

3. Geographical variation in gene frequencies.

While growing the races of maize of the countries of this hemisphere as part of a general taxonomic study, it seemed desirable to obtain data on gene frequencies of several genes which are easily tested and for which there is no strong presumption of selective value. Genes for which such tests have been made are Pr on chromosome 5, I on chromosome 9 and Ga on chromosome 4. All of these genes may belong to allelic series and no attempt has been made to distinguish between the different alleles. The test for both Pr and I, for example, involved a pollination of the stock A C R pr i by representative varieties from Latin America and by U. S. inbred strains, and no attempt was made to distinguish between the degrees of development of purple aleurone color or the inhibition of aleurone color. The data obtained from these studies are as follows:

Table 3. Percentage frequency of three genes in U. S. inbreds and in maize varieties of Latin America.

Country	Percentage Frequency		
	Pr	I	Ga
U. S. (inbreds)	98	0	0
Mexico	67	50	56
Guatemala	82	29	43
Honduras	63	77	69
Salvador	50	--	--
Costa Rica	55	50	57
Nicaragua	67	55	54
Panama	30	60	---
Colombia	86	11	26
Ecuador	93	13	25
Peru	96	25	7
Bolivia	95	22	10
Venezuela	69	19	50
Brazil	75	25	20
Paraguay	75	19	--
Cuba	33	17	--

Although the samples are far from adequate as a basis for final conclusions, several facts are quite clear.

Adjoining countries usually have similar frequencies for the same gene. Thus, the frequency of Pr is high in all of the Andean countries, Peru, Ecuador, Bolivia, Colombia and Venezuela. It is lower in the South American lowland countries, Brazil and Paraguay, and still lower in the countries of Central America with the exception of Guatemala which resembles the Andean countries.

The situation with respect to the I gene is similar to that for the Pr gene except that it is in reverse. The Andean countries have a relatively low frequency of I, the South American lowland countries a slightly higher frequency. The countries of Central America all have a relatively high

frequency of the I gene except Guatemala, which resembles the South American countries more closely than it resembles the adjoining countries.

The frequencies of the Ga genes resemble the frequency of the I gene. The Andean countries are lowest, the South American lowland countries are somewhat higher, and the Central American countries (again with the exception of Guatemala) highest.

The consistent resemblance of Guatemala to the Andean countries in frequencies of these three genes is probably highly significant. Earlier studies of the maize of Guatemala and Southern Mexico have revealed strong affinities of some of the Guatemalan maize to the maize of Bolivia, Peru, Ecuador and Colombia.

Another conclusion which may be drawn from these data is that the maize of the United States is unique so far as these particular gene frequencies are concerned, Pr having a higher frequency and I and Ga lower frequencies than in any other country of this hemisphere. So far as gene frequencies are concerned the U. S. maize resembles that of Guatemala more closely than it does that of Mexico. However, when gene frequencies are broken down by states and departments it is apparent that the maize of the United States is related to the maize of eastern Mexico, which in turn is derived from the maize of southern Mexico and northwestern Guatemala. The maize of the U.S., at least so far as it is represented by inbred strains of commercial varieties, is, however, still unique when compared to the maize of most of this hemisphere.

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