How to Grow Glorious Gladiolus

Chapter Eleven

CREATION OF NEW KINDS: HYBRIDIZING

One of the most exciting aspects of the hybridist is creating new cultivars with their own hand. Cross pollinating the glad himself, or getting the seed that nature open pollinated, is the start of new creation. Cooperation of man and nature create seeds that we plant and nurture with anticipation of the future. The following pages will explain the process and help you become an avid hybridizer.

The only other way new cultivars of gladiolus are developed is by natures own process called mutation. Mutations are by chance, not cross fertilization, and man has no control over these character changes.

Some changes in the gene arrangement of the chromosomes cause mutations, the chromosomes being the bearers of plant heredity. Within some chromosomes separate genes determine such characteristics as size, color, leaf structure and the like. A mutation occurs when, for instance, the gene for color is dropped from either the chromosome, or its position altered. When the gene for color is dropped, an albino results. When its position is altered, a change in color results, as from red to pink or pink to cream. These are only examples. Within plants these changes may affect the whole plant or only a part of it.

Happening only once in ten thousand or so cases, these mutations or variations are the things that a careful plant breeder is looking for. They most often call these off-types sports of a given cultivar. These sports are of a commercial value only when they exceed their parent in color, stature or health and can be propagated easily.

While hybridists have introduced mutations, other mutations can have a direct bearing on the advancement of the gladiolus. Sometimes hybridists can capture the changes that occur in single buds, or florets, such as doubling, through self-fertilization of that bud on the glad. No doubt we should pay more attention to such changes in individual flowers in the future.

Use of x-ray, radium or chemicals can sometimes produce mutations which upset the gene arrangement. Not having artificial means to induce mutations and little being produced, most glad fanciers focus their attention on sports produced by nature. Growers familiar with many cultivars should always be on the lookout for such possible sports from natures own workshop.

Hybridization, the crossing of one cultivar with another, will probably continue as the most reliable source of new cultivars. The goal of hybridizing or cross-fertilization is to create superior cultivars by bringing new combinations of genes within chromosomes together through cross pollination. The hybridization of glads dates from early Europe and Africa. Species of glads, natural to Africa, were mostly short budded and had small florets. Literally, there must have been millions of crosses to bring the gladiolus to its beautiful present state. In time, chromosome counts have changed and most modem glads can no longer be crossed with species found in Africa. Can you imagine the hundreds of years and thousands of hybridizers it has taken to achieve the level of beauty of this great flower? You are about to join this elite group of people to continue the creation of a *new kind*. Once, most by professionals and now scores of

amateur enthusiasts make thousands of crosses a year, producing millions of gladiolus seeds. There is no way of telling how many carefully crossed seeds are started around the world each year. There are certainly millions, each holding the possibilities of something special and unusual. Most prove ultimately of little value, but a few are a real advancement of color, stature or health. From that single seed to a bloom and corm, they are propagated to thousands for commercial sales. It is to this that gladiolus owes its present popularity and superior qualities.

Every gladiolus seed will produce something different from the parent plant, either slight or very different, from any other cultivar in existence. For most satisfying results, however, the seed should come from hand-pollinated flowers. Those that result from open pollination, that is, from uncontrolled crossing done by the wind, the insects or perhaps hummingbirds, leave too large an element to chance and greatly reduce the prospects of success.

Hand pollinating requires perspiration and inspiration, with chance playing a large part. An act and an art, knowing parentages and best characteristics of each gladiolus, help the hybridizer select his crosses with excellent judgment. This increases his chances of reaching his goal of what characteristics he is trying to achieve with each cross. Mechanics of gladiolus breeding are simple to master, because the sexual parts of the flower are comparatively large and readily distinguishable. The illustrations on the following pages will help your understanding of just what the various parts look like and their use.

Each flower bears both the male and the female organs. The male or pollen-bearing parts are the stamens, three in number, and made up of the filament and anther. The anthers are the actual pollen-bearing parts, and in the gladiolus, each of these has two pollen-carrying sacs. The female part is the pistil made up of the style and the stigma. The stigma is the part that actually receives the pollen, germinating on the stigma and growing down the cytoplasm filled tube to the ovary. A separate individual pollen grain pollinates each seed. The stigma of the gladiolus consists of the three feathery prongs borne at the tip of the style. The ovary is made up of three compartments each bearing many immature unfertilized ovules. The object of the hybridist is to place the pollen from the anthers of the male parent on the stigma of the female parent, so that it will fertilize these immature ovules held in the ovary. The cross-fertilized, or hand-pollinated seeds are the result.

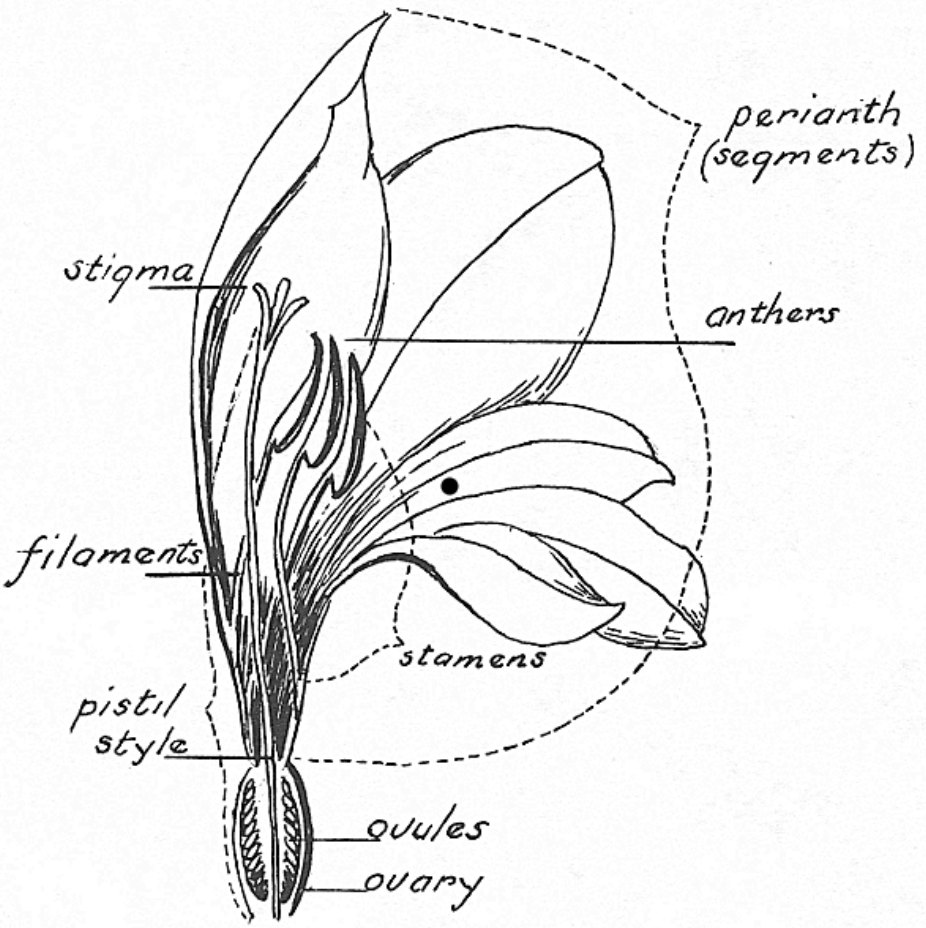
The hybridizer transfers some dust like pollen from the anther of one glad (known as the father) to the stigma of another glad (known as the mother), which will produce the seed. Since all glads have both sexual parts, crossing can be made each way, making a single glad both a mother and father. Many people use camel hair brushes to transfer pollen, but I prefer a toothpick, finger or knife, so as not to contaminate the cross with pollen left in the brush from past use.

The whole stamen, filament and anther may be picked from the floret and the pollen-bearing anther brushed against the stigma. You should take care to not injure either the stigma or the style which holds it, for the pollen must germinate and grow through the style and to the ovary to be effective. Tweezers may be used, but for all practical purposes the fingers will do as well. While you are carrying the stamen, be careful not to knock off pollen while transferring it to its new location.

A flat toothpick or knife is the preferred use if the pollen sac is not open and the green pollen has to be gently scraped out of the anther pollen sac. This green pollen will be creamy and moist and for many in rainy or windy areas, will be easier to collect and transfer. Still

contained in the sac, it has not been exposed to the elements, washed or blown away. Being sticky, it stays in place on the stigma better and is sometimes more viable.

The hybridist begins by deciding which cultivars are to be used in crossing, deciding which for the female or seed-bearing parent, which for the male, or pollen-bearing one. Having decided, it is wise to remove the stamens from the female parent when the flowers open. This will help to prevent open or self-fertilization. These stamens are easily pinched out with the tips of the fingers. Pollen is then brought from the male parent and brushed on the stigma. If the flower has not been disturbed, the pollen will be seen as a powdery substance on the anthers. When it is dry and dust like, it works best. Some hybridizers cut the spikes of the male parent, take indoors, place in a vase away from the elements and let the pollen develop up the stalk. This will assure them a ready supply of pollen for several days, when the mother glad will bloom. Outside, pollen is apt to be knocked off the anthers by wind, rain, insects and birds.



Cross Section of Floret
to show reproductive structure

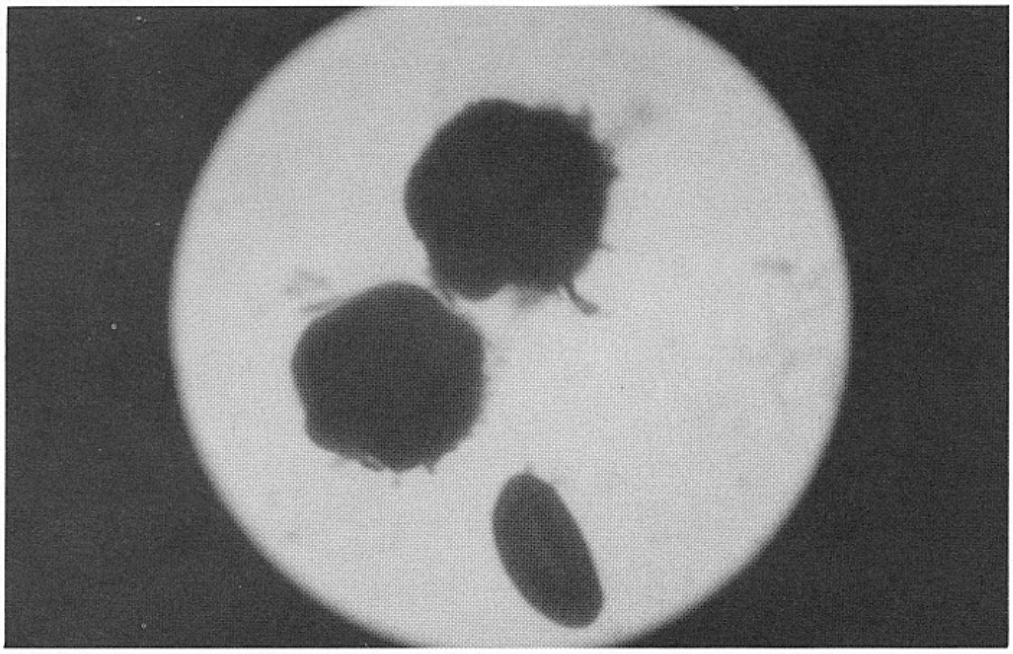
Anthers bear pollen
Filaments hold anthers
Anthers and filaments compose stamens
Stigma receives pollen
Style carries pollen to ovary
Stigma and style compose pistil

Many collect pollen at the close of gladiolus shows, when their own supply is limited. Anytime you wish to collect pollen from another person's seedling, you MUST ask and be granted permission to use it. Please respect their wishes and they will respect yours. Pollen should be readily used or dried at room temperature, as it can mold and decay. After drying the pollen, it can be stored in small plastic film cans and frozen. Pollen that has been frozen, can be saved for use many years later. Ice crystals are very sharp. If pollen is not dry when frozen, they will puncture the pollen membrane and the protein and everything else will leak out. Pollen has little food stored and freezing it keeps it dormant and more viable for a longer period of time. The two pictures shown of pollen may help you understand pollens' fragile but important existence. Not all pollen is viable and picture one show two round viable and one flat aborted gladiolus pollen grains.

The pollen grains are about one tenth of a millimeter across. Environment and heredity play a large part in the number and percentage of viable pollen produced. Pollen can be genetically flawed or disrupted by disease, rain or heat at different stages before maturing. Modem gladiolus generally have sixty chromosomes, with thirty held in the pollen and thirty in the ovaries, with the nucleus holding a copy of each chromosome.

The second amazing photo of germinating pollen may explain why environment is important. The nuclei are carried down the cytoplasm filled style to the ovules. The nuclei leaves the pollen left on the surface of the stigma and is carried on the tip of the growth, pushed by the cytoplasm filled styles to fertilize the ovules in the ovaries. Gravity plays no part, but environment and weather do. Heavy dew, humidity, heat, wind and rain may cause premature pollen germination or destruction of it. Understanding this may help you decide when in your environment, it is best to collect pollen and pollinate your gladiolus.

Nature tries to prevent inbreeding or self-pollinating, usually by placing the stigma above the anther and maturing the pollen before the stigma of the florets become receptive. Most times the pollen on a floret has fallen before the three lips of the stigma spread apart, showing the hairy covering which means pollination can begin. The stigma is usually not receptive until two days after opening. In other words, opening flowers usually bring their pollen into maturity a day or so before the Stigma matures.



Top: Microscopic view of two good and one bad gladiolus pollen. Pollen size is about one-quarter of 1/10 of a millimeter.

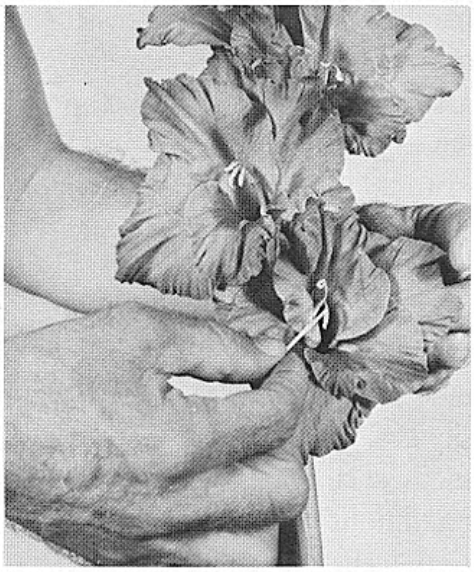
Bottom: Amazing microscopic picture of gladiolus pollen germinating. Growth of pollen tube. After landing on the stigma, the pollen would grow down the style and fertilize the ovules in the ovary.

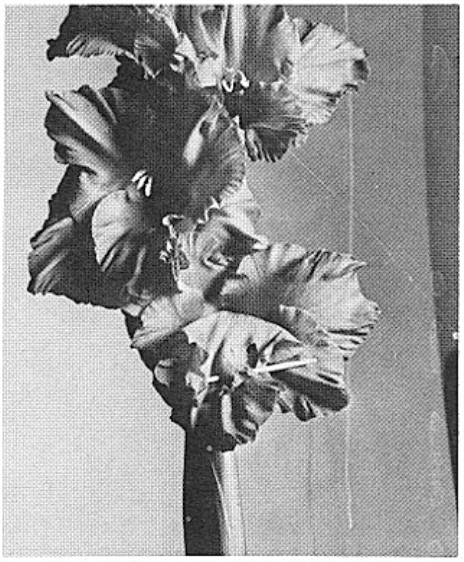
After the pollen has been placed on the pistil, or more exactly, the stigma, you may employ some means to cover the flower to assure that some visiting insect will not accidentally mess up your cross. Coverings of cheesecloth or paper bags have been used. A simpler method is to use a toothpick. You may close the petals of the flower by weaving the pick through them, or fasten the pistil to the upper petal of the flower by means of the toothpick. Use the toothpick as a common pin would be used to hold a corsage on the coat lapel. It is easier yet to break or cut off the lower two petals, thus denying any visiting insect a landing place. Here, use care not to injure the center part of the flowers. Remove only the free part. In fact, many hybridists today are convinced that chance pollination by insects is very slight and they take, therefore, no special precautions against it. Close observation seems to show that in the flowers of the larger cultivars, an insect entering a flower does not touch the sexual parts. With the small flowered kinds, that would not be true.

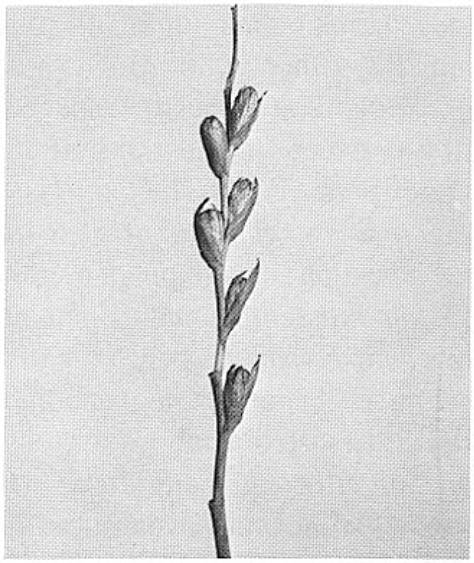
This would help to account for the fact that in glad plantings where no hand-pollination has been done, the only cultivars found bearing much of any seed will be the miniature ones. Put it this way, no precautions against accidental fertilization seem needed when hybridizing the larger cultivars. When hand pollinating the miniature ones, it seems advisable. On a given day not more than two florets on a single gladiolus can be fertilized. To obtain several seed pods on one stem will require that the work be done daily, as the florets open and the stigma matures. The number of florets to be pollinated will depend upon the wishes of the hybridist. If he wants to obtain as much seed as possible from a certain seed parent, he may fertilize almost the entire spike, over a one or two week period.

Hybridizers may cross all florets with the same pollen parent or if the cultivar is limited, change to another pollen parent halfway up the stalk. Always carefully mark where the cross changes, so you can keep an accurate record of your work. When pollinating late in the year and maturity is a problem, many stop after the sixth bloom, removing the stalk above the last floret crossed. This hastens the seed development and assures the pods will develop and mature at the same time. Hybridizers have cut spikes of late crosses before a killing frost and grown it to maturity in a vase indoors. They add sugar and preservative to the water, changing it regularly to assure continued growth of the seed pod to maturity.

In pollination you obtain better results under some conditions than others. The best hours are usually the cooler parts of the day, either morning after dew is dried, or late afternoon, when the sun has begun to slip away from directly overhead. Watch the visiting bees for a clue as to the best time to work. It won't be the hottest part of the day. Climatic conditions have a bearing on the results too. Moisture will ruin a cross, or prevent its' becoming effective. A heavy rain will wash out your work if it comes too soon after the pollen has been placed on the stigma. When rain is threatening, pin the pistil to the upper petal with a toothpick. Often it will keep the pollen dry under the petals protection. Humidity is the most harmful condition of all. When there are long periods of especially humid weather, hybridizing is a very discouraging business. The effects of it can sometimes be reduced by removing all parts of the crossed flower except the central portion bearing the ovary and the pistil. The upper petal can also be left. Use scissors or a sharp knife blade to trim down a flower; don't try to tear it apart. It is a good idea when hybridization is contemplated, to begin as early in the season as possible, so your crosses can mature. In most regions of the country there will be less humidity and dews will not be the heavy lingering type, in mid or late summer. These last suggestions are only hints on overcoming possible difficulties. Hopefully your crossing will continue satisfactorily without encountering too many stumbling blocks.







Top Left: Flower to be used as seed parent showing stigma opening, stamens removed.
Top Right: Putting pollen on pistil, with flat end of toothpick.
Bottom Left: Some like to close flower after pollenizing, a toothpick can be used.
Bottom Right: Seed pods resulting.

Where you have made a successful cross, the ovary, or seed pods will begin to swell in a few days. It may then take a month to six weeks to ripen. Seed pods are gathered after they have begun to turn brown and are just beginning to burst. After the pods are thoroughly cured (dried) you may remove the seed and discard the pod. The glad seeds, about the size of a radish seed, have a brown paper covering around them. This makes them appear about one quarter inch in size, with a bulge in the center, which is the actual seed. Since they will be stored until next season, leaving this protective covering on is advisable. The seed may be placed in paper envelopes and stored in a cool dry place. Room temperature will suffice. If seed is not to be planted the following season, freezing the thoroughly dry seed is advisable. Place the seed in an envelope in an airtight container and freeze. This preserves the seed for use several years later.

When ready to plant, remove the brown oily paper wing surrounding the seed. This will hasten germination. Many seeds from a pod may not be fertile. Good seed will have a hard swollen center and when the wing is removed, it will be plump and pink to red in color. You should discard any questionable seed, for they will not grow. Good seeds hold many promises and the hybridist will prize them highly. They are worth the work involved and the occasional difficulties that must be overcome to acquire them.

The real hybridist will want to keep a record of his crosses, evolving his own private system. Purchased or home made plastic tags work well. Crosses marked on the tag with a permanent black pen or a grease pencil will last till the seed ripens. Always stake pollinated glads because a storm can ruin days of hard work. Fasten tags to the spike so when they are harvested, the record of the cross will not be lost or mixed. Many use numbers, letters or abbreviations and record the actual cross in a note book. Small tags can be placed right in the envelopes the seeds are stored in. If a glad such as Parade is designated as number 1 and Ice Cap as number 4, a system could be worked out with the year as the last number. A tag showing 1 x 4-96 might mean that Parade pollen was placed on Ice Cap and they harvested the seed in 1996.

Records are a source of pleasure and ultimately a valuable source of information. You may have some fan developing your own system, but always record your thoughts for others in the future.

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