Section II
Foliage & Seed-Feeding & Mining Insects

Evaluation of USDA collection of Brassica napus for resistance to the cabbage seed pod weevil.

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The cabbage seedpod weevil (Ceutorhynchus assimilis Paykull) is one of the major insect pests of winter rapeseed in the Pacific Northwest. The need for effective control measures for this insect led to evaluation of a diverse population of rapeseed (Brassica napus L.) for potential sources of natural resistance. In the fall of 1988, 422 accessions of rapeseed from the USDA world collection were planted at Moscow, ID. Agronomic data was taken, along with measurements of adult weevil counts, feeding punctures, number of laval exit holes and pod length. A high degree of variation was found for all indices. Thirteen entries with either the highest or lowest number of feeding punctures per pod or feeding punctures per mm of pod were selected for further field evaluation along with three commercial varieties. These studies may identify sources of insect resistance which could lead to the development of new varieties which incorporate these traits.

MATERIALS AND METHODS

USDA Collection:

In the fall of 1988, 422 accessions of B. napus from the USDA world collection were planted at Moscow, ID. This observation trial consisted of two replications of each entry arranged in a non-random design. The two-row plots were 3m long and planted on 1.5m centers with 18 cm between rows. Cabbage seed pod weevil data collected from each plot included adult weevil counts, number of adult feeding punctures on the pods, number of larvae exit holes on the pods, and pod length. Adult cabbage seed pod weevil counts were made on June 5, 1989 by dislodging the weevils into a 5 gallon bucket with a beat of the hand at each end of the sampled plot. The temperature was about 30 °C and the skies were clear.

The feeding puncture assay was started on June 6, 1989 by removing 6 pods from each of 4 plants (24 pods/plot) at different locations in the plot. Two pods were removed from the main raceme at basal, middle and distal points for each plant sampled. Collected pods were stored in a cold room (6 °C.). Over the next week, pods were removed as needed and examined under a microscope to count and record the number of feeding punctures per pod.

The larvae exit hole assay was started on June 29, 1989 by removing 6 pods from each of 4 plants (24 pods/plot) at different locations in the plot. Two pods were removed from the main raceme at basal, middle and distal points for each plant sampled. Collected pods were stored in paper bags to allow the pods to dry

and not mold. After four weeks, exit holes were counted and recorded. Entry means were calculated for each variable and entries were evaluated for inclusion in a replicated trial during the 1989-90 growing season.

Selected Lines:

Thirteen entries with either a high or low number of feeding punctures per pod or feeding punctures per mm of pod were selected for further evaluation, along with three commercial varieties. The selections were planted in September of 1989 in six-row plots, 1 m wide and 4.9 m long, on 2 m centers. The trial was a randomized complete block design with four replications. Percent fall stand was assessed on October 13, 1989 and percent spring stand in April of 1990. There was 100% winter survival for all of the lines and estimates of winter damage were made in April. Julian dates of half bloom for the plots were recorded.

Adult weevil data was taken on three sampling dates, May 14, June2, and June 18. Adult counts were taken as before. Twenty immature pods, approximately 40 mm long, were collected from each plot. Feeding punctures per pod and eggs within the pods were counted for each of the dates. Pods for exit hole data were collected on July 23, 1990. Data were subjected to analysis of variance and correlation analysis.

RESULTS & DISCUSSION

USDA Collection:

The USDA oilseed Brassica collection contained significant variation for resistance to the cabbage seed pod weevil (CSPW). Both punctures per mm of pod and exit holes per pod had nearly normal distributions and identified accessions that suffered limited damage from this insect. Because of the large number of lines included in this initial evaluation, thirteen accessions were selected for more intensive evaluation during the 1989-90 growing season. Seven accessions were selected for high levels of resistance, five accessions for low levels of resistance and one accession and three commercial cultivars were selected for intermidiate levels of resistance.

Selected Lines:

The 1989-90 study was exposed to high populations of CSPW. Under this level of insect pressure, significant differences were found between accessions for all indices except adult CSPW. The three accessions with the greatest promise as sources of resistance were PI 324 507, PI 169 083 and PI 176 876.

Correlation analyses showed that date of half bloom had a significant effect on several of the indices of insect resistance. Adult counts of CSPW indicated that at the first sampling date, the early maturing plants had more insects and this effect disappeared at the later two sampling dates. The

number of CSPW eggs at the third date of sampling was higher in the early maturing accessions. The number of CSPW eggs at the two earlier dates was lower in the early maturing accessions. This effect was the same when evaluating the number of eggs per feeding puncture. A comparison of all four indices of insect resistance over sampling dates, showed that individual indices were highly sensitive to sampling date. The number of eggs per pod and eggs per puncture increased over the sampling periods. The adult counts showed a uniform decline and the punctures per pod increased dramatically at the middle sampling period.

CONCLUSIONS

There appears to be sufficient variation in B. napus to allow the development of CSPW resistant cultivars. Because there are significant interactions between the growth of the rapeseed plant and the expression of insect resistance, the four indices of insect resistance are sensitive to sampling period. Development of CSPW resistant cultivars will require the use of sophisticated screening procedures.