

Pinkeye of Potato in 2011 – The Most Significant Appearance of This Disorder in 4 years

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Pinkeye (PE) of potato, formerly associated with the bacterial pathogen(s) (*Pseudomonas marginalis* or *Pseudomonas fluorescens*), and often associated with other diseases such as Rhizoctonia black scurf and Verticillium wilt, is now recognized to be an aberrant periderm disorder caused by a several overlapping factors. Koch Postulates, [the steps to establish pathogenicity which are: (1.) the suspected causal organism must be consistently associate with the disease; (2.) the organism must be isolated and grown in pure culture; (3.) when a healthy plant (tuber) is inoculated, the original disease must be reproduced; and (4.) the same organism must be reisolated from the experimentally infected plant (tuber)], has never been completed in the case of the causal organism responsible for PE. Therefore this condition is not a seedborne problem, but is due to current season growing conditions associated with excessive moisture and high soil temperatures leading to cell damage and death of both the natural tuber periderm and the underlying cortical parenchyma cells. If diseases such as bacterial soft rot, leak, and Fusarium dry rot do occur, they are the result of injury on the PE-affected tissue or additional wounding during harvest. Tubers affected by PE are therefore at risk for postharvest losses.

Diagnostic symptoms on affected tubers –Pinkeye derives its name from the pink and somewhat raised areas around and between the eyes on the surface of the periderm, especially on the bud (apical) end of the tuber (see Fig. 1, left). A subtle pink coloration may be seen internally when cut through the affected eyes and corky area (Fig. 2, right).



Fig. 1 (Left) Pink exterior coloration and “corky patch” as seen on the variety Pike. Note that this scaly skin appearing in the affected area is another diagnostic feature for PE; Fig. 2 (Right) Subtle pink discoloration noticed below the affected areas and internally on the variety Snowden.

The pinkeye symptoms appear at or before harvesting and in most situations will gradually disappear in storage as the tuber dries out. The “corky patch” is associated with extensive

suberin polyphenolic accumulation in the cortical parenchyma internal to the now damaged native periderm. Internally, browning of cortical cells underneath the native periderm develops into intensely fluorescent tissue (Fig 2) which appears fluorescent blue when exposed to ultraviolet light. However, if severe environmental and physiological conditions are existent in the field prior to harvest or storage, pinkeye can be manifested as intensive corky areas of the periderm (“elephant hide” or “bull hide”) which can make the tubers unmarketable for either fresh market or processing use (see Figs. 3-5, left to right below). The occurrence of growth cracks as seen on two tubers occasionally occurs. The “elephant hide” symptoms occur late in the growing season and are best described as exacerbated manifestations of earlier PE symptoms. Another problem associated with tubers manifesting such damage is that these tubers cannot be used for seed in the coming season, as the presence of viable eyes is unlikely.



Fig. 3-5 (L-R), Snowden showing various degrees of periderm destruction prior to harvest and storage. The stem attachment is on the left in all tubers.

Conditions that encourage the occurrence of pinkeye – It is generally accepted that there are Pinkeye years and non-PE years. A strong relationship exists between crop stress that occurs early in the season (high temperatures) and wet soil conditions later in the season. In general older potato land with many potato crops in a rotation can also be associated with PE. A comparison of climatological data over the past four seasons shows that extremes did occur during the 2011 growing season (Table 1). No correlation exists between soil type and the occurrence of PE.

Table 1. Climatological comparisons for a 4 year period from April – September (Ithaca, NY)¹

Year	Deviation from long term average (30 year norm)		Comments
	Accumulated ave. temp (F)	Rainfall (inches)	
2008	+5	-2.18	PE noticed on Snowden
2009	-3	+0.4	Summer without a summer; late blight occurrence severe threat
2010	+17	-3.11	Resprouting seen on potato
2011	+14	+12.1	Wet spring and late planted crop; particularly dry and hot in July; wettest Sept on record for Ithaca

¹ (http://nrcc.cornell.edu/climate/ithaca/moncrt_04-11.html) etc.

Varietal susceptibility – Reports of the occurrence of PE have come from throughout the US, and include the states of ME, NY, MI, WI, MN, NE, ND, ID, OR and WA. Given this

geographical distribution, it stands to reason that pinkeye has been reported on many different varieties. Western-grown varieties included Russet Burbank and Russet Norkotah and FL1879, while eastern varieties include Yukon Gold, Kennebec, Katahdin, Shepody, Superior, Pike and Snowden. Snowden was particularly susceptible in 2011, given that the condition was diagnosed for four different NYS growers. Other varieties grown nearby were either not affected or showed a minor occurrence of PE.

Management practices to reduce the occurrence of pinkeye – Wisconsin researchers have recently published on the cause the physiological tuber disorder known as PE (Sabba et al., 2008). They concluded that excessive moisture and high temperature contribute to hypoxic/anoxic soil conditions that result in cell death and death to the tuber periderm. Additional studies in Wisconsin established that a densely compacted soil layer can result in poor water drainage and increased susceptibility to tuber diseases and disorders (Copas et al., 2008). Efforts to reduce compaction through subsoil tillage can lead to better water drainage and reduced soil temperatures, thus reducing the occurrence of PE. Field and varietal selection are important since both can influence the occurrence of PE in challenging production seasons. Since pinkeye-affected tubers are more vulnerable for invasion by soft rot bacteria and wounding leads to additional infections, tubers need to be provided with cool and dry conditions in storage. Processing tubers with severe pinkeye using an advanced schedule is recommended to reduce losses in prolonged storage.

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