GRAPE RUST MITE: MITE DENSITIES AND SHOOT DAMAGE SYMPTOMS

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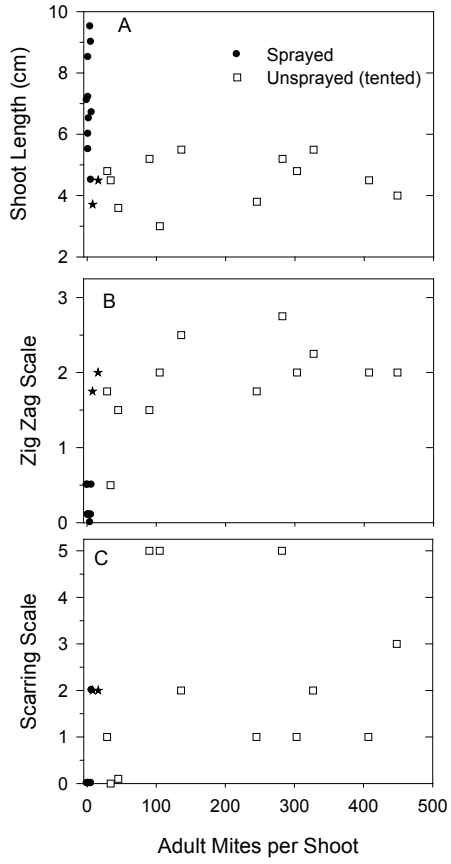
This is part of a larger project examining the phenology and population dynamics of the grape rust mite , *Calepitrimerus vitis*, as it affects the stunting and shoot distortion symptoms commonly called 'short shoot syndrome'. This tiny eriophyid mite overwinters under the bud scales and bark of grape vines. In the spring as the buds swell and break the mites moved deeper into the bud, feeding on the elongating shoot, leaves, and flower primordia. Their feeding results in a shorting of the internodes, crooking of the stem at the nodes resulting in a zigzagging appearance, and scarring of the epidermis. The flowering canes will outgrow light damage, but moderately damaged shoot will results in poor fruit production, and high damage will result in a cane that is unsuitable for use as the following year tie-down cane.

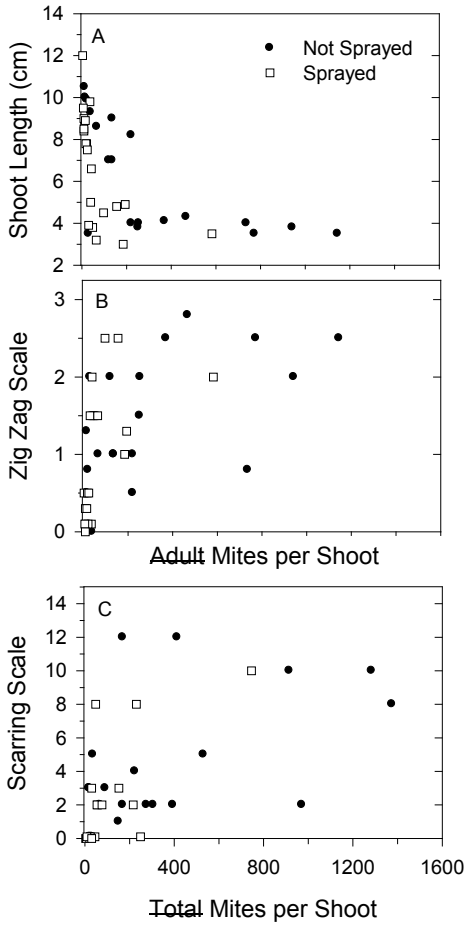
Figure 1



It is difficult and labor intensive to count these 170 µm long mites, and extraction measures require destructive sampling of plant tissue. To examine the impact of mite density on fruiting cane growth/ damage in 2013, I worked in 5 vineyard-blocks where high mite populations the previous fall suggested we would find mite damage the subsequent spring. I tented 6 or 8 2-vine replicates during the spring mite sprays (sulfur). In early May when healthy shoots were 7-9 cm long, one shoot per vine (taken from near the head) was taken for symptom recording and mite extraction.

Only one of the five blocks showed typical short shoot symptoms. The large decline in mite populations over the winter in these vineyards is the subject of subsequent work. The statistical significant relationship between adult mite density and Shoot Length is actually linear, even though it appears to be quadratic (Figure 1A). The relationship between mite density and the Zigzag score is quadratic (Figure 1B), while for the Scarring score only the intercept is significant in the regression model (no linear or quadratic relationship) (Figure1C). Mite populations over 100 per shoot caused significant shoot length and zigzag symptoms.

Figure 2



A vineyard in which I did not run experiments had significant short shoot symptoms in spring 2013. The vineyard manager had left 10 rows of two blocks unsprayed, and these areas showed severe symptoms. I sampled 20 shoots in each of the sprayed and unsprayed sections of one block in early May. The range in mite populations on the shoots was approximately 4 times higher than in the preceding example. The relationship between adult mite numbers and Shoot Length was negatively quadratic (Figure 2A), and that for Zigzag score was positively quadratic (Figure2B). The relation between mite numbers and Scarring was stronger when numbers of adult and juveniles were summed (Total Mites). This relationship was negatively linear (Figure 2C). In this vineyard mite populations between 100- 200 mites per shoot caused significant shoot length and zigzag symptoms.

Refinements: Subsequent analyses will examine whether the regression equations for sprayed and unsprayed samples are similar or vary with respect to the intercept or variable coefficients (slopes). This may give information on whether mites are doing damage in the late fall or late winter, before the first mite sprays are applied at wooly bud. The apparent difference between these two vineyards in the number of mites which begin to cause significant symptoms needs to be examined. This series of experiments will be repeated in 2014, and these results in conjunction with data mined from 2012 may enhance our understanding of the relationship between mite numbers on shoots and specific damage symptoms. Damage symptoms in the extreme range of those seem in Figure 2 appear to be required for a cane to suffer major season long distortions and fruit yield loss, e.g., shoot length less than 4 cm, zigzag scores above 2.