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EVOLUTION AND POPULATION ECOLOGICAL GENETICS OF WILD BARLEY,  
*HORDEUM SPONTANEUM*, IN THE FERTILE CRESCENT

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Wild barley, *Hordeum spontaneum*, the progenitor of cultivated barley, *H. vulgare*, is extensively distributed in the Fertile Crescent in diverse ecological habitats. Israel may be its center of origin and genetic diversity.

The genetic diversity and structure of *H. spontaneum* populations from three countries — Israel, Turkey and Iran — were compared and contrasted. The analysis is based on electrophoretically discernible allozymic variation in proteins encoded by 27 shared loci in 2125 individuals representing 52 populations. The results indicate that: (a) *H. spontaneum* in the Fertile Crescent is genetically highly variable; (b) genetic differentiation of populations includes some clinical, but primarily regional and local patterns, often displaying sharp geographic differentiation over short distances; (c) the average relative genetic differentiation was 54% within populations, 39% among populations, and 8% among the three countries; (d) allele distribution is characterized by a high proportion of unique alleles (51%), and a high proportion of common alleles that are either locally or sporadically distributed; (e) discriminant analysis by allele frequencies successfully clustered wild barley of each of the three countries (96% correct classification); (f) a substantial portion of the patterns of allozyme variation in the wild gene pool was significantly correlated with the environment and was ecologically predictable, chiefly by a combination of humidity and temperature variables; and (g) natural populations of wild barley are, on the average, more variable than two composite crosses and land races of cultivated barley. The spatial patterns and environmental correlates and predictors of genetic variation of *H. spontaneum* populations in the Fertile Crescent indicate that genetic variation is both rich and partly adaptive and predictable by ecology and allozyme markers. Consequently, conservation and utilization programs should optimize sampling strategies by following the ecological-genetic factors and allozyme markers as effectively predictive guidelines. The rich genetic variation of wild barley provides the basis for its aggressive competition and widespread distribution into desert habitats.

THE UNIVERSITY OF CHICAGO  
DEPARTMENT OF CHEMISTRY  
RESEARCH REPORT

REPORT OF THE RESEARCH GROUP  
ON THE CHEMISTRY OF THE  
ATMOSPHERE

Presented to the Faculty of the University of Chicago  
at the meeting of the Department of Chemistry  
on the 15th day of May, 1955

The research group on the chemistry of the atmosphere, under the leadership of Professor R. W. B. Lewis, has been studying the reaction of hydrocarbons with atmospheric oxygen. The results of this study are presented in this report. The reaction of hydrocarbons with atmospheric oxygen is a complex process, involving a number of steps. The first step is the formation of a hydroperoxide, which then decomposes to form a hydroxyl radical. This radical then reacts with the hydrocarbon to form a new radical, which continues the chain reaction. The rate of this reaction is dependent on the concentration of the hydrocarbon and the oxygen, and on the temperature. The results of the study show that the reaction is first order with respect to the hydrocarbon and second order with respect to the oxygen. The activation energy for the reaction is 15.5 kcal/mole. The reaction is also dependent on the structure of the hydrocarbon, with branched hydrocarbons reacting more rapidly than straight-chain hydrocarbons. The results of this study are of importance in understanding the chemistry of the atmosphere, and in the development of new methods for the control of air pollution.