

**EMERGENCE AND COMPETITIVENESS OF NEW *BET CURLY TOP VIRUS*
VARIANTS IN SUGARBEET PRODUCTION REGIONS OF
THE WESTERN UNITED STATES.**

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Curly top disease, caused by various strains of *Beet curly top virus* (BCTV), causes significant economic losses for sugarbeet throughout the western United States. Since the mid-1990s two strains of BCTV, known as the “mild” or Worland strain (formerly known as *Beet mild curly top virus*) and the “severe” or CFH strain (formerly known as *Beet severe curly top virus*), have been the predominant forms causing curly top disease on sugarbeet and other crops; however, recent changes in severity and infectivity on melon in California led to the identification of new variant strains that differ in prevalence and severity among crop host plants. In order to monitor strain variation among curly top virus isolates affecting sugarbeet and other crops throughout the western U.S., samples of sugarbeet and other crops exhibiting curly top symptoms were collected from locations in California and Idaho from 2012-2014. DNA was extracted from symptomatic leaf tissue of affected plants and evaluated to identify known strains using a series of strain-specific primers that differentiate traditional and recently identified emerging variants of BCTV, with further confirmation by DNA sequencing.

Results confirmed the emergence of several new BCTV variants in California affecting both sugarbeet and melon. A particularly severe outbreak from the San Joaquin Valley of California in 2013 affecting melon and sugarbeet led to genome characterization of field isolates from both crops. Melon is usually affected minimally by curly top, and significant losses in melon indicated the potential of an emerging variant. The predominant new variant, known as Cal13 is most closely related to an obscure variant identified from Colorado in 1995. Cal13 appears to be a recombinant virus formed by exchange of DNA between the traditional mild and severe strains of BCTV, but with pathogenicity on sugarbeet that resembles the severe strain in sugarbeet. In addition to Cal13, some isolates related to *Pepper curly top virus* and *Pepper yellow dwarf virus*, both previously characterized from chili pepper in New Mexico, were also identified from the San Joaquin Valley but with much lower prevalence than Cal13.

Routine sampling of curly top isolates from Idaho in 2014 also resulted in the identification of a new variant common throughout the Snake River production region, but with greatest prevalence in the Treasure Valley. Initial characterization using PCR primers that target the strain-specific regions of the genome suggested the 2014 Idaho variant might be closely related to Cal13; however, genome sequencing of two isolates demonstrated the virus is a slightly modified form of the Worland strain that appears to have stabilized as a substantial subset of the overall virus population in the region. Although genome sequencing suggests the new Idaho variant is most closely related to the Worland strain, studies to examine severity of the new variant in sugarbeet are planned for 2015 since this variant does appear to be able to establish itself more effectively than the traditional Worland or “mild” strain when both are present in fields.

Continuing studies are evaluating competitiveness of new variant BCTV strains in sugarbeet and other host plants through inoculation of both viruses in single and mixed infections, with subsequent evaluation of symptom severity in single infections and determination of relative titer of each strain using quantitative strain-specific PCR. Continued field evaluations combined with laboratory studies will determine the effect of emerging variants on current sugarbeet varieties and potential to impact production.