tem of an individual cell is duplicated in each of its daughter cells. The chromosomes produced will be the same as in the cell from which they came.

Asexual reproduction or vegetative reproduction is important in horticulture because the unique characteristics of an individual plant can be maintained. For instance, the millions of Golden Delicious apple trees throughout the world can all trace their ancestry to a chance seedling found in Clay County, West Virginia.

Cuttings and Rootings

The technique of removing a portion of the parent plant and placing it in a favorable condition to produce new roots and shoots is called cutting and rooting. Stems, leaves, and roots may be used.

The advantages of cutting and rooting with those plants that root easily are that many new plants can be made from a few stock plants. The method is simple, inexpensive, rapid, and does not require special skills.

It is important to have nearly ideal conditions to get the cutting to root. Generally, a temperature of 65° to 70° F, 100 percent humidity, and sterile soil produce satisfactory results.

Grafting is the art of joining parts of plants together so that they will unite and continue their growth as one plant. The part of the graft that is to become the lower part is termed the rootstock. All methods of joining plants are properly called grafting, but when the scion part is a small piece of bark containing a single bud the operation is called budding.

The reasons for budding and grafting are (1) to perpetuate a plant that cannot be reproduced by cuttings, layers, division, or other asexual methods; (2) to obtain special forms of plant growth; or (3) to obtain the benefits of certain root stocks. Root stocks may have disease resistance or growth controlling characteristics. Grafting or budding are also done to change the variety of an established plant, to increase production, or to grow a more popular variety.

Tubers (potatoes), bulbs (onions), and tuberous roots (sweet potato) differ botanically but have one thing in common. Each is an enlarged underground portion of the plant. The gardener reproduces these plants by cutting up or pulling apart the thickened structures into pieces from which new plants grow.

Many plants can be reproduced either sexually or asexually and often both methods are used. In other instances a combination of both methods is used.

Apple and other fruit trees are produced in great numbers by planting the seeds to grow into root stocks, then grafting or budding the desired scion wood or variety to the root stock.

PLANT POLLINATION

by S. E. McGregor

Many plants can be propagated vegetatively by cuttings or underground parts. This is not always as practical as growing the plant from seed. But for seed to be produced the plant must flower and the flower needs to be pollinated.

There must be a union of the sperm of the pollen with the ovule, or developing seed, within the flower. This union has to take place at precisely the right time and in a manner carefully prescribed by the flower, as we shall see. First we need to get acquainted with the flower.

Within every flower there is a sexual column, usually surrounded by petals. The female part, the pistil, consists of the ovary, style and stig-

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ma. In the ovary the seed or fruit develops. There may be only one seed, as in the peach, or hundreds of seeds, as in the melon. The stem-like style extends beyond the ovary. At its outer tip is the stigma, the area on which pollen must land if seed is to be produced.

The male part of the flower usually consists of numerous hair-like filaments, the stamens, bearing on the outer ends the pollen-producing anthers. When an anther matures it splits and disgorges the microscopic pollen grains.

Transfer of pollen from anther to stigma is termed pollination.

When a pollen grain lands on the stigma of a receptive flower it sprouts a pollen tube. This tube grows down the inside of the style to the ovary. The sperm nuclei of the pollen grain in the tube contact an ovule in the ovary and seed development is initiated. This union is referred to as fertilization.

Some plants are not receptive to their own pollen. These are referred to as self-sterile. Most commercial apple varieties are self-sterile. They produce fruit only when pollinated by another apple variety, and in some cases only by a specific variety.

If the plant is receptive to its own pollen it is referred to as self-fertile. If fruit or seed can be produced by the plant without the aid of any outside agency it is self-pollinating and self-fertilizing. When two varieties will pollinate each other they are compatible or cross-fertile.

There is an important difference, which is often overlooked, between self-fertility and self-pollination. Most peaches and muskmelons, for example, are self-fertile but they are not self-pollinating. An outside agent is necessary to transfer the pollen from anther to stigma. At least one pollen grain must land on the stigma at the right time for each seed that develops.

William E. Carnahan

Honey bee is most effective of all pollinating insects.

Only one viable pollen grain is necessary to produce a peach. About 10 seeds must develop within an apple if the fruit is to be uniform in shape. This means that at least 10 viable pollen grains, of a compatible variety, must land at precisely the right time on the stigma. Hundreds of grains must land on the melon stigma, sometimes within only a few minutes, if a perfect melon is to be produced.

Agents of Pollination

There are numerous pollinating agents: wind, insects, birds, bats, raindrops, and to a degree gravity. Wind and insects are the primary cross-pollinating agents of cultivated crops.

Plants that are insect-pollinated usually have colorful flowers which produce nectar and pollen attractive to insects. The pollen grains are coated with a sticky material that tends to hold them together. Nectar is secreted in nectaries that are usually located within the flower near the base of the sexual column.

Flowers of wind-pollinated plants are usually inconspicuous. They have small petals, or none at all. They produce pollen in great abundance that, when dry, is easily carried by wind. The stigmas are often relatively large, complex, and exposed so as to in-

Some Fruits and Vegetables That Benefit From Insect Pollination

Almond	Mango
Apple	Muskmelons
Apricot	Pawpaw
Avocado	Passion fruit
Blackberry	Peach and nectarine
Blueberry	Pear*
Broadbean	Peppers
Chayote	Persian melon
Cherry	Plums and prunes
Chinese gooseberry (kiwi apple)	Pumpkin
	Quince
Cucumber	Raspberry
Currant	Scarlet runner-bean
Eggplant	Squash
Gooseberry	Strawberry*
Honeydew melon	Tangelo
Lima bean	Tangerine
Macadamia	Watermelon

*Some varieties

crease the likelihood that wind-carried pollen will contact them.

Corn is an example of a wind-pollinated plant. Pollen is produced in the anthers of the tassel at the top of the plant. The silks on the ear are the styles leading to the ovules or grains of the ear. Both wind and gravity aid in pollinating corn.

Most fruits and many vegetables are insect-pollinated.

The honey bee is the best of the pollinating insects, because it visits flowers of many different plants, is widespread, and can be manipulated by man. It collects large quantities of nectar and pollen for maintenance of the colony. In the process of collecting this food it accidentally transfers pollen from anthers to stigma of the flower.

Each bee usually visits many plants but only one plant species on a foraging trip. Therefore it effectively pollinates many flowers.

There are other pollinating insects, including "wild bees", ants, beetles, butterflies, moths, and wasps. Only the wild bees provision their nests with nectar and pollen; this makes them, like the honey bee, more efficient pollinators.

On some crops, such as apples, intensive bee activity on the flowers for one day is enough to produce an excellent crop of fruit. Their activity may be required for three or four weeks on cucumbers.

A few plants will produce fruit without any form of pollination. Such fruit is seedless, and referred to as parthenocarpic. The seedless oranges, seedless raisin grapes, certain cucumbers, certain pears, pineapples, some figs, and bananas are examples of parthenocarpic fruit.

Home gardeners sometimes keep a colony of honey bees to insure pollination.

Insecticides should not be applied to flowers in such a way that pollinating insects are killed.