

BOTANY

# Amateurs Can Contribute To Field of Plant Breeding

## You Can Even Work in Winter If You Have Room Enough To Grow a Few Potted Plants Indoors; Use Colchicine

**YOU DON'T** have to be a Ph.D. in botany to make valuable contributions in the field of plant breeding. All you need is some seeds, a little colchicine—and plenty of interest in the subject, plus patience, and willingness to keep your garden-patch weeded. You can even work in the winter, if you have room enough to grow a few potted plants indoors.

What interested hobbyists can do in the science-aided evolution of new kinds of plants has been well demonstrated at the University of Oklahoma. Under the leadership of Dr. O. J. Eigsti, assistant professor of botany there, something over 300 amateur collaborators are scattered through 38 states.

The roll of Dr. Eigsti's far-flung army of scientific collaborators includes rich men, poor men (though presumably no beggar-men or thieves), doctors, lawyers, merchant-chiefs, as well as housewives, nurses, schoolteachers, ministers, policemen, court clerks, contractors, stock-brokers, miners, editors, and a host of others. When the job threatened to run away with the botanist's time, the WPA came to the rescue, with the approval of the Department of Agriculture.

One of the most promising results turned in thus far is a new variety of soybean, twice as big and heavy as its parent strain. This was produced by Miss Eunice Moore, a Tulsa, Okla., nurse. Bigger, brighter flowers from the ornamental plants, with new shapes and denser, greener leaves, are common results.

Not all the colchicine experiments bring forth giant flowers, Dr. Eigsti warns. Sometimes the thing most desired is greater height, or wider leaves, or earlier bearing, or drought resistance. No plant is to be rejected merely because it does not bring forth big flowers. All the qualities and characters of a new strain must be carefully examined in judging its possible value.

Dr. Eigsti developed the idea in his laboratory at the University of Oklahoma. He announced his willingness to supply a small quantity of colchicine to any

person seriously interested in experimenting with plant breeding. At first he intended to limit the group to 100, but the wave of interest that had been aroused was just too great to check, and in the end more than 300 were participating in the work.

Colchicine is a yellow powder, extracted from the underground part of the autumn crocus, *Colchicum autumnale*—whence its name. It is an active poison, so that caution is necessary in handling it. It may cause skin irritation if handled too freely without rubber gloves, and it is definitely dangerous to get any of it into the eyes.

Three ways are commonly used, in treating plants with colchicine to induce genetic changes. First and simplest is to soak seed in a solution of the drug in distilled water. If you want to work it this way, have your pharmacist mix half a gram of colchicine in a pint of water. This should cost about 50 cents.

This stock solution can be used straight, or further diluted with water. Seeds can be soaked for varying lengths of time, from half an hour to several days, then rinsed off and planted. After they have germinated they should show the effects of the drug in stems, leaves, flowers—all parts of the plant. Their seeds should carry on the new developments into following generations.

A second method is to have the colchicine mixed in a colloid spray consisting of glycerin, water, and a vegetable or fish oil. This is sprayed on the plants to be treated with an atomizer. Such treatment produces irregular patches and areas of stimulated growth, from some of which buds and flowers originate, producing seeds that carry the newly originated characters.

Better control of effects is obtainable with the third method, which consists in having the colchicine mixed with lanolin (wool fat) in a ratio of one gram of powder to 100 grams of the fat. The resulting salve is applied to the growing tips of branches, producing on some of them strange flowers that bear the seeds of the new varieties.

A fourth method is to make up a mixture of colchicine, glycerin, water and alcohol, which is applied to growing seedlings with a brush.

Amateur experimenters should always remember to leave a certain number of plants untreated, for purposes of comparison. These, in the language of the scientist, are "controls." Without controls you cannot tell whether your experiment is working or not. The control, no matter what the nature of the experiment, is the mark of the truly scientific method.

Colchicine produces its strange effects on plants because it paralyzes the process of cell division at one very critical stage.

When a cell divides, the little rod-shaped heredity-bearing bits of protoplasm in its nucleus, called chromosomes, first line up at its center and each one divides in half. The number of chromosomes is thus doubled. Then half of the chromosomes retreat to opposite ends of the cell and a new cell wall grows in between them. Two new cells, each with the original number of chromosomes, are thereby formed.

In a colchicine-treated cell, this division of the doubled number of chromosomes, with retreat to opposite ends of the cell, does not take place. Instead, the enlarged cell remains, with the doubled number of chromosomes. Later, it divides, still keeping the increased chromosome number; and repeated divisions of this kind give rise to the new tissues and organs.

These "giantized" cells very often produce giantism in the new parts that develop from them, which accounts for the double-sized flowers and huge fruits so frequently seen in the colchicine-treated plants. They transmit their big cells, with doubled or even trebled or quadrupled chromosome numbers, to the embryo plants within their seeds, and thus give rise to new varieties.

*Anyone seriously interested in carrying on experiments in plant breeding with the aid of colchicine should write to Dr. O. L. Eigsti, Department of Botany, University of Oklahoma, Norman, Okla. Dr. Eigsti can supply detailed information on where to obtain the colchicine, how to dilute it, time and methods of treatment, and recording of results. Experimenters must be prepared to carry on patiently for many months, and preferably for several successive seasons, scheduling regular hours every week to be devoted to the work.*

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