Curly top disease, caused by viruses in the genus, *Curtovirus*, has impacted western US agriculture for over a century; however, over that period the viruses responsible for the disease have changed, and new species have emerged at different time points. Recent studies indicated that *Beet curly top virus* (BCTV), the traditional American curtovirus, can be found only rarely, and isolates are genetically quite diverse. In contrast, *Beet severe curly top virus* (BSCTV) and *Beet mild curly top virus* (BMCTV) are now found throughout the western US, and members of these latter more common species are phylogenetically closer to one another than are isolates of BCTV. Furthermore, new curtovirus species have been identified in some areas of the southwestern US affecting chili pepper and pumpkin production, although to date the new species have not been identified in sugarbeet production areas. Nevertheless, the emergence of new curtovirus species illustrates the potential for further emergence and spread of new curtovirus species within American agricultural production regions.

To identify factors that drive the emergence and establishment of new curtovirus species, as well as determine what factors cause a variant to become dominant, studies were undertaken to examine virus accumulation, competition and transmission among common weed and crop curtovirus hosts. Single and mixed infections of BSCTV and BMCTV were established in several weed and crop curtovirus hosts. Single and mixed infections of BSCTV and BMCTV were established in several weed and crop hosts, to determine efficiency of accumulation in each individual host plant species, as well as which virus dominates during mixed infections. TaqMan® probes were developed to selectively amplify distinct curtovirus species by quantitative polymerase chain reaction (qPCR).

Results indicated differential accumulation of each virus depending on the host plant infected. Tests in which single infections of shepherd’s purse (*Capsella bursa-pastoris*) were established using approximately 10 viruliferous leafhoppers per plant demonstrated that BMCTV accumulated to approximately 100 fold higher levels per plant than did BSCTV in single infections, and that co-infection with both viruses did not alter this ratio. Even in shepherd’s purse plants infected with both viruses, BMCTV accumulated to approximately 100 fold higher levels than BSCTV. Similar results were observed with bean (*Phaseolus vulgaris*), with BMCTV accumulating to a much greater level than BSCTV, although virus accumulation in bean was more variable than in shepherd’s purse. Neither virus was substantially affected by co-infection, with BMCTV maintaining dramatically higher replication levels than BSCTV in bean. In contrast, single infection of sugarbeet with BSCTV resulted in at least 100 fold higher levels of BSCTV than did plants with single infections of BMCTV. Plants inoculated with both viruses accumulated BSCTV and BMCTV similarly to singly-infected plants, with at least 100 fold more BSCTV than BMCTV on average in sugarbeet plants infected with both viruses simultaneously. Interestingly, tomato plants accumulated both BSCTV and BMCTV with approximately equal efficiency during single infections, although previous
studies have suggested that BMCTV is more commonly found in tomato plants than BSCTV. The most surprising observation was that both viruses were suppressed to low levels during co-infection of tomato, a result observed in several plants, although the test will need to be repeated.

These studies demonstrate that BSCTV and BMCTV accumulate with differing efficiencies depending on the host plant. Studies on tomato suggest that co-infection can shift accumulation patterns in a host-dependent manner although further studies will be necessary to confirm this unexpected early result. However, in at least three of the four plant hosts examined in studies to date, co-infection by two curtoviruses did not alter accumulation patterns. Further studies are examining transmission from single and mixed infected plants of known virus concentration. These studies will examine the impact of virus concentration and co-infection on transmission efficiency, and accumulation of each virus in a host plant specific manner. This will lead to broader knowledge of factors driving emergence of curtovirus species and the role of the host plant in this process.