bi-monthly research notes

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BOTANY

Phragmoid Cells of Leaf and Twig Scars on Northwest Poplar (*Populus X deltoides* Bartr. cv. 'Northwest').—Normal poplar leaf and twig drop follows the occurrence of the first frost in the late summer when night temperatures drop to -5°C. A second twig drop may occur during the next growing season after a spring frost affects foliated shoots. The time of the leaf drop and the number of days required to bring about defoliation by frost fluctuate from year to year. Poplar stands will retain discolored leaves in the autumn if there is a rapid freeze of leaf and bark tissues. Scar tissues form in the current year after early autumn leaf and twig drop during the warm daytime temperatures required for tissue formation. These tissues do not form readily if leaf drop is late. Leaf and twig drop and scar tissue formation starts with abscission, which involves meristematic activity and rapid dilation of isodiametric cells at the base of the leaf stalk and twig. The newly formed scar tissue has a phragmoid cell that is described here for the first time.

Several Northwest poplar trees obtained from the Provincial tree nursery at Oliver, Alta. were potted in the greenhouse during the autumn of 1973. They leafed out in December and were maintained until April 1974. Abscission was induced in 24 leaves in February by freeze-killing the petiole 5 mm above the point of attachment to the twig by applying 5s freon flow from a 1-mm nozzle attached to a pressurized container. Care was taken not to kill the basal part of the petiole or the bark to which it was attached as this would prevent abscission tissues from forming. Four leaf samples were checked during the first 2 days to ascertain the number of days required for meristematic tissues to develop at the base of the petiole. The leaves began to drop on the third day and sampling was discontinued. Six-week-old leaf scars were excised, cooked in 3% sodium bisulfite, rinsed, macerated, and observed under a light microscope.

Twig scars of Northwest poplar formed after a frost in September 1973 were obtained in January 1974 from a cultivated local tree. Samples were cooked and pulped in 1:1 mixture of acetic acid and 15% hydrogen peroxide. Pulped tissues from the leaf and twig scars were stained by adding 1% aqueous solution of chlorazol black at 107°C, rinsed several times, and mounted in Aman's lactophenol.

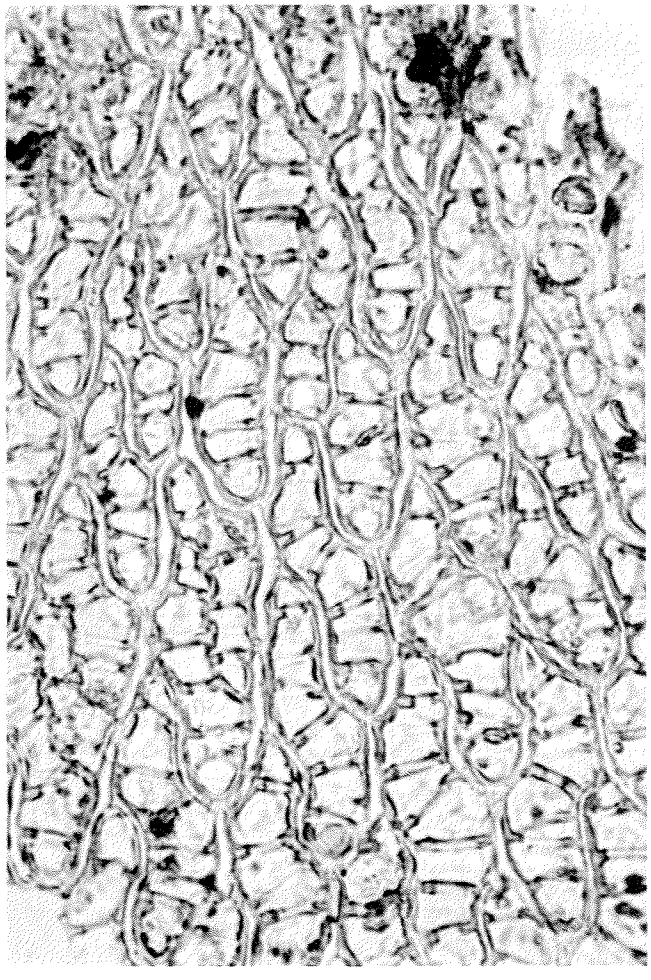

Figure 1.

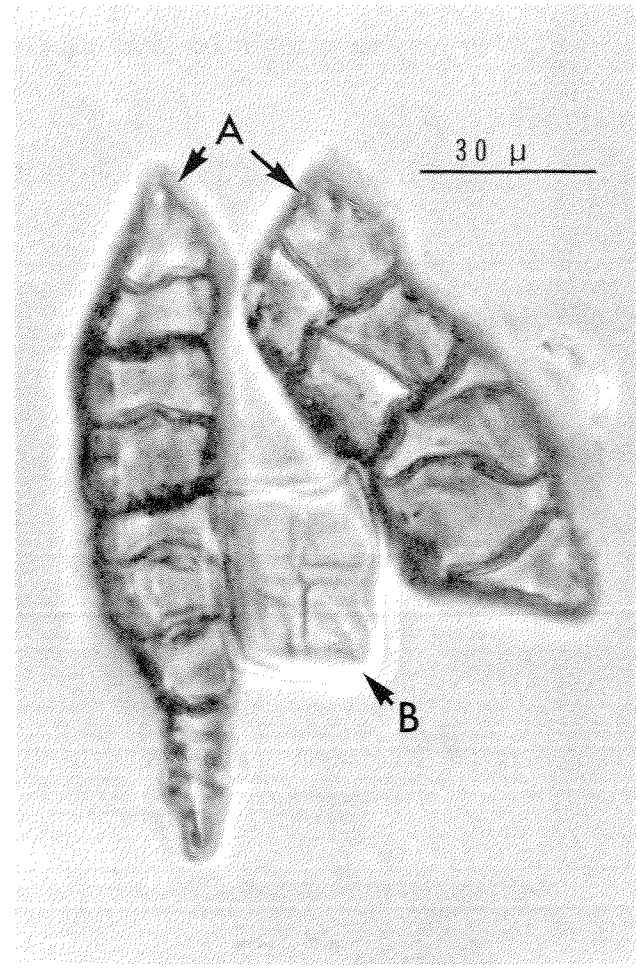

Figure 2.

The corky tissues of leaf and twig scars were heterocellular. They were composed of expanded fusiform cells arranged in irregular rows and contained a band or groups of elongate phragmoid cells (Fig. 1). Isolated phragmoid cells were heterogeneous, with or without scalariform pitted walls (Fig. 2A). The cell walls varied in thickness within and between these multicellular phragmoid cells. The most abundant cell within corky tissue was the angular, isodiametric thin-walled cell (Fig. 2B), and the least abundant was the sclereid-like cell (Zalasky, Inf. Rep. NOR-X-48, 1972).

The lumen of each fusiform phragmoid cell is packed with unequal angular cells arranged longitudinally, and occasionally horizontal intercallary cells may be present. This phenomenon is common in the fusiform initials of the cambium, glandular trichomes of certain plants, and the suspenor cell of certain embryos. The variations of phragmoid cells are probably due to the effects of internal division within the confines of the original cell wall.—H. Zalasky, Northern Forest Research Centre, Edmonton, Alta.

ENTOMOLOGY

Mating Disruption of Tussock Moths by Atmospheric Permeation with Synthetic Sex Pheromone.—Sex pheromones show promise as an environmentally acceptable means of suppressing insect populations (various authors in Birch (ed.), Pheromones, North Holland Publ. Co., Amsterdam 1974). The most appealing technique appears to be the permeation of the local atmosphere of a pest with a level of sex pheromone sufficent to disrupt its mating ability. Presumably, the atmospheric pheromone habituates the males rendering them incapable of responding successfully to the small amount of pheromone released by the females with the net result that males are unable to locate females and mate with them. The sex pheromone of the Douglas fir tussock moth, [*Orgyia pseudotsugata*], has been identified as (Z)-6-heneicosen-11-one (Smith *et al.*, Science 188: 63-64, 1975) and is commercially available. Although this compound has not yet been reported from females of other tussock moth species, it sexually stimulates and attracts in the field both white-marked [*O. leucostigma*] and rusty [*O. antiqua*] tussock moths (unpublished data). Therefore, laboratory experiments were conducted to determine whether (Z)-6-heneicosen-11-one, hereafter referred to as ketone, has the potential to disrupt the mating ability of these two species which are currently pests in several localities in Canada.

Experiments were carried out in covered 3.6 *l* glass jars lined on the bottom with filter paper and gauze. The ketone, in hexane solution, was deposited in known amounts (0.1 to 100 μg) on 2x2.5 cm frosted glass plates (ends of histological slides). After the solvent had evaporated, the plates were placed in small petri dishes on the bottom of the jars, each of which contained six 1-day old male tussock moths. Controls consisted of similar jars with untreated glass plates. One hour after the introduction of the chemical, five newly-emerged virgin females were placed in each jar. The number of successful matings was indicated by a count of egg masses which are normally deposited 30-60 minutes after successful copulation. These were corroborated by a count of spent females. Evaluations were made 6 and 24 h after the introduction of the females. Tests with each quantity of ketone were replicated 3-6 times (2-4 jars per replicate). Other chemicals evaluated for comparison were (Z)-6-heneicosen-11-ol (supplied by J. Weatherston, I.P.R.I.), disparlure ((Z)-7,8-epoxy-2-methyloctadecane, the sex pheromone of the gypsy moth, like the tussock moths a lymantriid species), a related compound 2-methyl-(Z)-7-octadecene, and (Z)-7-dodecenyl acetate. Each of these compounds was tested only at the 100 μg dose.

The results of the test with the ketone against white-marked tussock moths are shown in Fig. 1. The mating success of the experimentals was significantly lower than the controls ($p < 0.05$, χ^2 test) for each level of ketone tested except the 0.1 μg dose after 24 h. The reduction in mating success appears to be linearly related to dosage of ketone on the substrate and presumably,

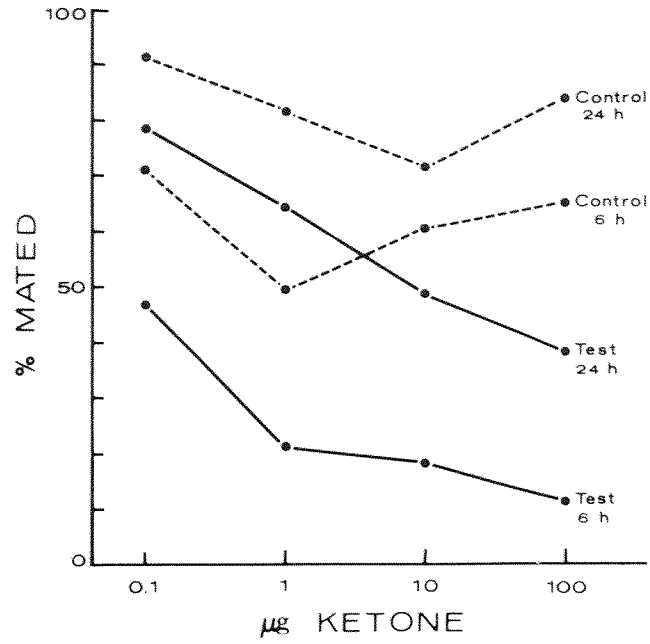

Figure 1. Mating success of *Orgyia leucostigma* moths exposed to various quantities of (Z)-6-heneicosen-11-one (ketone) compared to unexposed moths (controls) 6 and 24 h after introduction of females.

therefore, to the amount of ketone in the jar atmosphere. The percent mating reduction (difference in percent mating between experimentals and controls expressed as a percent of the percent mating controls) after 6 h ranged from 34% for the 0.1 μg dose to 82% for the 100 μg. These reductions in mating were greater than those obtained after 24 h when the reductions ranged from 14 to 55% over the same dosages. This decrease in mating reduction between 6 and 24 h may be due to the increased chances of a male accidentally coming into contact with a female where short range mating stimuli, such as visual and tactile cues, may take over from pheromones and lead to copulation. Undoubtedly the unnaturally high moth density in the jars was the reason that mating was not completely eliminated by any of the treatments. When the experiment was repeated with the rusty tussock moth, mating reduction with 100 μg of ketone was 70% after 6 h and 61% after 24 h ($p < 0.01$ in both cases).

Each of the four other chemicals tested against white-marked tussock moth males (Table 1) had some effect on the mating success of this species but only disparlure caused a statistically significant reduction in mating after 24 h. It is significant that in electroantennogram (EAG) tests, which measure the responsiveness of moth antennae to olfactory stimuli (Grant, J. Econ. Entomol. 64:315-316, 1971; Grant, Bi-mon. Res. Notes 31:19, 1975), disparlure was far more stimulating to male antennae of white-marked tussock moths than any of the other

TABLE 1

Mating reduction of *Orgyia leucostigma* moths caused by atmospheric permeation with various chemicals (100 μg on glass substrate)

Compound	% Mating Reduction 6h	24h
(Z)-6-heneicosen-11-one	82*	55*
(Z)-6-heneicosen-11-ol	33*	12
(Z)-7,8-epoxy-2-methyloctadecane	60*	32*
2-methyl-(Z)-7-octadecene	24	14
(Z)-7-dodecenyl acetate	15	16

* χ^2 significant, $p < 0.05$.

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