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Plant Breeding for the Home Gardener

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fectively as long as the amount of shade on the roof averaged 20 percent or more for the entire day.

Deciduous vines that cling to trellises along walls can afford protection on the south and west sides of a house. Vines which cling directly to walls may cause some structural deterioration. By providing shade on walls, vines keep the surface temperature down and reduce convection-caused heat gain. Additional cooling comes from evaporation of moisture from the leaves. Evergreen vines such as English ivy should not be used on walls facing south since they block the winter sun's warming rays. Vines may help insulate walls on the north and west sides by curbing winter winds.

For more information request publication 324-859 from the Extension Distribution Center. Onsite assistance in locating and designing windbreaks and selecting appropriate trees and shrubs can be provided by your local USDA Soil Conservation Service office, extension agent, or farm forester.

Plant Breeding for the Home Gardener

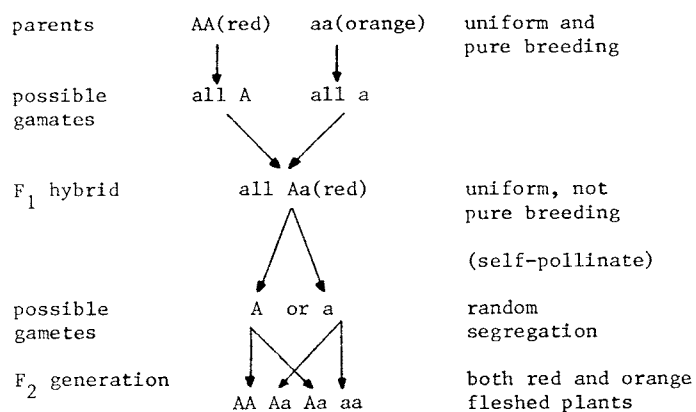
Henry R. Owen, Jr.
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In their natural habitat and in cultivation, plants reproduce both asexually and sexually. Asexual reproduction is the propagation or perpetuation of a species by vegetative means. It is also referred to as clonal propagation, because the progeny in most cases are genetically identical to the parent plant. Plants reproduce sexually by means of seeds or spores. Seed development generally involves genetic recombination and the union of gametes (sperm and egg cells), resulting in many forms or varieties of a plant species. Varieties which have been further developed through artificial selection are designated as cultivars, for cultivated variety. Man has utilized both methods for plant propagation; cloning for the maintenance of desirable cultivars, and seed propagation for the development of cultivars. Many cultivars of popular vegetable or ornamental plants are described as hybrids.

Hybrid seed production exploits genetic recombination in a predictable way. Pure lines are developed through inbreeding for use as parent plants in a hybrid cross. Pure lines are plants that "breed true" or produce sexual offspring that closely resemble their parents. By crossing pure lines, a uniform population of F₁ (first filial generation) hybrid seed can be produced with known characteristics.

Seeds produced by an F₁ hybrid, however, tend to develop into plants which are highly variable and generally inferior to the F₁ hybrid. This is illustrated by the following diagram for the segregation of a single trait (e.g., flesh color in tomato, where plants designated as AA or Aa have red flesh and those designated aa have orange flesh).

Segregation of a Single Trait



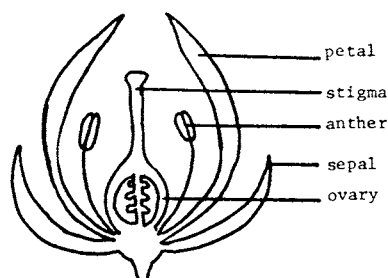
In plants and animals, genetic traits are expressed in pairs in the whole plant, but are passed on individually to the gametes. The parents (here designated as AA and aa) have identical pairs for a trait, but differ from one another. Only one type of progeny (Aa) can result from union of gametes since each parent must be represented. These hybrids, in contrast to their true-breeding parents, are not true breeding because they can produce more than one type of gamete (A or a). Thus, the F₁ (first filial generation) can produce seed (F₂ or second filial generation) with various combinations for each trait.

These combinations can be observed when seeds are collected from an F₁ hybrid and planted. In the above example, a gardener planting F₂ seed would observe both red and orange-fleshed tomatoes. Examples of F₁ hybrids which set seed easily include tomatoes, peppers, cucurbits, purple coneflowers and black-eyed susans.

A few principles must be considered before attempting to breed plants by seed. Some plants are tolerant of inbreeding and can be self-pollinated. These include houseplants such as asparagus ferns and spider plants, many perennials, and vegetable crops, such as peppers and peas. Other plant species exhibit inbreeding depression or self-incompatibility and must be cross-pollinated for sexual reproduction. Good candidates for cross-pollination between different cultivars include African violets, geraniums, marigolds, petunias and lilies.

Hybrid plant production involves the transfer of pollen from one plant to the stigma of a different plant of the same species. This essentially is a 6-step procedure:

1. remove anthers from the flower of the female parent prior to pollen maturation to prevent self-pollination.
2. collect pollen from the male parent.
3. transfer the pollen to the stigma of the female parent using a fine brush.
4. tag the flower, indicating the date and the cross made (female x male).
5. harvest the mature seed.
6. plant the seed.



Cross Section of Flower

Seed fertility and viability must also be considered. Some plants may set seeds or spores which have a low germination percentage, or are totally sterile. For these reasons, gerbera daisies, Boston ferns, and banana cultivars should be avoided in breeding efforts. Other seeds may be fertile, but dormant and require a length of time in storage or a cold treatment to break dormancy. Many perennial plants exhibit such dormancy. The length of time that seeds retain their viability in storage depends on storage conditions and the plant species. Some long-lived seeds include zinnia, petunia and lotus. Generally, low humidity and cool temperatures extend seed viability.

In most instances, don't expect spectacular performance in flower quality or yield from seeds produced from commercial plant cultivars, due to their hybrid origin. However, backyard plant breeding may be worthwhile and rewarding to gardeners who wish to expose inherent genetic variability, observe trait segregation, and grow plants with new combinations of traits.

Convenience Fertilizers For Home Landscapes

Bonnie Appleton.
Extension Nursery Specialist

Many homeowners recognize the value of fertilizing trees and shrubs in their landscapes, yet they become confused when confronted with the variety of fertilizers available to them. Also confusing can be directions that give application rates in pounds of nutrient per acre when only one tree is to be fertilized. For many people fertilizer calculations are difficult to perform and prevent them from applying fertilizers.

Development of compressed fertilizer spikes, tablets and briquettes has been attractive to these gardeners because it simplifies the process. A premeasured amount of fertilizer is formed into a larger dispensing unit that can be applied according to homeowner's directions on a "so many per plant" or "so many per a certain number of square feet" basis.

What consumers need to be aware of is the trade off or price they pay when using convenience fertilizers. While convenience fertilizers are easier and less time consuming to apply, the same amount of fertilizer is almost always less expensive if purchased in bulk as a granular material.

In a survey of local garden centers, one of the best known convenience fertilizers is selling for an average of \$4.50 for 5 spikes or \$10.00 for 12 spikes, a range of \$0.83 to \$0.90 per spike. Based on the 16-8-8 fertilizer analysis given on the package, and the fact that each spike weighs approximately 5.2 ounces, the 0.8 ounce of nitrogen per

spike makes the cost of the actual nitrogen approximately \$1.13 per ounce or \$18.00 per pound.

By comparison, an ounce of actual nitrogen from the common granular fertilizer 10-10-10 (based on an average price of \$9.00 for a 50 pound bag) costs approximately \$0.11 per ounce or \$1.75 per pound. Based on these prices a consumer pays a price ten times higher for the same amount of nitrogen fertilizer when buying the spike's convenience.

A generic spike from a bulk bin selling for \$0.29 per spike had a 15-7-6 analysis and a spike weight of approximately 4 ounces. This equates to an actual nitrogen cost of approximately \$0.48 per ounce or approximately \$7.75 per pound. This spike costs less than half the name brand spike but still over four times more than the granular fertilizer.

A very common debate with regard to tree and shrub fertilization concerns placement of fertilizers. In the past, fertilizer was typically applied only within the limits of the drip-line. Instructions accompanying fertilizer spikes have placement generally limited to the drip-line or within it. Recent studies have shown that plant roots typically extend far beyond the drip-line. Since most of these roots are fine feeder roots that absorb water and nutrients for the plant, fertilization should not be confined within the drip-line.

Broadcasting fertilizer on the soil surface under trees and shrubs has been shown to be as effective as deeper placement. Though grass roots do get a large portion of the fertilizer, there generally is an adequate amount left for trees. If a homeowner routinely tests the soil and applies the amount of fertilizer needed for good grass growth, additional fertilizer for trees and shrubs growing in the lawn is probably unnecessary and would be considered luxury feeding where the plants may absorb and store extra fertilizer, but produce no appreciably extra growth because of it. The "two inch below soil level" recommended for spikes would place them right in the major area of root concentration. It should be noted that if a soil test shows that additional phosphorus (P) and potassium (K) are not needed, money is wasted if a spike or any other type of fertilizer with a complete analysis is used.

Spike products do offer some additional advantages that may compensate for cost to some gardeners. They are a form of controlled or slow release fertilizer. Small amounts of fertilizer are available to the plant at any one time so that no burning occurs. In addition, slow metering means that fertilizer is not leached away or wasted. Enough fertilizer is contained in each spike that using the number recommended gives slow, even feeding for a full year.

A new type of spike has recently been introduced that contains a systemic insecticide in addition to the above mentioned slow release fertilizer. The spikes can feed and protect plants against insects such as bagworms and aphids if used in the number and with the frequency recommended on the package. There are convenience and reduced waste benefits, but again, both the fertilizer and the insecticide costs more than if applied conventionally.

For people who would otherwise not fertilize or spray their trees and shrubs, spikes are an excellent product. For those who would, weigh cost against convenience and purchase accordingly.