References

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1. Tissue differences in the relative activity of alcohol dehydrogenase isozymes in maize in crosses with a newly discovered high activity line.

Efron (Science 170:751,1970) described an inbred line of maize with low activity of alcohol dehydrogenase (ADH) in the scutellum of the mature seed. This line is homozygous $\underline{Adh_1}^S/\underline{Adh_1}^S$, having a slow migrating isozyme band. In a genetic study, the above line was crossed with a homozygous $\underline{Adh_1}^F/\underline{Adh_1}^F$ line having a fast migrating isozyme band and a normal activity of ADH. Based on the results obtained in the F_1, F_2 and B.C. generations, it was concluded that the activity level of ADH in the scutellum of maize is controlled by the gene $\underline{Adh_r}$ which is located about 17 crossover units from the $\underline{Adh_1}$ gene. The $\underline{Adh_r}^N$ allele specifies equal activity of both the $\underline{Adh_1}^F$ and $\underline{Adh_1}^S$ products. The $\underline{Adh_r}^L$ allele gives lower activity of the $\underline{Adh_1}^S$ products only and is dominant over the $\underline{Adh_r}^N$ allele.

In the present study, the ($\underline{Adh_1}^S/\underline{Adh_1}^S$; $\underline{Adh_r}^L/\underline{Adh_r}^L$) line (7) was crossed with six different homozygous $\underline{Adh_1}^F/\underline{Adh_1}^F$ inbred lines. Line 1 was of known activity (Efron, Science 170:751, 1970) whereas the other lines were of unknown activity. The scutella of the mature F_1 seeds from each cross were tested by means of starch gel electrophoresis and the intensities of the FF, FS and SS isozyme bands were measured with a densitometer. The results measured as the percent activity contributed by the $\underline{Adh_1}^S$ allele are summarized in Table 1.

Table 1

Relative activity contributed by the $\underline{Adh_1}^S$ allele in the scutellum and the pollen of $\underline{Adh_1}^F/\underline{Adh_1}^S$ heterozygotes in crosses between line 7 and six different $\underline{Adh_1}^F/\underline{Adh_1}^F$ lines

Cross	Activity in the parental lines	Percent activity contributed by the $\underline{Adh_1}^S$ allele	
		In scutellum	In pollen
1 x 7	Normal x Low	41.5 ± 2.0	39.6 ± 5.2
10 x 7	Normal x Low	41.1 ± 4.2	38.7 ± 4.1
11 x 7	Normal x Low	39.2 ± 3.3	39.6 ± 4.9
20 x 7	Normal x Low	41.0 ± 4.6	39.4 ± 4.6
45 x 7	Normal x Low	41.9 ± 2.1	38.3 ± 3.5
19 x 7	High x Low	25.7 ± 2.3	63.3 ± 4.3

In ($\underline{Adh_1}^F/\underline{Adh_1}^S$; $\underline{Adh_r}^N/\underline{Adh_r}^N$) scutella (equal activity of the two parental lines) the percent activity contributed by the $\underline{Adh_1}^S$ allele is 49.6 and in ($\underline{Adh_1}^F/\underline{Adh_1}^S$; $\underline{Adh_r}^L/\underline{Adh_r}^N$) scutella the $\underline{Adh_1}^S$ allele contributed only 39.9 percent (Efron, Science 170:751, 1970). Five out of the six crosses, including line 1, showed very similar results indicating that the five parental $\underline{Adh_1}^F/\underline{Adh_1}^F$ lines have equal activity of ADH and that the effect of the $\underline{Adh_r}^L$ allele is similar in different genetic backgrounds. On the other hand, in the cross 19 x 7 the percent activity contributed by the $\underline{Adh_1}^S$ allele was significantly lower.

There are two possible explanations for this result: (1) line 19 has high activity levels of ADH, or, (2) the effect of the $\underline{Adh_r}^L$ allele is stronger in the genetic background of line 19. A test for the activity levels in three parental lines showed clearly that line 19 had higher activity than line 7 (low) and line 1 (normal):

Parental line	:	19	7	1
Activity units	:	234.3 ± 35.6	79.2 ± 7.89	123.9 ± 15.0
Percent activity	:	100.0	33.8	52.9

Based on these results, the expected contribution of the $\underline{Adh_1}^S$ allele in 19 x 7 and 1 x 7 F_1 scutella is 25.3 and 39.0 percent, respectively. The actual values obtained in the F_1 hybrids (Table 1) are very similar to the above expected values.

ADH is active also in the mature pollen of maize. Only FF and SS isozyme bands are found in $\underline{Adh_1}^F/\underline{Adh_1}^S$ heterozygotes. This indicates that the ADH which is present in the mature pollen was formed after meiosis. When the percent activity contributed by the $\underline{Adh_1}^S$ allele was tested in pollen collected from the various F_1 plants (Table 1), the results were similar to those obtained for the scutellum in the first five crosses. However, in the cross 19 x 7 the results were markedly different. In the scutellum the relative contribution of the $\underline{Adh_1}^S$ allele was lower, while in the pollen it was higher than in the other crosses. The possibility of any deviation in the number of $\underline{Adh_1}^F$ and $\underline{Adh_1}^S$ pollen grains produced by this hybrid was ruled out by testing the F_2 generation. Among 220 F_2 seeds tested, the ratio of the $\underline{Adh_1}^F/\underline{Adh_1}^F$: $\underline{Adh_1}^F/\underline{Adh_1}^S$: $\underline{Adh_1}^S/\underline{Adh_1}^S$ was 51:113:56, respectively, which is in good agreement (P = .8 - .9) with the 1:2:1 ratio expected.

Unfortunately, the level of activity in the pollen of the parental lines has not been tested. Therefore, it is too early to hypothesize an explanation for the difference between the two tissues. Also, it is not known at the present whether the high activity of ADH in line 19 is controlled by the $\underline{Adh_r}$ gene.

Yoel Efron

2. Relative activity of $\underline{AP_1}$ controlled acid phosphatase isozymes in pollen of hybrids between inbred lines of maize differing in activity level.

Efron (Biochem. Genetics 5:33, 1971) presented evidence that the $\underline{AP_1}$ controlled acid phosphatase activity in maize is variable in different inbred lines. Five distinct groups of activity were found among 23 inbred lines tested.

Two major difficulties arise in the attempt to study the genetic control of the variation in specific enzyme activity: (1) the presence