

# MATURITY OF POTATO SEEDLINGS IN THE GREENHOUSE AND THEIR LATER BEHAVIOR IN THE FIELD<sup>1</sup>

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Early separation of individuals according to their maturity is often desirable in breeding work. It has been observed that when potato seedlings are started from seed they may vary in the number of days required to mature in the greenhouse. Tests have been conducted to study the significance of this variation in maturity and its relation to the behavior of later clonal generations in the field.

In breeding work, potato seedlings are usually started in September and harvested in February. In 1936 and 1937 the individual seedlings were recorded as the vines died in the greenhouse. These individual readings were then used to secure the average mean number of days to maturity for each family. The use of four randomized blocks allowed the variance in maturity due to hereditary differences between families to be separated from the variance caused by environment. Since a different group of families was grown each year, the data for the two years are presented separately. The analysis of variance is presented below:

Variation Caused by	1936		1937	
	D. F.	Mean Square	D. F.	Mean Square
Families	50	51.2*	67	234.7*
Blocks	3	88.1*	3	182.9*
Error	150	14.6	201	52.9

\*Values for F exceed the 1 per cent point.

It will be noted that the differences between blocks were significant, indicating that the location in the greenhouse influenced the time required for seedlings to mature. All observations showed that this difference was caused, at least in part, by the location in relation to available light. The variation caused by differences

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between families was significantly higher than error during the two years. Since the differences in the mean number of days to maturity between families can not be reasonably assumed to be due to chance, other probable sources of this difference must be sought.

Hereditary variations between families might satisfactorily explain the results. The mean number of days for maturity of progenies from early and late varieties crossed with selection 5-10-1 is given in table 1. The  $F_1$  progenies of crosses involving the early varieties, Warba, Early Ohio, and Triumph, required fewer days to mature than those from the late varieties, Russet Rural, and Jubel. The mean number of days to maturity of progenies from early varieties as a group differs significantly from that of the late varieties. These observations suggest that differences in maturity between families in the greenhouse are heritable and that the factors responsible for varietal differentiation for maturity in the field are also operative in differentiating their progenies in the greenhouse.

The differences in maturity obtained between families in the greenhouse could be used to advantage in breeding for early maturity providing the families reacted the same in the field. Seventeen of the fifty-one families harvested in the greenhouse during the winter of 1936 were grown in the field in 1937. This was their second clonal generation in the field. The maturity of these families

TABLE 1.—*Mean maturity in the greenhouse of  $F_1$  families from individuals of varying maturity pollinated with selection 5-10-1*

Pistillate Parents	Mean Number of Days to Maturity of Progeny
Warba	114.9
Early Ohio	118.5
Triumph	120.5
4-9-3-1-1-1-1-1	120.9
4-25-6	121.1
116.30-1	121.6
Russet Rural	122.8
Jubel	126.7

S. E. of difference = 2.56

was measured by the same methods as previously employed in the greenhouse. Since no family matured all of its seedlings before

harvest, an additional record was made at weekly intervals of the percentage of green foliage that remained beginning five weeks previous to harvest, and these weekly estimates were averaged to obtain a mean for the family. The data on greenhouse and field observations for the seventeen families are presented in table 2. An

TABLE 2.—*Maturity of each of seventeen families in greenhouse and in field*

Family Number	Mean Number of Days to Maturity		Per Cent of Foliage Green* 1937 Field
	1935-6 Greenhouse	1937 Field	
118.35	115	110	15
124.35	121	116	18
11-8-1-9-4	119	117	48
111.35	119	118	38
119.35	123	114	42
21-2-2	121	117	47
121.35	117	121	63
82-11	120	119	55
11-1-2-2-4	122	120	55
39.25	122	120	42
194.35	123	117	57
167.35	122	121	54
5-10-1	126	119	48
165.35	127	119	52
107.35	127	123	49
104.35	126	125	71
166.35	127	123	62

\*Average of observations each week for six weeks previous to harvest.

inspection of the data shows that there is an association between the greenhouse and field observations. The coefficients of correlation between the greenhouse and the two sets of field observations were .567 and .569.

The analysis of variance for the seventeen families in greenhouse and field shows that the mean differences for maturity between families, when the results obtained at the two locations are combined, are highly significant. The analysis is presented in table 3. It will be noted further that the variance for interaction of families with locations is no greater than that obtained for error. This can be interpreted to mean that the families reacted the same for maturity in the greenhouse as they did in the field, and that any

dissimilarity of behavior for maturity at the two locations could be reasonably ascribed to chance.

Further evidence of an association between maturity in greenhouse and field was obtained from observations on four families grown in the greenhouse in the winter of 1936-'37. The seedlings of the four families were each divided into five groups according

TABLE 3.—*Analysis of variance for maturity of seventeen seedling families grown in greenhouse in 1935 and in field in 1937*

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F
Families	16	645.38	40.34	3.2**
Locations	1	226.12	226.12	
Blocks	1	19.06	19.06	
Families x locations	16	177.38	11.86	
Error	33	414.94	12.52	
	67	1482.88		

\*\*Exceeds the 1 per cent point.

to the maturity of the seedlings in the greenhouse. The groups comprising each family were then grown in the field and observations were obtained on their maturity. The data are presented in table 4. A significant difference between the means for maturity

TABLE 4.—*Showing relation between number of days required for seedlings to mature in greenhouse and percentage of seedlings green at time of harvest in field*

Families		17-3 (121)*	17-2 (126)*	80-7 (129)*	9-1 (137)*	
Group	Mean Days to Maturity in Greenhouse	Field Immature Seedlings at Harvest				Total
		Per Cent	Per Cent	Per Cent	Per Cent	
1	100	22	22	45	44	133
2	110	36	55	58	40	189
3	115	46	55	45	50	196
4	120	55	51	53	55	214
5	125+	50	43	42	57	192
	Total	219	226	243	246	924

\*Mean number of days to maturity of family in greenhouse.

of the five groups was obtained. The groups within the families tended to mature in accordance with their behavior in the greenhouse with the exception of family 80-7 in which the groups show no particular trend.

The mean maturity of the four families in the field was consistent with their greenhouse behavior. The results of this experiment agree with those obtained from the other studies. They furnish additional evidence of an association for maturity between greenhouse and field.

#### SUMMARY

Significant differences in the mean number of days to maturity was obtained between families of seedling potatoes in the greenhouse. Progenies from crosses involving the early varieties matured more quickly than those from the late varieties. The coefficient of correlation for maturity between greenhouse and field was .56. The variance for interaction of families with locations was no greater than that obtained for error. This result indicates that in this experiment early and late families reacted the same for maturity in the greenhouse as they did in the field. A study of maturity in the greenhouse and field, with seedlings comprising four families, furnished additional evidence of an association in maturity between the greenhouse and field. The observations indicate that maturity in the greenhouse, when combined with field observations, may increase the reliability of the estimate of the breeding value of a parent for quick maturity.

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### REPORT ON POTATO VIRUS DISEASES IN 1937

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This report comprises a review of some of the papers on potato virus diseases published in 1937.

Putnam (15) found in his comparative studies of the three viruses that mottle virus, the ringspot virus, and yellow mottle, belong to the same group. They were able to infect *Datura stramonium*, were not transmissible by *Myzus persicae* and were equally resistant

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