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MESEMBRYANTHEMACEAE L.
(Aizoaceae, Ficoidaceae)

A family of the plant kingdom with perhaps the longest name, 19 letters, with the relatively simple meaning of, "pistil in the middle." It was formerly spelled Mesembrianthemum, with the meaning of "midday flower," but as some bloom in the morning, afternoon and many at night the name was changed. The family is composed of mostly succulent plants of which 99% are found in South or Southwest Africa. The other 1% are found in coastal areas of Australia, New Zealand, the Mediterranean area, Canary Islands and the western coasts of Chile and California.

Plants of the Aizoaceae, as many were first known, have been studied as long ago as 1652 and came into cultivation about then. Some who worked with them were Prof. Paul Hermann, Richard Bradley, Andrian Hardy Haworth, Alwin Berger, Dr. N. E. Brown and Dr. H. M. Bolus.

Dr. Brown was one of the first to start to separate the large genus Mesembryanthemum into many smaller units. This division was carried on by Dr. Bolus, Prof. K. Dinter, and later Prof. Dr. G. Schwantes. Still later workers in the field were Dr. Marloth, Prof. Nel (Lithops) Jacobsen, Vol. III, A Handbook of Succulent Plants and the most recent English edition of his Succulent Lexicon. Volk, Prof. Desmond Cole (with his recent revision of the genus Lithops), and Rawe (with his revision of the genus CONOPHYTUM which is going on right now in the "AMERICAN CACTUS and SUCCULENT JOURNAL, Vol XLVII, 1975.)

Probably, though, we owe most of our present day knowledge to that grand old man of succulent collectors, Hans Herre, former curator for many years of the gardens at the University of Stellenbosch in South Africa. His many expeditions to the little known parts of South Africa increased the number of genera and species hitherto unknown. His book, "THE GENERA OF THE MESEMBRYANTHEMACEAE", printed in 1971 is a beautiful work of art as well as a tribute to his vast knowledge of these plants. His kindness to collectors everywhere, (including the author), with information, and many seeds is well known. And

Another collector to be mentioned here is Harry Hall, formerly of Kirstenbosch, South Africa, who also gave of his time and seeds and plants.

Most of the Mesembs., (the shortened name most often used) are perennials with a woody rootstock and highly succulent leaves. There are a few annuals but most are of little importance and will not be discussed here. The family consist of roughly 125 genera and about 2,000 or more species.

Family characteristics are:

1. SHOWY PETALOID STAMINOIDS, ie, there are no true petals but merely modified stamens that look like petals.
2. INFERIOR OVARY, ie., the ovary is below the stamens, pistil and other floral parts.
3. HYGROCHASTIC CAPSULE, ie., closed fruits (capsules) that open on wetting and close on drying. Seeds are ejected by the kinetic energy of rain drops which propels them some distance from the plant. Seeds start germinating rapidly.

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usually within 24 hours and 98% of them will have germinated within one month. Seeds of the "Fig Marigold" (the common name) have a long viability, as much as ten years.

4. GYNAECIUM consist of three to many carpels.

Also can be divided by pollen morphology and the number of chromosomes which is n-9.

The family is divided into two sub-families according to the attachment of the seeds to the walls of the capsules.

1. APTENIOIDEAE where the seeds are attached to the central wall of the capsule. Genera in this sub-family are: APTENIA, DACTYLOPSIS, SCLETIUM and some 16 other genera with some annuals as well as perennials.

2. RUSCHIOIDEAE WITH THE SEEDS ATTACHED TO THE BASAL AS WELL AS THE OUTER WALL OF THE CAPSULE. This sub-family has those genera most collectors are interested in, ie., LITHOPS, CONOPHYTUMS, FAUCARIA, PLEIOSPILOS, etc., and about 100 or more genera.

GENERAL CULTIVATION

Discussion on soil, pots, watering, and position, etc., will be considered.

1. SOIL:

I use 1/3 pumice, 1/3 sand and 1/3 Baccto. Leaf Mold is the other constituent most often mentioned but being hard to find. I use a commercial potting mixture called BACCTO which is put out by Michigan Peal, Box 66388, Houston, Texas, 77006. In my mixture I usually use one part.

2. POTS:

The square plastic pots are good and the small bonsai pots can be used. For the highly succulent genera, clay pots are best with which I use just a slightly heavier soil mix. Drainage seems to be very important, ie., when watered the water should not stand but drain through quickly. Mesembs. do not need repotting very often as their demand on the mix is very slight. I repot mine every 3 to 5 years. Try to do the potting when they are flowering or showing new growth or new leaves.

3. WATERING:

In general, watering of most genera can be started in late August or early September when plants start to show flower buds or new leaves. For some species it varies but can usually be started at this time. When watering, give the plant a good soaking and then let it dry out. In Arizona this takes about one week. When resting, most start around the end of February, or the first of March; the schedule is cut down to once every two weeks or once a month. With some of the highly succulent ones (see under individual genera), I use a 1 or 2 ounce rubber ear syringe and apply a little water to the outer edge of the pot, just enough to keep the roots from drying out. I have also started to use a fogger attachment, (Fogg-It Fine, IGPM,; Fogg-It Nozzle Co., P. O. Box 16053, San Francisco, Cal., 94116) on the garden hose. This gives a fine fog-like mist from which the plants obtain some moisture, much as in their home-land on the extremely arid west coast of South Africa. Those planted out on the ground and established can take some supplemental water dur-

ing our dry hot summer months before our monsoons of July and August arrive. If not sure it is best to delay water for at least a few days because a perfectly resting plant can go a long time without watering, and if watered too soon, it can turn into a gooey mess overnight.

4. POSITION:

In Arizona it is best to give some shade during the hottest part of the day. In their homeland they are often found in the shade of small rocks, grasses or where they can withdraw down into the soil with contractile roots. They will take considerable sun if actively growing, and the color of the leaves is better too.

5. FERTILIZERS:

Actually, Mesembs. can be grown without any fertilizer as they take so little out of the soil. When the new leaves start growing they utilize the water from the old outer leaves, which dry up and form a protective covering over the young leaves. At the start of the growing season a solution of Sodium Phosphate, either mono or dibasic, using 3 grams to 1000cc, can be applied at two week intervals for three or four times. This chemical has no nitrogen so no lush growth is produced but it does help in forming new leaves and flowers.

6. PESTS:

Sometimes red spider mites or root meemies attack the Mesembs. but these can usually be controlled with one of the systemic sprays. Otherwise, de-pot the plant and cut the roots way back, then re-root in new soil in new pots or sterilized old ones. Occasionally birds and grasshoppers take a liking to some of the plants but if you feed the birds and kill the hoppers they are easily kept from doing too much damage.

7. AIR:

Possibly this should come under the heading of position but I believe it is of enough importance to be considered by itself. I have noticed over the years, that if I am going to lose plants it usually occurs in August or September. This is the time of year that we have the hottest temperatures and the cold frame I keep some plants in doesn't have a free flow of air. All other things considered this is the only thing I can think of that might cause the plants to rot. Especially since watering increases the moisture content of the air and bacteria and fungus can proliferate. It is very true with Mesemb. seedlings that within two or three days after germination, any cover used to aid in germination should be completely removed.

CULTIVATION OF SOME INDIVIDUAL GENERA OF THE MESEMBRYANTHEMACEAE

In my collection, which started in 1949, I have over 25 genera and more than 200 species of Mesembs. The following notes are from observations made during that time. I must say here that my losses have been more than my successes, or at least my card file indicates this. It has been only in the last ten years that my losses have come down considerably.

1. ALOINOPSIS:

Dwarf tufted plants with tuberous rootstocks. Use a deeper pot. Flowers January through March. Growth starts around this time. Mine

are planted out in the rock garden and have taken frost down to 14 degrees Fah. Here in Sierra Vista we have about 100 nights a year when it frosts as we are at an altitude of 4,600 feet. We also have from 7 to 11 inches of snow a year.

2. ARGYRODERMA:

I have had very limited success with these plants. Growth and flowering season seem to start in the fall. Probably clay pots with very porous soil mix should be used and water only when new growth or flowers appear. By February water should be in the form of mist or small amount to outer edge of the pot.

3. BERGERANTHUS:

Flowers December through March and sometimes in the fall. Growth should be rested for a few months in winter.

4. BIJLLIA:

Growth starts in October with flowers shortly after. Will take considerable water when growing. Needs resting period starting in March.

5. CHEIRIDOPSIS:

Flowers January through March. Growth can be off and on the year around especially with those in rock gardens. Usually starts in October when in pots. Some plants hardy to 14 degrees Fah.

6. CONOPHYTUM:

Small succulent plants which can be cone-shaped, (thus the genus name) cylindrical with windows, or bilobed. This lovely group should be more widely grown. I have 45 species in my collection from ten years old down to one year. One clump of C. minutum has over 100 heads. These plants on the whole take heavier soil, (equal parts) and more water. Flowers start appearing the latter part of August and usually are finished by the first part of November. Growth starts showing through old leaves about the month of January and continues through March. Rest for at least 6 to 8 weeks, occasionally giving small amounts of mist, or water to outer edge of pot. Water heavily when growing. Conophytums do NOT do well planted in the ground.

7. DINTERANTHUS:

One of my favorites, as the plants look unreal, i.e., as if carved out of stone. Flowers start appearing in the middle of August and continue through the first part of November. Use a soil mix of about 3 parts sand to one part Baccto. Plant in clay pots and under water at all times. I have four of the six species and most of them live about three to five years with me, although one plant of D. microspermus I have had for seven years. At least one of the species, D. puberulus, grows well in the rock garden and didn't freeze until the temperature went down to 6 degrees Fah. one night last winter. Lovely plants well worth the effort to keep them alive. When my plants flower I often take them to work, (at the pharmacy) and Dinteranthus always causes people to stop and look and exclaim in wonder, "Are those really plants?"

8. FAUCARIA:

An interesting genus of about 33 species with succulent leaves that have cartilaginous edges and often stout awn-shaped teeth along the margin, that look like gaping jaws, hence the genus name. Quite often F. tigrina or

F. tuberculosa are among the first Mesembs. a collector gets. Those in the rock garden start blooming in August and continue (in pots) up into November. Growth starts any time after blooming and seldom are these plants lost to overwatering. Most are hardy down to 14 degrees Fah. and some down to 6 degrees Fah.

9. FENESTRARIA:

Flowers can appear from the end of August up through the end of January but on the average they appear in November. Rest from March onward for several weeks. Will take quite a bit of water when actively growing. Not hardy.

10. FRITHIA :

Frithia pulchra the only plant in the genus which is stemless with alternate windowed leaves and pretty reddish-purple flowers. Use plastic pots with equal parts of sand and Baccto, then add some more sand. Place the base of the plant in a top dressing of pebbles so that it is not touching the soil. The two plants that I have had for the past five years have bloomed in the following months: May, June, August, October, November and December. New leaves appear January through March.

11. GIBBAEUM:

A genus of 21 species that, with me, has proven impossible to grow. The only member of this genus that I have had any success with at all is Gibbaeum heathii. One plant that I raised from seed was in my collection for 7 years. This was planted out in the rock garden and the following observations were made from that plant. Flowers appear in April and new leaves January through April except one time in September. Hardy to 14 degrees Fah. I would like to know more about the cultivation of these plants as most are outstanding in general appearance and flowers.

12. GLOTTYPHYLLUM:

Flowers appear September through December. New growth anytime after that. This genus appears at its best when potted in clay pots with a very porous soil mix, (3 parts sand and 1 part Baccto). Watering is kept to the very minimum. If watered too heavily these plants tend to lose their characteristic form and become leggy and unnatural in appearance. Glottiphyllum oligocarpum, is in my estimate, one of the most beautiful plants that God made.

13. HERREANTHUS:

H. mereri is the only plant in this genus. A lovely plant with Argyroderma-like epidermis and scented white flowers, that once open remain open day and night for two weeks. Buds appear in late October and bloom from November 15 through the 30th. New leaves appear in February or March. Water should be withheld from May through June or thereabouts. Lovely plant.

14. LAPIDARIA:

Another beautiful plant that is monotypic, i.e., only one species in the genus, L. margaritae. Yellow flowers appear from the end of September up through the end of October. Porous soil but plastic pots are O.K. Keep water at a minimum. New leaves start showing from January through March.

15. LITHOPS:

These interesting South African succulents have been cussed and discussed in great detail, even a whole book has been written about them. In my collection I have 22 species, 7 varieties and 1 duplicate. L. localis (L. terricolor), raised from seed 21 years ago, has been planted out in the rock garden for the past 18 years. L. salicola and L. turbiniformis have been planted out in the ground for nine years. Along with others they have withstood temperatures as low as 14 degrees Fah. and some even to 6 degrees Fah. Lithops can be planted in plastic pots with fairly porous soil mix and watered heavily during their growing period, from August up through February. Plants in pots should be planted higher than those in the ground. Those in the ground can be planted down to their leaf tops. Flowers appear from August to November, except L. optica var. rubra which flowers in December or January. Very interesting and fascinating plants. For an up to date list on LITHOPS see Dr. Desmond Coles Checklist in "Excelsia, #3, December 1973."

16. MITROPHYLLUM:

Very touchy genus. Use porous soil and plastic pots. Growth starts in September and is over by the first of March. NO WATER at all from March through September. The leaves can be fogged with a spray once every two or three weeks. I have 3 species, two for five years and one for four years. As yet they haven't flowered for me. The plants have an interesting type of leaf growth as they form two types of leaves each year, (heterophylly). Difficult but worth the extra care they take.

17. NANANTHUS:

Dwarf tufted plants with tuberous rootstocks. Use deep pots and somewhat porous soil. Water when new growth flows, usually in December to January. Flowers from January through March. Easy plants if not over-watered. Will take temperatures down to 14 degrees Fah.

18. OSCULARIA:

Shrubby plants that are easy to grow. Medium soil with lots of water from September through February. Tender below 25 degrees Fah.

19. STOMATIUM:

Miniature plants that are highly succulent and somewhat resemble Faucarias. Flowers are straw colored and open at night. Some have withstood temperatures of 14 degrees Fah. Easy to grow in medium soil mix and plastic pots. Growth starts in January and often continues right on through the summer.

20. TITANOPSIS:

Short stemmed, very succulent perennials with spatulate leaves, the ends covered with raised pustules containing calcium. These plants, when withdrawn into the soil, greatly resemble the tufts of limestone, among which it grows. Use porous soil, plastic pots and minimum amount of water to keep them natural looking. Flowers December through March. New leaves appear in summer. I have had one plant of Titanopsis calcareo (that I raised from seed) for 23 years. It has done well in the rock garden for 20 years. Very interesting group of plants and quite hardy.

21. OPHTHEALMOPHYLLUM:

Also BERRISFORDIA.

Highly succulent plants somewhat resembling LITHOPS on the one hand and CONOPHYTUMS on the other. I have 5 species and 3 duplicates. Flowers start appearing in September and bloom through October. Most are white, some diurnal, others nocturnal. New leaves appear in March. My favorite plant is O. rufescens with its red windowed leaves and fragrant white nocturnal flowers. This plant of two heads has won 4 blue ribbons and 1 red. Use clay pots, porous soil and only water when blooming or showing new growth.

22. PLEIOSPILOS:

Blooms August to December. Hardy to 14 degrees Fah. Of easy culture. P.nelii blooms in March and is only hardy to 28 degrees F. Medium soil, clay or plastic pots and lots of water when flowering or showing new leaves.

23. VANHEERDIA:

Very succulent plants of diversified leaf forms. I have two species in my collection. One, V. divergens looks like a fat CHEIRIDOPSIS, while V. primosii looks like a windowed leaf LITHOPS. Use plastic pots with porous soil and water only when flowering or showing new leaves. New leaves appear in March while flowers appear in May. V.divergens is hardy to 14 degrees Fah.

This covers some of the genera in my collection that I have personally watched over a period of years. I hope these notes will be of some use in the growing of these wonderful plants. Lots of T.L.C. is needed but is well worth it. After all we talk to our plants and the molecules of heme (hemoglobin) and chlorophyl differ only slightly in their configuration, one having iron, the other having magnesium.

I would like to end this article with a quote that covers my feelings about these beautiful mimicry plants. It expresses my feelings about raising them and enjoying their diversity.

PSALM 96:12 - "Let the field be joyful and all that is therein; then shall all the trees of the wood rejoice."

This article by JAMES A. ROBBINS first appeared in the NEWSLETTER OF TUCSON CACTUS AND BOTANICAL SOCIETY, Volume XII, No. 2, 1976.



The following article was submitted to BETWEEN THE SPINES, Central Kansas Cactus and Succulent Society Newsletter, and taken from FLORISTS REVIEW, June 30, 1983. It is a small sample of the large amount of plant experimentation and research constantly being conducted.

Courtesy of Elaine Taylor.

A NEW TECHNIQUE FOR GRAFTING CACTI

"Medical discovery helps cacti 'stick' together"

(by N. Zeislin and A. Keren, associates with the department of Ornamental Horticulture of the Hebrew University of Jerusalem.)

Grafting is common in the propagation of cacti. This technique is used for a variety of purposes, such as accelerating growth of slow-growing plants, preserving species that do not grow well on their own roots and preserving abnormal forms that are not capable of independent development, such as red cacti without chlorophyll or monstrous cristate forms.

There are several methods of cactus grafting available. All require a good fit of scion and root-stock, along with materials to ensure good contact between them, such as strings, rubber bands, clips, or thorns. And, of course, skillful handling is vital. As a result, it is difficult to graft cacti soon after germination of the root stock and scion species because of the small size of the seedlings.

Several years ago a medical publication about using an adhesive instead of strings for tissue contact in human surgery stimulated the idea of using the same technique in cactus grafting. Subsequently, many types of adhesives based on various chemical components were examined. Most of the glues were unsuccessful, including the very expensive medical one which was donated by an Israeli hospital.

Finally, after three years of effort, an adhesive based on cyanoacrylate as an active ingredient was found to be successful.

Many cactus cultivars and species were grafted by gluing at various stages of stock and scion development, including very small seedlings. Species not previously used as root-stock were tested and found to be very suitable for this purpose. Grafts of a red-colored variety of *Gymnocalycium michanovichi* and various cristates were examined.

Of all the experimental grafts, more than 80% were successful. The glue graftings worked even in winter, unlike conventional methods, which often are successful only during spring and summer.

Improvement of the method by addition of growth substances to stimulate the development of connective tissues to the adhesive, and the use of this grafting technique in various woody species, are now under investigation.

