Solutions should be found to diversify means of financing urban forestry programs, to protect remnant wooded areas and individual trees, to improve arboriculture practices, tree planting, tree production and survival, and to strengthen citizen and political support for urban forestry.

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INSECTICIDE SPRAYS FOR CONTROL OF THE NORTHERN PINE WEEVIL IN SOUTHERN ILLINOIS

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Abstract. The northern pine weevil, *Pissodes approximatus,* is a serious pest in Christmas tree plantations where harvesting of trees has occurred and where seedling trees have been planted. During the spring months the immature stages of the weevil develop in stumps from trees harvested during the previous November or December. When the adult weevils emerge during May and June they feed on seedling trees causing high mortality. Excellent control resulted from a carbofuran spray applied March 12, 1985 onto Scots pine boles in southern Illinois.

Résumé. Le charançon du tronc des pins, *Pissodes approximatus*, est particulièrement dommageable dans les plantations d'arbres de Noel où des arbres furent récoltés et où des semis furent plantés. Pendant les mois du printemps, les insectes passent par différents stades larvaires à l'intérieur des souches des arbres récoltés au cours des mois de novembre et décembre. Quand l'insecte adulte émerge en mai et juin, il se nourrit sur les arbres nouvellement plantés, causant un haut taux de mortalité. Un excellent contrôle fut assuré par la pulvérisation de carbofuran le 12 mars 1985 sur des plants de pin sylvestre localisés au sud de l'Illinois.

Landowners in the Midwest have found that sites which are not suitable for growing food crops can often be used for Christmas tree plantations. Profit can be gained through the sale of merchantable trees. During the period before tree harvest, insects such as the Nantucket pine moth, *Rhyacionia frustrana;* European pine shoot moth, *R. bouliana;* Zimmerman pine moth, *Dioryctria zimmermani;* and various sawfly species can cause problems for the grower. After tree harvest, most growers desire to replant pine trees in the same area, and it is at that time when another serious insect problem may develop. Stumps of trees cut in November and December may serve the following spring as sites for the development of the northern pine weevil, *Pissodes approximatus* Hopk. Dead pine trees can also become infested as well as logs and larger pieces of slash that come in contact with the soil surface.

The northern pine weevil is found from Wisconsin and Illinois eastward, and from Pennsylvania southeastward as far south as North Carolina. Finnegan (2) reported the following pines as hosts: white pine, *Pinus strobus;* pitch pine, *P. rigida;* jack pine, *P. banksiana;* shortleaf pine, *P. echinata;* red pine, *P. resinosa;* shrub pine, *P. virginiana;* and mountain pine, *P. pungens.* Nielsen and Balderston (3, 4), Appleby et al. (1),

and Schuder (5) have reported Scots pine, *Pinus sylvestris*, as a host.

The adult northern pine weevil, *P. approximatus*, is approximately 8 mm in length, has a typical weevil body form with a short slightly curved snout, and is dark red-brown with two tan-white bands near the posterior of each front wing (Fig. 1). The mature larva is 12 mm in length with a tan head and white body and is found inside "chip cocoons." These chambers are located just beneath the bark of infested dead pine trees, stumps, or slash. Pupation occurs within these chambers. Newly formed adult weevils chew their way out of the chambers and bark, and exit to the outside. *P., approximatus* injury is often not detected and the death of weevil-killed seedling trees is often blamed on drought or poor planting techniques. Only under very close examination can the pinhead size hole caused by the adult northern pine weevil be seen in the bark. If the bark is removed the feeding damage can be recognized as a small patch of chewed tissue. In contrast the pales weevil, *Hylobius pales,* chews irregular patches off the bark of seedling trees or limbs of larger trees.

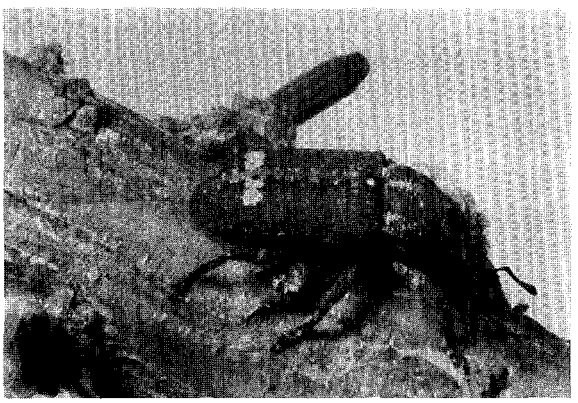

Fig. 1. An adult northern pine weevil feeding on a Scots pine seedling.

Since the development of *P. approximatus* is dependent on the availability of recently dead pine wood, the removal and destruction of stumps, slash, and dead trees is one means of reducing the likelihood of problems with this insect. These procedures are often time consuming and expensive. An insecticide spray application to pine wood to prevent oviposition or to kill newly hatched larvae has been used in the past as this method is convenient and less expensive than stump removal. Schuder (1978) reported that a single spray application of Furadan (carbofuran) 4F 1.0 lb, or lindane 2E (0.5 lb ai/100 gal) onto stumps in mid-April in Indiana provided complete control. Nielsen and Balderston (1975) indicated that furadan (carbofuran) 4F in water or kerosene at 5 lb ai/100 gal, Dursban 2E (chlorpyrifos), or lindane 2E in kerosene at 5 lb or 10 lb ai/100 gal respectively, gave complete control when applied on May 6 in Ohio. Presently none of these

Table 1. Summary of mean number of emergence holes, number of emergence holes per bole surface area (cm^2) and adult weevil emergence by treatment, when insecticide sprays were applied on March 12, 1985 in southern Illinois.

Insecticide	*Formulation and rate*	*Mean number of emergence holes*[1]	*Number of emergence holes per bole surface area*	*Number of emerged adult weevils*
carbofuran	Furadan 4F 1 lb ai/100 gal	5.5a	0.005	34
chlorpyrifos	Dursban 4E 1 lb ai/100 gal	72.0b	0.9	399
check	—	40.3c	0.03	202

[1]Tukey's Studentized Range (HSD) Test Means followed by the same letter are not significantly different at the 5% level.

chemicals is registered for stump treatment. This study was undertaken in hopes of providing data that eventually may result in the registration for a stump spray treatment that could be used for effective control of the northern pine weevil.

Methods

At the University of Illinois Dixon Springs Agricultural Research Center, located in Pope County, southern Illinois, three red pine trees were felled on March 11, 1985. The trees were cut into 45 boles, 30 cm long, 8-20 cm in diameter. The boles were divided into 3 groups of 15. Within a group, each bole was placed in a row on the soil surface in an upright position with approximately a 45 cm space between each bole. The block design rows were spaced approximately 6 m apart. On March 12, 1985 the three treatments (Table 1) were randomly applied within each block. A one gallon sprayer at 20 psi was used to apply the spray to each bole until runoff. Each treatment was replicated 5 times within each row. Chicken wire mesh was placed around each bole to prevent feeding damage by woodpeckers. On June 7, 1985 the boles were removed from the field and transported to an insectary at Champaign, IL and arranged by treatment in wire cages. Adult emergence was monitored each day until emergence had ceased. On July 20, 1985, the bark from each bole was removed, the number of chip cocoons counted, and the surface area of each bole recorded.

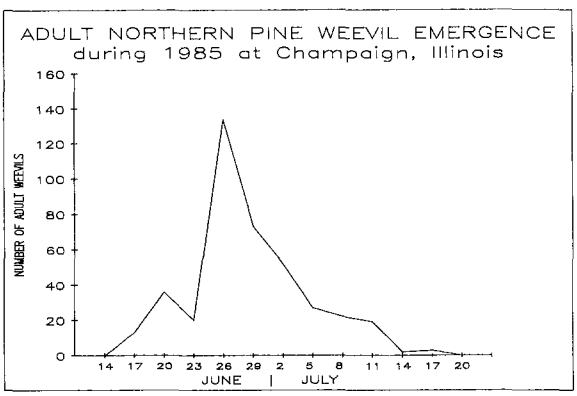

Fig. 2. Adult northern pine weevil emergence from untreated Scots pine boles during 1985 at Champaign, Illinois.

Results and Discussion

Adult weevil emergence from the untreated pine boles began on June 14, 1985 and continued until July 20 with peak emergence occurring on June 26, 1985 (Fig. 2). This information substantiates reports from Christmas tree growers in southern Illinois who have reported that adult weevil feeding on pine seedlings is most commonly observed in late June and early July.

The Furadan (carbofuran) treatment (Table 1) gave the best control indicated by the lowest number of emergence holes, the lowest number per square cm of bole surface and the lowest number of emerging adult weevils compared with Dursban (chlorpyrifos) and the check. The reason for the larger numbers in the chlorpyrifos treatment compared to those of the check and carbofuran treatments is unknown. We hope that this information will aid in the eventual registration of carbofuran spray applications for pine stump treatments for northern pine weevil control.

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