POTATO VINE AND HARVEST MANAGEMENT AS IT RELATES TO YIELD AND BRUISING

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During growing seasons when plant emergence and development are delayed due to cool spring conditions, it may be tempting to postpone vine kill in an attempt to squeeze every bit of tuber bulking out the crop. However, research has shown that this strategy may not increase yields as much as commonly believed, and delayed vine kill may have unintended consequences on quality by making tubers more susceptible to black spot bruise damage at harvest.

Key points from this research include:

- **Tuber bulking rapidly declines after late August for both Russet Burbank and Ranger Russet, and coincides with the appearance of about 10% dead vines (stems) in the field**
- **For Russet Burbank, susceptibility of tubers to black spot bruise increased when there were more than 70% dead vines in the field**
- **For Ranger Russet, susceptibility of tubers to black spot bruise increased when there were more than 20% dead vines in the field**
- **Allowing available soil moisture to drop below 50% at harvest increased susceptibility to black spot bruise in both cultivars**

GROWING CONDITIONS AFFECTING BLACK SPOT BRUISE

Corsini et al. (1999) conducted a grower-field survey to determine the effects of vine maturity, specific gravity and soil moisture on black spot bruise potential. Tubers harvested from vines that were rated in late August as more mature (less green) tended to black spot bruise more than tubers harvested from plants that were less mature. For Russet Burbank, more black spot bruising occurred on tubers harvested from fields that had 70 percent or more dead vines (Table 1), and for Ranger Russet more black spot bruising resulted from fields where 20 percent or more of the vines were dead (Table 2). The authors concluded that the best strategy to minimize black spot bruise is to kill the vines before 40% have died for Russet Burbank and before 5% have died for Ranger Russet.

Table 1. Vine maturity of Russet Burbank potato fields in Idaho as it relates to black spot bruise potential.

Black spot Severity Group	Vine Maturity[1]		
	1993	**1994**	**Mean**
Resistant	17	54	36
Mod. Susceptible	33	59	46
Susceptible	48	61	55
Very Susceptible	59	89	74

[1] Visual rating of percent dead vines in fields in late August.

Table 2. Field maturity as it relates to black spot bruising of Ranger Russet potatoes.

Black spot Severity Group	Vine Maturity[1]
	1994
Moderately Susceptible	5
Very Susceptible	30

[1] Visual rating of percent dead vines in fields in late August.

The survey also revealed that tubers with higher specific gravity generally were more susceptible to black spot bruising. Russet Burbank tubers with specific gravity above 1.080 and Ranger Russet tubers with specific gravity above 1.085 were more susceptible to black spot bruising than tubers with lower specific gravities.

The third factor in the survey that was measured was available soil moisture. Fields with lower available soil moisture (less than 50%) at harvest tended to have more black spot bruising on tubers than wetter fields. Fields with sandy or loamy sand soil generally had lower available soil moisture at harvest resulting in tubers with a higher amount of black spot bruising. A previous study by Jeff Stark at Aberdeen (1987) showed that it takes about 4 to 8 days after an irrigation to rehydrate tubers that have become susceptible to black spot bruise due to dehydration in dry soil. If soil moisture is 50 percent or below at vine kill, it will take at least one week to fully re-hydrate tubers.

The data from these two studies strongly suggests that maintaining green vines for Russet Burbank and Ranger Russet and maintaining soil moisture above 60 percent will help reduce the potential for black spot bruise at harvest. However, it should be noted that even tubers that are fairly resistant to bruising can still be damaged if not handled properly.

DETERMINING VINE KILL DATE

It's logical to think that as long as potato vines/stems are green that the crop should continue to bulk, so vine kill should be delayed as long as possible to get the most yield possible. However, research at the Aberdeen R & E Center has shown that as soon as vines begin to naturally die the rate of bulking rapidly decreases, thus the amount of yield loss from killing fields with nearly all green vines is much less than might be expected (Bohl and Love, 2006).

The relationship between vine maturity and bulking rate for Russet Burbank is shown in Figure 1. On August 26, 2004 there were 8 percent dead vines—visual rating of dead stems, not dead leaves. However, after that date the yield increased by only another 13 cwt/ac for the remainder of the season ending on September 23. In contrast, during the previous two-week period the yield increased by 46 cwt/ac. Bulking rates by two-week period averaged over the two years of the study are presented in Table 3.

The relationship between vine maturity and bulking rate for Ranger Russet is shown in Figure 2. From August 26 to September 9, the crop gained 45 cwt/ac, but from September 9 to 23 only 19 cwt/ac were accumulated. Note that on September 9 there were an

estimated 97 percent green stems, yet the bulking rate had dramatically decreased from the previous two-week period. Note in Table 3 how rapidly the bulking rate declined from late July to mid September.

The point to note here is that the end of the linear bulking phase—the time during rapid tuber bulking—appears to be closely associated with the onset of stem death, and having a large percentage of green stems does not mean the crop is still bulking at the same rate it was earlier in the season. This data strongly suggests that the presence of dead stems is a good indication that bulking rate is declining. However, stem death is probably not the only factor responsible for declining tuber bulking rates. Cooler temperatures and shorter day length are also likely at least partially responsible for bulking rates declining after late August.

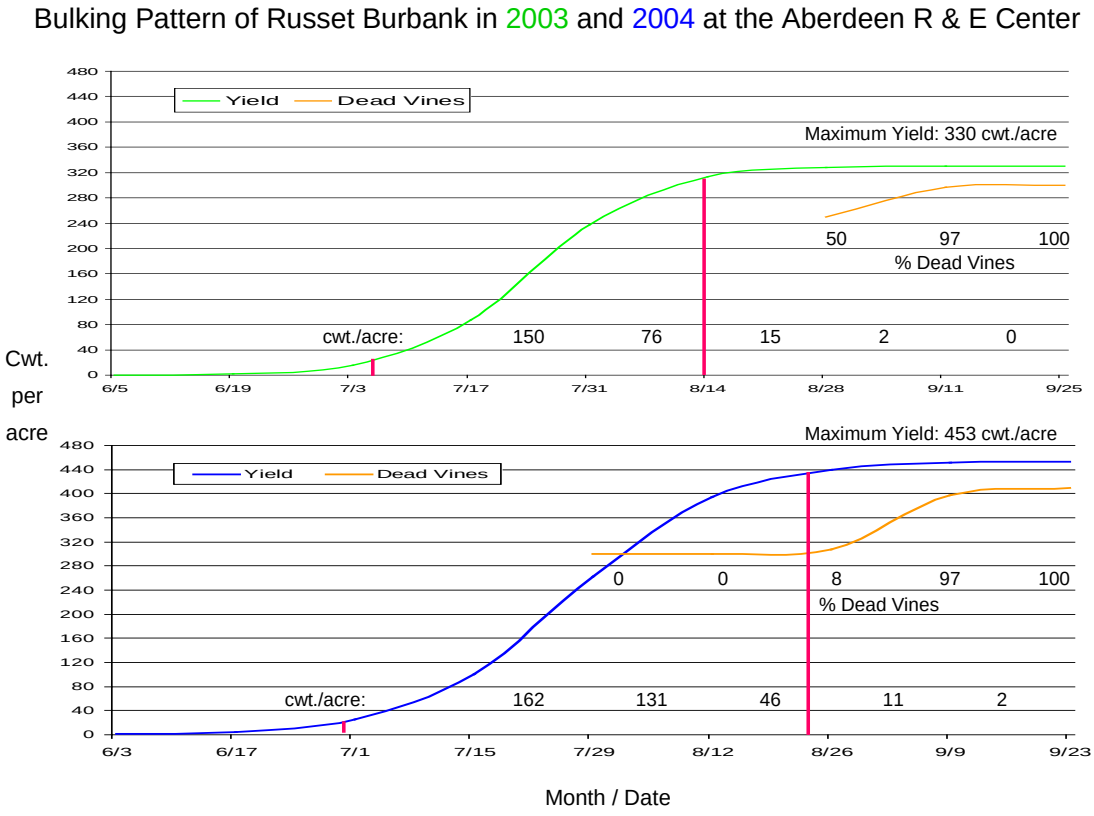

Figure 1. Bulking pattern of Russet Burbank in 2003 (top) and 2004 (bottom) at the Aberdeen R & E Center, Idaho.

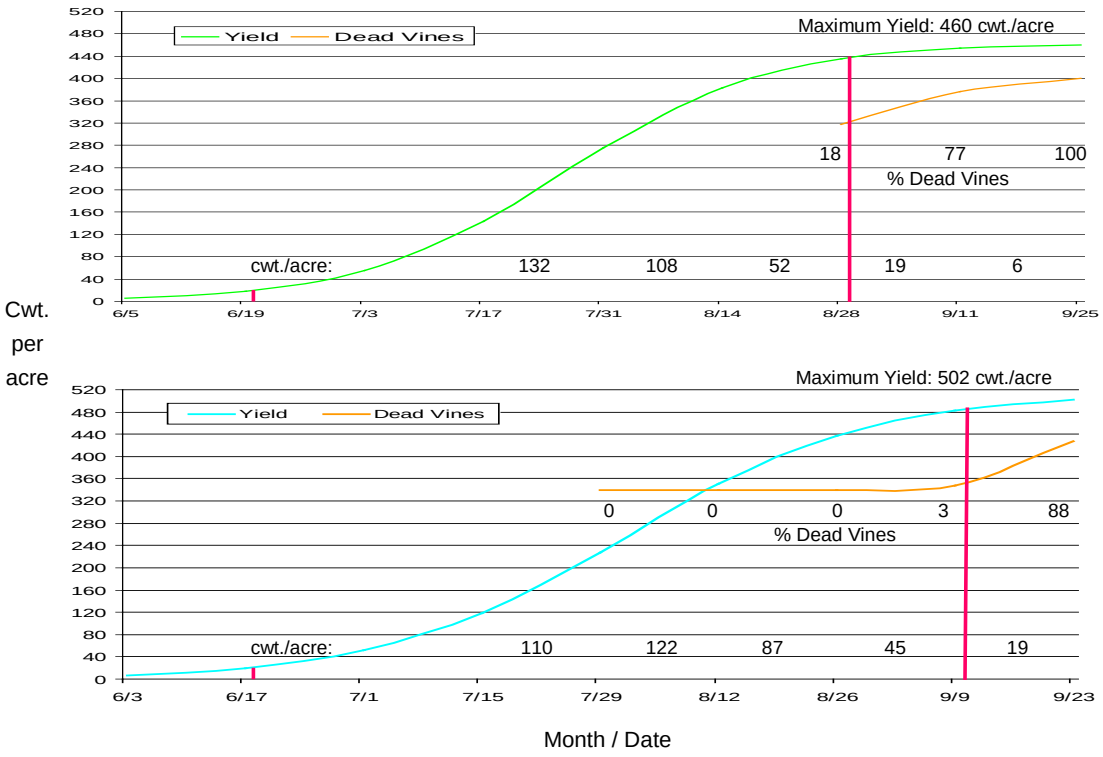

Figure 2. Bulking pattern of Ranger Russet in 2003 (top) and 2004 (bottom) at the Aberdeen R & E Center, Idaho.

Table 3. Yield gain over a two-week increment for the last 8 weeks of the growing season averaged over 2003-2004 at the Aberdeen R & E Center.

	Bulking Period			
	7/31-8/14	8/14-8/28	8/28-9/11	9/11-9/25
Variety	**----------cwt./acre---------**			
Russet Burbank	104	28	5	1
Ranger Russet	117	69	30	11

Details of this study and information on bulking rates of other varieties can be found on-line at:
http://www.cals.uidaho.edu/potato/Research&Extension/Topic/Growth&Physiology/UnderstandingTuberBulkingRatesOfSixPotatoVarieties-06.pdf

Information Sources:

Bohl, W.H. and S.L. Love. 2006. Understanding Bulking Rates of Six Potato Varieties. Proceedings of the Winter Commodity Schools. 30:143-148.

Corsini, D., J. Stark, and M Thornton. 1999. Factors contributing to the black spot bruise potential of Idaho potato fields. Amer J of Potato Res 76: 221-226.

Stark, JC. 1987. Effect of late-season management on tuber quality. University of Idaho Winter Commodity School Proceedings 19: 82-84.