

LIU, HSING-YEH\* and ANJU GULATI-SAKHUJA, USDA-Agricultural Research Service, 1636 E. Alisal St., Salinas, CA 93905. **Biological and molecular characterization of Beet oak-leaf virus.**

### ABSTRACT

During a survey for rhizomania disease, an unnamed virus that caused oak-leaf pattern symptoms on sugar beet leaves was found in California in early 2000. A virus with rod-shaped particles was isolated in addition to *Beet necrotic yellow vein virus* (BNYVV), the causal agent of rhizomania. This unnamed virus of sugar beet is tentatively called Beet oak-leaf virus (BOLV). Tap roots of beets infected with BOLV often appear healthy, unlike those of beets infected with BNYVV. The objectives of this study are to determine the biological, serological and molecular characteristics of BOLV and the interactions between BOLV and BNYVV in mix infested soil.

Beet oak-leaf virus induces oak-leaf pattern symptoms in some breeding lines different from Rhizomania, while some beet cultivars are symptomless. BOLV is transmitted by *Polymyxa betae* and also can be transmitted by rub inoculations. The host range of BOLV is similar to BNYVV, which mainly infects Chenopodiaceous plants. BOLV has been purified from rub inoculated spinach (*Spinacia oleracea*) plants. The virus particles are rod-shaped and are about 20 nm wide with 4 modal lengths ranging from 180 to 340 nm in length. The molecular mass of the capsid protein was estimated to be 46.0 kDa. A polyclonal antibody from rabbits has been produced from purified BOLV virions and can be used in enzyme-linked immunosorbent assay (ELISA), western blot, immunogold labeling, and tissue blotting immunoassays. BOLV is serologically distinct from BNYVV, *Beet soil-borne mosaic virus* (BSBMV), and *Beet soil-borne virus* (BSBV). The genome of BOLV contains four RNA species. The RNA sizes were estimated by using RNA standards. A standard curve for mobility of nucleic acid in gels versus log nucleotide bases were determined and used to estimate RNA sizes for BOLV. The RNA sizes estimated for the four species of BOLV were 6.4, 6.0, 5.2, and 4.6 kb.

During the survey of Rhizomania disease in the United States, BOLV was frequently found co-infected with BNYVV in the same field and sometimes in the same sugar beet plant. BOLV has been found in Colorado, Idaho, Michigan, Minnesota, Nebraska, Oregon, and Wyoming. The interactions between BOLV and BNYVV were conducted. Soil testing of BOLV and BNYVV alone and in combination on relative ELISA value in sugar beet was determined. When BNYVV existed in mixed infections with BOLV, the level of BNYVV was significantly reduced in all cultivars tested. However, the level of BOLV remained the same in single infections or in mixed infections with BNYVV. The interaction tests between BNYVV and BOLV indicated that BOLV may suppress BNYVV in mixed infections. If BOLV causes little or no damage on sugar beet production, it may be useful to consider BOLV as a potential suppressive agent in heavily rhizomania-infested fields.