A REEVALUATION OF BROMOETHANE IN COMPARISON TO RINDITE FOR THE POST-HARVEST DETECTION OF POTATO VIRUS Y IN TUBERS BY ELISA

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Abstract

A reevaluation of breaking tuber dormancy with bromoethane to increase the concentration of potato virus Y in the tuber revealed a positive response, by ELISA testing, to the treatment. The degree of response increased with the maturity of the tuber. Response to treatment with rindite was generally stronger, although differences were slight.

Introduction

Artificial breaking of dormancy to increase the concentration of virus in the dormant tuber has been found to be essential for the reliable detection of potato virus Y (PVY) in the tuber by enzyme-linked immunosorbent assay (ELISA) (3, 4). In a previous study (2) we reported that although bromoethane was as effective as rindite, a fumigant of high mammalian toxicity (1) at breaking dormancy, it did not appear to increase virus concentration in a manner similar to rindite. However, as described in the previous study, treatment with these two chemicals was not comparable. A commercial fumigation chamber was used for the rindite treatment, while plastic containers were used to hold the tubers for the bromoethane treatment in the laboratory. This divergence in methods was necessitated by the lack of appropriate containment facilities for laboratory treatment of tubers by rindite.

In order to compare the effects of these two chemicals under uniform conditions, the present study was initiated.

Materials and Methods

Tubers of the Russet Burbank variety, secondarily infected with PVY, were planted May 22, 1985 and the progeny was harvested on three different dates: August 9th, September 6th, and October 4th, 1985. Prior to treatment, tubers were held at 15 C.

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Accepted for publication July 18, 1988.
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ADDITIONAL KEY WORDS: Solanum tuberosum, Russet Burbank, dormancy breaking.
At day 11 after each harvest, separate groups of tubers were treated with bromoethane, 0.2 ml liquid/L, or rindite (a mixture of ethylene chlorohydrin, dichloroethane and carbon tetrachloride, 7:3:1 by volume), 0.2 ml/L, in sealed plastic containers in a fume hood at room temperature (ca. 24 C) for 24 h. After fumigation, 30 tubers from each treatment, as well as 30 untreated tubers (control group) were planted in pots in the greenhouse (18-20 C) under 16 h day conditions to observe emergence. The remaining treated and untreated tubers were held at 18 C and RH >90% in the dark prior to being tested by ELISA.

For each harvest, ELISA testing was conducted on untreated tubers on the day of fumigation and on treated and untreated tubers 21, 35, and 49 days later. Each sample consisted of three replicates of five tubers chosen at random. Tubers were processed as described previously (2), by taking slices of tissue from the rose end and extracting the sap with a mechanical sap extractor. The duplicate extract samples of each replicate were placed in separate microtitre plates. An analysis of variance was carried out on the ELISA data and LSD values calculated.

Results and Discussion

The observations on shoot emergence (Table 1) indicated relatively little dormancy breaking response to either fumigant on tubers harvested August 9, but progressively more response on tubers from subsequent harvests.

ELISA data for individual testing dates are shown in Figure 1, while the pooled means from each harvest date are shown in Table 2. ELISA values for healthy control tubers were <0.10.OD.

The ELISA data parallel the dormancy breaking data by indicating no increase in virus titre for treated tubers from the first harvest but significant responses to treatment with bromoethane and rindite for tubers from subsequent harvests. Therefore, the ability of the tuber to break dormancy may correlate with its responsiveness to stimulate PVY synthesis. Although the rindite values were often higher than those for bromoethane, these differences (Figure 1 and Table 2) were only occasionally significant.

Table 1. — Effect of bromoethane and rindite on shoot emergence from tubers of Russet Burbank.

<table>
<thead>
<tr>
<th>Harvest Date</th>
<th>Control</th>
<th>BE</th>
<th>Rindite</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. August 9</td>
<td>111</td>
<td>97</td>
<td>99</td>
</tr>
<tr>
<td>B. September 6</td>
<td>119</td>
<td>65</td>
<td>92</td>
</tr>
<tr>
<td>C. October 4</td>
<td>79</td>
<td>24</td>
<td>50</td>
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