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Aloe polyphylla: Care & Cultivation 5.0 Spring 2011

Congratulations! You have just purchased a very special plant threatened by extinction due to habitat deterioration related to the effects of overgrazing by cattle, sheep, and goats. You may now participate in the salvation of an endangered species and enjoy its unique beauty.

Aloe polyphylla is no longer able to reproduce itself because the bird that pollinates it, the Malachite Sunbird, is endangered as well. Viable seeds have few opportunities to find hospitable niches on the basalt slope since the flow of water regulated by the grasses, *Themeda triandra-Festuca caprina*, has dried up. The thick sod formed by these grasses functions like a sponge to regulate the flow of water downslope to the seedlings below, and dryness has resulted in very few successful germinating seeds.

Your new plant is grown from a seed produced by my pollination technique. This species is an obligate outcrosser. It does not self-pollinate to produce viable seeds. All natural progeny are hybrids.The species is dependent on hybrid vigor. Other growers are now producing clones by tissue culture methods.These plants will be slow to develop, and without hybrid vigor. Viewing a large block of one-gallon plants is a good way to see the genetic variation preserved by hybridization, which is the only acceptable way to save the gene pool of any endangered species. Cloning preserves only the genotype of the parent plant. A striking physical variance in the marginal dentation of the leaf in a block of seedlings illustrates this.

The one-gallon 35- to 40-leaf plants are about two years old and will grow to an adult plant with 150-175 leaves 16” high and 32-36” diameter in about five years if all goes well. There are five rows of leaves emanating from the center. A Left spiral is described by pointing your left thumb at the center and matching any one row (sequence) of leaf with the curl of your fingers. A Right spiral matches the curl of your right-hand fingers in the same way. All plants I ship come labeled R & L with a diagram.

As new leaf is produced, the older leaf is shoved to the outside of the row sequentially, with the oldest leaf being appressed to the soil surface and shaded. This leaf is retired by the plant; the “goo” is conserved and used for other leaf and root tissue. Never attempt to remove any leaf just because it has some tip necrosis or looks bad. Remove only empty paper thin leaf from the underside.

Aloe polyphylla is bio-conservative and dynamic. The lifetime of a leaf on a mature plant is about two years. As new leaf appears in the center, the plant twists clockwise or counter-clockwise to accommodate the spatial demands of the vertically

oriented leaf. As the new leaf emerges, a keel on the outside edge unequally divides it into a wide and a narrow section. The physical forces acting here produce a lateralization of the leaf, thus the spiral begins here.

Right-hand plants always have the narrow side on the right, and left hand plants always have the narrow side on the left. If you have trouble seeing the spiral orientation in your juvenile plant, it is because of the lower number of leaves. Be patient, almost every customer I've dealt with can see it at the 50-leaf stage. Many people have trouble recognizing the spiral pattern. Yes, the plant is conducting the business of constructing the leaf sequence which will become manifest. The question is always, "Can your brain recognize the pattern your eye sees?" Almost all customers can recognize the five-row spiral sequence of a 50-leaf plant. If you have trouble with this, the number of leaves and the orientation of the leaves are variables in a young plant (30-40 leaf) not present in an adult (150-175 leaf) plant.

The spiral orientation is not genetically determined. Any individual may spontaneously change from R to L or L to R . These plants are very confusing to study. I have almost equal numbers of R and L plants in my inventory. My field studies of wild populations reveal the same. Spiral phyllotaxy is a solution other plant species use to maximize photosynthetic capability (via leaf exposure) given their ability to mechanically support themselves. Acaulescence (without a stem) is a growth habit which imposes real challenges to plants in other families, such as the *Crassulaceae* and *Cactaceae*. This biophysical solution is described by the Fibonacci equations.

The maximum size of any acaulescent Aloe is related to the internal support the individual leaf gets from the vascular strands and other fibers. *Aloe polyphylla* leaves have virtually no internal support from fibers, only from vascular strands found just below the leaf surface. The rest of the leaf mass is "goo". Pressure from the roots inflates each leaf to a turgid state and this gives *Aloe polyphylla* its form and drives new growth. *Aloe polyphylla* biomass is about 98% water. Storage of starch (the fuel) is diffused in *Aloe polyphylla* leaf. In other woody plants, starch is stored in parenchyma tissue. The translocation distance from leaf to root through the crown is short. *Aloe polyphylla* can rapidly move "goo" to the roots and water from the roots to the leaf.The crown zone is a tightly packed mass of vascular stands, where leaf vessels connect with root tissue vessels. *Aloe polyphylla* is a dynamic plant which reinvents itself continuously by retiring old leaf and roots, and using its "goo" to produce new tissue, almost in the same space. You cannot induce new leaf to form by adding fertilizer to an adult plant without witnessing the senescence of the oldest leaf.

One consequence of diffused starch storage within the leaf is affected flower production. To produce an inflorescence the size of deer antlers requires a lot of energy. A minimum leaf count required for flowering is about 90. This physiological feat requires the expenditure of several leaves. Plants may not repeat flower the next year and they rarely flower at all and then do not accept their own pollen.

I believe *Aloe polyphylla* is a very young species, only appearing in the Drakensberg and Malutis mountains of Lesotho in the last 25,000 years since the end of the Pleistocene glaciation. Populations are only found in a narrow altitude range--7500 feet to 8500 feet in the Malutis Mountains and the Drakensberg at 29-30 degrees South latitude on North facing slopes only, facing the equator. Cold and dry winters with nightly lows of 10-15 F alternate with daily highs of 30-40 F. Light snow may come from

cyclonic storms from the South. Plants flower in the Spring and the Malachite Sunbird returns to sip nectar and pollinate while the summer weather is mild with 30-40" rainfall from thunderstorms.

When you take a plant species out of the environment it evolved in, it may encounter conditions it had never experienced before. Weather extremes can be a natural selection factor which, at a minimum, might restrict the plants performance and development. The temperate climate described will not have fungal pathogens found in more Tropical climes. The following recommendations for plant management are very broad and specific site microclimates will always rule over regional advice:

- For USDA zones 1-9a, juvenile plants should be brought inside and protected from hard freezes. The use of a Gro-light on a timer to give eight hours a day of extra light is essential to preserve good form. Without extra light, the leaf width narrows and the leaf length increases. The spiral form is dependent on shorter wavelengths of light from UVA and UVB, which are plentiful at higher elevations.I suggest a small fan and never let your plant go dry. Cooler temperatures are better, 40-60 F is OK. The adult plants are more tolerant of extreme temperatures than the juvenile plants.

- To cultivate *Aloe polyphylla* in low desert areas with 100+ F summer temperatures, do not use black plastic containers. Ceramic is best to insulate the roots against high temperatures. Morning sun is OK, but shade in the afternoon is necessary. I sometimes stretch 70% shade cloth over the plants. Use high quality water only, not salty or alkaline. Acidic soil mixes are beneficial. During high summer temperatures *Aloe polyphylla* will not grow, withhold fertilizer until the fall.

Understanding root physiology is important to successfully grow *Aloe polyphylla*. The bright yellow roots with white hairs have high oxygen demand. At high soil temperatures (90+ F), the rate of respiration races beyond the soils ability to breathe and deliver oxygen so root tissue begins to die by suffocation. You can kill root tissue in two minutes by dropping it into 90 F water. A physiology like this places *Aloe polyphylla* just to the right of *Cymbidium* orchids on a scale which arranges plant root oxygen demand, with orchids on the left(highest O2 demand) and plants such as Bald Cypress(Taxodium) on the right. A proper combination of temperature, water availability and soil particle size enable the roots to function like a pump to inflate the leaf fully. The first check on plant health is the turgidity of the leaf.

A good soil mix for container *Aloe polyphylla* will start with any good potting soil, free of pest and diseases to which orchid bark chips are added to about 50% volume. These will be digested by actinomycete fungi in 3 years, however. A longer lasting additive for permanent container plants will be pumice or red lava with 5/16" or 3/8" grade. I use #3 or#4 perlite in the soil mix to about 30% volume. I use vermiculite also.

Landscape *Aloe polyphylla* will develop best on top of a sandy loam soil with free root run (i.e. no competition). The roots are very aggressive and will explore the soil volume wherever physical conditions permit. When in doubt, select a larger container than you might suspect. An adult plant can be raised in a half-whiskey barrel. Confined roots which circle and girdle other woody plants are not a problem for *Aloe polyphylla*.

In the genus, Aloe leaf propagation is not possible. You must utilize tissue culture methods, or have offsets, stem section, or seed. Occasionally, a plant splits growth centers. Wait for about two years before attempting to separate the plants. Let this happen naturally. Once separated, you may clean the undercrown with a water jet and use some root hormone to help new roots form. Place the plants in some shade and use compost for media. If the leaf collapses and the rosette closes, pull your plant up and jet wash the undercrown of all dead root tissue. To grow new roots, place the plant on moist mini-orchid bark or coif fiber in a shaded place. In about 4 weeks a new set of roots will enable you to replant it.

Aloes are attractive to Homopteran insects such as aphids and mealy bugs, which may be farmed by ants. Aphids can tap a vein on the abaxial side of the leaf. Thrips, nematodes, and some small beetles may chew the roots and undercrown tissue. A preventive program of insecticide application will be a life insurance policy for *Aloe polyphylla.* The only soil-borne pathogen which can kill *Aloe polyphylla* is *Fusarium oxysporum*, a primitive fungus with a large host plant list and that causes horticultural and agricultural businesses big headaches. If there is cloudy and cool weather for a week, foliar infections are possible and result in purple lesions anywhere on the leaf. This will not kill your plant, only mar its appearance, but not permanently. When enough sun shines, the UVA and UVB will kill the mycelium.

If *Fusarium* infection occurs on the roots, it will create a localized purple lesion that will not travel up through the vascular bundles. This infection will interfere with the root physiology at this locale only and does not kill the plant. If insects create a court of infection at the undercrown, then *Fusarium* may kill the plant rapidly. Some fungicides that will stop or suppress *Fusarium* are Captan, Benlate, and Cleary's 3336. Step one of the best strategy to manage the threat is to use "clean" soil. The next step is to inoculate the soil/plant with another microbe to protect the plant from any infection. I now use Actinovate SP and Iron on all container soil. This contains the bacterium *Streptomyces lydicum*, which becomes an ectophyte on the surface of roots, aiding uptake of nutrients and disabling more pathogens than just *Fusarium*. All plants I ship are dipped in a solution of of Actinovate SP and have 1 tablespoon of Actinovate Iron inoculate added to the sample soil below the plant. This should have a lasting value for plants shipped to new owners.

If you have need for further consultation, send me a picture email and I can advise. My best advice is to tune into your plant and learn what it is telling you about current conditions of soil moisture, root aeration, and light quality and quantity. Remember that the plant I ship to you is a starter plant which will re-morph into a form different from what you first see. *Aloe polyphylla*, like all plants, is very plastic and in constant slow motion. We only notice this in cacti and succulent plants with a recognizable geometry, but the principle applies to all plants as well.