

DISRUPTIVE SELECTION, POLLINATION SYSTEMS AND THE  
ORIGIN OF OLD WORLD CULTIVATED CEREALS

In their geographic center in western Asia the Old World cultivated cereals - wheats (Triticum) barleys (Hordeum) ryes (Secale) and oats (Avena) - show largely sympatric distribution: of pairs of main types:

(i) Genuinely wild forms which occupy mainly primary habitats. In all four cereals such wild types constitute important components of the native vegetation. They are all highly specialized grasses and show conspicuous adaptive specialization in seed dispersal devices (arrow-like or drill devices).

(ii) Man dependent forms (domesticated forms or obligatory weeds). These grow only in cultivation. All tame members of the four groups show breakdown of the wild mode of seed dispersal and its replacement by full dependency on man - on his reaping and sowing.

The archeological information available indicates that the start of cereal agriculture took place in West Asia in the same general area where wild cereals predominate. Thus splitting of the original optimum into its present two adaptive ranges apparently started some 10.000 years ago.

In wheats, barleys and oats disruptive selection was thus initiated in populations with predominance of self-pollination. Effective isolation between the wild populations and the tame populations was immediately achieved - by virtue of the mating system. Significantly wild and tame counterparts in each pair still retain full interfertility.

Rye, in contrast, is cross-pollinated. In difference with the selfers, wild and tame types here show well developed sterility barriers: tame and wild differ from one another by virtue of a compound translocation. Rye, most likely, presents us with a case where disruptive selection operated on a panmictic plant, and as theoretically expected resulted in the built up of sterility barriers.

THE EFFECTIVE SELECTION, VARIATION, EVOLUTION AND THE  
ORIGIN OF OUR MODERN CULTIVATED CEREALS

- 2 -

The effective selection of cereals in western Asia the Old World  
cultivated cereals - wheat (Triticum) barley (Hordeum) rye (Secale)  
and oats (Avena) - show a truly systematic distribution of their  
varieties.

(1) Genetically wild forms which occupy mainly primary  
habitats. In all these cereals such wild forms constitute important  
components of the native vegetation. They are all highly specialized  
organisms and show a high degree of specialization in seed dispersal  
(wheat, barley, rye, oats).

(2) Genetically domesticated forms or obligate  
domesticates. These are the cereals which have been domesticated  
by man. They are all highly specialized organisms and show a high  
degree of specialization in seed dispersal and growth.

The statistical information available indicates that  
the great majority of cereals took place in West Asia in the same  
general area where wild cereals predominated. Thus selection of the  
original cereals into the present two adaptive ranges apparently  
started from the same area.

In wheat, barley and oats domestic selection was thus  
initiated in populations with mechanisms of self-pollination.  
Effective isolation between the wild populations and the tame populations  
was immediately achieved - by virtue of the mating system. Significantly  
all tame counterparts in each case still retain full fertility.

And, in contrast to cross-pollinated, in difference with  
the cereals, wild and tame types show well developed sterility  
barriers: tame and wild differ from one another by virtue of a compound  
translocation. Rye, too, is likely, present as with a case where disruptive  
selection operated on a gametic plant, and an evolutionarily expected  
result in the form of sterility barriers.