Potato Stands in Washington

by

Robert E. Thornton
Extension Horticulturist
Washington State University

A number of topics have appeared in the Conference proceedings on the influence of seed size on potato yield. Here in Washington the past two years considerable emphasis was placed on demonstrating the need for proper seed size and spacing on the yield potential of Washington grown potatoes. The 1968 and 1969 seed lot trials included demonstration plots showing these effects. The data from these plots were reported in previous proceedings (2) as has also earlier research (1). Research conducted at the Othello Experiment Station in 1970 and reported elsewhere in these proceedings further strengthens our understanding of and appreciation for the importance of seed as an influence on yield potential. Both research and demonstration plots are essential in determining and illustrating the importance of seed size and spacing. Research and demonstration plots do not give us an understanding of what the situation actually is in Washington potato fields. In 1970 a grower survey was conducted to determine what the seed piece size and plant stand situation is in Washington potato fields*. This study has added information to that which had been previously gathered and reported by the Washington State Potato Commission on seed piece size (2).

Thirty potato fields throughout the Columbia Basin were sampled after plant emergence by potato fieldmen and growers. In addition, the cooperating growers provided information concerning the planting rate and plant spacings they were attempting to obtain. The in-row (between plant) spacings reported were then compared with the actual stand counts. The reason for missing plants was determined whenever possible. All fields surveyed had used 34 inch spacing between the rows, therefore the only difference was the spacing between the plants. The percentage of stand varied from 62 percent to 100 percent with an average stand of 87 percent. The average stand was higher than anticipated and can in part be accounted for by the fact that some of the fields had over 100 percent stand when the reported spacing was compared with the actual stand (example: 10 inch x 34 inch spacing would require 120 plants every 100 feet of row. Some fields planted on the 10 inch x 34 inch spacing had over 120 plants/100 feet).

Another way to express this difference is shown in the following table.

	Distance Between Plants	
	Reported	Actual
Widest Spacing	10	12.6
Closest Spacing	7	8.2
Average	8.8	10.1

The average difference between the reported in-row spacing and the actual plants that were present is 1.6 inches. This doesn't appear to be a very significant difference but in 27 percent of the fields surveyed the actual plant spacing exceeded the intended plant spacing by 2 inches or more and in 10 percent of the fields it actually exceeded the intended spacing by 4 inches or more.

A difference of 2 inches (8 inches vs 10 inches) between plants reduces the number of plants in an acre by over 5,500 plants which is a reduction in plant population of 24 percent. A difference of 4 inches (8 inches vs 12 inches) reduces the number of plants per acre by over 7,600 or 33 per cent.

* Firms participating in the plant stand survey were: Lamb-Weston, Quincy; Sunspiced Inc., Moses Lake; Chef Reddy, Othello; D.E. Phillips Ranch, Lind.

The causes of the improper plant spacing are shown in the following table.

Cause of Poor Stand			
1. No Seed Piece			81%
Includes:	Skips	68%	
	Wrong Spacing	13%	
2. Seed Size or Condition			10%
Includes:	Seed Piece Slivers		
	Seed Without Eyes		
	Seed With Eyes That Didn't Grow		
3. Disease			9%
Includes:	Rotted Seed Pieces		
	Emergence Prevented by Rhizoc		

Eighty-one percent of the reduced stands in the surveyed fields can be directly attributed to the planting operation. As shown, 68 percent of the stand problem is due to skips - that is, no seed where there should have been. This could be due to a number of causes but the most often observed is that of picks on picker planters not picking up seed which results when picks are bent or broken. Excessive speed of operation is also known to be an important contributing factor. Thirteen percent of the reduced stand was identified as being due to improper spacing. This was determined by comparing the plants that were present plus the obvious skips with the plant population that should have been present at the spacing intended.

Seed condition and size accounted for 10 percent of the stand problem observed. This group included seed pieces that were classed as slivers, not to be confused with the seed pieces of less than one-half ounce in the seed size studies. The slivers are extremely small and are not able to produce plants that are strong enough to emerge. This group also contained seed pieces of all sizes that had no eyes and seed pieces that had eyes but the eyes failed to grow for any number of reasons.

Nine percent of the lack of stand was attributed to disease. This includes seed piece decay (no attempt was made to determine the casual organism or condition) and seed pieces which had germinated but the emerging stems were cut off by rhizoc.

The data show that the largest percent of the stand problem is associated with the planting operation, a factor which can be easily identified and corrected. To put seed size, spacing and plant populations in their proper perspective consider what we know about the influence of the seed on the average yield of potatoes in Washington in 1969 and 1970.

If the average stand is 87 percent or a 13 percent reduction in stand, a reduction of as much as 13 percent in yield might be expected. Or to look at it another way, if we could eliminate reduced stands as a factor we could increase yields by 13 percent. The remaining plants do compensate some for the production loss when stands are reduced but the amount is difficult to determine, in these examples the compensation factor is ignored.

The Commission's survey also shows that 62 percent of the seed pieces planted in Washington averaged one ounce, and Dr. Iritani's research shows that one ounce seed produced 95 percent as much yield as one and one-half ounce seed. Sixty-two percent of the seed with a production capacity reduced by 5 percent results in a decrease of 3.1 percent in potential yield, or if one and one-half ounce seed were planted instead of one ounce seed the average yield could be increased by 3.1 percent.

Influence of Seed Size and Plant Population
on Washington Potato Yields and Dollar Return

	1969			1970	
	Yield		Cost & Return		
	cwt	T/A		cwt	T/A
Average Yield	416	20.8	+83.70	386	19.3
			(1) -13.50		
Stand - 13%	470	23.5	+21.00	436	21.8
			(1) - 5.00		
			(2) -12.60		
Seed Size - 4.7%	490	24.5		445	22.3
Net Increased Income			+73.60		

(1) Increased cost of harvest at $5/T due to increased yield)
(2) Cost of additional seed required at $5/cwt)

The above table shows what effect elimination of the seed size and plant population reduction might have had on the potato yield the past two seasons. Also shown is the effect on return per acre for 1969 using the average price for that season. Added yield due to stand improvement could have resulted in an increase in income of $83.70 per acre. Yield increase due to seed size improvement could have increased income per acre by $21.00. The added seed required would increase the cost per acre by $12.60 and increased cost of harvest would have been $18.50, or a net increased income of $73.60/A for the plant stand and seed size adjustments. In addition to yield advantage quality is also known to be influenced by seed size and spacing. In general closer spacing results in higher quality potatoes. Closer spacing also reduces the percent of larger tubers. Dr. Iritani's seed size studies show that the one-half ounce has a U. S. No. 1 yield potential of 80 percent that of one and one-half ounce seed and one ounce seed has a U. S. No. 1 yield potential of 90 percent of one and one-half ounce seed. Or by having all one and one-half ounce seed an increase in yield of U. S. No. 1's of 9 percent could result. One important point to remember is that 81 percent of the plant population involves planter adjustment and operation. Both of these factors should be quite easily analyzed for and corrected. Seed piece decay and rhizoc, both very difficult situations to correct, are not usually the major problems. Even with some compensation for stand loss occurring elimination of reduced stands and undersized seed as limiting factors should be our goal.

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1. Kunkel, Robert 1964
The Effect of Seed Piece Size on Potato Yields, Proceedings, 3rd Annual Washington State Potato and Vegetable Conference, p. 3

2. O'Leary, A. George 1970
Effect of Seed Piece Size on Yield. Proceedings, 9th Annual Washington State Potato Conference, p. 129