Intra-varietal Diversification in Oat Breeding

Neal F. Jensen

Oats is rather unique among grain crops in the United States in that the principal use of the harvested product as feed imposes few geographical limits on its growth. A popular wheat variety may have as wide a range of adaptation yet because of the influence of market factors its acreage will tend to be concentrated in an area as well defined as the hard red spring wheat region. A popular variety of oats on the contrary is limited in its spread only to the degree that it lacks adaptation to various environments. Oat varieties, thus, can and do spread over vast areas of the United States.

Stakman (17) and Stevens (20) among others have pointed out the effect of changes in varieties on changes in the population of certain plant pathogens. It seems obvious that the plant breeder has unwittingly aided the rapid build-up and spread of plant pathogens through the simultaneous release and propagation over wide areas of oat varieties which frequently have the same complex of disease susceptibilities. Stanton and Coffman (18) described 18 varieties of oats recently released through the cooperative efforts of the U. S. Department of Agriculture and several state agricultural experiment stations. Of these 18, 15 were Bond-related varieties. The same pattern of similarity was evident earlier when plant breeders released several varieties derived from crosses with Victoria. It can easily be seen why oat breeding problems are national in scope.

There is no lack of confidence in overcoming the present disease problems in oats through a plant breeding approach, but it is also clear that these problems sometimes demand a solution within a shorter period than even the minimum time required to produce a new variety. Such is the case with the problem of race 45 of crown rust today, and there is a growing realization that the production and distribution of new pure line varieties alone as in the past may not be a sufficient measure to provide the desired stability in oat production. This thought has recently led to rather general agreement on several elements which together may be summed into the one word diversification.

DIVERSIFICATION

The principle of diversification is an old one with an application particularly suited to risk situations. The risk situation in oat production today, of course, is one of disease problems created primarily by plant pathogens, principally crown and stem rust, which are able from oat field to oat field without encountering genetic barriers in the form of resistant varieties to spread appreciably. Diversification of oat varieties, thus, appears as an obvious attempt to re-establish these barriers within and between regions not so much to keep oat varieties from spreading but which today have been virtually eliminated.

Diversification in oat improvement can be applied in many ways. There may be diversification of parent types and crossing combinations. This is a frequent practice of plant breeding. Today, however, particular emphasis is being placed on regional or State level because it is here that recommendations are made to farmers and their recommendations are accepted. Diversification here is concerned with the recommendation of an adequate number of good oat varieties, different genetically that the random selection of these varieties by farmers will provide some protection against plant pathogens on an area-wide basis. Diversification does not imply restriction in any form upon the distribution of a popular variety over a wide area. It does not insist that this should not be made inevitable by too limited a selection of varieties for the recommendation.

It is apparent that the application of diversification in oat improvement is wholly inter-varietal. The farmer who plants one oat variety on different fields of his farm is applying diversification to its practical extreme. As a rule there are many farms, at least in the Northeast, both valley and hill soils where such a practice may be sound, but whether farmers generally will follow such a procedure is doubtful.

With the background of the past decade it is apparent that the fresh approach to the solution of oat breeding problems should be ignored, and the question may be asked whether there is not a logical extension of the diversification from the inter-varietal to the intra-varietal level. In other words, can a single variety be developed with "built-in" protection? While there have been few attempts to develop such a variety, this problem has been considered for its evol- outance, and there are also data available on the situation in oat production today, of course, is one of disease problems created primarily by plant pathogens, principally crown and stem rust, which are able from oat field to oat field without encountering genetic barriers in the form of resistant varieties to spread appreciably. Diversification of oat varieties, thus, appears as an obvious attempt to re-establish these barriers within and between regions not so much to keep oat varieties from spreading but which today have been virtually eliminated.

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