Section II
Foliage & Seed-feeding & Mining Insects

EFFECTS OF ADULT DIET AND TEMPERATURE ON OOGENESIS OF CABBAGE SEEDPOD WEEVIL (Coleoptera:Curculionidae)

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I. Effects of Food Source and Quality on Ovary Development:

The effects of different diets on ovary development of post-diapause adult Cabbage Seedpod Weevil (CSPW), Ceutorhynchus assimilis Pakull were examined in the last year. In the first experiment, treatments consisted of different rapeseed, Brassica napus L., plant parts or sugar water. In the second experiment, plant material from rapeseed varieties containing high and low glucosinolate levels were evaluated.

Experiment 1: Six different diets were used in this experiment. Whole flowers, flowers without anthers, anthers alone, green stems, sugar water and water were used as food sources. Ten male and 10 female weevils were maintained with each respective diet at 22^{o}C, 15:9 (L:D) photoperiod, and R.H.= 40% in a 50 dram (169.8 cm^{3}, 5 cm diam by 11 cm length) plastic vial cage that had one end covered with organdy; a total of 30 female weevils (three cages) were used for each treatment. Plant material was all from the variety 'Bridger'; all food material was changed every other day. Weevils were allowed to feed on the diets for 0, 7, 14, 21 days. After the respective feeding period, the females from each treatment were killed and preserved in Kahle's solution until they could be dissected. Weevils were dissected with the aid of a stereomicroscope (40x) and ovariole development was characterized according to a three level rating system developed by Bonnemaison (1957). This rating system provided a good assessment of the reproductive maturity of the female weevils from the point where the ovarioles were small and undeveloped (stage I) until they were fully developed with eggs present (stage III). Analysis of variance was used to test whether diet had any effect on ovariole development.

There was a significant effect of adult diet on oogensis. Whole flower racemes, flowers without anthers and green stems all allowed significantly ($P < 0.05$)more development of ovarioles than the other treatments. No ovariole development took place with water, sugar water or anthers

alone indicating that sugars and pollen were not as important as green plant materials associated with the flower racemes or green stems.

Experiment 2: This experiment was conducted to evaluate whether rapeseed variety has any significant impact on female CSPW reproductive maturation. The five treatments consisted of a check (no food), and racemes (containing flowers and buds) of each of the following four varieties: 'Bridger', 'Dwarf Essex', 'Jupiter' and 'Cascade'. Those four varieties contain different levels of glucosinolates (Auld et al. 1986).

Ten male and ten female weevils were placed in a vial cage (as noted in Experiment 1) with the respective food treatment, maintained at 22°C, 15:9 (L:D) photoperiod, and R.H. = 40% and allowed to feed for 7 or 14 days. A total of 30 females were tested for each treatment. After the respective feeding period, all females within a treatment (rapeseed variety) were dissected and ovariole development were documented as noted in Experiment 1. Analysis of variance was utilized to assess rapeseed varietal effects on reproductive maturation.

There was no significant ($P > 0.05$) effect of rapeseed variety on oogensis indicating that each of varieties tested was acceptable for ovary development despite differences in glucosinolate levels.

II. Effects of Temperature on Ovariole Development:

Four constant temperature treatments (10, 15, 20 and 25 ± 1°C) were used in this experiment. Weevils (10 male and 10 female) were maintained in cages as described in Experiments 1 and 2 with 'Bridger' racemes. Within each temperature regime, weevils were allowed to feed for 0, 7, 14, 21 or 28 days. After the respective feeding period, female weevils were preserved in Kahle's solution and later dissected and measured as noted in experiments 1 and 2. The lower thermal threshold for ovariole development was estimated using linear regression. Temperature was the independent variable (x) and development rate (1/day) was the dependent variable (y) (Arnold 1959). The base temperature was determined by solving the linear model $y=mx+b$ with $y=0$. Degree-day requirements for ovariole maturation were calculated by subtracting the base temperature from the particular rearing temperature and then multiplying it by the mean developmental time (days) at that temperature.

All the results from this experiment showed that different temperature has significant different effects on

the weevil's oogenesis ($P < 0.01$). The optimum temperature for female reproductive maturation was 10°C, 15°C. Based on the results of this development study, a base temperature of 7°C was estimated for ovariole development. Using this base temperature, we calculated the degree day requirements for ovariole development to be 177.2 ± 34.5 degree days and 412.11 ± 120.34 degree days for Stage II and stage III respectively.