POTATO VINE KILLING METHODS AS RELATED TO RATE OF KILL, VASCULAR DISCOLORATION, AND VIRUS DISEASE SPREAD

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INTRODUCTION

Potato vine-killing has of necessity become a commercial practice in Maine and many other potato-producing areas during the past several years. It is practiced mainly for four reasons: to reduce the spread of virus diseases in seed potato fields, to control late blight tuber rot, to allow harvesting the crop before freezing weather, and to control tuber size. Excessive skinning and bruising of tubers also result during harvesting operations if vines are not killed two weeks or more prior to harvest.

One of the first methods of destroying potato vines practiced by Maine growers was that of hand-pulling. This method proved to be impractical on large commercial acreages because of the excessive cost and the need for large numbers of laborers to accomplish the job. Therefore, considerable interest has been shown in the use of relatively new methods of potato vine-killing, and research has been conducted for several years to compare these methods.

Steinbauer (15) in 1946 reported the appearance of occasional
discoloration in the vascular bundles of tubers harvested from vines killed with sodium nitrate, dinitrocresol and phenol compounds. Prince (11) in 1947 made detailed microscopic examinations of discolored tubers harvested from vines killed with chemicals. He concluded that the discoloration was confined to the xylem elements of the vascular ring with the discoloration being more dense on the stem end side of the vessel end walls.

Other investigators using chemical vine-killers (3, 4, 9, 10, 12) have reported the occurrence of vascular discoloration in tubers following the use of these materials. However, few have attempted to differentiate between the vascular discoloration produced by vine-killing and that produced by other causes. The vascular discoloration induced by vine-killing is distinctly different from that of stem-end browning and net necrosis described by Folsom and Rich (8). They described stem-end browning as affecting both the phloem and xylem, whereas net necrosis affects only the phloem. The “half-inch depth” method of cutting described by Folsom and Rich has been used with success to differentiate between the vascular discoloration produced by vine-killing (Fig. 1, A and B) and the discoloration which is typical of stem-end browning (Fig. 1, C and D). Generally, stem-end browning is confined to the stem-end portion of the tuber and usually does not occur at depths greater than one-half inch from the point of stolon attachment. Vascular discoloration produced by vine-killing in most cases will extend more than one-half inch from the point of stolon attachment. The vascular discoloration resulting from vine-killing may also be readily distinguished from net necrosis (Fig. 1, E). Discoloration from vine-killing is confined to a definite ring within the vascular tissue, whereas that of net necrosis is usually scattered throughout the vascular tissue, giving the characteristic netted appearance typical of the disease. However, the presence of net necrosis in tubers would result in a “masking” of the discoloration produced by vine-killing. Green Mountains and Irish Cobblers appear to be readily susceptible to stem-end browning and net necrosis, whereas varieties such as Katahdin and Chippewa have only rarely been found with either of the diseases (8). Vascular discoloration resulting from vine-killing has been reported in practically all varieties that have been used in vine-killing tests.

Callbeck (3, 4), while reporting his work from Prince Edward Island with the Green Mountain variety, uses the terms stem-end browning, stem-end discoloration, and vascular discoloration more or less interchangeably. This raises the question of whether he studied the effect of vine-killers on stem-end browning or did not differentiate between the two types of discoloration. It is noted that in his latest report (4) the percentage of tubers showing discoloration increased considerably for all