

Grape Bud Mite Studies

seasonal cycle searched for weak point to attack
pest assumed to be responsible for abnormal growth

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Abnormal vine growth found in certain California vineyards—short basal internodes, zigzagged shoots, witches broom formations, scarification, flattened canes, dead overwintered buds—results in a reduced crop.

Growers usually refer to these abnormal growths as grape bud mite symptoms.

The grape bud mite and the abnormal growths have commonly been observed together in some northern California coastal counties and in the San Joaquin Valley since 1938. Research workers believe identical or very similar symptoms may have different causes.

In most cases it was assumed grape bud mites caused the abnormalities and control of the mites could prevent reduced yields resulting from the abnormal growths.

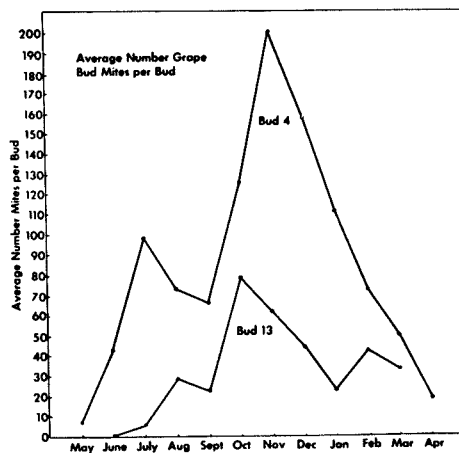
A search for a weak point at which to attack the bud mites led to a study of their seasonal cycle. The mites must have living tender tissue on which to feed. To observe the mites one must dissect the grape bud under the microscope. This operation necessarily destroys their natural habitat. Research workers have rarely seen bud mites openly exposed on the vines. Thus, it is not easy to study their habits.

Weekly observations were made over a period of more than a year. Each week eight Carignane buds were collected at Davis from each of nine locations on grape shoots or canes. Counting from the base of the shoot the 2nd, 4th, 7th, 10th, 13th, 16th, 19th, 22nd, and 25th buds were collected. Each bud was dissected under a microscope and the numbers of mites and eggs on each bud scale were recorded.

In late April and early May the majority of the bud mite population on the new growth was found outside of the new buds. They were in very narrow crevices either beneath the small bracts on the stems at the bases of the leaves or between the buds and the stems.

After May, over 98% of the mites were found inside the buds and only a few could be seen between the buds and the stem, or between the buds and the leaf petioles. The leaf bracts dry up as the summer progresses and become unsuitable for mite feeding.

Carignane grape buds consist of a central growing point, and two smaller grow-



Mite population averages for bud number four and bud number 13 compared. No data for bud number 13 were available for April since the canes were pruned to four-bud spurs in late March.

ing points each surrounded by a number of overlapping bud scales. The two or three outer bud scales surround all three growing points. Embryonic leaves are present at the bases of the inner bud scales. By fall, the primordia of the clusters which produce the berries of next season's crop are also present deep in the buds. All spaces in the bud are packed with hairs which arise from the outer surfaces of the bud scales. The mites feed and lay their eggs on the smooth inner surfaces of the bud scales.

Observations at Davis

In the Carignane grape buds at Davis the mites and eggs increased from May to July and then decreased somewhat in August and September. The mite population rose rapidly in October and reached a peak in November. The number of mites then declined steadily through the winter and into April of the following season. The greatest number of eggs was found in July. By December eggs were scarce and remained so until late March when the buds started to grow. During the summer the mites penetrated deep into the buds and more buds became infested.

In September mites were first observed to have penetrated to the primordial clusters close to the central growing point of the bud. The embryonic tissue showed typical feeding damage and in some cases

appeared to have been killed by the mites. More cases of such deep penetration were observed in October, November, and through the winter. Nearly all of the infested cluster primordia were found in the first basal buds. The infestation varied greatly from bud to bud. The greatest number of mites found in any one bud was over 1,000.

When the buds start to grow in March the central core begins to elongate. The basal portions of the new shoots are thus formed from 10 or more nodes that were present, partially developed, in the overwintered bud. The outer bud scales of the overwintered bud remain at the base of the new shoot. The inner bud scales are carried out with the new growth to form the bracts at the bases of the leaves of the basal nodes. Thus, the mites and eggs on such inner bud scales are carried out on the new shoot to a place very near to where the new buds appear.

The number of basal nodes with bracts bearing mites and eggs depends on how deeply they were in the overwintered bud when growth started. The first few basal buds would stand the greatest chance of being infested in such a manner.

A limited amount of migration between buds occurred in the summer, especially from May to July. Such migration was greatest on the basal portion of the shoots near buds which were heavily infested. Infestation of basal buds also may possibly occur by migration of mites from the old bud scales at the bases of the shoots. The first 10 basal buds were more generally infested and carried heavier populations of mites than buds farther out on the canes—buds 13 to 25.

These grape bud mite studies revealed that most of the mites move outward underneath the bud scales as the twigs grow and the mite populations increase steadily until late fall.

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This study of the seasonal cycle has not revealed a weak point where the mites are sufficiently exposed to be controlled by ordinary sprays. The finding of mites and mite feeding injury on the primordial clusters at the center of grape buds adds considerable support to their being a cause of dead overwintered buds.