

Types of Cultivars

The types of cultivars used to propagate a species for commercial production have a major impact on the methods utilized by the plant breeder for genetic improvement. For example, tests of combining ability are a major consideration in the development of inbred lines used in the production of hybrid cultivars, but are not of importance in the development of a self-pollinated cultivar. Methods of inbreeding are important for the development of inbred lines or self-pollinated cultivars, but not for the selection of a clone to be used as a vegetatively propagated cultivar.

Classification of the different types of cultivars provides an overview of the alternatives available for commercial propagation of crop species. The variability among species for modes of reproduction makes it difficult to develop absolute definitions for each cultivar class. Nevertheless, a committee of the U.S. Department of Agriculture has developed useful guidelines for classifying cultivated plant populations. The committee report and the International Code of Nomenclature for Cultivated Plants are the basis of the information outlined in this chapter on types of plant cultivars.

The terms variety and cultivar (cultivated variety) will be considered equivalent. A cultivar is a group of plants with characteristics that are distinct, uniform, and stable. Distinct indicates that the cultivar can be differentiated by one or more identifiable morphological, physiological, or other characteristics from all other known cultivars. Uniform designates that variation among the plants of a cultivar for distinctive characteristics can be described. Stable indicates that the

cultivar will remain unchanged to a reasonable degree of reliability in its distinctive characteristics and its uniformity when reproduced or reconstituted.

CLONAL CULTIVARS

A clonal cultivar consists of one clone or several closely similar clones that are propagated by asexual means. The methods of propagation include cuttings, tubers, bulbs, rhizomes, and grafts. A clonal cultivar could be propagated asexually from seed produced by obligate apomixis. Examples of clonal cultivars include 'Meyer' zoysiagrass, 'Elberta' peach, 'Russett Burbank' potato, 'Coastal' bermudagrass, 'Peace' rose, 'Iceberg' chrysanthemum, and 'Higgins' buffelgrass.

LINE CULTIVARS

Line cultivars consist of a group of plants of self- or cross-pollinated species that have largely the same genetic background, defined as a theoretical coefficient of parentage of 0.87 or higher (Kempthorne, 1957). The cultivars are maintained by self-pollination or sib mating. Examples of line cultivars from normally self-pollinated crops include 'Gaines' wheat, 'Tendercrop' snap bean, and 'Wayne' soybean. Examples of line (inbred) cultivars from normally cross-pollinated crops include 'MSU-713-5' gynoeocious cucumber, 'WF9' maize, 'Nittany Lion Red' geranium, and 'B2215C' onion. Classification of single-line facultative apomicts is complicated by variation among cultivars in the percentage of seed produced asexually. Cultivars with 95 percent apomixis for single-line facultative apomicts are considered pure lines. In cases where it is not possible to achieve 95 percent apomixis, single-line facultative apomicts with a level of apomixis as low as 80 percent may be classed as line cultivars even though the plants may differ in morphological characteristics. Examples of single-line facultative apomicts meeting the 95 percent apomixis requirement include 'Pennstar' and 'Merion' Kentucky bluegrass. Cultivars with below 95 percent apomixis include 'Adelphi' and 'Bristol' Kentucky bluegrass.

OPEN-POLLINATED CULTIVARS OF CROSS-POLLINATED CROPS

Open-pollinated cultivars consist of normally cross-pollinated plants selected to a standard that allows variation but in which the cultivars have one or more characteristics that differentiate them from other cultivars. Examples include 'Kenland' red clover, 'Nordan' crested wheatgrass, 'Yellow Bermuda' onion, 'Elbon' rye, 'Thumbelina' zinnia, 'Poinsett' cucumber, and 'Golden Bantam' sweet corn.

SYNTHETIC CULTIVARS

First-Generation Synthetic Cultivars (Syn 1)

A Syn 1 cultivar consists of first-generation progenies derived by intercrossing a specific set of clones or seed-propagated lines. A Syn 1 cultivar may be used for normally cross-pollinated crops or for self-pollinated crops into which mechanisms have been introduced to maximize cross-pollination, such as male sterility or self-incompatibility. The cultivars usually contain mixtures of seed resulting from cross-, self-, and sib-pollination. Syn 1 cultivars consist only of first-generation progenies after intercrossing and cannot be reproduced from seed of the first generation. Examples include 'Gahi' pearl millet, 'Vitagraze' rye, and 'Tempo' alfalfa.

Advanced Generation Synthetic Cultivars (Beyond Syn 1)

Synthetic cultivars may consist of generations of open-pollinations advanced beyond the Syn 1 generation. The Syn 2 generation is produced from the Syn 1 generation, the Syn 3 is produced from the Syn 2, and so forth. The cultivars usually are stable for only a limited number of generations of reproduction, and are reconstituted from the original parental lines or clones. Examples include 'Ranger' and 'Moapa' alfalfa, 'Saratoga' bromegrass, and 'Pennlate' orchardgrass.

HYBRID CULTIVARS (F_1)

Hybrid cultivars consist of first-generation (F_1) progenies from a cross produced through controlling the pollination between (a) two inbred lines (single cross), (b) two single crosses (double cross), (c) a single cross and an inbred line (three-way cross), (d) an inbred line or a single cross and an open-pollinated or a synthetic cultivar, or (e) two selected clones, seed lines, cultivars, or species. The hybrid cultivar cannot be reproduced from seed of the hybrid generation. Examples include 'Hybrid-7' spinach, 'US 13' hybrid maize, 'RS-610' hybrid grain sorghum, 'Moreton' hybrid cabbage, 'Valley' hybrid sunflower, and 'Picadilly' hybrid cucumber.

F_2 CULTIVARS

An F_2 cultivar is derived by self-pollination or open-pollination of an F_1 hybrid. The cultivar cannot be perpetuated by growing additional generations. Examples

include 'Foremost F₂' tomato, 'Market Pride' cantaloupe, 'Violet Blue' petunia, and 'Seven-Eleven' pansy.

COMPOSITE-CROSS POPULATIONS

A composite-cross population is generated by hybridizing more than two cultivars or lines of normally self-pollinated plants and propagating successive generations of the segregating population in bulk in specific environments so that natural selection is the principal force acting to produce genetic change. Artificial selection also may be imposed on the population. The resulting population is expected to have a continuously changing genetic makeup. Breeder seed is not maintained as originally released. Examples include 'Harland' barley and 'Mezcla' lima bean.

MULTILINES

A multiline or blend is a seed mixture of cultivars or lines each present in excess of 5 percent of the whole. A multiline may consist of two or more near-isogenic lines of normally self-pollinated plants that are similar in most characteristics but differ in a limited number of distinctive characteristics, such as disease resistance. The term multiline also has been used to describe a seed mixture of two or more unrelated lines. A multiline is derived by growing the component lines separately and then compositing the seed in a predetermined percentage of each component. If the components differ in seed productivity in a mixed population, the genetic composition of the multiline will change each generation of reproduction. Examples include 'Webster' blend oat and 'Miramar-63' wheat.

REFERENCES

- International code of nomenclature for cultivated plants. 1980. *Req. Veget.* 104:7-32.
- Kempthorne, O. 1957. *An introduction to genetic statistics*. John Wiley, New York.