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COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

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FLORIDA STATE COLLEGE FOR WOMEN,
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FLOWERING BULB CULTURE IN FLORIDA

By T. A. BROWN

County Agent, Volusia County, Florida

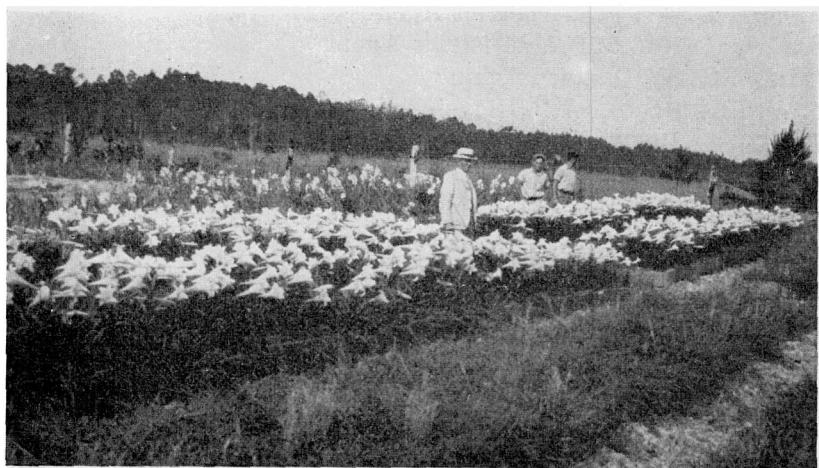


Fig. 1.—A field of Easter lilies.

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FLOWERING BULB CULTURE IN FLORIDA

By T. A. BROWN

For many years, there have been growing in dooryards in central Florida many different kinds of flowering bulbs, and for as many years there have been disappointments on account of the failure of certain other bulbs to do well under Florida conditions. Until recently there have been few attempts to grow flowering bulbs on a commercial basis. However, the interest in commercial production of bulbs has grown quite rapidly and there now appears to be so great a demand for information on bulb culture that an attempt has been made here to set out some of the ideas and practices that seem to have had an important bearing towards successful bulb culture in Florida up to this time.

It will be borne in mind that no technical discussion will be attempted, but that this information has been gathered from the experience and observations of pioneers and amateurs who have been studying bulb growing under conditions of climate, soils, rainfall, etc., in Florida which are widely different from those in Northern States and Foreign countries.

Many questions covering bulb growing in Florida have not been solved and this bulletin makes no pretense of being the final word.

BULBS TO PLANT ONE ACRE

One of the first questions asked by a person just going into bulb growing, is, "How many bulbs does it take to plant an acre?" The answer to this will of course depend on the width of the rows and the distance apart in the rows the bulbs are planted. Small slabs will be planted closer together than mother bulbs or commercial bulbs, and more of the slabs would naturally be required to the acre. In general, the number of bulbs to the acre ranges from 50,000 to 100,000.

GLADIOLI

The Gladiolus is now one of the most common of the flowering bulbs, and can be grown well in season in almost every state in the Union, where reasonable cultural care is exercised.

While the origin seems to have been in South Africa, the American public has taken this delightful flower on its merits and adopted it for its own. No American flower garden is complete without it in many varieties, of which there are thousands.

VARIETIES

The varieties of *primulinus* hybrids, evolved from the crossing of *Gladiolus primulinus* with various large-flowered species, are to be numbered by the score. No effort is made to list the varieties in full, the following being some which are more generally grown for the florist's trade:

VARIETIES	COLOR OF BLOOM
Alice Tiplady	Orange
America	Lavender pink
Brenchleyensis	Bright red
Chicago White	Pure white with lavender markings
Flora	Golden yellow
Halley	Salmon pink
Maiden's Blush	Blush pink
Mrs. Francis King	Flame pink
Mrs. Frank Pendleton	Rose pink with velvety red blotch in throat
Mrs. O. W. Halliday	Pink with yellow throat
Niagara	Primrose yellow
Panama	Deep pink
Peace	White with lilac feathering in throat
Schwaben	Yellow with garnet blotch in throat

WHAT TO PLANT

While the variations of color and type are the results of both natural and cross pollination, usually little satisfaction will be found in planting seed for the production of bulbs for the garden. On the other hand, the easiest and most satisfactory means of reproduction is from the small corms (cormels)—in Florida commonly called bulblets—that form within the root system of the new bulb which replaces the old one with every current growth.

Standard sizes of bulbs are: No. 1, 1½ inches and over in diameter; No. 2, 1¼ to 1½ inches; No. 3, 1 to 1¼ inches; No. 4, ¾ to 1 inch; No. 5, ½ to ¾ inch; and No. 6, ¼ to ½ inch in diameter. The best planting stock for the average beginner probably is the two-year old bulb that is from 1¼ to 2 inches in diameter and thick from top to bottom. Such bulb is called

by commercial growers as fat, or plump, and is usually a vigorous grower and bloomer. This will include the sizes numbered 1 and 2. Smaller ones will often bloom well but are not so vigorous and should not be allowed to bloom. They should have the spike cut out as soon as it appears above the foliage, so as to induce better growth and vigor for next season. When properly handled, this larger sized bulb should not only bloom, but should produce from a dozen to a hundred small corms or cormels (bulblets), that will range in size from a No. 6 down to the size of a pea, and which should be carefully saved at digging time for replanting and the subsequent production of large bulbs for bloom.

In this climate, these cormels may be planted at once after digging, or may be packed in dry sand for several weeks storage, or they may be dried and put away for a year before planting. In the latter case, owing to excessive drying and hardening of the shell, it is advisable to cover the cormels with water for a day and then pour off the water and cover the wet cormels again with a wet sack for three or four days to soften before planting. The resulting growth should produce no bloom in most cases, but a good foliage and bulbs up to an inch in diameter, and will likely make a great many new cormels the first year.

In Northern climates where the ground freezes, the cormels that remain in the ground will be killed and there is no danger from mixtures resulting from those left in the soil at digging time. But in Florida, if the grower has more than one variety

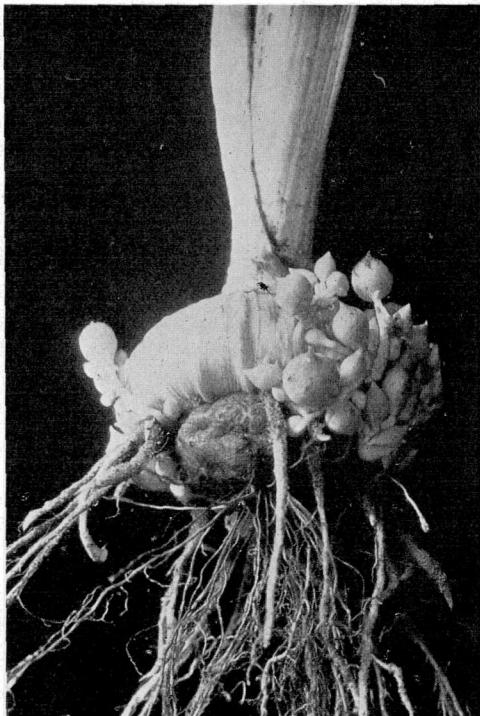


Fig. 2.—Gladiolus, showing old bulb, new bulb and increase.

(which is usually the case), a new place should be chosen each time for planting, since even the most careful digger will leave some cormels in the soil, which will come up later and cause a hopeless mixture in the next crop, if planted on the same ground.

Many beginners seem to want to start with very large bulbs, thinking that these should produce extra large, fine blooms. But as a rule, the bulb that has reached a diameter of more than three inches has gotten very thin in comparison and is too weak to produce a good bloom. It should be discarded.

SOILS AND FERTILIZERS

While Gladioli will grow and bloom fairly well in almost any well drained soil that has been well worked and contains plenty of moisture, they do best on a heavy loam where Irish potatoes will grow well. The culture and fertilizer usually given potatoes seem to suit bulbs. Bulbs should not be planted on very new ground that is full of palmetto roots, or has too much lime, recently applied. The land should be well subdued and in good state of tilth. The more humus the better, if it is well rotted down and mixed with the soil, but it should not consist of raw manures or any agency that will stimulate decay, or trouble is likely to follow. Commercial fertilizers may and should be used, mixed in the row at planting time and as a side-dressing later. A light application of nitrate of soda is sometimes found very beneficial if applied just before blooming time.

CURING GLADIOLI

Bulbs grown in the North, being planted in May and June and harvested in October, should not be planted much before Christmas in Florida, as they will not be well enough cured in most cases to start growth readily. In this climate, native-grown stock may be planted at any time after it has had time to cure, which will of course depend on the stage of maturity at which it was dug. If dug as soon as foliage begins to yellow, more time will necessarily be required for curing than if allowed to die down in the field.

Curing should be done in any dry well ventilated place, and the length of time required will vary from six weeks to four months. If cured entirely in ordinary storage, the best way to tell when bulbs are ready to replant is to watch for signs of

growth, and then planting must be done at once or top growth will start and vitality of the bulbs will be rapidly depleted.

When the first eyes begin to swell, some growers prefer to place the bulbs in cold storage for two or three weeks to chill them thoroughly, claiming that they come up more uniformly. However, this point seems not to have been definitely settled. It is true that when planted before the curing process is complete, the bulbs do not sprout evenly and the rows often appear very uneven and ragged.

PLANTING

The season for planting in Florida may include every month in the year, but for the production of flowers for profitable markets, Gladioli should be planted in September and October for fall and in January and February for spring, thus bringing the bloom when there is none produced in the North. Cormels (bulblets) should be planted about 50 to the foot in straight rows that have a very definite V-shaped bottom, to simplify cultivation and regulate depth. The depth should be 3 to 4 inches. Care must be taken to keep plenty of moisture to the young bulbs at all times until they approach maturity.

Blooming bulbs should be planted six inches deep and a distance apart equal to the width of a bulb, thus allowing for expansion and growth. At each growing period it will be found that the old bulb when planted, puts up a top growth as soon as, if not before, root growth starts. After the top gets started a new bulb starts to form just on top of the old one and this new bulb puts out a set of roots independent of those of the old bulb. When the new bulb approaches maturity and has bloomed, it puts out a set of rhizomes that resemble short roots, which develop the small corms or cormels (bulblets) at their ends. By the time the top begins to die down, these cormels are ready to dig with the parent bulb. The old bulb will be found quite firmly fastened to the new one at digging time, but after they have been in storage for 10 days or two weeks, can be readily pulled off, at which time the cormels may be separated also and re-planted or stored.

In dooryards, many people prefer to plant blooming bulbs six inches apart each way, in Dutch beds or in borders or designs. In the open field for commercial production, most growers plant in single rows to enable them to cultivate with horse power,

thereby reducing the cost. In this case, the distance between the rows will be governed largely by the type of cultivation used and the moisture conditions. The average grower finds that in order to get through between the rows at blooming time they should be about 30 inches apart. In "flatwoods" land, where drainage is very essential, it seems advisable to ridge the ground and work the soil up to the plants in a manner similar to the way potatoes are worked. In the drier soils where drainage is not essential, it is just as well to plant flat and cultivate likewise. In any event the bulbs should be a good six inches in the soil or the heavy bloom stalk will pull the plant over in the sand at the first strong wind.

DIGGING GLADIOLI

In the dooryard beds, there may not be any occasion to dig every year. We have seen bulbs left in the ground three or four growing seasons and yet put up excellent bloom, although sodded together in the rows or clumps very thickly, because the numbers had been multiplied by a new crop of cormels at each growth. This was in very strong land, and while the original bulbs had disintegrated, the younger ones had replaced them in the blooming ranks.

Cormels planted in September and October make their regular growth and die down in the early spring, although some will be delayed until others are half grown. This necessitates digging while some are immature, which is not usually considered much loss. If left in the ground for the late ones to mature, some of the earlier ones will be growing again before these latest ones are ready to dig. One must decide when to dig by watching the general average.

Commercial crops should be dug at the end of every growing season, just as soon as the average tops are yellowing and ready to die down. The tops should be cut off with a sharp hoe. The rows may be barred off with a small plow, leaving just the narrow strip containing the bulbs. This may be carefully picked up with a shovel, being sure to get the cormels, and the whole sifted through a screen having about eight meshes to the inch. Naturally, the soil must be dry. Some Northern growers use a tile scoop such as is used to level the ditches before laying tile, and this may be set at just the right angle to scoop up the core of soil in which the bulbs are.

After screening, the bulbs are taken to the curing shed and spread out in trays or shallow bins to dry, after which they are separated and cleaned and returned to the bins until market or planting time.

Great care must be exercised at all times to keep from getting the different varieties mixed, as, once mixed, there is no probability of getting the varieties separated without several seasons' careful roguing and waste.

In cleaning the bulbs, the outer husk may be removed to give the bulbs a nice appearance, but enough husk must be left on to prevent excessive drying of the eyes or buds. A bulb that has been completely peeled is not considered good merchantable property.

CUTTING THE BLOOM

Northern growers of Gladioli, who have but one season each year for production, tell us that from 75 to 120 days are required from planting time to bloom, according to variety. However, in Florida, much less time is sometimes required, and it is difficult to say just how long the average period will be.

In the case of the smaller bulbs, one year from cormels, unless they are exceptionally vigorous, it is not advisable to let the bloom mature at all and most growers go over and cut out the spikes just as soon as they are far enough out of the foliage to get at, so as to put all of the strength into bulb growth. With the regular bloom crop, where bloom is to be marketed, the spikes are cut just as the first bud begins to open.

The foliage should not be cut off or the vitality of the bulb will be reduced. The spike should be cut with a small bladed knife that can be slipped down between the leaves, getting as much stalk as possible. The spikes may be tied in bunches of 25 and packed in paper lined crates that are practically airtight, without moisture of any kind, and shipped by parcel post. The crates should be long enough that the spikes will lie out straight. A light block should be nailed down across the stems to prevent slipping and bruising the spikes.

As soon as the receiver gets the package, he will recut the stems and put them in water to fill and revive. While they will be quite wilted, they will straighten and open up when they get in the water. If the spikes are filled before being packed, or if

water is kept on the stems while lying in the crate, the spikes will endeavor to straighten to an upright position and become crooked and will stay that way, spoiling the appearance of the bloom spike.

If the shipping distance requires more than 36 hours, it is sometimes found advisable to ship in paper lined hampers with wet sphagnum moss in the bottom, upon which the cut ends of the stems may rest in order to take up moisture. In this case the hamper should be well filled and then shaken down so that all of the stems will come in contact with the moss and there will not be slack space for the spikes to shake around and become bruised. The hamper should be marked on top with large plain label indicating the nature of contents and cautioning express employees to keep right side up, or injury to the flowers will surely follow.

In cutting flowers for the house or show window, several flowers on each spike should be open, and the others will open as the first ones fade. They should not be placed in a draft as they evaporate water readily. Each day the stems should be cut fresh, taking off a half inch each time. Fresh water should be provided each day. With proper care thus given daily, all of the buds should open eventually and as the old blooms fade they should be pulled off to keep the bouquet looking fresh. In this way it should last for several days and be a delight to the eye of any lover of beauty.

The fact that the Gladiolus bloom has no scent whatever makes it especially desirable for the sick room, and the wonderful colors make it a source of delight wherever seen.

After the main crop of bloom has been cut, the culls that have not made proper development, are stubby or not true to type, should be pulled up and discarded before their identity has been lost, and the more careful the grower is in his roguing, the more satisfaction will he have with succeeding crops.

NARCISSUS (DAFFODIL)

This dainty member of the flowering bulb group, belonging in the class with the Amaryllis, seems to be one of the oldest cultivated flowers of which we have a record. Greek mythology relates the story of a very beautiful youth named Narcissus, who, gazing into a quiet pool, became so enamoured of his own beauty

that he pined away to only a spirit. The Gods gave his name to the dainty flower which is known and admired the world over.

Originally a native of southern Europe and Asia, it has been naturalized in all parts of the civilized world and has become a great favorite with gardeners everywhere. Owing to its adaptability to forcing under glass or in bowls of water and gravel, it has become one of the foremost flowering bulbs in the trade.

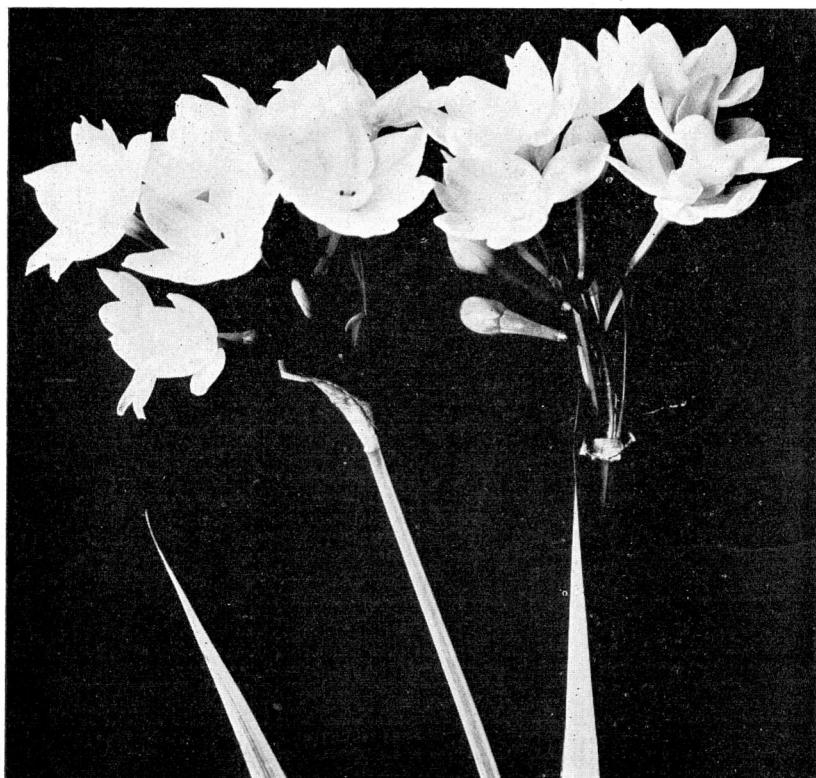


Fig. 3.—Bloom of the paperwhite Narcissus.

Different countries have bred up different strains of Narcissi until the varieties are now numbered in hundreds. There are 11 main divisions or groups of Narcissi. Foremost are the Trumpet Daffodil, Jonquilla, Poeticus and Poetaz (*Polyanthus*) groups with many variations in each type. The first three were bred and introduced mainly in the British Isles and the Netherlands, and the *Polyanthus* in Southern France, Italy and China. It is

with this southern strain that we are most concerned, because our climatic conditions are more nearly similar to those in the native home of this tender variety.

The Polyanthus (Tagetta and Tagetta hybrids) varieties usually found in Florida commercial plantings are the Paperwhite, Grand Soleil d'Or, and Chinese Sacred Lily. Double Roman, Pearl, and several others are being tried with some success. The heaviest importations for commercial use have always been the Paperwhite and this variety now far exceeds in number anything else produced in Florida, so much so that it is considered the standard in all discussion of Narcissus types among our growers, although the other Polyanthus types do equally well and are handled in much the same manner. The hardy varieties adapted to Northern conditions appear to be rather unsatisfactory throughout the major portion of Florida. For many years the Polyanthus type of Narcissus has been grown in Alachua County by Mr. T. K. Godbey, but since 1925 plantings have increased very rapidly until it is now a standard crop in many counties, the bulk of the crop being located in Alachua, Duval, Clay, Volusia and Seminole counties.

WHAT TO PLANT

As with every other flowering bulb, the type variation in Narcissi is so great when plants are grown from seed that commercial producers depend entirely upon propagation from the natural division of the bulbs. This occurs at a certain stage of growth by means of offsets or slabs separating from the mother bulb, which, when planted separately, under proper cultural conditions will round out to a size that should produce a good bloom the following year. This is the bulb of commerce, which should be round, firm, and single nosed (evidence of one set of foliage). When planted in the greenhouse and forced for bloom, the only object is to get the finest bloom in the shortest possible time. After this the bulbs are usually discarded and destroyed, but if they are carried on to maturity and properly handled they may be returned to the field and rejuvenated for propagation purposes.

When the mature round type of bulb is planted in the open field, it should not only bloom well the first season, but should grow and divide, often making two or three or more slabs. Aside

from the Chinese Sacred Lily, which may make six or eight slabs, growers generally look with disfavor on the bulb that makes more than four slabs, as this sometimes results in weakening the blooming ability of the later generations. Such plant is said to become grassy.

After being dug and cured in dry storage for some time, the slabs are broken loose and planted to produce round bulbs for market and the mother bulb is again planted to produce more increase, which it will continue to do under proper cultural conditions. This bulb is the grower's capital stock, and should not be disposed of or neglected.

It will be seen that, starting with round marketable bulbs as planting stock, it will be two seasons before one again has round bulbs to sell, but by planting the mother bulbs back the second year they should keep up the supply of slabs, enabling the grower to turn off something each year thereafter. Some of the larger slabs will split again instead of rounding up, and some of the smaller ones will not make a round bulb of the size required by the trade and must be planted back with the growing-on stock if typical of the variety.

This does not imply that the grower should increase his planting stock with bulbs that will not make the grade, but on the contrary, for the purpose of keeping the stocks up to a high standard, some of the very best type round bulbs should be planted back each year separately as nursery stock from which to build up the strain.

At planting time, a careful watch should be kept for any bulbs that are soft or diseased, or that are apparently not true to type, and these should be destroyed to avoid getting anything started in the field that is not wanted.

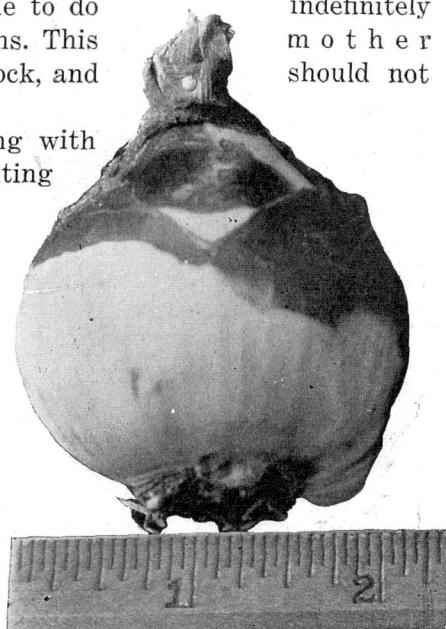


Fig. 4.—The *Narcissus* bulb of commerce—natural size.

SOILS AND FERTILIZERS

While good *Narcissus* bulbs will make a nice growth of foliage and bloom well in nothing but water, using the food stored in the bulb, it exhausts the vitality to such an extent that it will not be much good again. By the same token, bulbs that are planted in very poor soil will apparently make a growth but will not be found to have the vigor expected when planted out another season, and are very disappointing.

The best results to date have been found where the heavy loam soil of Orange

County is found suitable for and vegetables. A heavy type grove soil, hammock soil or "flatwoods," seems to be ideal for this crop, and should be well worked to a good depth to insure ample rooting space and drainage. While *Narcissus* will stand being submerged in water for a few hours during a heavy rainfall, the roots should not be subjected to continuous wet conditions in the field. The souring of the soil and the absence of air will cause a sloughing off of



Fig. 5.—*Narcissus* mother bulb and slabs (below). The mother bulb cleaned of slabs and roots is shown above.

the roots and the development of basal rot, which is very disastrous. At the same time a good soil moisture must be maintained for best results, the same as with any vegetable crop.

Little has been done as yet to determine just what fertilizer combinations will give best results with Narcissi, but so far most growers have found that a good Irish potato fertilizer analyzing around 5-7-5 (N. P. K.), about half from organic and half from inorganic sources, has produced satisfactory results. Some growers seem to think that more potash than 5 percent should be used, and we concede that much is yet to be learned by field trials.

Where the single row method is followed, with 50 to 70 thousand bulbs per acre, one half to one ton of fertilizer is broadcast on the land and disked in, or drilled into the row and reworked to mix with the soil before planting. Some growers side-dress with another application when the bloom period is about over. Others claim that this is not necessary, having a tendency to promote a second growth, and is therefore undesirable. Late applications of fertilizer or water should be avoided on this account, as they may stimulate a second growth which leaves the bulbs soft after digging, resulting in some decay of the centers and great difficulty in grading for market.

PLANTING NARCISSI

Owing to the fact that this crop requires a long growing period, it has been found best to plant reasonably early in the fall, September or October, but plantings made as late as December will do fairly well under favorable conditions. The early fall plantings will be matured and ready to dig by late May while the weather conditions are generally most favorable. Later digging operations are frequently handicapped by summer rains, and in some cases the bulbs start rooting an undesirable second growth. Also, the bulbs that are dug out of dry soil are in much better condition to go into storage than those dug wet.

The location for a planting should be carefully considered, since a heavy investment is to be made. One should see that adequate drainage is assured, the soil is free from Bermuda or other grasses that are expensive to control, and is in a good mechanical condition.

The rows are laid off with any suitable implement and the depth is decided largely by the thoroughness of the drainage. Where land is tile drained or there is no likelihood of excessive water, furrows should be five or six inches deep, but where there is danger of excess moisture, such as the average "flatwoods"

field, it seems advisable to plow the field in lands, leaving an open water furrow every 50 feet to carry off excessive rainfall. The rows may be run across these beds so that water draining off between them will be carried off into the water furrows more readily. In this case the planting furrows should not be more than four inches deep. Sufficient furrows for this may be made with a sled-runner type of marker having three or five runners made of 2 x 4" scantling and weighted down to run the proper depth. The bulbs are placed in the furrow about as far apart as

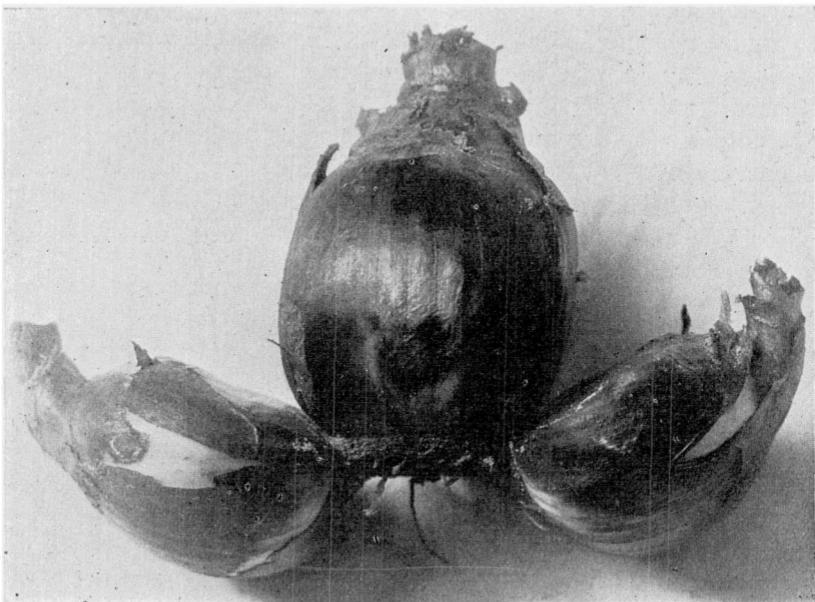


Fig. 6.—Mother bulb and offsets of the *Narcissus*

the thickness of the bulb itself, thus allowing room for growth expansion. Next, the row is covered with soil, usually by means of a wheel-plow furrow, to prevent the sun cooking them, as they are very easily ruined by sunburning. Bulbs should not be exposed to the hot sun more than 30 minutes.

Within a day or two a good ridge of soil is thrown on top of the row to a depth of six inches, to prevent the bulbs from heaving out of the soil, which they will certainly do when starting to root, if not held down by plenty of covering. Subsequent workings will draw the soil from the middle up to the rows and

leave them distinctly ridged. This completes the planting, and cultivation will be needed only to keep down weeds and grass and maintain a good ridge.

Care must be exercised in cultivation to avoid breaking the roots, which spread widely. For convenience in working, the rows should be about three feet apart, straight and one exact distance apart in every case.

Implement for cultivating are varied, according to the size of planting and type of cultivation—whether ridged or flat. Some use nothing but a garden cultivator and others use a sweep. In large plantings, a potato ridger or two-horse corn plow is sometimes used. In case of the latter, care must be taken to avoid running the shovels so deep as to disturb the roots.

ROGUING

In all plantings of bulbs of every kind there are always a few scattering ones that are odd varieties, degenerates or otherwise undesirable mixtures. To eliminate this condition as closely as possible, a constant watch, especially during the blooming period, must be maintained. Everything that is not true to type should be removed immediately before its identity is lost. This requires a number of inspections and is considered one of the most important items of successful bulb culture.

When the rogue is a standard variety, it is well to move it to its own plot in another field, but if it is not of a very desirable standard variety the best practice is to destroy it and avoid getting it back into the stock through someone's carelessness. Too much stress cannot be laid on the importance of keeping the stock free from mixtures and the grower who makes a constant effort to keep his stock up to the highest possible standard will be well repaid for his efforts when going into trade competition.

While the roguing process is taking place at blooming time, where the bloom is not sent to market, it is well to pull the heads off all bloom of the main crop when fully open to prevent seeding, which will conserve some strength for the bulb and simplify the inspection of later bloom for rogues.

DIGGING

Narcissi should not be harvested until the tops have completely died down at maturity, which is usually the latter part of May or early June. But they should be dug before summer rains

start the bulbs into second growth. If dug in a growing condition, the vitality of the bulb is likely to be impaired. The smaller growers usually dig by hand, barring the rows off with a small plow and lifting the bulbs with a potato rake, or by running the plow directly under the row and turning it over so that the bulbs may be picked up from the bottom of the furrow slice. Great care should be exercised to get all of the bulbs, as any remaining in the soil are likely to be completely ruined or lost and those coming up the following season will be found weak, and in the wrong place to fit into the current planting.

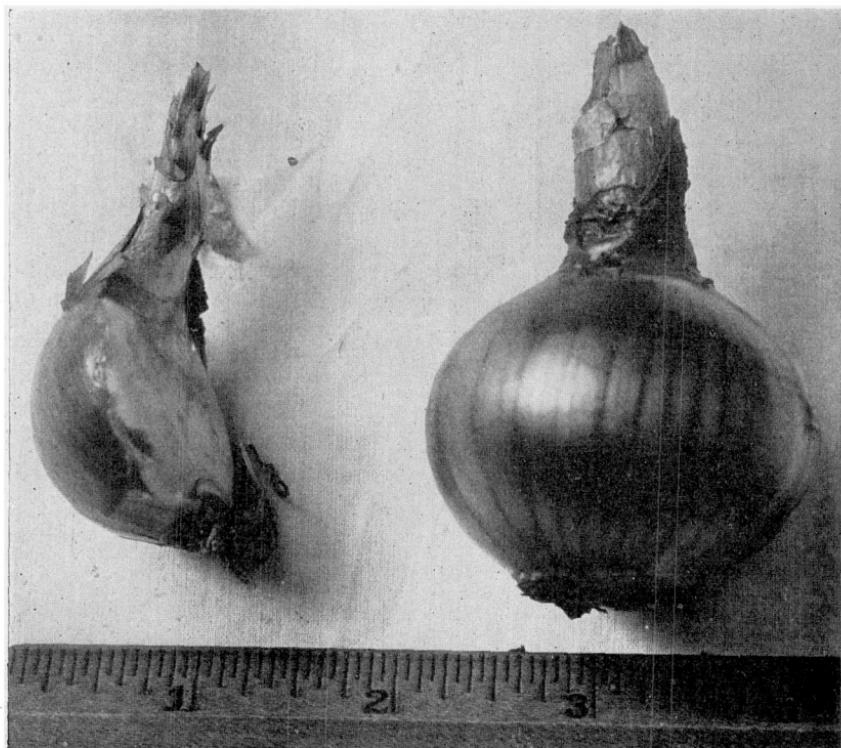


Fig. 7.—Slab (left) and flowering Narcissus bulb.

The larger growers are now quite universally using a mechanical potato digger for lifting the crop. This is proving to be far the best, from the standpoint of both economy and efficiency. In all cases the bulbs should be picked up at once and taken to the shade, as an hour's exposure to the hot sun is likely to result in sunburn, and later, a dry rot in storage.

CURING NARCISSI

As soon as the bulbs are dug, they should be taken at once to the storage or curing shed, which should be absolutely dry and well ventilated. It should be arranged so that the sun will not shine directly on the bulbs at any time, the most approved type of shed being located east and west the long way, with a driveway through the center and the bins on each side. A building 24 feet wide has been found very satisfactory, providing an 8-foot driveway and bins 8 feet wide.



Fig. 8.—One type of bulb curing shed.

The bins should be built of strong material, as the load they must carry will be heavy. The bulbs should not be placed in them to a depth of more than six or eight inches, to avoid heating. If piled up when freshly dug, or even left in field barrels or crates over night, bulbs are likely to be injured by heating. A good method of arranging the bins is to cut the floor boards to standard lengths and leave them loose, so that as one level is filled the next floor above may be laid. The floors should not be closer than 12 inches, leaving several inches air space between the bulbs in one bin and the floor above. Side boards should be fitted to the bins to prevent the bulbs rolling out. Provision should be made to lock the shed to prevent the innocently curi-

ous visitor from handling the bulbs, taking out a bulb here and there and replacing it in a bin of another variety.

The roof of the shed should be well built to prevent leakage on the bulbs. A cupola, or ventilator, the full length of the comb has been found advisable for the maintenance of a good circulation of air. The eaves should be broad and low, to protect the bulbs from blowing storms, and the sides should be left open except for a closely woven poultry netting, to prevent handling of the bulbs from the outside. Gables and ends of the building should be fully enclosed as a protection from sun and rain, although the doors to the drive may be slatted to aid in air circulation.

During the first two weeks of storage, it is well to examine the bulbs daily to determine if any heating is taking place. If so, the bulbs may be stirred by means of a cypress pole pushed through them in the bins, loosening them and letting the air through. If the bulbs should be wet when stored this stirring is essential until they become thoroughly dry.

CLEANING AND GRADING NARCISSI

After the bulbs have been in storage for six or eight weeks and are thoroughly dried and cured, the separation of the grades may take place. At this time, the slabs will be found somewhat loosened from the mother bulb and can be easily separated with the fingers; the outer husk is dried and loose, and this, together with the dried roots and any remainder of the top, may be easily cleaned off. As the slabs are separated from the mother bulbs they should be placed in separate bins and later planted separately, as that is what the marketable bulbs are grown from. The mothers should be kept separate for planting, to produce more slabs. All round, single nosed bulbs, 12 centimeters and more in circumference should be carefully cleaned and prepared for market. Bulbs from which slabs have been taken, or that have been injured in any manner, should not be put in this grade.

TESTING FOR BLOOMING QUALITY

About the first of September, grower and buyer begin to search for evidence of blooming quality. A market sized bulb is selected at random and split from top to bottom, exposing the exact center of the vertical layers of the bulb. At the base of the

center should be found a tiny cluster of embryo buds, folded in an almost transparent envelope, which a few weeks later will have advanced almost to the top of the bulb. Until this embryo has become well advanced, the bulbs should not be forced into growth or the result will be that the growth of foliage takes the strength away from the bloom and the forcing will complain of the bulbs being grassy. On either side of this little bloom embryo may be found similar embryos of foliage, which later develop into the offsets or slabs.

SIZING NARCISSI

After the grading is finished, the next step is sizing the bulbs that are to be marketed. Some small growers use a board fitted with holes of various sizes, and all work is done by hand, but the larger growers, finding this to be very unsatisfactory and expensive, have imported mechanical sizers from Holland, which, working by a system of oscillating shakers, convey the bulbs over wooden screens through which the sizing is done very efficiently and rapidly.

COUNTING

Since the sales are based on the count in thousands, this operation is of major importance. In Europe, where labor is cheap, this is all done by hand. So far, the same has been true here in general. But a counting table was evolved in 1927 that should be in general use within a short time. A table is made with a regular series of two inch auger holes in the top, the series being in number, 250 or 500. A false bottom of slats is arranged closely underneath the table top, so that when shoved home, the slats will form the bottom of each hole or pocket. A shovelful of bulbs is thrown on the table and one bulb placed in each hole until all are occupied, when the false bottom is pulled about two inches by the operator and the bulbs all drop through a chute into the packing case, which is then known to contain exactly a certain number of bulbs.

THE PACKING CASE

As yet there is no set standard for the packing case, two or three different types being in use. The one most generally approved seems to be one that is light and strong, having the

boards properly spaced for ventilation and of a size that will hold 1,000 bulbs of 13 centimeters, this being the size to which most crops of Narcissi seem to run the heaviest. A 13 centimeter bulb measures 13 centimeters in horizontal circumference. One centimeter is 0.3937 inch, or approximately 2.5 centimeters are required to make one inch. A 13 centimeter bulb is thus slightly over 5.1 inches in horizontal circumference or 1.6 inches in diameter. As the sizes advance, a less number will fill the crate. Thus 1,000 13 centimeter bulbs, 900 14 centimeter, and 800 15 centimeter bulbs will be required per crate. A crate $30\frac{1}{2}'' \times 13'' \times 11''$ is in use for Paperwhites. It is made of heavy veneer, wire-bound and having a panelled head. It was found very satisfactory.

Because the Chinese Sacred Lily and Soleil d'Or bulbs are coarser and larger, a larger crate was adopted as a standard, being $30\frac{1}{2}'' \times 14\frac{3}{4}'' \times 14''$ and holding 1,000 14 centimeter bulbs. In any case, the bulbs should not occupy quite all of the space in the crate, but should have room to shift when the crate is turned over, as tight packing will lessen the ventilation and may cause heating.

Care must be exercised at all times to avoid getting the bulbs wet after curing has begun or they will immediately start rooting and growth, even though absolutely free from soil. After packing, the bulbs may be kept for several months in dry, cool storage without any damage whatever.

MARKETING

The bulbs produced in Florida have so far been marketed through established wholesale distributors in the North. This practice has been very satisfactory, owing to the economy of shipping in car-lots and to being handled by established firms who have been in the business for years. Smaller growers have clubbed together in assembling shipments, or sold through some larger shipper.

THE SALE OF BLOOM

The practice of shipping the bloom, in most cases, has been found unsatisfactory, and is considered rather unfair to the grower to whom one expects to sell bulbs. It is difficult to get the bloom to Northern markets in good condition. It is consid-

ered bad practice to cut any foliage with the bloom. Therefore the shipped flowers are not usually in first class condition to go into competition with the product of the greenhouse and consequently cheapen the product unfairly.

THE EASTER LILY

The Easter lily best adapted to Florida conditions, appears to be the Harrisii, which is of the *longiflorum* type commonly called the Bermuda Lily. It is too tender to be much of a success in the more rugged climates of the North. It is found in dooryards from Lake City south, seemingly quite at home. Until recently, no efforts have been made to commercialize it to any extent. The hardier lilies, such as the Regale, Candidum, Rubrum, etc., will make a fine growth and bloom the first year when planted here, but seem to become exhausted and disappear in succeeding seasons instead of growing in numbers and adapting themselves to our climate. The other varieties of the *longiflorum* species, such as Gigantum, Formosum and Erabu, have not as yet met with as much success as the Harrisii, perhaps owing to the fact that the latter has been naturalized here for many more years than any of the others.

In Florida, the Easter Lily does not seed as freely as in some other localities, and for this reason most of the increase is obtained by vegetative propagation, viz: stem bulblets and scales. (See U. S. D. A. Farmers' Bulletin No. 962.)

POPAGATION OF EASTER LILIES

With the approach of maturity, the bloom stem develops a setting of tiny bulblets at the leaf eyes that are just at, and just below the soil surface. These root independently the following season and develop to a blooming size in one or two growing seasons. This is the most natural method of propagation, but where the grower wishes to increase his stock more rapidly, he may do so by breaking the mature bulbs apart and using the resultant scales of the bulb for propagation.

The general method following the breaking up of the bulbs is to layer the scales immediately in some moisture carrying medium, such as clean coarse sand or peat muck soil that has been thoroughly decomposed and is in good mechanical condition. Care must be exercised to avoid any possible agency of decay, as

the scales will rot at the least hint of infection. Some success is had with scale propagation by scattering them on the ground where they will have shade through the middle of the day, and covering with a light mulch of leaves.

The usual method employed is to propagate in boxes, sifting in a light layer of sand or other suitable material, and then covering this with a layer of the scales, another layer of sand, another layer of scales, etc., until the box is full. The sand should contain barely enough moisture to prevent the scales from drying out. The moisture content should be carefully watched, maintaining only enough moisture to keep the scales from wilting. The sand should be examined twice a week, and if necessary, additional moisture may be supplied by spraying water over the surface with an ordinary fly spray atomizer. In about three weeks, tiny pips should appear on the concave side of the scale base where it was broken loose from the parent base. Within a short time, these will assume the form of small bulblets, which are quite identical with those grown naturally on the stem on mature plants.

They are now ready to plant out in the open. If preparation was started in August, the bulblets should be large enough to plant out about the first of October, which is usually after summer rains and heat are over. Occasionally, the larger of these bulblets will grow rapidly enough to put up a stem six or eight inches high the first season, and even, in rare instances, one flower. But growers usually cut the bud just as soon as it appears, in order to conserve the strength for the bulb development. The season's growth should bring the bulbs to a size that will develop two or three flowers. The first size bulb in commercial grading should be from 6 to 7 inches in circumference and, unlike the Narcissus, lilies are always quoted by sizes in inches of circumference.

SOILS

Almost any well drained soil will, if properly handled, grow Easter lilies, the range running from Marion County clay to East Coast dune sand. The clay-sand-loam in the vicinity of Eustis, Mt. Dora, Leesburg and Umatilla has produced strong, vigorous plants with the least cultural troubles that we have seen, although individual successes have been observed all over central Florida.

PLANTING

The planting season for Easter lilies in Florida is usually September 1 to November 1. Since lilies must not be cultivated after the bloom stems have reached a height of three or four inches, the Dutch bed method of planting is advised. Lay the soil off to a depth of about four inches and rake the bottom of the bed level. Space the blooming sized bulbs about six inches apart each way, setting them upright (smaller sized bulbs may be planted closer and not so deep), and return the soil to cover about four inches again, avoiding any possibility of manure or any other decaying agency coming in contact with the bulbs.

A light application of commercial fertilizer, such as is used on vegetables, should be raked into the top soil, and a light mulch of well rotted manure applied on the surface. Very little cultivation, if any, should be practiced and after the plants are well up, additional mulching may be added. Occasional feedings of liquid manure or dissolved nitrate of soda in small quantities are beneficial to the plants. Grass and weeds should be kept pulled out of the beds, but one must be very careful not to disturb the surface roots, as the plants are very sensitive to root injury. Merely walking across the bed will often result in the yellowing of the foliage and consequent stunting of the plants.

DIGGING AND STORING OF THE BULBS

Unlike most other bulbs, the Easter lily bulb should never be dried out excessively or it will wilt and shrivel, thereby losing much of its vitality. The natural season for the growth to start is in the fall, with the approach of cool weather. The bulbs may be left in the ground all summer, and, if dug at all, should be lifted just before rooting starts (usually late August and September). They may be immediately rebedded, or kept in a cool place away from drying air currents for several weeks. Imported bulbs are generally packed in tight boxes of dry soil and are immediately placed in cold or cool storage to prevent either rooting or excessive drying.

If at digging time the grower wishes to leave the old bulbs and remove the natural stem increase, he may carefully dig down around the old stem and remove it with the bulblets, without disturbing the old bulbs at all. Where the soil is reasonably well drained, it seems advisable not to disturb the old bulbs, unless

needed, for two or three years at a time, after which they should be lifted and divided, to prevent root-binding in clumps.

CUTTING THE BLOOM

The Easter lily is considered not only a splendid plant for bedding and potting, but also one of the finest for cut flowers. The care and cutting of the bloom are important. Usually the longer the stem, the more desirable the lily as a cut flower. But one must bear in mind that the plant grown in the open will not be likely to have as high a stalk as that grown under glass or in part shade. Where the object is to produce bulbs as well as bloom, the stems should not be cut too close to the ground. At least six or eight inches of stalk should be left to assist in properly maturing the bulb and should not be again molested until it naturally dies down, which in most cases will be in late June.

Unless one wishes to attempt to produce seed, the anthers should be removed as soon as the bloom opens, in order to avoid the shattering of the yellow pollen over the pure white interior of the flower, which spoils its appearance. This may be done with the fingers and will be well repaid in the appearance of the flowers when on display.

The bloom may be shipped some distance by parcel post or express if cut when the buds begin to show white. The stalks are tied in bunches of six and rolled tightly in paper with the buds straightened out carefully, and several bunches packed in a well lined box or crate that is long enough to prevent bruising the buds. Upon opening the package, the stems should be re-cut and placed in water, when they will open quite naturally.

AMARYLLIS (HIPPEASTRUM)

This is one of the favorite flowers for the dooryard in Florida, usually blooming in spring—February, March and April. While it has not been produced in commercial quantities until very recently, the Amaryllis should soon take its rightful place as a bedding and pot plant. The small red species, *Johnsonii*, found in such great numbers in dooryards from Palatka to Lakeland, has been grown here for many years. It is a great favorite for borders and beds, owing to its ability to shift for itself under almost any conditions, especially in the lighter sandy soils.

The so-called hybrids are the result of long years of careful

cross-pollination of the best obtainable stock. It is with these that there seems to be the best opportunity for commercial production. When properly hand pollinated they will produce good crops of seed, although they are slow to propagate by natural division, while the *Johnsonii* is the opposite, producing many offsets and almost no seed.

The individual flowers of the common Amaryllis do not usually measure more than three inches across, and are confined to the one color, red, while the hybrids frequently attain a size of eight inches across the face of the flower and the colors range from nearly pure white to the deepest maroon, with many different patterns of white background striped or splotched with brilliant colors of red and pink.

SOILS

Amaryllis seem to adapt themselves to a wide range of soils, but the best results appear to be attained on a strong loam approaching stiffness. Hammock or heavy flatwoods vegetable or potato soils are excellent if well drained and irrigated when needed. Good drainage is very



Fig. 9.—The Amaryllis.

essential but not more so than plenty of moisture during the growing season.

CULTIVATION AND FERTILIZATION

The soil should be well worked to a depth of six or eight inches and in a good mechanical condition. Half a ton of complete fertilizer, such as is used on potatoes and vegetables in about three applications during February, May and September, supplemented by well rotted stable manure, if possible, to keep up the humus content of the soil, may be broadcast or sown in the drills and well mixed with the soil. The rows should be about 30 inches apart and the bulbs spaced 4 to 6 inches in the row, planted just deep enough so that they are covered about two inches after the soil has settled.

GROWING FROM SEED

For maximum seed production, hand pollination must be practiced with Amaryllis, taking pollen from one flower to use in the next, being careful to use pollen from the very finest bloom. The pollen is dusted over the pistil during the first three days it is in sight and before it is self-pollinated, as the latter condition usually does not produce much seed.

Seed ripen four to five weeks after pollination. As soon as the pods turn dark and show signs of cracking open they should be gathered and dried for a few days. The seed should then be removed and planted at once.

Some growers plant the seed in flats under half shade slatted sheds, while others prepare a bed with a tobacco cloth covering, similar to the usual celery seedbed. Care must be exercised to keep an even moisture in the bed without having it wet enough to be soggy. When the plants are well started, it is well to raise the shade, allowing some sunlight. This should be increased as the weather cools off, until the shade may be discontinued by November.

Frequent applications of liquid manure and some commercial fertilizer with light cultivation, will keep the plants in a thrifty condition. They may be lined out in field formation in early spring, when they should have a diameter of about three quarters of an inch.

CRINUM

Crinum, sometimes called "spider lily," is a large type of the Amaryllis family which is very common in Florida dooryards. It grows in almost any kind of soils, making a rapid growth where conditions are favorable. In early spring and summer it sends up heavy bloom stalks which bear clusters of three to five flowers of an open trumpet shape, usually white in color, with stripes of red or pink. The bulbs have a tendency to grow large, often reaching six inches in diameter. Natural propagation is generous from both offsets and seed. The seed, however, do not grow readily unless gathered and handled with some care. Habits of growth and cultural practices are very similar to those of the Amaryllis, but no great commercial value has yet been placed on the Crinum.

EUCHARIS

Eucharis (commonly called Christmas Lily or Amazon Lily) is one of the Amaryllis family, growing from a fleshy white bulb, and having dark green waxy leaves as wide as

a man's hand. This is an ideal pot plant, as the heavy clump of foliage stays green the year round, the pure white waxy flowers, several of which are produced in a cluster at the top of each stalk, blooming as early as December and as late as early March.



Fig. 10.—The Eucharis (Amazon lily).

The natural increase is from offsets and is rather slow, hence the numbers are comparatively few.

Eucharis is grown best in large pots or boxes, and appreciates some shade. It is rather sensitive to cold and is used mainly for porch boxes and dooryards where it may be protected from frost damage. It is supposed to be native to northern South America.

FREESIAS

While this is a member of the bulb group that has been grown in Florida for a good many years, it does not seem to be very well known. California produces most of the bulbs for the trade.

The bulbs are small, $\frac{1}{2}$ to 1 inch in diameter and conical in shape. The bloom stems are seldom more than a foot in length and the small trumpet shaped flowers set in a double row along the upper third of the stem, usually six to a dozen in number.

There are several varieties of color, but the best we have seen in Florida have been the yellows and whites. Very little work has been done with Freesias here, and about all that we can say is to try several colors, planting the bulbs in early September so that the bloom period will be past and the bulbs matured before mid-winter cold kills the tops. A spring crop is sometimes produced by planting in late February, but is not considered as good as the fall crop.

MONTBRETIA

This dainty little flower is perhaps most easily described as the "vest pocket edition" of the Gladiolus, having somewhat the same character of bulb and foliage and producing its flowers on delicate spikes slightly similar, and of a wide range of colors. The bulbs are planted in early spring—February and March—and will bloom in July. When foliage dies down in the fall, the bulbs may be dug and stored the same as Gladiolus, or may be left in the ground for two or three seasons at a time until the clumps become root-bound. Any good soil, well drained, will grow Montbretias, and they appear to appreciate a location that is partly shaded.

WATSONIA

This is another of the bulbs similar to the Gladiolus, having much the same type of bulb and foliage. The bloom stalks attain a height of 30 to 36 inches and the flowers are produced on