GODFREY, LARRY D.[1*], KELLY BREWER[1], and TOM BABB[2], [1]Dept. of Entomology, University of California - Davis, One Shields Ave., Davis, CA 95616 and [2]Spreckels Sugar Company, Woodland, CA 95776. **Influence of arthropod pests on sugarbeet seedling establishment in California.**

ABSTRACT

Stand establishment is a significant problem facing sugarbeet producers in California. The unpredictable nature of establishment is as much of a problem as the level of the establishment. Poor stand establishment results in direct losses to growers through higher costs for seed and fees for hand-thinning as well as indirect costs through increased weed competition, uneven stands, etc. The exact causes of this poor seedling establishment are unknown in California; seed germination is apparently good but seedling establishment still lags. Between the time of seed germination and about the 3-leaf stage, up to 50% or more of the seedlings perish. In some cases, abiotic factors (heat, wind, improper soil moisture) undoubtedly play a role in poor establishment; however, biotic factors, including insects, are believed to be important in many cases. Insect pests may directly kill the seedlings by chewing, clipping, etc. the seedlings or may probe the cotyledons/stems and allow pathogens ready-entry into the seedling.

Controlled studies were set-up to study the effects of arthropod pests on sugar beet seedling establishment. Plots were located on the UC Davis Farms near the Davis campus. Studies were conducted in 1998, 1999, and 2000. Plots were arranged in a split plot design with soil treatment (metam-sodium [1998], imidacloprid [1999], and chlorpyrifos [2000] compared with none), sugarbeet seed treatment (1. bare, 2. treated with fungicides [apron/chloroneb], 3. treated with imidacloprid [Gaucho®], and 4. treated with Gaucho and fungicides), and arthropod cage treatment (four different ones) comprising the treatments. Cage treatments consisted of 1. aluminum barrier extending 3 inches in the soil and 3 inches tall to exclude the movement of soil dwelling pests, 2. aluminum barrier with cloth row cover to exclude the majority of soil-dwelling and foliage feeding arthropods, 3. row cover material only draped over the row, and 4. no cage. These treatments ranged from maximum to no exclusion of arthropod pests and would hopefully provide some delineation of soil-borne and foliar pests. Cage treatments (2.5 row-ft) were set up in the field around the newly planted seeds immediately after planting. Each treatment was replicated 4 times. Seedlings were counted daily upon emergence (starting 5-7 days after planting) and tagged with a painted toothpick. Counts were made for the next ~14 days; the condition of the emerged seedlings, i.e., incidence of and type of injury, was noted. Presence of arthropods on the seedlings was also recorded.

Over the 3 year study, percentage establishment (% of seeds resulting in a seedling at 14 days after emergence) averaged 52, 81, and 32% for 1998, 1999, and 2000, respectively. The soil treatment or seed treatment had no significant effect on establishment. Results showed that beet armyworm larvae (*Spodoptera exigua*) had the most impact on spring sugarbeet seedling establishment. It should be pointed out, however, that two of the three years had "unusual" conditions with respect to beet armyworm. In 1998, the test was done in late July (due to El Nino) which favored beet armyworm populations. In 2000, the moth flight was usually high for the early-mid June period, which coincided to when the test was done. Beet armyworm larval damage was quite cryptic on the small seedlings as much of the damage occurred at night and during the day the larvae typically hid

beneath soil clumps. Some feeding was noted on seedlings as they were just emerging through the soil or even still beneath the soil surface. Darkling beetles, flea beetles, and cucumber beetles were also found occasionally damaging seedlings, but were minor compared with the armyworms. Grasshoppers, thrips, and earwigs were also recorded as seedling pests.