THE CONCEPT OF THE CULTIVAR[1]

by James S. Pringle

With the publication of the first edition of the International Code of Nomenclature for Cultivated Plants in 1953, a new category, that of cultivar, was added to those in use for the classification of plants. Thus formal recognition was given to a category of variation among plants which had long been know to exist, but for which there had previously been no adequate provision under the rules of botanical nomenclature.

Since the publication of this Code, increasing numbers of plant scientists have found the term *cultivar* and the concept which it represents to be useful. This term now appears not only in technical publications but also, with increasing frequency, in popular horticultural literature. Many people, however, remain uncertain as to exactly what a cultivar is, and how this category differs from certain others which pertain to the classification of plants. In this paper, the concept of the cultivar, and its place in the classification of cultivated plants, are discussed.

A cultivar is a named group of cultivated plants which are: 1) distinguished from other members of the same species or interspecific hybrid complex by any combination of genetic traits which may be significant in relation to the purposes for which the plants are cultivated; 2) usually derived from a single selection of one plant or a small group of similar plants; and 3) propagated by means which maintain a high degree of genetic uniformity among its member individuals, at least with regard to horticulturally or agronomically important characteristics, and usually also with regard to characteristics affecting the appearance and recognizability of the plants.

The term *cultivar* is applicable to selections of flowering or nonflowering plants, whether herbaceous or woody, and whether cultivated for ornamental or utilitarian purposes. The applicability of this term is independent of the source of the original material from which the cultivar was propagated. Cultivars may be derived from individuals selected from wild populations, from seedlings raised in the garden from open-pollinated parent plants, or from the progeny of controlled breeding programs. Its applicability is also independent of the means by which the cultivar is propagated, as long as the required degree of genetic uniformity is maintained.

The classification of plants is based on similarities and differences among individual plants and plant populations. An understanding of the concept of the cultivar, and of how the cultivar differs from other taxonomic categories, requires a basic understanding of patterns of variation among plants, especially at the infraspecific level.

Even though individual plants are members of the same species, they are not identical. Some variation within species, of course, is attributable to differences in the ages of plants and to environmental factors. Much of the variation within species, however, shows no such correlations. Within some species, variation is correlated with geography. It is to such infraspecific variants as these, which encompass whole series of natural populations, that the Latin term *varietas* and its English cognate *variety* are applied under the provisions of the Botanical Code. Because, in nature, each of these varieties occupies a different geographic range, interbreeding generally occurs only among the plants of the same variety.

The Botanical Code also provides for the recognition of the subspecies, as a taxonomic category intermediate in rank between the species

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[1]Reprinted in part from *The Garden's Bulletin*, Royal Botanical Garden, Hamilton, Ontario, Vol.27(3): 1973.

and the variety. The use of the term *subspecies*, and the establishment of taxonomic entities at this rank, have been matters of differing opinions in recent years. Some botanists feel that *subspecies* should completely replace *variety* as the designation for the major geographic subdivisions of species. Their arguments are that *variety*, being a long-established taxonomic category, was used for too many kinds of infraspecific taxa, before distinctions were made among cultivars, forms (defined below), and varieties as defined above; and that *variety*, being a common English word, is often used, at least informally, in senses other than that established in the Botanical Code.

Other botanists, however, prefer to retain *variety* or *varietas* as the term for the major subdivisions of species. They content that, because of the long and widespread use of *variety*, and its prevalence, for example, in most of the floras used on this continent, its replacement would require an excessive number of nomenclatural changes; and that it is consistent with taxonomic practice generally to have a distinctive term for each of the regularly recognized taxonomic ranks, and to use terms prefixed with *sub-* as intercalary ranks in especially complex situations. They also feel that within some widely distributed species there is so much diversity that it is of practical value to have more than one taxonomic rank, above that of form, available for the subdivisions of species.

A subspecies or a botanical variety usually occupies a major portion of the range of a species to the exclusion of other subspecies or varieties, or at least comprises all of the individuals in a population or a series of populations. It is usually differentiated from other subspecies or varieties of the same species by several characters which generally occur in combination, except sometimes in limited zones of intergradation with other subspecies or varieties. Other infraspecific variation, however, pertains only to individual plants. Such indivdual variants, which differ from typical plants of their respective species in one conspicuous trait, may be given names with the rank of *forma*, or, in English, *form*, under the provisions of the Botanical Code.

It should be noted that the name of a form, like that of a species, is determined by the author who first describes the form and publishes a name for it in accord with the provisions of the Botanical Code. Forms do not receive their names automatically; not all forms distinguished by white corollas bear the epithet *alba*, nor are all forms with deeply incised leaves to be designated *laciniata*.

The division of species into subspecies, varieties, and forms is generally based almost exclusively on morphological traits. Plants, of course, differ in many other respects, often in ways which are not readily discernible except under experimental conditions. Individual plants which are classified as being members of the same species and variety, and even of the same form, may differ from one another in cold hardiness, relationship of floral-bud initiation to day length, tolerance of shade or of soil acidity, resistance to various fungus pathogens, rate of growth or abundance of bloom under comparable environmental conditions, and in many other physiological aspects. Biochemical differences may affect such properties as the flavor or aroma of certain plant parts.

Sexual reproduction provides ample opportunity for genetic segregation and recombination. Almost any two plants which developed from different fertilized eggs, therefore, can be assumed to differ from each other in some genetic aspects. Asexual reproduction, in contrast, provides no opportunity for genetic recombination. Barring the relatively rare occurrence of a mutation, all of the cells derived from the same fertilized egg are genetically identical, even though they may eventually comprise many individual plants. All of the plants derived from the same fertilized egg, either through natural asexual reproduction or through asexual propagation in horticulture, constitute a clone. All of the runner plants which may develop from one seedling strawberry, for example, would comprise one clone, as would all of the cuttings taken from one seedling lilac. Subsequent *generations* of cutting would be part of the same clone. To state that a group of plants is a clone is to indicate the genetic, rather than the taxonomic status of these plants. *Clone* does not appear within the taxonomic hierarchy of ranks. A clone may receive a name if it happens also to be a cultivar, but is is not named simply because it is a clone.

Obviously, it is not feasible to attempt to name every individaul plant or clone which comes into existance, or even every readily discernible variation which can be shown to have a genetic basis. The Botanical Code, therefore, provides for the classification of self-perpetuating or recurring entities, the existance of which can be expected to transcend the life span of any individual plant or clone. Such entities described under this Code generally encompass some genetic variation among individual plants. When plants are selected for cultivation, however, it is to individual plants that attention must often be given. Plants are selected because they excel over other members of the same species, variety, or form in traits which make them especially valuable as potential crop or ornamental plants. The Cultivated Code supplements the Botanical Code in that it deals specifically with plants derived from selected individuals.

By definition, a cultivar comprises a group of plants so propagated as to maintain a high level of genetic uniformity. If a plant selection can feasibly by propagated by asexual methods, the required level of uniformity can obviously be maintained, since asexually propagated plants are genetically identical to the parent plants from which they are derived. Many cultivars, therefore, are clones, including virtually all cultivars of woody plants and most cultivars of herbaceous perennial species. Cultivars may be propagated by taking advantage of natural reproductive processes, such as the production of runner plants by strawberries, or axillary bulbils by some lily cultivars. Cultivars of many hervaceous perennial species are commonly propagated by the division of clumps. Cuttings are used for the clonal propagation of many woody plants and herbaceous conservatory plants. Cultivars of other plant species, almost all of them woody, are propagated by grafting or budding a portion of the cultivar onto some compatible rootstock, which may itself represent another cultivar.

Many cultivated plants, including nearly all annual ornamentals, lawn grasses, oilseed and forage crops, and cereal grains, along with a majority of the vegetable crops, are generally propagated by means of seeds. Since, in most seed-producing species, seed production is the outcome of sexual reproduction, the named products of breeding and selection within such species are not clones, but they may nevertheless be designated cultivars. The individuals which comprise such cultivars are not genetically identical to one another, but an acceptible level of genetic uniformity is maintained through methods which involve some degree of inbreeding.

The fact that some cultivars are propagated by means of seed does not mean that the seedlings of any cultivar can be said to represent that cultivar. The only populations of seed-propagated plants to which this status is properly applicable are those which were specifically introduced as seed-propagated cultivars, after having been rendered acceptibly true-breeding through some degree of inbreeding and isolation. If a cultivar was intended to be propagated asexually when it was introduced, seedlings from plants of this clone cannot properly be said to represent the same cultivar, however much they may appear to resemble it. This restriction provides that a cultivar which is propagated asexually will be uniform in traits which would not be readily demonstrable in a population of seedlings, such as hardiness under various climatic conditions, or resistance to certain strains of pathogenic fungi.

Cultivars propagated by means of seed inevitably retain more variability among individuals than is the case with clonal cultivars. After selection for uniformity has been deemed sufficient, and a sexually propagated cultivar has been introduced, natural selection can operate on the residual genetic variability in this cultivar as it is grown in quantity for seed production. Since natural selection does not necessarily favor horticulturally desirable qualities, it may lead to a decline in the horticultural quality of a cultivar in the years subsequent to its introduction. The chances of such a decline are minimized by thorough selection for uniformity in significant traits prior to introduction, and continued inspection and roguing of the plants cultivated for seed production.

The status of a population or a series of populations as a species depends upon its intrinsic properties, i.e., to what extent and how sharply it is differentiated from other populations. In theory, at least, a plant scientist recognized that a group of plants is a species, rather than making it a species. Cultivar status, however, is definitely conferred by humans. The plants to be so designated must be selected for this status; provision must be made for their propagation at an acceptable level of uniformity; and they must be named.

The Cultivated Code provides rules for the naming of new cultivars, and for the determination of the correct name of a cultivar. The basic requirements for the validity of a cultivar name are that it must have appeared in print, accompanied by a description of the culitvar if published after 1958; be the earliest name applicable to the cultivar; and be distinctively different from the name of any closely related cultivar (e.g., within the same genus). The name of a new cultivar should be in a modern language. Cultivars given Latin names before the existence of the Cultivated Code retain these names, however, and cultivars originally but inappropriately described as varieties or forms under the Botanical Code retain their Latin names when subsequently treated as cultivars. The compilers of the Cultivated Code realized that many people other than specialists in nomenclature have a vital interest in cultivar names, and provided a number of "loopholes" which can be used for the sake of the stability and general acceptability of cultivar names. Names may be rejected, for example, if their use would "lead to confusion", or if they are commercially unacceptable; and a cultivar name may be reused if the cultivar to which it was originally applied has ceased to exist and is not of significance as an ancestor of existing cultivars. Further details of the rules can be found in the Cultivated Code itself, or in articles in journals circulated among amateur and professional plant breeders.

Registration authorities have been established to deal with the nomenclature of cultivars in certain genera in which many new cultivars are continually being introduced. These organizations keep records of the cultivar names which have been published in the genera for which they are responsible, in order to minimize the possibility that the same name might be applied to more than one cultivar, or that one cultivar might be known by more than one name. They are also empowered to rule on departures from the general principles, such as that of nomenclatural priority, established in the Cultivated Code. The role of registration authorities is further described in this code.

The Botanical and Cultivated codes of nomenclature require that the rank of any taxon below the rank of species be indicated when the name of that taxon appears in print. For the ranks established under the Botanical Code, this is done by inserting the term denoting the rank, or more commonly its abbreviation, immediately before the epithet of the infraspecific taxon, as illustrated in such names as: *Quercus rubra* var. *borealis*; *Actaea rubra* f. *neglecta*; *Prunella vulgaris* var. *lanceolata* f. *candida*.

A similar format may be employed with cultivar names, e.g.: *Fraxinus americana* cv. Kleinburg; *Syringa* X *prestoniae* cv. Isabella. Single quotation marks around the name of a cultivar also serve as an indication of its taxonomic rank, and are more commonly used, at least in horticultural literature: *Crataegus monogyna* 'Stricta'; *Spiraea nipponica* 'Halward's Silver'. In technical publications, both indications of rank are commonly used for clarity, in the format; *Syringa vulgaris* cv. 'Anne Tighe', *Cucurbita moschata* cv. 'Waltham Butternut'.

Some cultivars have been selected from interspecific hybrid populations for which no Latin name has been published. Other cultivars cannot be associated with any one species or named hybrid taxon because their ancestry in volves several species or is unknown. The names of such cultivars may follow the generic name directly as in *Lillium* 'Algoma'; *Clematis* 'Ramona'. Although this format is permissable with any cultivar name, even if the cultivar is a selection of one species it is generally advisable to retain the species name when possible, especially in highly variable genera, or when the cultivar name is in Latin form. The inadequacy of a designation such as *Crataegus* Stricta or *Picea* 'Conica' is obvious.

When an unambiguous vernacular name is available for a genus or species, a cultivar name may be used with this name. For example, one has the option of writing *Acer rubrum* 'Armstrong'; Red Maple 'Armstrong'; or 'Armstrong' Red Maple.

As the examples above indicate, the name of a cultivar is not italicized, regardless of whether it is in Latin form or in a modern language. The initial word and all major words in a cultivar name are begun with capital letters.

ROYAL BOTANICAL GARDEN
HAMILTON, ONTARIO, CANADA

ABSTRACT

Peterson, G.W. and D.A. Graham. 1974. **Dothistroma needle blight of pines.** USDA Forest Service, Forest Pest Leaflet 143. 5 p.

Dothistroma needle blight, caused by the fungus *Dothistroma pini*, is the most damaging disease of pines in the Southern Hemisphere. Severe damage has been caused by this disease in North America too, especially in plantings. The disease seldom has been detected in young seedlings in North American nurseries, yet experience with epidemics in isolated new plantings in the Great Plains indicates that trees infected in the nursery must have been responsible. The fungus commonly has been found on older pine transplants in nurseries in the Central States which produce pines for landscape plantings.

Twenty pine species and hybrids are known hosts in North America; the fungus has been found in 23 of the United States and four Provinces of Canada, but has not been reported in Mexico.

Symptoms develop in the fall of the year of infection in the central United States and British Columbia. Early symptoms on the needles consist of yellow and tan spots and bands that appear water-soaked. The spots and bands may turn brown to reddish brown. The reddish bands are more distinctive and numerous on infected needles of pines in the western United States where this disease is often referred to as red band disease. Commonly, the distal ends of infected needles become chlorotic, then necrotic, with the base of the needles remaining green. Needles may develop extensive necrosis 2 to 3 weeks after the first appearance of symptoms.

Infected needles drop prematurely. Infected second-year needles are cast before infected first-year (current-year) needles. In some seasons, second-year needles are cast in late fall of the year they became infected. In other seasons, loss of needles is not extensive until late the following spring or early summer. Needles that become infected the year they emerge often are not shed until late summer the following year.

Copper fungicides effectively prevent infection by Dothistroma needle blight. Bordeaux mixture (8 pounds of copper sulfate, 8 pounds of hydrated lime, 100 gallons of water) applied twice in the growing season has provided essentially complete control. The first application (mid-May) protects previous seasons' needles; the second application (July) protects current-year needles. The second application can be made after considerable new growth has occurred, since current-year needles of these species are initially resistant to infection and do not become susceptible until mid-summer.