROGEN FIXATION OF BLACK LOCUST (ROBINIA PSEUDOACACIA) SEEDLINGS GROWN UNDER ELEVATED ATMOSPHERIC CARBON DIOXIDE

K.S. Olesniewicz and R.B. Thomas

Interactive effects of elevated atmospheric CO_2 and arbuscular mycorrhizal (AM) fungi on biomass production and nitrogen fixation were investigated using black locust (Robinia pseudoacacia). Seedlings were grown in growth chambers maintained at either 350 µmol mol^{-1} or 710 µmol mol^{-1} CO_2. Seedlings were inoculated with Rhizobium spp. and were grown with or without AM fungi. The ^{15}N isotope dilution method was used to determine N source partitioning between N_2 fixation and inorganic fertilizer uptake. Elevated atmospheric CO_2 significantly increased the percentage of fine roots that were colonized by AM fungi. Mycorrhizal seedlings grown under elevated CO_2 had the greatest overall plant biomass production, nodulation, N and P content, and root N absorption. Additionally, elevated CO_2 levels enhanced nodule and root mass production, as well as N_2 fixation rates, of nonmycorrhizal seedlings. However, the relative response of biomass production to CO_2 enrichment was greater in nonmycorrhizal seedlings than in mycorrhizal seedlings. This study provides strong evidence that arbuscular mycorrhizal fungi play an important role in the extent to which plant nutrition of symbiotic N_2-fixing tree species is affected by enriched atmospheric CO_2. (New Phytol. 1999. 142:133–140)

EFFECT OF COTTONWOOD LEAF BEETLE (COLEOPTERA: CHRYSOMELIDAE) LARVAL POPULATION LEVELS ON POPULUS TERMINAL DAMAGE

Y. Fang and E.R. Hart

The cottonwood leaf beetle, Chrysomela scripta F., is a major defoliating pest of Populus in North America. We determined the relationship between larval population densities and defoliation levels in central Iowa, and related that to potential biomass loss. During the 1995 and 1996 growing seasons, egg mass surveys were performed: in 1995 for generation 2 and in 1996 for all 3 generations. Open and caged Populus trees were infested with different populations of freshly enclosed larvae on actively growing terminals. The 1996 observations from the open and caged trees in the second generation and from the caged trees in generations 1 and 3 are consistent with those of the open and caged trees of the 1995 second generation. The results from the open trees during the first and third generations in 1996 are much different from those of the second generation in either year. The probability of reaching damage levels that cause biomass loss is greatest for the second generation. Egg mass density may be useful in predicting damage levels. Damage rating is an accurate estimator of foliage loss. (Environ. Entomol. 2000. 29(1):43–48)

VEGETATION CONTROL IN EASTERN ELECTRICITY

J. Crawly

The best way to save costs with regard to the impact of trees on overhead electricity lines is by tree trimming, rather than waiting for tree-related faults to occur. The history of tree trimming in Eastern Electricity is briefly reviewed. The company had a culture of short-term, very variable, tree trimming contracts. For example, these typically lasted from between 5–6, or 10 weeks, and at times involved more than 60 individual contractors. Gradually, the culture changed, and longer-term contracts were let, to smaller numbers of contractors. Eventually, open management-style contracts were let, lasting 4 years, with an additional 6-month lead-in period. At this stage, the number of contractors was reduced to only four. Benefits to contractors and to Eastern Electricity were considerable, and they are reviewed here. It is concluded that the latter, more participate management style has lead to benefits in the quality of overhead line management, to cost savings, and to reduced resource usage. (Arboric. J. 1999. 23:177–184)

PEST STATUS OF AMERICAN PLUM BORER (LEPIDOPTERA: PYRALIDAE) AND FRUIT TREE BORER CONTROL WITH SYNTHETIC INSECTICIDES AND ENTOMOPATHOGENIC NEMATODES IN NEW YORK STATE

D.P. Kain and A.M. Agnello

Surveys were conducted in 1994 and 1995 to determine the pest status of the American plum borer, Euzophera semifuneralis (Walker), in New York State stone fruit crops. These surveys indicate that American plum borer is the most important of the woodboring insects infesting tart cherries and also is an important pest in peaches suffering from canker diseases. It is not prevalent in plums or healthy peaches. Trials to control American plum borer were conducted in tart cherry and peach by using chlorpyrifos, esfenvalerate, and two commercially available formulations of entomopathogenic nematodes, Steinernema feltiae (Filipjev) and Heterorhabditis bacteriophora (Poinar). Two applications of chlorpyrifos, timed at petal fall and at the beginning of the second flight, effectively controlled the pest. One application of chlorpyrifos applied at petal fall did not provide effective season-long control, except where numbers where very low. Programs using one (petal fall) or three applications of esfenvalerate were ineffective. Control by either nematode formulation was insignificant. (J. Econ. Entomol. 1999. 92(1):193–200)

MICRONUTRIENT FERTILIZATION OF WOODY SEEDLINGS ESSENTIAL REGARDLESS OF PINE BARK pH

A. Wright, A. Niemiera, J.R. Harris, and R. Wright

The objective of this study was to determine the effect of micronutrient amendments to pine bark on seedling growth over a wide pine bark pH range. Koelreuteria paniculata (Laxm.) was container-grown from seed in pine bark amended (preplant) with 0, 1.2, 2.4 or 3.6 kg/m^3 (0, 2, 4, 6 lb/yd^3) dolomitic limestone and 0 or 0.9 kg/m^3 (1.5 lb/yd^3) Micromax™ (micronutrient fertilizer). Initial pine bark pH for each lime rate was 4.0, 4.5, 5.0, and 5.5, respectively. Final pH (week 10) ranged from 4.7 to 6.4. Seedlings were harvested 10 weeks after planting and shoot dry mass and height determined. Pine bark solution was extracted using the pour-through method at 3, 7, and 10 weeks after planting. Solution pH was measured, and solutions were analyzed for Ca, Mg, Fe, Mn, Cu, and Zn. Shoot dry mass and height were greater in Micromax-amended bark than in bark without Micromax. Lime had no effect on shoot dry mass or height. In general, adding Micromax increased pine bark solution Ca, Mg, and micronutrient concentrations. Adding lime increased pine bark solution pH and Mg concentration and either had no effect on or decreased solution Ca and micronutrient concentrations. Regardless of pine bark pH, Micromax additions resulted in better growth, and adding lime was not necessary. J. Environ. Hortic. 1999. 17(2):69–72)