MODIFICATION OF RUSSET BURBANK GROWTH AND DEVELOPMENT TO IMPROVE BOTH INTERNAL AND EXTERNAL QUALITY

by
Robert E. Thornton
Extension Horticulturist
Washington State University

Over the past several years research has led to the development of a mathematical model that will reliably predict the potential growth of the potato using temperature as the major consideration. The predicted potential for potato growth (yield and specific gravity) from the model has been compared to the actual yield and specific gravity levels obtained over the past 10 years and the order or rank has been correct 8 of the 10 and the two misses were so close in predicted and actual yield that the error is insignificant. From this information it becomes evident that there are some years in which the climatic conditions (primarily temperature) are detrimental to potato growth and development. To overcome these problem years cultural practices need to be developed that will allow the potatoes to produce both high yields and good quality despite the influence of climate. Work in both Wisconsin and Idaho have shown that the sprout inhibiting chemical Maleic Hydrazide (MH) when applied at the proper time can improve potato tuber quality without reducing yield. Based on this information research on how MH might be used to influence the yield and quality of the Russet Burbank potato has been underway in Washington. This research has involved Dr. W. M. Iritani, Dr. L. K. Hiller, Dr. R. E. Thornton, Dr. M. W. Hammond of WSU and Dr. B. B. Dean, previously with WSU, now with U & I Inc., Tri Cities, Washington. Earlier research by Dr. Robert Kunkel and R. Thornton and observation from the industry indicated that in some circumstances the application of MH might cause a phytotoxic response of the potato vine but the research showed no decrease in yield or quality at final harvest. However, it was not shown whether or not plant tuber growth was effected during the growing season nor if the specific gravity of growing tubers was influenced. These questions were the basis of the recent research effort. Results indicate that minor modification of these growth parameters does occur but that at final harvest all treatments were equal to or better than the non-treated (Table 1).

During this same period Dr. W. M. Iritani was conducting research on potato seed physiology. One aspect he investigated was planting date. During the course of his studies he also applied MH 30 to some plots. Final harvest data from these plots showed that MH 30 planting date, length of storage, storage temperature and tuber size influenced the occurrence of a quality factor known by several terms but called Internal Brown Spot (IBS) by Iritani (this is an internal necrosis of the tuber tissue commonly but erroneously called heat necrosis), Table 2, 3 and 4.

This information prompted IBS data being taken on the tubers from MH growth and development research in both 1980 and 1981 (Table 5). The amount of IBS at harvest in this study was substantially higher than that observed at harvest by Iritani. The effect of MH on IBS in the growth and development plot was not as good as that observed by Iritani. However, he also observed that as potato tubers were kept in storage the amount of IBS increased which suggests that at harvest there was an amount of IBS triggered or initiated or whatever else you wish to call it that wasn't observable at the time of harvest.

In order to develop an actual potato growth profile to prove the acceptableness of the mathematical model plants must be harvested periodically throughout the growing season and the needed information gathered, i. e., plant size, tuber weight, and specific gravity. When doing this each week the researcher has information on a number of individual plants. Given the information of Iritani's that IBS probably is not observable at harvest at its maximum level

This Presentation is part of the Proceedings of the 1982 Potato Conference & Trade Fair.

tubers from the individual plants harvested each week (20 plants in 4 locations until MH treatment than an additional 10 plants for each of the 4 treatments) as a part of the growth and development study were stored until December and January (3 to 4 months after harvest) to maximize the opportunity to observe IBS. This data shows that IBS was initiated as early as 70 days (Figure 1) after planting (by July) in some fields. This means that when using MH as recommended for quality improvement or sprout inhibition the IBS already initiated would not likely be prevented. However, the MH appears to reduce the IBS that is triggered following the application or delayed its appearance during storage adequately that its presence is not a quality factor.

This doesn't mean, however, that IBS control can't be accomplished. Again Dr. Iritani has used some additional materials to attempt to control the development of IBS and some of these show promise (Table 6). Its entirely possible that with one or more of these materials in combination with MH the IBS problem can be eliminated. Research on this will be conducted this coming season.

Figure 1. Internal Brown Spot observed in tubers held 3-4 months in storage following harvest.

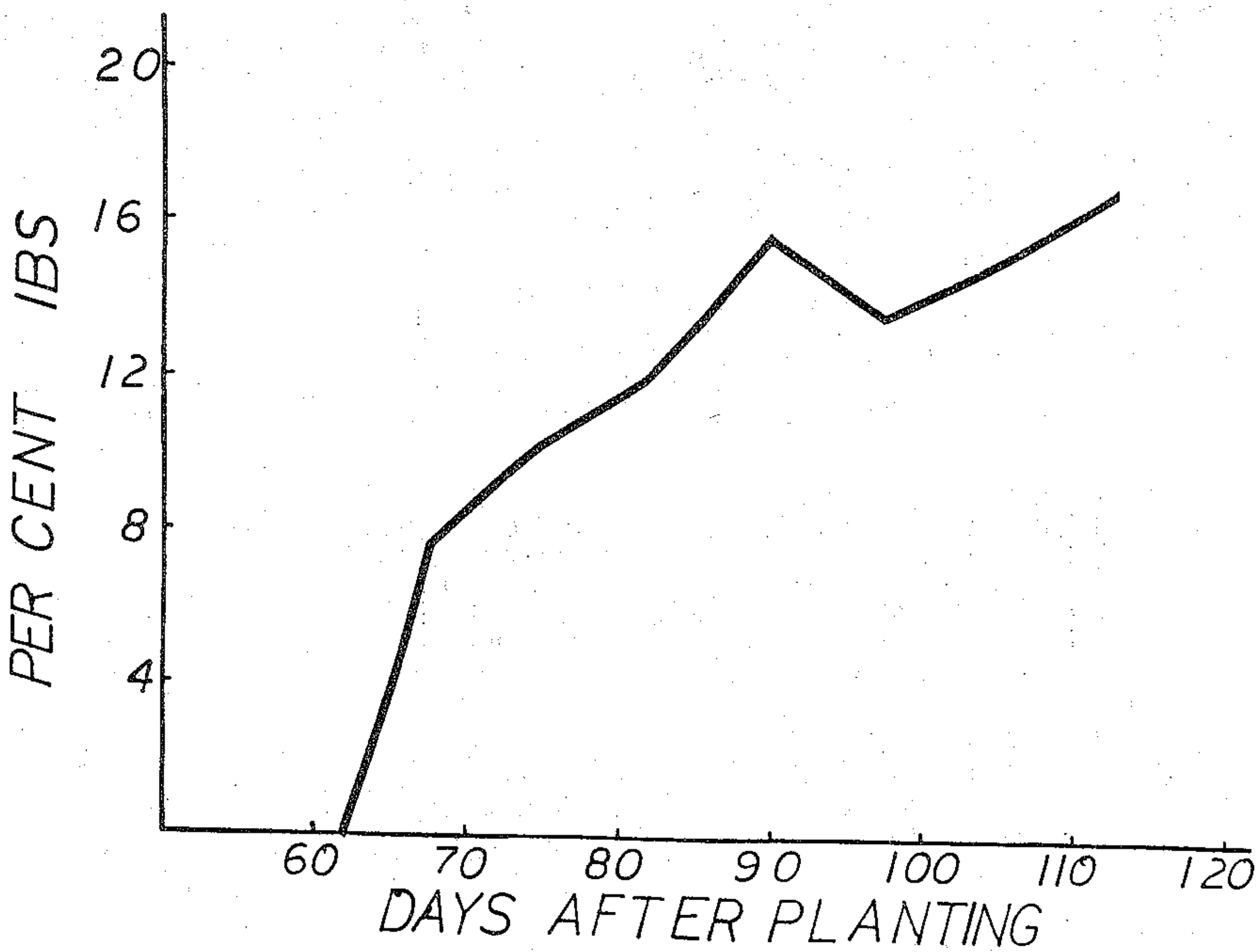

Table 1. Effect of MH on Potato Yield & Quality for Washington.

	Yield CWT/A	% 1's	10 oz	Sp. Gravity
Check	557	75	17	1.077
MH 30	580	79	23	1.080
Royal MH 30	558	79	20	1.078
Royal Split	569	81	25	1.079
Royal Late	588	76	23	1.077

Table 2. The effect of time in storage on percent internal brown spot of check and MH (maleic hydrazide) treated tubers. Stored at 42°F. *

PERCENT INTERNAL BROWN SPOT

Time in Storage	Check	MH
Nov. 2	4.5	0
Dec. 9	8.9	0
Jan. 5	12.4	2.6
Feb. 4	21.7	2.8
Mar. 25	21.1	6.0
April 16	21.1	8.9
May 13	33.3	15.5

*Source: W.M. Iritani, L.D. Weller and R.E. Thornton. Internal Brown Spot (IBS) Development. Proceedings of the 21st Annual Washington Potato Conference and Trade Fair. (In press.)

Table 3. The influence of three planting dates on percent internal brown spot for 1980 and 1981. *

PERCENT INTERNAL BROWN SPOT

Planting Date	1980	1981	Ave.
Mar. 31	27.7	21.3	24.5
April 20	15.7	15.5	15.6
May 12	4.6	7.0	5.8

*See footnote for Table 2.

Table 4. The influence of storage temperatures (42 and 48°F) and tuber size on percent internal brown spot development. *

PERCENT INTERNAL BROWN SPOT

Tuber Size	STORAGE TEMPERATURE 42°F	48°F
Small	21.4	36.5
Medium	36.5	56.3
Large	53.9	61.1

*See footnote for Table 2.

Table 5. Effect of MH treatments on internal brown spot (IBS). *

Treatment (Year)	Check	MH 30	Royal MH 30	Royal Split	Royal Late
1980	24	10	15	13	12
1981	48	32	32	35	33

*IBS considered for these tests would be much less severe than would be considered as grade defects in commercial potatoes.

Table 6. The influence of Maleic Hydrazide and other chemicals on percent internal brown spot. The MH data is for 2 years and 2 application dates in 1981. *

PERCENT INTERNAL BROWN SPOT

Chemical Trts.	1980	1981	Ave.
Check	8.9	35.8	22.4
MH (July 27)	0	3.3	1.7
MH (Aug. 12)		12.5	
Ethrel		8.3	
$CaCO_3$		18.3	

*See footnote for Table 2.