

Potato Vine Killing or Desiccation¹

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Introduction

Proper tuber maturity at harvest is an important factor in producing high-quality fresh-market potatoes. There can be problems associated with both over- and under-mature tubers. Tuber maturity at harvest is generally recognized as an important determinant of storage ability and cooking quality. Maturity indices of potatoes include a peak in tuber specific gravity, desirable tuber size, senescence of the plant tops (vines), and thickening/setting (resistance to fracture) of the tuber skin. Potato varieties commonly grown in Florida are characterized by a thin, poorly developed tuber skin that rubs off easily during harvest and packaging, hence the term ‘new’ or ‘immature’ potatoes. Skin set is a physiological process in which the tuber skin adheres to the underlying tissue and a waxy substance called suberin is synthesized, making tubers more resistant to skinning during handling and to weight loss and decay during storage.

Potato Vine Killing Timing and Available Methods

Tubers naturally mature as the potato plant senesces. However, improved production methods cause potato vines to remain healthy and green longer into the season, thereby prolonging tuber maturity and increasing some detrimental effects. This is especially true for cultivars destined for fresh-market (tabletop) sale. In order to promote uniform development of skin set and develop resistance to abrasion (excoriation), it has been recommended that potato plant

vines be killed 7 to 21 days before harvest, a process termed ‘vine kill’ (Bohl 2003).

Tuber maturation can be artificially induced by killing the potato vines prior to harvest. This will benefit tuber appearance, limit tuber size, and improve tuber release from the vine, facilitating harvest operation. Vine killing also aids in reducing secondary growth and, in seed potatoes, results in uniform tuber size (Kempenaar and Stuik 2007). Another benefit of vine killing is the avoidance of disease and improved storage. Because vine killing promotes tuber skin set, fewer skin breaks occur, reducing the chance that tubers will come into contact with spores of fungi that are present in the vines, such as late blight (*Phytophthora infestans*) (Schweers et al. 2015; Kee and Mulrooney 2004). Proper vine killing can also decrease the chance of tuber weight loss while in storage (Woodell et al. 2004). One detriment of vine killing is that the specific gravity of desiccated tubers is generally lower than that of tubers harvested without desiccation (Kempenaar and Struik 2008; Johnson et al. 2003), however, in contrast with the chipping industry, low specific gravity is not considered a quality problem for the table stock potato market. However, killing vines too close to harvest, or harvesting immature tubers, can lead to storage decay problems and low starch and high sugar concentrations in the tubers.

The three widely used traditional methods for vine killing are mechanical, chemical, and combinations of the mechanical and chemical methods.

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Mechanical Vine Killing

Flail mowing and rolling are the prominent mechanical methods used to kill potato vines. Vines should be mowed or rolled 14 to 21 days prior to harvest to ensure ample time for tubers to mature. Care should be taken when using mechanical methods to avoid disturbing the soil excessively, which can lead to sunburned or mechanically damaged tubers.

Chemical Vine Killing

Chemical vine killing (desiccation) methods consist of applying herbicides to desiccate the potato vines over a varying number of days (Table 1). Chemical vine killing is more consistent, efficient, and usually more effective than mechanical vine killing (Kee and Mulrooney 2004). Application of chemical vine desiccants should not be made during cool and damp or hot and dry weather. If application cannot be avoided in hot, dry weather, desiccant rates should be reduced (Kempenaar and Struik 2007). Vine killing can have detrimental side effects. It can be an expensive production practice that results in varying degrees of success. The internal quality of the tuber can also be adversely affected. Stem-end browning of the vascular ring can occur if the vines are killed quickly under unfavorable environmental conditions. This discoloration makes for an unattractive tuber, which may result in a lower fresh-market tuber grade and/or value (Knowles and Plissey 2008).

To limit the potential for vascular ring discoloration from vine killing, the following production practices should be followed. First, the use of chemical vine killers should be avoided in hot, dry weather. If application must be made under these conditions, reduce the rate of the material used to achieve a slower vine kill. Secondly, roll or mow vines prior to chemical application. Lastly, bring soil moisture to an adequate level with irrigation, if available, prior to chemical application.

The use of spray adjuvants is advised when recommended on the label. To ensure adequate vine desiccation and tuber health safety, labels should be read thoroughly prior to applying any agricultural chemical.

Improved vine kill on actively growing plants may be achieved by splitting the chemical desiccant application into two events. If the chemical desiccant label permits, an application of desiccant at less than full rate followed by a second application 5–7 days later may improve vine desiccation and tuber skin set.

Combining Mechanical and Chemical Methods

A combination of mechanical and chemical methods can increase the effectiveness of vine desiccation and, in turn, shorten the tuber maturation process. A roller can be used to bend the vines while spraying a chemical desiccant. This can improve stem coverage of the desiccant. Vine rolling may also close cracks in the potato row, reducing the incidence of tuber sunburning after vine desiccation. Application of chemicals for vine killing could also be done before the flail or chopping mechanical methods are used. In this method, the chemical application will kill the vine, while the flailing or chopping reduces the size of the plant material left to aid in harvesting.

Determining When to Vine Kill

For Florida growing conditions, potatoes generally require 90 to 105 days to progress from planting to maturity. Depending on the growing conditions, vine kill will often occur between 80 to 90 days after planting. After vine killing has occurred, sample tubers are dug to test for adequate skin set by applying thumb pressure and lateral force to the skin; the tubers are only dug when there is reduced skin slipping. One to three weeks are needed between vine kill and harvest to achieve proper tuber maturity and skin set. However, the length of time is dependent on the potato variety planted, the maturity of the plant when the vines were sprayed, and the environmental conditions after the desiccant application. Potato vines from naturally senescing plants are usually more easily killed than vines of actively growing, late maturing plants. High soil moisture and cool or cloudy weather are also factors that can increase the time between vine kill and proper maturity.

Potato Harvest after Vine Kill

For two commonly grown Florida table stock varieties, 'Fabula' and 'Red LaSoda,' the weight lost during storage was found to be significantly lower in tubers harvested 21 days after vine kill (Makani et al. 2015). Tuber skin set increased with time after vine kill, resulting in less weight loss during storage. However, if tubers are left too long in the ground after vine kill, they are prone to the development of physiological disorders, such as enlarged lenticels (Figure 1) and rots. Enlarged lenticels are caused by the high precipitation common to northeast Florida during the harvest period (late spring) and high soil moisture conditions. When tubers were evaluated for the enlarged lenticel disorder, there was increased severity with delay in harvesting (Makani et al. 2015). Delaying harvest until 21 days after vine killing is also associated with a decrease in

tuber specific gravity and dry matter content. Ideally, tubers must be harvested when these compositional qualities are at their peak content in order to get the best cooking quality. Specific gravity has been shown to decrease from an average of 1.064 for ‘Red LaSoda’ tubers harvested at 7 days after vine killing, to 1.055 for those harvested two weeks later. A similar trend was observed in ‘Fabula’. Dry matter content also tends to decline in ‘Fabula’ and ‘Red Lasoda’ after harvest. Based on these studies, it is recommended that for northeast Florida, the ideal harvest time for table stock potatoes is between two and three weeks after vine kill, when tubers are at maximum compositional quality, are less susceptible to skin injury, and have minimum severity of physiological disorders and rots caused by the high rains commonly experienced late in the season.



Figure 1. Enlarged or swollen lenticels, also called water bumps, on potato tuber, caused by exposure of the tuber to wet soil or storage conditions.

Credits: Mildred Makani, UF/IFAS

Conclusions

Vine killing or desiccation can improve tuber maturation and skin set, which can add to the value of the crop. Potatoes with proper skin set maintain better skin color, lose less weight in storage, and are more resistant to bruising and soft rot. Follow label guidelines for all chemical desiccants to improve both vine kill success and tuber quality.

Additional Resources

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Table 1. Potato vine desiccants.

Active Ingredient	Common Name	Manufacturer	Product Application Rate	Preharvest Interval ¹	Relative Vine Desiccation Rate
Carfentrazone	AIM	FMC	3.2 to 5.8 fl. oz/A	7 days	Fast
Diquat	Reglone	Syngenta	1–2 pts/A	7 days	Fast
Gulfosinate	Rely	Bayer	3 pints/A	9 days	Slow
Pelargonic Acid	Scythe	Dow	7–10% solution	1 day	Fast
Pyraflufen	ET	Nichino	2.75 to 5.5 fl. oz/A	14 days	Slow

¹ Preharvest interval is the minimum time between application and harvest. It is not necessarily the time required to achieve tuber maturity and good skin set.