Short Shoot Syndrome of Grapes

Vaughn Walton (waltonv@hort.oregonstate.edu), Jay Pscheidt (pscheidj@science.oregonstate.edu), Ray William (williamr@science.oregonstate.edu), Jessica Sandrock (sandrocj@hort.oregonstate.edu)
Oregon State University

Introduction:
Short Shoot Syndrome has become increasingly recognized as important in Oregon, and more lately Washington State wine-grape areas. These symptoms started to emerge during 2001 in Oregon and have now been observed in Washington state vineyards. Symptoms associated with this syndrome include shoot scarring, severely stunted growth, bunch loss and curled or malformed basal leaves. In severe cases, growers experience complete crop losses due to the abortion of affected bunches. Vine structure can be impacted due to the dieback of affected shoots and this may have a negative impact on crop quality. Vineyards that have shown these symptoms are located the Willamette, Rogue and Umpqua Valleys and also the Walla-Walla, Milton-Freewater, Yakima Valley and Columbia Valley grape-growing areas in Oregon and Washington States. These symptoms have been found to vary with a variation in bud mite and rust mite proportions in a five year study in Australian vineyards.

Initial survey work has shown correlations between rust and bud mite infestations and the above symptoms. There has been no formal analysis and thus this association has not been confirmed. There are several theories to explain the symptoms and these include; Boron deficiency, physiological factors and arthropod damage such as the eriophyiid rust and bud mites as well as thrips. Many reports have been found of these symptoms occurring with either of these factors playing a role. One explanation for these symptoms are that damage may be caused by an enhanced wound periderm response to feeding injury during the previous season when the primordia are formed for the next season of growth.

In order to help producers to identify the syndrome we will describe symptoms on the different plants including leaves, shoots, whole plants in in-vineyard distribution.

Plant Parts

Leaves – The basal or oldest leaves on the canes displaying short shoot are darker green and puckered. These leaves can also be described as having the “draw string” effect where it looks like the leaf surface (petiole) has been pulled back, something like a loose thread being pulled in the middle of some fabric. There is no change in the appearance of these leaves as the season progresses. During the remainder of the season, subsequent leaves further away from the base of the canes have no such symptoms. (Fig. 1)

Shoots – Grape shoots are shorter in comparison to the unaffected longer shoots in spring after bud break (Fig. 2). Short shoots are delayed in bud break and have a zigzag growth pattern (Fig. 3). These shoots typically have few to no grape clusters (flowers) on them (Fig. 4) These shoots look as if they have developed from secondary or tertiary buds due

to the lack of bunches. In many cases these shoots will die back (Fig. 5) with secondary shoots with no bunches developing from these nodes. In many instances primary shoots seem to lose apical dominance and the summer lateral shoots break and start growing early. As the season progress the vines continue to grow and appear as if it is not affected, except for the lack of bunches and the alteration in the architecture of the vines (vineyard looks 'better' as time goes on).

Affected shoots also display railroad track-like scars (Fig. 6). These scars can be found on the first one to four inter-nodal regions of the shoots and on the main veins of the underside of the leaf. These symptoms are considered to be very much like thrips injury and were found on all of 400 shoots examined that display short shoot symptoms.

When looking at the **whole plant,** cordon pruned vines display these symptoms on most of the spurs with more uniform distribution of symptoms on the vine. Cane pruned vines display these symptoms on the current-season shoots nearest to the main trunk. Shoots farther form the head show fewer symptoms or are not affected at all.

When looking at symptoms throughout **vineyard blocks,** there is a **v**ery high incidence of the syndrome throughout heavily affected blocks. The severity of crop damage is enough to significantly impact yield to such an extent that harvest is not justified in these blocks (Fig. 7). Closer examination of damage distribution within blocks showed that symptoms may not be specifically on every vine in a block. It has been found in whole-block surveys that symptoms are in many cases clustered and more concentrated in certain areas of affected vineyards. In less severe cases, these patterns of symptoms will also be found, but at less frequent intervals and only 1 or 2 % of the vines show symptoms.

During the latter part of summer and autumn many producers have found bronzing of leaves (Fig. 8, 9). Closer investigation of these leaves under the stereo microscope have revealed a mixture of bud and rust mites with numbers ranging between twenty and one thousand per leaf. It is believed that these mites move into over-wintering buds as soon as the leaves start to drop. Good numbers of bud and rust mites have been found on double-sided sticky tape (Fig. 10) as well as in dissected buds (Fig. 11) both in the Willamette and Yakima (D. James, personal communication) valleys.

The patterns of symptoms **between vineyard blocks** can be described as follows: Heavily affected blocks can be physically adjacent to blocks without or with very few symptoms. Not every block on a production unit or vineyard (defined as a contiguous set of vines and blocks run by the same manager(s)) shows symptoms in the same year. Different blocks within a production unit will show symptoms year to year. Blocks will show symptoms for about 2 years and then symptoms appear to get less severe with symptoms found at much less frequent intervals.

Fig. 1. Leaf symptoms include what can be described as ‘draw-string effect’. Leaves further from the base of the cane do not display symptoms.

Fig. 2. Comparison of affected and unaffected shoots during theearly growing season.

Fig. 3. Affected shoots show a zig-zag pattern and in many cases bunches will be necrotic and eventually abort during the following weeks.

Fig. 4. Affected shoots have few or no clusters, have a 'zig-zag' growth pattern, and lose apical dominance with the secondary shoots becoming dominant later in the season.

Fig. 5. In many cases the primary shoots will die back and secondary shoots will appear to be the dominant shoots. These secondary shoot do not display scarring and do not bear any bunches.

Fig. 6. Affected shoots display ‘railroad-track’ scarring. Note the ‘drawstring effect’ of the basal leaf on the bottom right.

Fig. 7. The radical effect of bunch loss on the affected shoots can be seen here, often resulting in producers not harvesting whole production blocks due to low yield. Some scarring of tissue can be seen on the shoot on the right.

Fig. 8. Bronzing of leaves can be best seen in the early morning or late afternoon.

Fig. 9. Leaf bronzing found associated with rust and bud mite infestations.

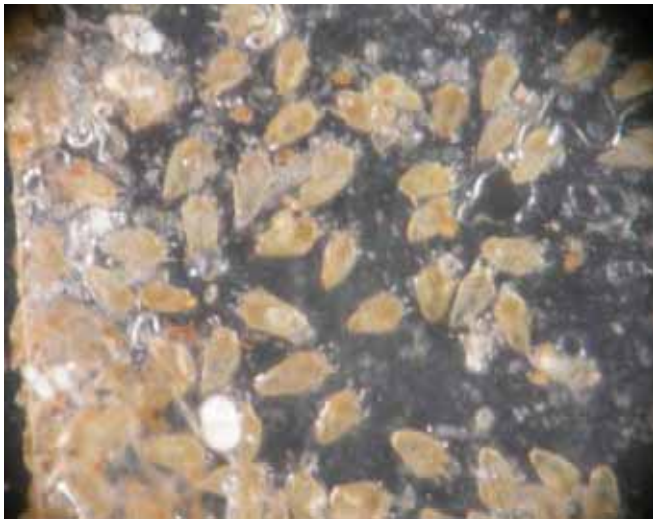

Fig. 10. Rust mites found on double-sided sticky tape traps during the autumn period in vineyards in the Willamette Valley.

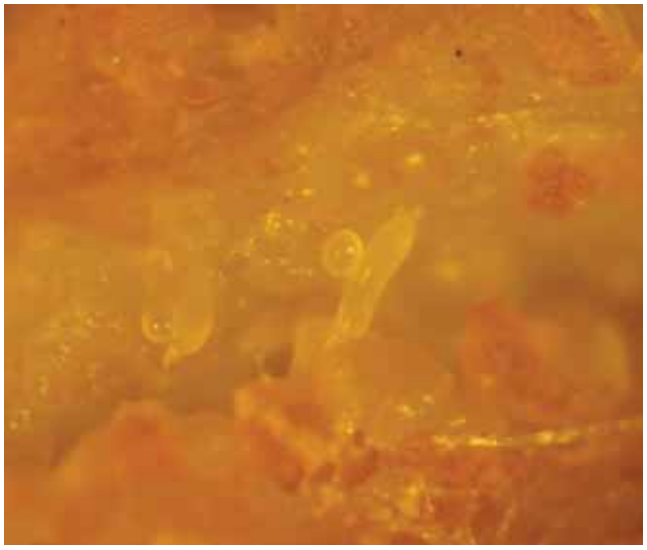

Fig. 11. Bud mite found inside a dissected bud during the autumn in a Willamette Valley vineyard.