Plant breeders must be concerned with populations of plants from two
different points of view. In the first instance, there is the cultivar that is
used in crop production. In reality, a cultivar of a crop growing in a field
for agricultural production is a population of plants growing together in a
community with individual plants interacting with one another at all stages
of growth. In the second instance, genetically heterogeneous populations of
plants are used with a number of plant breeding methods. These methods
are referred to as “population breeding” methods.

CULTIVAR TYPES

Types of plant cultivars are: (1) pure lines, (2) hybrids, (3) multilines,
and (4) synthetics.

A breeder or agriculturalist is interested in these kinds of populations
for (1) total production per hectare and (2) response and stability of produc­
tion over environments.

Basically, four mechanisms in plants and plant populations affect the
response and stability of production of a cultivar across variable environ­
ments. They are: (1) phenotypic plasticity, (2) heterozygosity, (3) hetero­
genecity, and (4) polyploidy. Mechanisms 1, 2, and 4 are features of a geno­
type, whereas mechanism 3 is a feature of populations. A given cultivar may
have only one mechanism, i.e., a pure-line cultivar of barley, or it may have
all four, i.e., a cultivar of alfalfa. In this chapter I assess different cultivar
types in terms of productive capacity and production response and stability.

1Journal Paper No. J-9873 of the Iowa Agric. and Home Economics Exp. Stn., Ames,
Iowa. Project 1752.
2C. F. Curtiss distinguished professor in Agriculture, Iowa State Univ., Ames, IA 50011.
Copyright © 1983 American Society of Agronomy and Crop Science Society of America,
677 S. Segoe Road, Madison, WI 53711. Crop Breeding.