CLEMSON EXTENSION

HORTICULTURE

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Understanding and Producing Amaryllis

In the U.S., the name "amaryllis" generically refers to commercially important bulbs, although the commercial bulbs marketed in the trade were derived mainly from plants of the genus *Hippeastrum* (meaning: "horse star"), now the accepted genus of the hybrids that we grow commercially. Some still use the genus name *Amaryllis* for the Dutch hybrids, an archaic practice. "Amaryllis" is the common name, *Hippeastrum* the botanical name. *Amaryllis*, however, is still the generic name for *A. Belladonna*, but, crinium is no longer *A. bulbisperma*, it's *Crinium bulbisperma*, a lycoris is no longer *A. radiata*, it's *Lycoris radiata*, etc. The *Hippeastrum* species name is listed in England as *hybridum* but here it's *vittatum*. Many people simply give the cultivar name (*e.g.*, *Hippeastrum* 'Bouquet').

In the South, it is common to see outside large clumps of amaryllis bulbs, their flowers trumpet shaped, looking much in shape like an Easter lily flower. Their color is red with a white stripe or white with a red stripe. These are the old "Mead types," developed in Florida by Dr. Mead. Outside, they often produce these large clumps which present a lot of color in the landscape. Although the Mead types come true from seed, they are not as striking as the Dutch hybrids. Their color range is very limited, and their flower form is considered inferior to the Dutch hybrids. The petal/sepals of the Dutch hybrids are far wider and more reflexed than the Mead types, making their flower wider in diameter and flatter than the Mead types.

The popularity of the Dutch cultivars has increased greatly over the past decade. A few years ago, potted bulbs were offered for sale via mail orders at Christmas by major credit card companies. Today, one simply has to go to the local supermarket to purchase one. Also, undeveloped scapes occasionally are sold as cut flowers, the retail value of one scape being roughly equal to that of a mature ready-to-flower bulb.

The Dutch hybrids come in many colors, various color combinations with their tints and shades: white, red, pink, orange, and, just recently, yellow. Some of the rose pinks exhibit a blue tint in their petals. A yellow species (*H. Evansiae*) was discovered in Bolivia about 35 years ago. It is a relatively small bulb (ca. $1^1/_2$ inch in diameter, maximum) with a relatively small flower of about an inch in diameter. It's taken quite a while to incorporate the yellow into the large flowering yellows recently available commercially.

Amaryllis flowers are produced (2-6) in an umbel arrangement [i.e., stems (pedicels) of florets attached at same point on main axis (peduncle)] on the scape (i.e., a leafless, hollow stalk that originates at ground level). The scape's rapidity of development is truly amazing -- from being just visible at the bulb's nose to as much as 3 feet long in a few weeks. Individual flowers of 11 inches in diameter may open. In some cultivars, the leaves emerge from the bulb with the scape; but in others, leaf emergence from the bulb follows flowering. Often, more than one scape, usually 2, will develop and flower simultaneously. Regardless, another scape usually develops 2 to 3 weeks after the first floral display. Each flower may develop into a fruit (capsule) which may contain over 100 seeds. Seeds are a good place to begin discussing amaryllis culture.

The capsule, after turning yellowish, will begin to split about 6 weeks after the flower opens, revealing its black seeds (Figure 1). At this stage the highest percent germination will be attained -- the longer one keeps the seeds after this point, the fewer will germinate. Seeds not planted right away should be kept in the refrigerator until sowing. Seeds should be

removed from the capsule and floated overnight in a bowl of water before sowing. They may be sown thickly (i.e., seeds touching one another) about a quarter of an inch deep in builder's sand. In less than two weeks, the surface of the sand will be covered with small leaf blades. Continue to water them. The sand insures good drainage, so they won't rot. A tiny bulblet is evident with the formation of the second or third leaf. After a month, a complete liquid fertilizer of about 200 ppm N is recommended, which may be increased to 500 ppm N at 4 months. After 6 months, 700 to 800 ppm N is recommended. They grow like weeds.

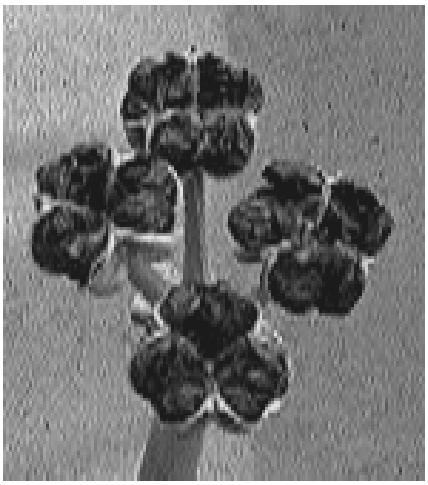

Figure 1. Four capsules of *Hippeastrum* containing seeds ready for sowing.

The bulblets will probably need dividing at the 3-5 month stage, again at 10 months, when you can introduce each bulb to its own pot. When dividing them, use a mixture (by volume) of three parts builder's sand, four parts pine bark (soil conditioning grade), and two parts peat moss. Because of their herbaceous roots, the main consideration is large air spaces in the growing medium. The pH should be adjusted with dolomitic limestone to about 6.5. NEVER fertilize an amaryllis bulb that has no leaves; the roots will be killed. Amaryllis grown from seed will flower in 3 years, occasionally in two years -- if greenhouse grown.

Amaryllis should be potted with about one-third to one-half of the bulb above the growing medium surface. This keeps the bulb's nose dry, precluding conditions conducive to "red blotch" infection. Potted bulbs thrive under conditions in which they are pot bound. When potting a mature bulb, leave only an inch between the outside of the bulb and the inside of the pot rim.

In outside beds, the bulb should be planted with only half of its nose above ground. Heavy mulching in the fall/winter is advised.

The life cycle of the amaryllis is extremely interesting. Seedlings do go through a juvenile stage, noted by the fact that they continue to grow vigorously in the greenhouse in winter. The juvenile stage probably ends with the initiation of the first scape within the bulb. In the greenhouse, mature amaryllis have a tendency to have a rest period [i.e., a period in which visible growth completely ceases because of internal (physiological) conditions within the plant, not because of external (environmental conditions)] but actually do not exhibit one. In winter, their growth slows, but it does not cease completely.

In the greenhouse, if left alone, mature bulbs generally flower in the spring, but many also flower sporadically at other times of the year.

The mature amaryllis bulb initiates flowers while growing vegetatively. Its initiation of a flowering scape within the bulb is not photoperiodically controlled. Research has shown, however, that very warm temperatures (e.g., >83° F days, >73° F nights) increase leaf growth but reduce bulb growth and the number of scapes initiated. These conditions are common in summer in the deep South. In general, a bulb will initiate a flowering scape following the production of 3 to 4 leaves. It follows, then, that the more leaves it produces, the more scapes it initiates. A mature bulb will average about 12 leaves during a growing season, producing about 3, and on rare occasions, 4 scapes. If outside, growth ceases in the fall as temperatures decline, and the leaves die back. The winter is really a dormant period (i.e., growth ceases because the temperatures are unfavorable, not because of some physiological stage of development). This forced period of inactive vegetative growth induces the scapes to begin development (i.e., expand, take up water, etc.), and by early

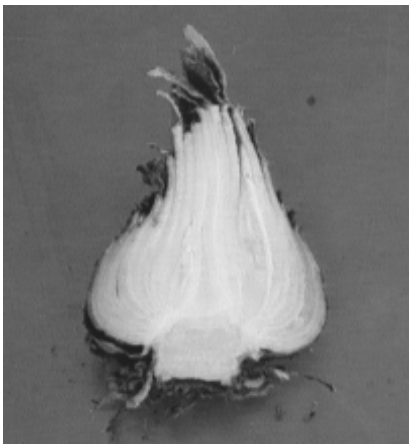

Figure 2. *Hippeastrum* bulb cut (longitudinally) in half in midwinter revealing scapes ready to emerge through the neck of the bulbs

spring they will be visible at the nose of the bulb, usually developing before the leaves, which do not appear until warmer temperatures. This winter period of inactivity "programs" the scapes to develop in the spring. In the greenhouse, these same scapes might not develop until summer.

The interesting part of their life cycle is that the scapes that develop in the spring (i.e., emerge through the neck of the bulb, elongate, and flower) are the ones that were initiated about 18 months previously, not the ones initiated during the most recent growing season. In other words, when it finishes flowering in the spring, the scapes initiated the last growing season are still within the bulb and won't develop until the next spring. At the end of the growing season in the fall, the bulb has within it scapes of two ages: those initiated last year and those initiated in the current year (Figure 2).

In the greenhouse, one can program flowering by withholding water in August and turning the pots on their sides to make certain that no water gets into the pots. The leaves should not be cut off. They should be allowed to die naturally. In December, the scapes will appear at the nose of the bulb. To force them at that time, the pot is turned upright and the bulb watered. The bulb will flower in 4 to 6 weeks in a 62 to 65° F minimum greenhouse. They should not be fertilized until leaves develop. For later flowering, they can be stored at 40-45° F. This 40-45° F. exposure is not a necessary part of the plant's life cycle (i.e., it does not fulfill some rest requirement because it doesn't have a rest requirement). This temperature range merely acts as an unfavorable environment for vegetative growth and scape development. It is simply a holding temperature, and bulbs can be held for at least a year at this temperature before forcing. About 4 to 6 weeks before flowering is desired, the bulbs should be removed from the 40-45° F. storage and watered. If they're potted during the 40-45° F. storage, the bulbs must be watered occasionally. Bulbs already rooted when removed from storage will force faster and produce larger flowers than bulbs which must root during scape development. It is possible to force amaryllis at any time of the year.

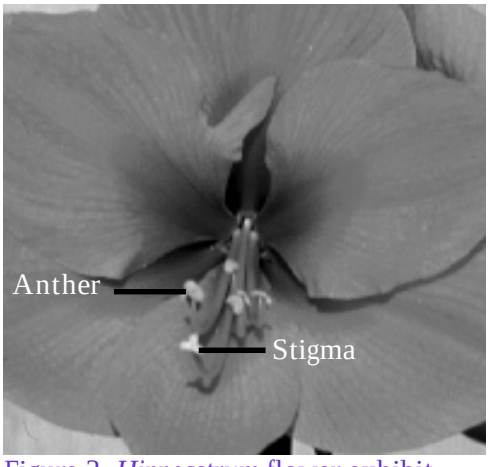

Figure 3. *Hippeastrum* flower exhibiting ripe anthers containing pollen and receptive stigma, as manifested by expansion at its apex into 3 lobes.

Amaryllis are extremely easy to pollinate. Once the pollen is on the stigma (Figure 3), the flower will begin to streak and wilt within a day or so. Most of the seedlings produced will have striped flowers, even if both parents have solid colored flowers. Also, many of the seedlings will not have the open, flat form of their parents -- they'll be more trumpet-shaped. It is possible, however, to get seedlings equal to and occasionally better than their parent(s). In a yard, what matters is color (i.e., the mass effect), not the quality of an individual flower.

Amaryllis do produce offshoots, some cultivars more readily than others. Any offshoot, of course, would be identical to its parent. Commercial producers prefer that cultivars not produce offshoots readily, and this is a consideration in whether the cultivar is released commercially. Propagators would much prefer to sell additional bulbs. Offshoots initiate their first scape at about the 9-leaf stage, but often this first scape aborts.

Amaryllis may also be propagated by cuttings (i.e., bulb dissection). Only large bulbs should be used in asexual propagation. First, the bulb is cut in half longitudinally (top to bottom) through its basal plate. The halves are halved again (total = 4 pieces), then again making 8, and then 16. It is possible to continue to 32 (Figure 4), etc., but it is recommended that nonprofessionals stop with 16 divisions. Each cut piece must contain a piece of the basal plate (stem tissue) or it will not root because roots develop from stem tissue, not leaf tissue. The bottom third of the cutting, which includes the basal plate, should be covered with sand and watered. In several weeks, a new leaf will appear, then two, etc. and a new bulb will form at their base. This bulb will flower in about two years. Asexual propagation like

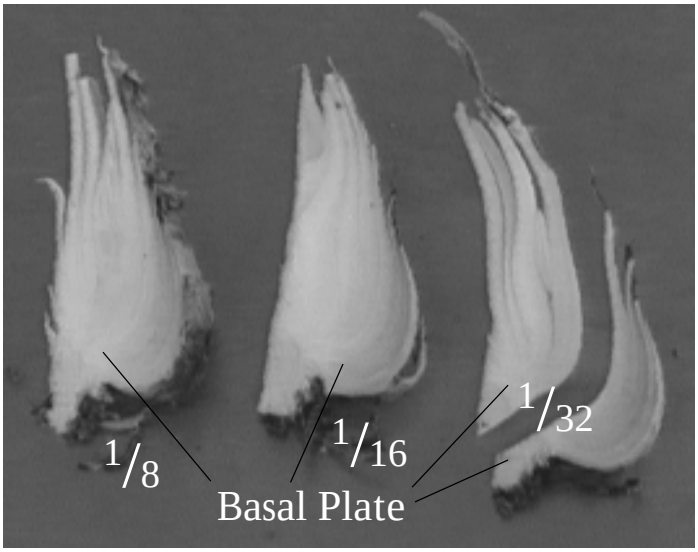

Figure 4. *Hippeastrum* bulb cut longitudnally for propagation into $^1/_8$ and $^1/_{16}$, then the $^1/_{16}$ piece divided tangentially to yield $^1/_{32}$ pieces, each piece still containing a portion of the basal plate.

this is how named varieties are increased. Each plantlet is genetically identical to the parent.

The main pest problems of amaryllis are mosaic virus and "red blotch". Occasionally, plants in the greenhouse will get soft brown scale, but this is easily controlled. Spider mite infestation is rare, but it too is easily controlled.

Figure 5. *Hipeastrum* leaf blades: healthy, dark green leaf (left) and lighter greenish-yellow leaf severely infected with mosaic (right). Darker streaks in infected leaf are areas where chlorophyll content has not yet been visibly reduced by the virus.

There is simply nothing one can do to eliminate mosaic from a plant. Its symptom is light yellow streaking of the foliage, the yellowing increasing with time (Figure 5). New leaves may not manifest the symptom until they have elongated and matured. A plant with mosaic will exhibit reduced vegetative growth as the years progress. Eventually, it will not flower. Also, it serves as a source of infection of healthy bulbs. The mosaic virus can be spread by insects, also by cutting an infected plant with a knife, then a healthy one with the same knife. There is some evidence that smoking tobacco in a greenhouse can produce infection. Some believe that the virus can be transmitted from root to root in a bed situation. Plants infected with mosaic do not transmit the disease to their seeds. So, if the plant produces a nice flower, one might make a few crosses with it, then throw it away.

"Red blotch" is caused by the fungus *Stagonospora curtisii* (Figure 6). It is very destructive and, if unchecked, progresses rapidly within a bulb and from bulb to bulb. This same disease is called "scorch" on daffodils. The disease manifests itself by reddish brown spots that develop into lesions on the bulb, leaves, and/or scape. The fungus can progress into the heart of the bulb. The scape may rot off at the attacked location before its flowers open. Even today, it is unfortunately common for bulbs to be infected with both mosaic and red blotch when purchased.

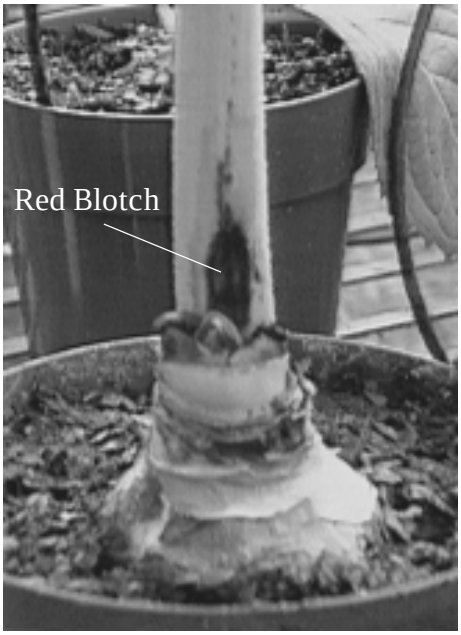

Figure 6. *Hippeastrum* scape infected at bulb nose with "red blotch" (*Stagonospora curtisii*).

Captan™ and Bordeaux mixture once were recommended for red blotch, but neither was very effective. Benlate™ is extremely effective in eradicating *Stagonospora* from amaryllis. If properly timed, one spray in early fall could eliminate the disease from a moderately infected plant. Because the fungicide is systemic, the plant probably draws the fungicide into the bulb when it translocates its leaf carbohydrates

into its bulb as its leaves wither and die. Assume newly purchased bulbs have the disease; soak them in a Benlate-like fungicide for half an hour before planting. A couple of companies have introduced Benlate-like fungicides: Cleary, called 3336™, and Sierra, called Domain™.

There are many amaryllis cultivars available. Some of the older cultivars produce offshoots more readily than some of the more recently released varieties.

Apple Blossom: a white flushed pink; the American favorite; an older cultivar with strong substance and nice flower form.

Bouquet: a salmon orange with strong substance; flower form is a bit triangular, caused by its petals reflexing too much; its color its best attribute.

Fantasy: looks very much like Apple Blossom but with a lot more and deeper color; does not have the substance of Apple Blossom.

White Giant: aptly named; one of the largest flowers but also with one of the longest scapes; a vigorous grower.

Marie Goretti: a white with frilled edges; flowers have good substance and form but not many flowers per scape.

Doris Lillian: a deep rose pink -- a favorite; good substance and flower form; open flowers have a blue tint in their petals; can be hard to find.

Wyndham Hayward: a dark red of extremely good substance and flower form; this clear red color hard to find.

Majuba: a scarlet with exceptional flower form (very wide petals/sepals which do not reflex) but tall.

Trixie: a cherry red; very good substance and flower form; color is unique.

Picotee Petticoat: white with red-lined petals/sepals; substance and form an improvement over Picotee but only a little better than average.

Yellow Pioneer: new color but poor flower form; not a very vigorous grower.

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