



Pacific Forestry Centre

Yew Big Bud Mite

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Introduction

The yew big bud mite, *Cecidophyopsis psilaspis* (Nalepa), causes the formation of bud galls on yew, *Taxus* spp. (Fig. 1), and is the most damaging and ubiquitous pest of Pacific yew, *Taxus brevifolia* Nutt., in coastal areas of British Columbia. Mite damage on Pacific yew is chronic and usually severe, with mortality of terminal buds averaging more than 20%. Extensive and chronic bud mortality throughout the tree crown results in an irregular branching pattern and produces an asymmetric crown that is characteristic of trees infested by the yew big bud mite.

The recent success of clinical trials of the promising anti-cancer agent Taxol® (paclitaxel), derived from Pacific yew, has raised interest in the management of this little-known species. One of the most promising strategies for Taxol® production is clonal propagation and intensive plantation culture of Pacific yew. Damage caused by the yew big bud mite could reduce the feasibility of such a program because of its deleterious effects on shoot growth. Also, the movement of infested nursery stock could introduce the mite to areas that are currently mite-free. The yew big bud mite is considered a serious pest of English



Figure 1. Big bud symptoms on a Pacific yew branch.

yew, *Taxus baccata* L., in Europe and was likely introduced to coastal British Columbia on infested nursery stock during the mid to late 19th century. This mite is not known to occur at high elevations (>700 m) on the coast or in interior regions of British Columbia.

Distribution and Hosts

The yew big bud mite (Fig. 2) occurs throughout much of northern and central Europe and in temperate coastal

regions of North America, including Long Island, New York and the Pacific northwest from Oregon to British Columbia. In British Columbia, the yew big bud mite occurs throughout the coastal range of Pacific yew (Fig. 3), from Prince Rupert to Victoria, including the Queen Charlotte Islands. It is not known to occur in the interior of British Columbia and is apparently absent from high elevation (>700 m) coastal yew populations.



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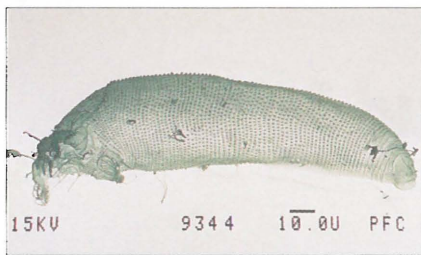


Figure 2. Yew big bud mite. Scale bar = 10 μ m.



Figure 3. Distribution of Pacific yew in British Columbia.

Description

Egg: Opaque white, about 30 μ m in diameter, spherical when first laid, becoming somewhat oblong as the larva develops.

Larva: Approximately 95 μ m in length, translucent white, similar to the nymph but smaller.

Nymph: Approximately 130 μ m in length, opaque white; similar to adults except in size and colour.

Adults: 130-150 μ m in length, orange brown, vermiform or worm-like in body shape, with two pairs of legs (rather than four as in most mites) located at the anterior end. Males and females are similar in appearance.

Host species recorded in British Columbia include Pacific yew, English yew, Japanese yew, *Taxus cuspidata* Sieb. and Zucc., Canada yew, *Taxus canadensis* Marsh. and Chinese yew, *Taxus mairei* (Lemeé and Level.).

Life History and Habits

All life stages can be found inhabiting infested buds throughout the year. Mites migrate to newly formed terminal buds (Fig. 4) during shoot elongation in spring; about mid May near Victoria. Within two weeks, feeding activity under the outermost bud scales induces an abnormal elongation and swelling of the immature bud scales. By mid July, the distal margin of outer bud scales becomes rusty in colour and are covered with numerous minute surface eruptions (Fig. 5). Later in the fall, winter and early spring, mites can be found feeding under the inner bud scales (Fig. 6) and on the apical meristem (Fig. 7). Populations in infested buds gradually increase and peak in early spring. The yew big bud mite appears to have a direct form of life cycle with egg, larval, nymph and adult stages being present in overlapping generations throughout the year. No special overwintering form (deutogyne) has been observed. Wind appears to be the primary dispersal mechanism but some dispersal may occur by mites hitchhiking on insects and birds.

Detection

The most conspicuous symptom of yew big bud mite infestation on Pacific yew is distortion of the normal symmetrical growth-form of the host tree. Closer examination of the branch structure of infested trees reveals that chronic terminal bud mortality, dieback of the subtending shoot and transfer of apical dominance to axillary buds (Fig. 8), produces a very erratic branch form (Figs. 9, 10) which ultimately affects the overall appearance of the tree. The characteristic "big bud" symptom is also easily recognized on infested trees.



Figure 4. Migrating yew big bud mite settled in new bud of Pacific yew.



Figure 5. Feeding damage on outer bud scales in early summer.

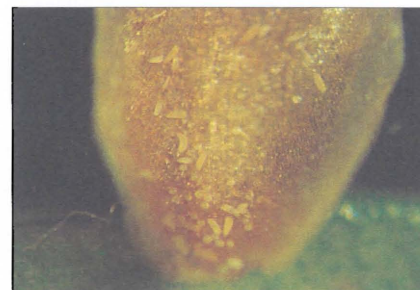


Figure 6. Yew big bud mite colony and feeding damage on bud scale.

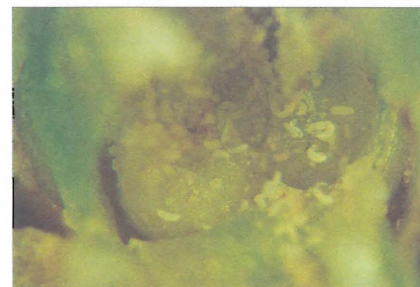


Figure 7. Yew big bud mite colony feeding on apical meristem.



Figure 8. Assumption of apical dominance by axillary bud.

Damage

Damage to buds is highly variable and ranges from slight swelling and marginal scorch of external bud scales to grotesque hypertrophy and complete necrosis of affected buds (Figs. 11, 12). The most heavily infested buds swell, become increasingly scorched and eventually turn black as necrosis sets in. Most black necrotic buds die, but some manage to survive by producing a submeristematic bud. The outer scales on many buds are often severely damaged, but the inner scales and needle primordia are undamaged; these buds flush normally. Severe twisting and hypertrophic growth (Fig. 13) usually occurs on <10% of the new shoots. This damage occurs when mites feed directly on the developing shoot and needles during early bud swelling and shoot elongation. Very lightly infested buds show only slight or marginal discoloration of the outermost bud scales and flush normally in the spring.

Yew big bud mite attacks all age classes of Pacific yew from seedlings to mature trees. Surveys to determine the extent of mite damage on Pacific yew growing in low elevation natural stands throughout south coastal British Columbia indicate that all host trees support yew big bud mite populations and that >99% of these trees exhibit obvious bud, shoot, branch and tree abnormalities. Rarely, a lightly infested Pacific yew is found showing no symptoms of mite attack. Studies in selected stands indicate that, on average,



Figure 9. Erratic growth form of Pacific yew branch suffering chronic bud mortality.



Figure 10. Normal growth form of Pacific yew branch.



Figure 11. Moderate bud damage.



Figure 12. Complete necrosis of severely damaged bud.



Figure 13. Distortion of shoot and needles.



Figure 14. Premature swelling of male flower buds damaged by yew big bud mite.



Figure 15. Necrosis of female flower buds damaged by yew big bud mite.

>90% of the terminal buds are damaged by the mite and that >20% of these buds are killed each year. Damage to axillary buds and reproductive buds is less common (Figs. 14, 15). Chronic high bud losses severely affect both tree and branch form and likely reduce annual increment and biomass production.

Management Options

Biological

Many predaceous species of mites, lacewings, thrips, flies, beetles and true bugs are known to feed on closely related eriophyoid mites. However, at present there is no evidence that any of these provides effective biological control of the yew big bud mite. Studies in south coastal British Columbia indicate that the larva of a small predatory wasp, *Tetrastichus* sp., occurs in <0.5% of infested buds (Fig. 16). Although mites belonging in families known to be predaceous have been observed in yew big bud mite infested buds, no direct evidence of feeding has been observed.

Genetic resistance

At present, a number of Pacific yew trees supporting light, non-damaging mite populations have been identified. These trees appear to be resistant to the buildup of damaging mite populations and have a desirable growth form. Trials are in progress to deter-



Figure 16. *Tetrastichus* sp. larva in infested bud.

mine if the apparent field resistance of these trees holds up in intensive nursery and plantation culture. The mechanism of mite resistance on these trees has not been investigated.

Chemical

Trials are required to verify the efficacy of various miticides against the yew big bud mite. Chemical control would be an option only in nursery or intensive plantation culture and could not be considered in the natural forest.

Quarantine

Given the low elevation coastal distribution of this mite and the unknown status of its cold hardiness, it would not be wise to transport yew stock grown on the coast to interior locations.

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