Honey bees are subject to diseases, pests, pesticide poisoning and industrial pollutants which may result in bee mortality. Fluoride gases and particulates are released as by-products from aluminum smelters. Reports concerning fluoride levels in honey bees and their response to airborne fluoride emission are few. In 1984, we began a three year study on fluoride levels in honey bee colonies and the biological response of colonies exposed to different levels of airborne fluoride emissions.

The field study was conducted in the Puyallup Valley, WA. Honey bee colonies were placed in locations which provided for high (FH location), medium (VRF location), low (REC location) exposures of bees to fluoride. Other colonies located at Prosser, 200 miles from Puyallup served as checks. Live, dead, and teneral adults, stored pollen, and honey obtained from each colony at each location were analyzed for fluoride content periodically during the study. Each year, from April to October, colonies were carefully inspected every 10 to 14 days. Data on number of adult bees, number of dead adults, amount of brood, brood survival, brood population dynamics, and honey production were evaluated.

Results

Mean fluoride concentration of live adult bees was different between locations. Highest amounts of fluoride were found at the FH location (219 ppm) and lowest at Prosser (11 ppm) with the REC and VRF location intermediate. Mean fluoride concentration of dead bees was significantly different between locations though there were no differences between live and dead bees at the four locations. Fluoride was found in stored pollen in the lowest level at Prosser (8 ppm) and the highest at FH (37 ppm). Fluoride levels in honey varied from 0.3 ppm (Prosser) to 1.2 ppm (VRF).

The average adult bee and brood population data were summed to a monthly mean. In general, all colonies developed normal-sized adult and brood populations with no striking consistent differences detected between locations. The number of dead bees found appeared normal and there were no significant differences between locations. In 1984, significant differences were detected in brood survival between locations though the differences were not related to areas of fluoride concentration. No differences were detected in 1985 or 1986. Brood population dynamics indicated the percent of individuals in different stages of development approximated a bell-shaped curve and no consistent differences were evident between locations or time of year of sampling. In 1984, no significant differences were evident between locations in honey production and the colonies at VRF produced the most honey. In 1985 and 1986, the colonies at Prosser produced the most honey followed by those at FH, REC, and VRF.
Summary

Data collected during this study show fluoride is present in or on honey bees, and in stored pollen and honey at different concentrations, depending on the location of the colonies in relation to a fluoride point source. Our data show that these concentrations of fluoride are not a factor in bee mortality, colony vigor, or honey production.