Chapter 5 **(with corrections & edits: rev. 17 April 2004)**

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Sacred Cacti Third Edition (2005?)
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Sceletium sp. nova

Delosperma ecklonis
***Delosperma britteniae* ?**
Coegakop

Trout's Notes on
Some Other Succulents

***Delosperma* sp.**
Hanburg 24095

featuring: Notes on the AIZOACEAE;
with particular reference to the genus *Delosperma*

by Trout & friends

Monadenium lugardae

***Delosperma britteniae* ? Coegakop**

A Bettter Days Publication

Chapter 5

Trout's Notes on

Some Other Succulents

This is a prepublication release containing material excerpted from the forthcoming

Sacred Cacti. Botany, Chemistry, Cultivation & Utilization (Including notes on some other succulents)
Third Edition. Revised & Illustrated

To-Be-Published ca. 2005

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Chapter Five

Trout's Notes on
Some Other Succulents

Notes on the AIZOACEAE: with particular reference to the genus *Delosperma*

Our attention was drawn to the ***Delospermas*** through a series of coincidental literature encounters involving other Mesembryanthemums.

Schultes & Hofmann [1980: 332-333] stated that, several centuries ago, the roots of a Mesembryanthemum called "Kanna" or "Channa" were chewed by the Hottentots of southern Africa, and retained in the mouths to induce visual hallucinations. They quoted Lewin 1964; ***"their animal spirits were awakened, their eyes sparkled and their faces manifested laughter and gaiety. Thousands of delightsome ideas appeared, and a pleasant jollity which enabled them to be amused by simple jests. By taking the substances to excess, they lost consciousness and fell into a terrible delirium."***

Currently the vernacular names of *kanna* or *channa*, [also *gauwgoed* and *kougoed* according to Emboden] are used for "certain species of ***Mesembryanthemum*** **[Note 1]** (or ***Sceletium***), especially ***M. expansum*** and ***M. tortuosum***"

Emboden in his 1972 *Narcotic Plants* noted also that the Mesembryanthemums currently known as *kanna* or *channa* were used for stimulant and sedative effects and these drugs sound unlike the effects described.

He suggested that there may have been a confusion with the somewhat similar ***Nananthus albinotus***, that he claimed

Nananthus albinotus **now** ***Rabeia albinota***

was used as a hallucinogenic drug known as '***S' Keng-Keng***'.

While searching for what could be located concerning occurrences of alkaloids in the Aizoaceae., this was still fresh in mind when encountering mention in Raffauf 1970 that DMT had been reported to occur in an unnamed ***Delosperma*** sp.

Raffauf had cited Smith, Kline & French Laboratories; unpublished work and personal communication.

Since this was not an accessible reference, as it was considered doubtful that Smith, Kline & French would care to share the exact species name or names, it was put on a back burner with the rest of the curious but unfollowable topics and plants.

The next stimulation came when noticing T.A. Smith's inclusion of ***Delosperma*** sp. as containing N-Methyltryptamine and N,N-Dimethyltryptamine. In his 1977 review of tryptamines, he had cited Rivier & Pilet 1971 and Deulofeu 1973.

After tracking down his two references, it was extremely annoying to find that both of them are simply secondary listings and both cited Raffauf 1970 as their source. (Ott 1993 & 1994 similarly listed the same two references.)

This was a return to the starting point and provided enough motivation (irritation) to begin actively locating and obtaining seeds and plants of all the ***Delosperma*** and ***Nananthus*** species that could be located.

Plants were grown from seed and also raised from plants obtained as specimens from multiple commercial sources (by Trout) and assayed (by Johnny Appleseed) at various times of year (usually when growth would allow). Sometimes entire plants were sacrificed for assay but usually only leaves and stems were sampled.

N,N-Dimethyltryptamine (DMT) appeared to be present in a number of ***Delospermas*** (nine of the species examined), based on co-tlc with a known reference standard and color reactions with Ehrlich's Reagent and/ or 0.1% Xanthydrol.

The frequent presence of N-Methyltryptamine (MMT) was inferred from similar co-tlc which relied on extracts of other plants known to contain MMT such as ***Psychotria viridis*** (observed in some samples of leaf), ***Desmanthus illinoensis*** (observed in some samples of root bark), ***Desmanthus leptolobus*** (observed in most samples of root bark) or ***Acacia maidenii*** (observed in all samples of bark or root).

DMT co-occurred with MMT in all of these species **[Note 2]**

We can only infer N-Methyltryptamine's presence as we lacked a pure reference standard for it. In some, such as ***D. klinghardtianum***, the alkaloid which was visible at this Rf can apparently occur alone in decent amounts.

A number of other Ehrlich and/or xanthydrol reactive components were also seen. Sometimes there were 3 or 4 present within a given sample. There were dramatic fluctuations in alkaloid content and composition when assayed at various times of the year. In general, fall and winter (in Texas) appear to be the times of highest and most varied alkaloids. DMT seems to show up in good amounts in late summer before the appearance of some of the other alkaloids.

What we suspect was 5-MeO-DMT was seen in several DMT producers when assayed in spring and summer. We have not yet determined a pattern for its occurrence. While many instances were at trace levels, 5-MeO-DMT was quite strong in a November sampling of ***Delosperma britteniae***.

As far as we are able to determine this is the first reported occurrence of 5-MeO-DMT in the genus *Delosperma* or in any member of the Aizoaceae. While it is a novel observation it is not a particularly surprising one as O-methylated components are well known in the Aizoaceae and DMT has been previously reported.

We have potentially observed the presence of 5-Methoxy-N,N-dimethyltryptamine (5-MeO-DMT) in eight species.

In some cases it was co-occurring with DMT. In several cases the 5-MeO-DMT seems to be present in substantial levels.

Only in a few species was the banding dark and broad. In some samples the other components were present at substantial and higher levels.

Our determination of the identity of 5-MeO-DMT was based on its co-tlc with a known reference standard of pure 5-MeO-DMT and on its color reaction with Xanthydrol.

(All alkaloid identifications by us should be regarded as tentative but strong indications of their presence rather than proof of their presence. Identification relied solely on co-tlc with known reference standards and color reactions. Neither isolation nor characterization was performed. Thin-lyaer chromatography was graciously performed by J. Appleseed.)

We currently have neither the resources nor facilities for such further work and offer this paper in hopes someone might find this an avenue worthy of their exploration efforts.

The genus ***Mesembryanthemum*** has undergone a revision which transferred some of the South African members to the genus ***Sceletium***. ***Sceletium*** species now number around 22 and ***Mesembryanthemum*** species around 74. Both the species ***expansum*** and ***tortuosum*** are now considered to be ***Sceletiums***. ***S. tortuosum*** is the type.

Roots and leaves of these two species are still chewed and smoked by Hottentots in Karroo, South Africa, for stimulating and narcotic but not for hallucinogenic purposes. [Smoking is often in combination with *Cannabis*]

This drug is currently called '*channa'*. Herre mentions the current use helps the "chewer to bear thirst and hunger and, according to the Hottentots, makes him tough."

From Herre 1971, in reference to the current drug '*channa'*: "*After fermentation, leaves are dried again and chewed*." (page 276) and "*Long before the White man came to South Africa, the Hottentots used to collect these plants; they wadded them into a vessel so that fermentation was caused. At the right moment, the process was interrupted and the dark and wet material was dried and chewed*." (page 37)

Time of year for harvest is said to be crucial as early harvests apparently contain less alkaloid. Smith *et al*. 1996

October is given as the preferred harvest time in Festi & Samorini 1995.

Smith *et al*. 1998 similarly commented that October might be considered a good time to evaluate *Sceletium* for such fluctuations as Waterhouse 1932 mentioned an early report commenting on the plant being gathered at this time (also the time of fruit production)

[While Jeffs *et al*. 1971 had reported that alkaloid concentrations in ***Sceletium*** were highest in the woody stems and lower in the roots, much lower in the green stem and still lower in the leaf; Smith *et al*. 1998 commented that Jeffs did not note the time of harvest so this should be considered.]

Sceletium tortuosum
flowering

Preparation according to Smith *et al.* 1996:

After crushing the harvested material between rocks, it is placed into a closed container to ferment. Bags of canvas or skins are traditional but plastic bags are used today. The bag is placed in the sun so it can heat up during the day and after 2 or 3 days it is opened, the 'koegoed' is "*mixed around*" and then tightly resealed again. The 8th day after the material was crushed, the 'kougoed' is taken out of the bag and spread to dry in the sun. The resulting material is "*stringy, light brown and unattractive in appearance*".

It was claimed that failure to follow the steps in the above recipe would produce an inactive product but Smith further noted another preparation where a fire was built and, after it had died down, the ashes were removed and a hollow dug out of the hot sand. A whole plant of freshly picked *Sceletium* was placed into the hole and covered with hot sand. After baking for one hour it is ready to chew and claimed to be similar to conventionally prepared material.

Fermentation and pounding were suggested by Smith *et al.* 1996 to serve to reduce the presence of oxalic acid. Adequate heating would accomplish the same thing.

When Smith *et al.* 1998 was examining prepared kougoed, made from crushed and prepared *Sceletium tortuosum*, they found that material produced by fermentation had the peak for 4'-O-demethylmesembrenol "*almost completely diminished*", the peak for mesembrine cut by half and the peak for mesembrenone doubled. The material that was instead dried at 80°C was very similar overall but still showed the presence of some 4'-O-demethylmesembrenol.

Fermentation before drying also occurred during our assays with ***Delospermas***. During the evaluations it was found that batches of ***Delosperma*** being dried in quantity, at 110°F, began to ferment within several days and dried only after this had occurred. Unless only small amounts were processed, the plant material always partially liquefied and fermented before drying.

Yeasts and other fermentation organisms are known to be associated with the roots of a number of species.

[See additional comments farther below.]

Schultes & Hofmann mention that ***Mesembryanthemum*** species have been found to contain alkaloids (citing Popelak & Lettenbauer 1967), one of which, mesembrine (present at 0.7%) produces sedative and cocaine-like effects and torpor. This sounds very unlike the effects described above and, on

Sceletium tortuosum

the surface, seems unlikely to be a drug used for hallucinogenic purposes.

This may be misleading, however, as one correspondent reported a mild LSD-like effect when ingesting the drug *channa*. Many people have reported a biphasic action and a growing number are describing the experience as psychoactive. Much more work is needed.

Plant material, extracted material and purified alkaloid are said to be available in the European marketplace. Most people we know who have tried the drug have been quite impressed in a favorable way. None have described it as overtly hallucinogenic except for one person who reported the purified alkaloid to be mildly LSD-like.

Some of the use we have encountered was as a quid but people are also snuffing 50-100 mg of the finely ground powder (we saw one appearance of it mixed in combination with pure arecoline) or smoking it. Smoking of *Sceletium* is known among indigenous users as well.

Our bioassays with prepared *Sceletium tortuosum* (oral or insufflated) have left us something less than impressed and uninterested in further evaluations. This probably reflects nothing more than personal tastes.

Humorously, the forms chosen for the commercial marketing of *Sceletium* have thusfar included purified alkaloid placed on blotter paper *ala* LSD and also the herbal material compounded into lollypops accompanied by literature clearly oriented towards the rave scene and purporting them to possess an MDMA-like action!

Since some sort of selective serotonin reuptake inhibition **(**SSRI) activity has been noted for *Sceletium* this is potentially a dangerous venue for release if they are then combined with MDMA or other substances capable of contributing towards excessive serotonin levels.

EMBODEN believed that two alkaloids, mesembrine and mesembrenine (the latter is more preferably referred to as mesembrenone) are responsible for the stimulant effects. He offered no reference to support this.

He suggests their unpleasant side effects might be responsible for ***Sceletium's*** limited popularity. Side effects are said to include mydriasis (dilation of pupils), headache, listlessness, loss of appetite and depression following stimulation.

Based on his review of the literature, SMITH *et al.* 1996 concluded that it was not a hallucinogen but rather a narcotic-anxiolytic agent. FESTI & SAMORINI 1996 commented that visual hallucinations occur at high dosage levels but it was not clear whether this was something published, an interpretation of something published or if it reflected an unpublished human bioassay.

HERRE 1971 mentions that "*Its smell and appearance are not attractive to Europeans*." SMITH *et al*. 1998 describes the fermenting material as "*foul smelling*" with visible fungal growth.

HERRE also says that the current '*channa*' also apparently causes drunkenness "*if taken in certain quantities*". He states that the active principle mesembrine is found in all species of ***Sceletium*** and that other members of the MESEMBRYANTHEMACEAE **[Note 3]** contain mesembrine but in smaller amounts.

According to WATT & BREYER-BRANDWIJK 1962: Mesembrine has possibly been found in ***Carpobrotus acinaciforme*** L.BOL. and ***Carpobrotus edulis*** L.BOL. (in leaf- noting that they can find no chemical work to support the assertion). They also mention ***Cryophytum*** (***Mesembryanthemum***) ***crystallinum***, ***Drosanthemum floribundum*** SCHW. and ***Trichodiadema stellatum*** SCHW. were thought to contain mesembrine by ZWICKY.

SOUTHON & BUCKINGHAM 1989: page 578, on the other hand, list the occurrence of Mesembrine only in ***Sceletium namaquense*** (along with mesembrane) and ***Sceletium tortuosum***. See notes on Aizoceous chemistry farther below for more info.

An intriguing comment made by both Herr and Jacobsen is that mesembrine is not formed in Europe and northern countries (such as Germany) but it is in North Carolina.

A more detailed summation of the published analysis can be found farther below

An interesting point made by SMITH *et al.* 1996 is that the active agents may prove to be something other than Mesembrine.

Herre dismisses the related ***Mesembryanthemum crystallinum*** and other species of ***Mesembryanthemum*** as containing "[mixed] *salt*[s] *in large quantities which is very troublesome to those who take it*." (page 276). See also WATT & BREYER-BRANDWIJK 1962 and additional comments elsewhere here.

As mentioned earlier, EMBODEN suggested that the apparent conflict between the formerly observed hallucinogenic use of 'channa' and the seemingly nonhallucinogenic nature of the current drug 'channa' (we must stress that this is a poorly studied area with regards to actual human activity), as well as the lack of hallucinogenicity in laboratory studies involving pure alkaloids, may be a result of confusion of ***Sceletium*** species with another related Aizoceous member, ***Nananthus albinotus*** (discussed below).

Lewin doubted that Aizoceous plants were responsible, suggesting instead ***Cannabis*** or other intoxicating plants, sometimes called *channa*, used in South Africa, such as ***Sclerocarya caffra*** and ***S. schweinfurthiana*** (*ANACARDIACEA*).

I am curious just how many of the ***Mesembryanthemums*** actually were or are referred to by the same common names of "*channa*" or "*kanna*". The genus ***Mesembryanthemum*** is but one of many genera of Aizoceous plants known more generally as *Mesembryanthemums* (the plural is more properly *Mesembryanthema* but this is rarely used) or 'mesembs'. Many still refer to these members of the AIZOACEAE as the MESEMBRYANTHEMACEAE.

EMBODEN 1972, page 31, shows the two species, ***Sceletium expansum*** and ***Sceletium tortuosum***, as depicted in two 18th century wood-cuts.

Comparison of the woodcuts included by Emboden with photographs or watercolors of the ***Sceletiums*** show considerable differences. The plants depicted by Emboden both more closely resemble a number of ***Delospermas*** such as ***D. acuminatum***, ***D. tradescantioides*** and other sprawling species of ***Delospermas***, more than they resemble any species of ***Nananthus***.

EMBODEN describes the practice of pulverizing whole plants of ***Nananthus albinotus*** ("*S' Keng-Keng*") to use as a hallucinogenic additive to smoking tobacco or snuff.

This name and practice is or was evidently present among "*a number of South African tribesmen, especially among the Old Griquas*" (a people widely renown for their extensive and effective knowledge of medicinal plants, unfortunately now largely lost).

Nananthus albinotus, now known as ***Rabeia albinota***, also resembles many of the ***Delospermas***, i.e. the lower growing clump forming species (as well as many other Aizoceous members), which also tested positive for 5-MeO-DMT and/or DMT. In some cases, such as 5-MeO-DMT observed in ***Delosperma britteniae***, they assayed positive quite strongly.

Almost all ***Nananthus*** and ***Rabeia*** species that have been tested to date, including ***Rabeia albinota***, have shown no targeted tryptamines present at levels we could detect. The lone exception to this was the observance of trace amounts of DMT during a November 1995 assay of ***Nananthus aloides***.

It is curious that many of the active ***Delospermas*** resemble both the ***Sceletiums*** and ***Nananthus albinotus***.

The identity of the original *channa* may or may not be known but perhaps it might be worth considering the species of ***Delospermas***, or other Aizoceous and as yet unanalyzed plants, that contain DMT, 5-MeO-DMT, and/or possibly other active compounds as candidates for this intriguing drug.

Chemical analysis of a far broader spectrum of the *AIZOACEAE* is in order **[Note 4]**.

Certainly smoking and snuffing are not uncommon forms of ingestion of DMT (or 5-MeO-DMT), although smoking is not presently the predominate means of administration except in Western societies.

It has been occasionally observed in native cultures with the smoking of ***Virola sebifera*** resin or bark and also with the seeds of ***Anadenanthera peregrina*** and the seeds/pods of ***Anadenanthera colubrina*** var. ***cebil***. Interestingly this last instance appears to predate snuff usage and apparently was largely replaced by it.

Smoking is a frequent form of ingestion of the free base of both alkaloids in modern cultures worldwide. While the smoking of *B. caapi* bark and/or leaf, *Virola sebifera* bark and also *Anadenanthera* seeds/pods have all been reported by anthropologists, this has not been the predominate route of ingestion among most of the people who use them.

Snuffing of DMT and/or 5-MeO-DMT plants has been widespread and is more common in native cultures of the Caribbean and throughout parts of South America. It has seemingly been this way since fairly ancient times. Interestingly the smoking of tryptamine containing *Anadenanthera* seeds predated snuffs in N. Chile/Argentina and is still practiced by a few groups.

The oral mode of *channa* ingestion, on the surface, casts doubts concerning DMT being an active component. Whether DMT is active via a retained quid remains to be seen.

It is unknown whether there was additional additives which were not mentioned, such as other plants or a strongly basic ash to facilitate the liberation of the free base and absorption by the mucous membranes when snuffed or retained in the mouth. Activity or interactions of other co-occurring plant alkaloids is also not known.

While DMT is not normally orally active without the presence of an MAO inhibitor, such as is found in *ayahuasca*, there are at least two notable exceptions. One is the use of ***Virola*** resin as "*orally ingested*" pellets (thought by Dr. McKenna and associates to be orally active due to the presence of MAO inhibiting methylenedioxy substituted lignins but later determined by Ott to be intended for buccal absorption and held in the mouth rather than swallowed) the other is the ancient drink, *vinho da jurema*, prepared as an infusion of the roots of ***Mimosa hostilis*** **[Note 5].**

We do not have a shred of hard evidence but, as Emboden did, must wonder if perhaps "*Channa*" or " *S' Keng Keng*" were only similar to those depicted.and were instead some other member of the voluminous *AIZOACEAE* (JACOBSEN included descriptions for 122 genera and ~2500 species). SMITH *et al.* 1996 estimated that, of the described species of Mesembs, less than 0.04% of them have ever seen analysis of any sort. Clearly the field is ripe for development.

We know DMT (or perhaps 5-MeO-DMT) containing *Delospermas* exist, there may also be additional potentially active Aizoceous plants (or alkaloids) capable of inducing a hallucinogenic state.

I think, Lewin's description of *kanna* as a pleasant, mirthful and colorful intoxication followed by unconsciousness and delirium when taken to excess, certainly approximately parallels native usage of other tryptamines, such as snuff usage in South America **[Note 6]** and on the surface suggests DMT containing members of the *AIZOACEAE* as, at least, plausible candidates for consideration as native intoxicants. This assumption could of course simply reflect some sort of cultural bias or biases on the part of the author and the people employing them are using and experiencing these plants from within an entirely different ontology.

It appears just as likely that the *Delospermas* may have never been used entheogenically by native people and the finding of DMT in plants physically similar to *channa* merely fortuitous.

The dried material and purified isolates of *channa* do in fact appear to be strongly active.

SMITH *et al*. 1998 evaluated the claims that drying at 80°C or fermentation was essential for activity. He found that it did not simply serve to reduce the oxalic acid content as had been previously conjectured but also produced a substantial shift in the actual alkaloid profile. (As detailed above, the traditional prep produced the best results.)

More work is clearly in order to better understand the pharmacology of *channa*.

We have come across only one solid reference to *Delospermas* being used in folk medicine. WATT & BREYER-

BRANDWIJK 1962 include ***Delosperma herbeum*** N.E.Br. as being given by the Tswana in the form of a root decoction and the powdered plant then being rubbed into scarifications, made over the vertebral joints, to make the "climacteric" strong and resistant to witchcraft. One other possible reference to a *Delosperma* species (***D. mahonii***) can be found in our discussion on other Aizoceous plants below.

[According to HARGREAVES 1998, COLE 1995 believes that *lemelanthufe* is possibly a local name used for *Delosperma* in Botswana.]

Delosperma cooperi also enters into preparation of the alcoholic drink *khadi* [also spelled *kadi* or *kgadi*] [**Note 7:** see also HARGREAVES 1998 & 1999] While it appears to be used as a source of fermentation organisms, its potential for pharmacological contribution cannot be dismissed without study. Interestingly despite the roots being a good source of fermentation organisms it is said to be the leaves which are used in making *khadi*. According to HARGREAVES this species was said, by DIETERLAN, to be used for beer making among the Bantu and by Europeans for a yeast source **[Note 8]**. [It should be added that this fermentation may actually be due to (1 or 2) fungus species known to convert sugar to oxalic acid; hence the dangerous reputation of this practice]

To further complicate the picture is the evidence suggesting there may be a seasonal fluctuation in alkaloid content. This has been noted to have been reported in other Mesembs according to SMITH *et al.* 1996 and was also suggested by the variable results we obtained during Johnny's tlc studies.

Unfortunately, much of the traditions and herbal knowledge of local African peoples has been lost or destroyed during acculturation **[Note 9]**. We may never know for certain the complete identities of the tantalizing entheogens known as *Channa* and *S' Keng Keng*.

We have attempted to assay as many of the ***Delospermas*** as we could locate and obtain assayable biomass from (140 species are included in JACOBSEN and many more are said to exist). We also set out to sample a number of ***Rabeia*** (7 described species - *Rabeia albinota* being the type) and ***Nananthus*** (9 are described) species for assay.

We have not yet exhausted the commercially available species. In the case of ***Delosperma*** we have made a little headway. Considering we have neither outside funding or support, all individuals involved freely contributing their time, materials and energy, nor have we received any compensation (beyond personal satisfaction) from these assays, we are pleased and satisfied with our preliminary results. Our exploration has been for the joy of doing it.

What was accomplished was as a small group of ordinary individuals with no established acceptance or funding. If a professional lab had even a small degree of resources or interest they could have expanded what we have done many times over and done so in a way that was actually meaningful.

***Delosperma britteniae*? Coegakop**

Descriptions of *Delospermas* mentioned in positive assays

Delosperma descriptions were adapted from JACOBSEN 1960 but also contain observations of plants grown for assay purposes

Delosperma = Ectotropsis = Schoenlandia

Delosperma comes from the Greek; *Delos* meaning "visible" and *Sperma* "Seed". [This is in reference to the seeds which lie visibly exposed in the seedpods (when they are wet).]

Delosperma acuminatum L.BOL.

Originally collected from Cape Province: Albany Division, near Grahamstown.

It forms a 20 cm. tall erect glabrous shrub with stiff branches which tend to be prostrate in cultivated specimens. Roots are tuberous and can reach 20 cm. The pale glaucous green leaves are acuminate and sharply keeled. The upper surface is flat and the sides rounded. They are borne erect and can reach 35 mm. in length; being 5 mm wide and long. Flowers are coppery-red and 2 cm. in diameter. Smaller in heat stressed plants.

Our specimens were described as ***Delosperma acuminatum*** **Alicedale** and have done very well as hanging baskets.

Delosperma brittenae (L.BOL.)

Originally collected in the Cape Province: Albany Division, "*rocks between Hamilton Reservoir and Bay Road, near Grahamstown.*"

This is a low growing succulent forming a glabrous shrub with stem 3 cm. thick at the base. The branches and branchlets are crowded and elongated. Internodes are not visible and rarely elongated.

Leaves are erect, keeled and dull glaucous with a firm texture. Some of ours have a distinctly bluish color. Leaves are acute and mucronate with the sides convex and the upper surface flattened. They reach 3 cm. in length and 7 mm. wide and thick, with a 4 mm long sheath. Pedicels are 15 mm long.

The solitary white flowers can reach 38 mm in diameter.

Ours show a distinct tendency to form shallow splits and line like scars on the leaves when exposed to too much sun.

Our specimens were labeled ***Delosperma britteniae***? **Coegakop**

Delosperma cooperi (HOOK. f.) L.BOL.

Originally collected in the Orange Free State.

This is a sprawling, freely branching subshrub with bright green glacous leaves. Internodes on the branches are shorter than the leaves. The leaves are spreading, bent or recurved inwards, linear and cylindrical with a slightly flattened top. They narrow somewhat towards the tip and appear striped with grey-green due to irregular papillae arranged in longitudinal lines. The leaves are up to 55 mm. long and are 6 mm. wide and 5 thick. Pedicels are 2 cm. long. Flowers are borne terminally; occasionally single but usually in groups of 3 to 7. They are silken purple and 4.5 to 5 cm. in diameter. Most we have seen are more pink than purple. This plant is said to be hardy to 10 degrees F. We have seen them die in the mid 20's.

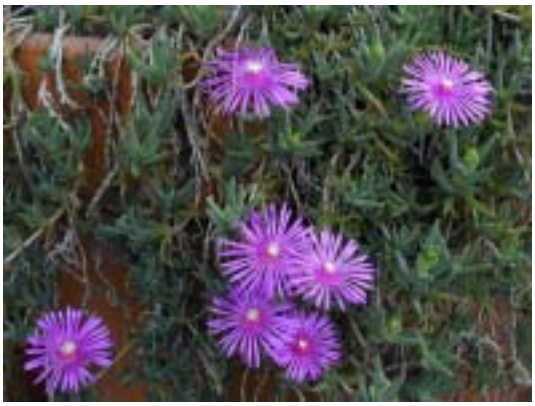
This species is incredibly hardy if the bulk of its mass can be prevented from contacting soil via the use of rocks, gravel, bark mulch or other approaches.

It is one of the few plants in our area that deer will not devour. Slugs will annihilate it if kept overly damp.

They can easily spread to cover a meter wide circle within several years. This one loves lots of sun.

A number of seed companies offer this species. Seeds and plants are readily available through many nurseries and hardware stores with a garden department. (We have found mislabeled plants sold as *Delosperma cooperi*.)

Our samples for assay have come from several commercial suppliers. The discrepancies in alkaloid production we have observed, occurred within given plants when assayed over a period of time and have generally seemed to reflect their source of origin.



Delosperma ecklonis (SALM.) SCHWANT.

Originally described from the Cape Province: on the Zwartkops River.

This small plant is very free growing with slender prostrate branches which are covered with fine white hairs when young. The branches root readily if they contact soil.

The leaves are close together, growing either erect or spreading horizontally and recurved. They are flat-compressed and connate at the base. They grow three angled, tapering and end in a short point. The upper side is wider and grooved towards the base. The leaves can reach 2.5 to 3.5 cm long. They are covered with fine papillae and soft hairs and are light green unless kept in a sunny position in which they turn reddish purple.

They produce small white flowers (16 mm in diameter) with short stalks.

Delosperma esterhuyseniae

We still need to locate a description of this enchanting dwarf. Our's flowered white.

Our specimens were provided as ***Delosperma esterhuyseniae*** **Adamskraal**

Delosperma halli

We still need to locate a description.

Our specimens were sold as ***Delosperma hallii*** **Namusberge** They were said to have striking pink flowers. Ours have flowered only briefly and occasionally. They were very nice.

Delosperma harazianum

We still need to locate a description.

We have assayed two forms to date. They were sold as:

Delosperma harazianum **Audhali Plateau, Yemen** Tiny grey leaves

Delosperma harazianum **Shibam** Shorter leaves, better flowers

Both are beautiful little clump formers with small flowers.

Delosperma hirtum (N.E.BR.) SCHWANT.

Originally collected in the Eastern Cape Province.

We still need to locate a description of this one. Our supplier describes it as resembling a slender *sutherlandii*, with fine summer blooms and deciduous leaves.

Delosperma litorale (KENSIT) L.BOL.

Collected from Cape Province: Mossel Bay, on the shore near the town and extending eastwards from the Cape Division along the coast as far as Port Elizabeth.

This grows as a prostrate loosely branched herb. While creeping in habit it does not send out roots unless buried in soil. The stems are elongated, dainty and pale, reaching 35 cm in length. The internodes are from 24 to 50 mm long.

Its leaves are somewhat connate and inclined. Young leaves are three-angled, subfalcate and laterally compressed.

Delosperma cooperi

The edges are bordered with white (the edges of ours were tinged in pink), elongated, narrowed toward the base and acute at the end. The upper surface is almost flat. They are blue and mucronate; reaching 25-30 mm in length and 5-6 mm thick.

Pedicels are 5-17 mm long and have two bracts.

White flowers, usually in groups of three.

Our specimens were described as *aff*. ***litorale*** St. Francis Bay.

Delosperma nubigenum (SCHLTR.) L.BOL.

From the South-East Cape Province in the Orange Free State, in the cleft of rocks on the top of "Mont aux Sources" at 3200 m.

This low decumbent sub-shrub has ascendant, roundish and papillose stems. The leaves are "standing off or erect standing off" and are elongate or elongate-elliptical, acute and narrowed towards the ends or else the leaves are linear and papillose.

They bear orange red flowers at the end of the stems. They are two cm in diameter and have short stalks.

Our plants used for assay were purchased at a local hardware store. They conformed to both published descriptions and photographs.

Delosperma lydenburgense L.BOL.

Originally found in the Transvaal: Lydenberg.

This plant is glabrous, loosely ramose and herbaceous in habit. Older branches are 20 cm. long and 4 mm. in diameter, internodes are 3-3.5 cm long. The herbaceous parts of the plant are minutely papillate.

The leaves are soft and linear when viewed from above. They are flat to grooved, narrowed, acute and have an obscure keel on the back when young. They grow 3.5-5.5 cm. long, 2-5 mm wide and 2-3 mm in diameter.

It bears flowers as groups of 2 to 3 in loose inflorescence which are 3 cm. tall and 10 cm. wide. Pedicels are 1-2 cm. long. The flowers themselves are 2-2.5 cm in diameter and purplish in color.

Our plants were said to have large pink purple flowers and hardy to the mid teens. We have found them hardy only into the low 20's in Central Texas.

Delosperma pageanum (L.BOL.) L.BOL.

Originally found in the Cape Province: southwest region, Montagu Division, near Montagu Baths.

This grows erect as a 26 cm. shrub, with a stem that can be over 3 mm. thick at the base. The stem is glabrous and branching and has pale skin becoming papery with a slightly hairy appearance on older branches. Internodes are 1 cm. long.

Leaves are spreading and cylindrical, and gradually taper to a blunt end. They are finely papillose with the papillae being ciliate with fine white hairs and a little connate at the base. They are 10-15 mm. long and 2 or 3 mm. thick. They are soft and a bright light green. Pedicels are 17 mm.. long. It has purple flowers; 16 mm. in diameter.

Delosperma tradescantioidesXbosseranum

Delosperma pergamentaceum L.BOL.

From the Cape Province: L. Namaqualand, Richersveld, hill 1 mile west of Arris Drift, Aneesfontein, Sendlingsdrift, Pokkiespram.

A glabrous shrub growing to 30 cm. tall with an elongated stem in young plants, 5 mm. thick at the tip. The branches are crowded densely and leafed with 4-6 leaves in a group. It forms floral branches up to 5 cm. long.

The leaves are spreading to ascending, obtusely keeled with the top surface flat and the sides flat or slightly convex. There are other (older?) leaves which are flat or convex, laterally compressed, narrowed towards the tip in profile, the tip itself being rounded to oblique or somewhat truncate and connate at the base. Sheath is 6 mm. long, pale blue and tinged with purple. Older leaves are vellum like, 7 cm. long and 16 mm. wide. Younger leaves are 4 cm. long, 8 mm. wide at the base, 2 mm. wide below the apex, 7 to 8 mm. thick at the base and 13-14 mm. thick at the tip. The pedicels are 18 mm. long. They flower as solitary white flowers 44 mm. in diameter.

Our specimens were furnished as ***Delosperma pergamentaceum*** **Numees** [said to need a genus, later said = ***Hartmanthus*** (we have been unable to locate this name)] and ***Delosperma pergamentaceum*** **Rooilepel** white or pink flowers

Delosperma tradescantioides Said to be great for hanging baskets. White flowers and, for a *Delosperma*, unusual leaves.. Freely rooting and fast growing.

Delosperma tradescantioides

Cultivation of the *Delosperma* species

Delospermas require barely damp soil with slightly damp but drying surface conditions on a regular basis. While rot prone if overly wet, they enjoy being misted every day when hot. *Delospermas* should be well watered only when they show visible signs of wilting. They love frequent light mistings and while not liking soggy conditions, do not like to be in totally dry soil.

Their main period of growth and flowering, in the US, is during the summer. They should not ever be allowed to become excessively dry during their growth period. During the winter they should not be watered except for an occasional misting. Most do not need winter protection unless rain is abundant. We have seen multiple species freeze solid with ice forcing otherwise prostrate branches into upright rigid poses then recovering with no problems. It should be added that there are some freeze sensitive species.

Some are suited for coastal plantings while others prefer an arid but cool mountain environment. Most grow in very rocky areas with frequent mist or dew.

An excellent method of maintaining soil moisture while decreasing the risk of overwatering was presented by JACOBSEN.

He suggests the use of a staging with provisions for drainage (a raised plant table with walls for creating a permanent bed) upon which is placed a thick layer of gravel, coke, lava rock or cinders. The plants, each in individual clay pots, are placed on this layer and the level of gravel is then brought to the top of the pots.

A top layer of various small rocks or gravel is then added to the individual pots themselves to accentuate the natural mimicry of these succulents, enhance the visual presentation and decrease surface evaporation of moisture.

This approach protects the pots from direct sun exposure. The rocks help retain heat and moisture, prevent drying out of the soil and help to avoid overwatering by establishing excellent drainage.

The plants, especially the shrubby *Delospermas* will send roots out of the bottoms of their pots seeking moisture in the gravel bed. When repotting such plants, the clay pots should be broken free of the plant to avoid damage to the roots. If growth is too extensive it may be preferable to make and root cuttings rather than transplant overgrown plants and disturb their neighbors.

Dead roots should be removed when replanting to avoid rotting problems. Dead branches on actively growing plants should also be removed.

They need a very mineral rich soil with **perfect** drainage. Jacobsen recommends adding coke or brick rubble to the soil. We have not had good results with this. They have done best for us when placed in a normal, fairly rich, cactus soil. Some of the smaller clumping forms do better if more rock is added. We have had success using a mixture of limestone and igneous gravel.

All *Delospermas* are sensitive to soil compaction in culture. Potted plants should be checked at least once a year and the old soil removed or replaced if it has compacted into a hard mass. (This is almost certain death for most *Delospermas*.) Soil must remain loose, friable and readily accept water. For all of these reasons we would discourage the use of peat moss, fine sand, loam or clays except as minor soil additives due to their bad setting and/or packing tendencies. Peat has a further undesirable tendency to not accept water once it has dried.

Jacobsen considers "*old weathered loam*" to be an essential soil additive. He suggests:

3 parts old compost or leaf mould.
1 part well rotted manure
1 part old weathered loam
1 part crushed brick and brick dust (we suggest limestone gravel, mixed with powdered gypsum and dolomite)
6 parts clean, sharp sand (all fine sand removed)

Delospermas usually have fairly small flowers that sometimes look as if they were made from pieces of straw with an almost metallic luster in vivid shades of red or violet. Others have small white flowers. Many species flower abundantly and freely.

There are two main types. One is bushy, occasionally sprawling, and the other growing along the ground in a more compact form. Some of the latter form compact clumps with thickened leaves and resemble other, more famous and widely cultivated *Mesembryanthemums*.

The bushy ones root well from cuttings being taken and simply stuck directly into soil. They do not require callusing prior to planting but it may be advantageous if a more succulent species is being rooted. As with all succulents, water sparingly and cautiously until well rooted. *Delospermas* wilt severely when rooting or when shipped through the mail. Normally, with misting and bright light (no direct sun) they recover rapidly.

While they can handle full sun in most cases and some such as *D. cooperi* and *D. lydenbergense*, are said to be able to take freezing temperatures, into the low teens, they fare better for us when given full sun for only part of the day. It is generally recommended that watering be tapered off before winter arrives and that they be allowed to go through winter with only ambient moisture (unless excessive). Indoor maintained plants seemed to suffer from dry heated air and required misting to maintain health. Enclosure in a humidity tent was tolerated only with adequate ventilation.

Excessive heat stresses them and better results might be observed in a summer cooled greenhouse.

Some, such as *D. cooperi*, did best when their smaller pots were clustered inside the top of other larger potted plants. These larger pots were 10 to 20 gallons in size and held such plants as *Acacia maidenii*, *Acacia auriculiformis*, *Adenanthera pavonia*, *Albizia procera*, Chili pequins (*Capsicum annuum* var. *aviculare*), *Zizyphus jujube* or other light filtering plants. They seemed very happy to grow at their base and spilled over the edges of the larger pots in attractive dripping masses. (*D. cooperi* has a wonderful texture to the skin which makes them look very much like aggregates of bright green lizard tails.)

Delosperma cooperi also thrives in rock gardens or on slopes where the body of the plant can grow out onto or over a large rock. Many Delospermas do well this way and

it is becoming a common practice in xeriscapes to plant Delospermas in areas where the body can sprawl across rock covered areas. Some are said to do very well in Aspen, Co.

Thin stalked, thin leafed types such as *D. acuminatum* did best for us when grown in baskets as hanging plants. These develop tuberous roots and need some room.

In some *Delospermas*, even in some of the lower growing miniatures, there is formation of a substantial tuber or tubers. These need adequate room for the tuber to grow and spread in order for the plants to be happy. They will need either periodic 'bumping-up' or division, deep narrow pots or else planting in a raised sloped deep bed.

Natural propagation is primarily from seeds being washed from their capsules by rain. The seed capsules open to release seeds only when wet, and the rain abundant enough to wash the seeds out, and close again when dry. This ingenious mechanism ensures that the release of seeds will accompany moisture and good germinating conditions.

***Delosperma britteniae*? Coogekop**
Seed pod closed when dry (Above)
Seed pods opens when wet enough (Below)

It is not uncommon to find many small seedlings in the pots with mature adults.

They grow quickly and easily from seed. Treat them and their small seeds like finely seeded cactus with slightly higher moisture requirements.

Delospermas are more prone to indoor problems such as black-flies and other insects with plant parasite larvae than most cacti. Unless these are kept controlled they will devastate *Delosperma* seedlings.

We have also lost some plants to a yellow soil fungus or mold. We plan to address this problem in the future by use of a systemic fungicide. Most of our plants were unaffected. The plants which were hit the worst were the commercially obtained *Delospermas* (mainly *D. cooperi*) which had been sold potted in a high bark mulch soil mix. Any of these which were allowed to dry out completely during winter died. Those which remained with the rest of our plants (trees and shrubs) and which consequently stayed slightly damp were fine without exception.

Slugs and grasshoppers can also be problems. Slugs and snail can be controlled with snail bait or beer traps (see under cultivation of cacti: pests). Grasshoppers can be minimized by yearly applications of beneficial nematodes to the surrounding areas. These nematodes are distributed by spraying in solution onto moist soil. They destroy the young of the grasshoppers while still in the ground. They are commercially available in springtime.

A few species have been repeatedly & aggresively targeted by mealy bugs. After ineffectivenss of other products I finally resorted to solving the problem by applying the systemic insecticide Merit.

Jacobsen suggests that wire netting be used in outdoor plantings to protect the plants from birds. We have never had a problem with birds. On the other hand we HAVE had a problem with thick plantings of ***D. cooperi*** becoming a favorite resting spot of cats on hot days, apparently due to their cool cushioning. They do not usually survive being crushed this way.

Rotting and wet wilting indicate watering needs to be cut back. Discontinue watering entirely but continue with light daily misting until health returns.

Occasionally a dry rot will attack the roots of these plants. Its cause is not known but presumed to be bacterial in origin. We have no idea how to cure it but have only lost a few plants to this. Any suspicious and less than healthy roots encountered when transplanting should be removed along with the soil surrounding them. Our standard approach to any indeterminate problem like this is to try freshly mixed Chinosol.

Several molds and a yeast were found in association with roots of (probable) ***Delosperma mahonii***, which, for this reason, is sometimes used as a fermenting agent for brewing or bread making. [See earlier comments conerning *D. cooperi*] It is said by Watt and Breyer Brandwijk to be dangerous due to the high oxalic acid content. It contains the equivalent of 3% oxalic acid. One of the molds produced large amounts of oxalic acid when cultured in a sugar solution. Other Aizoceous members are used similarly. [The presence of oxalic acid in any decent quantity could present problems during alkaloid extraction depending on the route chosen.]

There was a definite fermentation with bubbling observed in any decent sized (several grams or larger) ***Delosperma*** sample being dried at RT or 110° F. We have performed no elucidation of the organisms involved. Whether they are involved with either the presence of the alkaloids discussed or with our difficulty in obtaining a good isolation for characterization remains to be seen. The high salt content is said by some to be an obstacle in good isolations. It should be possible to deal with the high salt content using column chromatography similar to the approach used by CHARALAMPOUS *et al.* for isolating mescaline from urine or by the use of Porapak Q.

See "*Useful Manipulations of Mescaline and other Peyote Alkaloids*." in *Sacred Cacti* or the appropriate section in TN# FS-X7 *Some Simple Tryptamines* concerning DMT isolation procedures, by Trout and Friends. Substitute ammoniacal methanol for ammoniacal ethanol if using Charalampous' procedure.

See also the physical data section of **FS-X7 (*Some Simple Tryptamines*)** for more approaches and solvents.

Delosperma species in which we have detected the tentative presence of DMT and/or 5-MeO-DMT

(Based on co-tlc with known reference standards and color reactions with Ehrlich's reagent and/or 0.1% xanthydrol.)

Nearly all samples testing positive also had additional Ehrlich reactive compounds present. In some samples, at least 3 or 4. Identities of most are unknown at present. As is the potential presence of other bioactive alkaloids. We have tentatively identified one as the inactive N-Methyltryptamine (MMT) based on co-tlc with plants known to contain MMT and DMT.

All TLC was kindly performed by J.APPLESEED. All *Delosperma* species were commercially obtained and reference samples of the positive testing material and living plants (whenever possible) are being maintained.

Unless noted, all *Delosperma* samples were of leaves and branches. All samples assayed after plates #88 and 89 were dried before sending off for assay. Most were 2 to 2-1/2 gram samples (dry wt.) unless plant growth did not allow this much harvest. Some were much smaller. All of the samples used for plates 88 and 89 (Spring 1994 Assay) were far smaller **and** used fresh wet material from dormant plants.

In the 1994 Spring samplings we had used Ehrlich's reagent and commercially obtained *Psychotria viridis* leaf isolate as a reference standard. The reference standard showed a very nice DMT band with one additional weaker band present at a lower Rf. In this assay, all *Delosperma* spp. showed no banding; indicating no alkaloid to be present at levels our assay was capable of detecting. Our small sample size may have contributed to this but it could also be that alkaloids were lacking in the material.

A sample of *D. cooperi* harvested around the same time of year showed NO DMT or 5-MeO-DMT in GC performed by Sasha SHULGIN. He did detect the presence of an unidentified alkaloid or alkaloids. Whether this suggests that there is seasonal fluctuations, different chemical 'races' of *D. cooperi* or something else is presently unknown to us. Work is slowly ongoing.

[Rf is the relative ratio of the distance the alkaloid migrated as compared to the distance that the solvent front traveled.]

***Delosperma acuminatum* Alicedale** No alkaloids were observed in our early spring 1994 assays. 7 separate assays of samples taken during September, November and December of 1994 and 1995, showed a band to be present at DMT Rf. Usually the DMT bands were quite large and/or dark with the exception of a faint band seen in our 2 Sept. sample. In our 2 November 1995 assay we observed a large and dark band corresponding to both DMT and 5-MeO-DMT. We had previously observed smaller amounts of 5-MeO-DMT in May and summer samplings during 1995 (DMT was apparently absent).

***Delosperma britteniae*? Coogakop** A very nice dark blue 5-MeO band was seen in our 2 November 1995 tlc. No alkaloids had been observed in our early spring 1994 assay.

Delosperma cooperi Our initial early spring 1994 assay showed no alkaloid. May and summer 1995 both showed a nice 5-MeO-DMT band (we ran the May sample twice). Plants purchased via mail order had a much darker 5-MeO-DMT band, in the May assay, than those locally obtained at a hardware store. Both showed the presence of 5-MeO-DMT. Assays from September and December 1994 had shown the presence of DMT. Our early November 1995 tlc of these plants showed both DMT and 5-MeO-DMT present. Assays were done using both commercial plants and plants we grew from seed. Commercial plant material tested by Sasha showed no DMT in GC-MS.

Delosperma ecklonis A purple DMT band was seen in our 2 Nov. 1995 assays.

Delosperma esterhuyseniae Faint purple DMT band was seen in our 2 Nov. 1995 assays.

Delosperma hallii A dark blue 5-MeO-DMT band was seen in our 2 Nov. 1995 assays.

Delosperma harazianum A dark blue and purple band corresponding to DMT and 5-MeO-DMT was visible in our 2 November 1995 tlc.

***Delosperma harazianum* Shibam** A faint purple DMT band was seen in our 2 November assay 1995.

Delosperma hirtum A weak DMT band was seen in November and December assays and none in spring.

***Delosperma aff. litorale* St. Francis Bay** A nice blue 5-MeO-DMT band was seen in our 2 Nov. 1995 assay. No alkaloid was observed in early spring 1994 testing.

Delosperma lydenbergense 26 Nov. 94 A good DMT band was seen in our 26 Nov. 1994 testing and no alkaloids observed in spring 1994 assay.

Delosperma nubigenum A weak 5-MeO-DMT band was seen in May 1995 testing.

Delosperma pageanum DMT was suspected in 5 Dec. 1994 but utilized only Ehrlichs reagent. Traces of 5-MeO-DMT were observed the following November. A good 5-MeO-DMT band was present in May 1995.

Delosperma pergamentaceum Numees Traces of DMT observed in November but not in May.

Delosperma tradescantioides DMT has been observed in small amounts in November assays.

Summary of our Preliminary Results

Our (Appleseed & Trout) first year of assays did not use xanthydrol so we were unable to distinguish DMT from 5-MeO-DMT. The two alkaloids chromatograph at the same Rf in the tlc system used for the assays. There may have been additional positives for 5-MeO-DMT co-occurring with DMT that were not noticed. As sequential assays were performed on nearly all positive testing material, it is unlikely we confused DMT as 5-MeO-DMT. (with the exception of listing DMT in *D. pageanum* using Ehrlich's. This probably was 5-MeO-DMT.)

5-MeO-DMT

(Using Xanthydrol)

Delosperma acuminatum May assay. Faint in Nov. assay Dark blue and purple band corresponding to DMT and 5-MeO-DMT

Delosperma brittenae Nov. assay. Very nice dark band

Delosperma cooperi May assay (two sources) also in Nov. assay. 3 positives total

Delosperma hallii Nov. assay. Dark band

Delosperma harazianum **Audhali Plateau, Yemen** Nov. assay. Dark band

Delosperma litorale Nov. assay. Dark band

Delosperma nubigenum 9 May 1995 Weak band

Delosperma pageanum (Same plant tested Christmas 1994) May and Nov. assay. Faint in Nov. Good in May

DMT

Delosperma acuminatum Sept., Nov. and Dec. 5 positive assays over a 15 month period. (Xanthydrol-1 and Ehrlich's-4) Not observed in May assay

Delosperma cooperi Sept., Nov. and Dec. assays. 3 positives (Xanthydrol-1 and Ehrlich's-2)

Delosperma ecklonis Nov. assays (2, one year apart) (Ehrlich's and Xanthydrol) The first time it was erroneously thought to be lydenbergense

Delosperma esterhuyseniae Nov. assay. Faint (Xanthydrol).

Delosperma harazianum **Audhali Plateau, Yemen** Nov. assay (Xanthydrol)

Delosperma harazianum **Shibam** Nov. assay. Faint band (Xanthydrol)

Delosperma hirtum Nov. and Dec. assays. Weak band (Xanthydrol and Ehrlich's)

Delosperma pageanum Dec. assay Good DMT (or 5-MeO-DMT?) band (Ehrlich's)

Delosperma pergamentaceum Numees Nov. assay faint band (not present in May assay) (Xanthydrol)

Delosperma tradescantioides Nov. assay Faint band (Ehrlich's)

MMT

(All instances of suspected MMT occurrence lacked a good reference standard and relied on the presence of a band which was supposed to be MMT. The supposition was based on its presence in other assayed samples of plants known to at least sometimes contain MMT. (such as *Acacia maidenii* stem-bark, *Desmanthus illinoensis* root bark and *Psychotria viridis* leaf.)

Delosperma acuminatum Faint. Sept. and Nov. assays. (Ehrlich's)

Delosperma brittenae Nov. assay (Xanthydrol)

Delosperma cooperi Sept. and Nov. assays. (Ehrlich's and Xanthydrol)

Delosperma esterhuyseniae Nov. assay (Xanthydrol)

Delosperma hallii Nov. assay (Xanthydrol)

Delosperma harazianum **Audhali Plateau, Yemen** Nov. assay showed traces (Xanthydrol)

Delosperma hirtum Nov. assay showed traces (Xanthydrol)

Delosperma klinghardtianum Nov. and Dec. assays. (Xanthydrol and Ehrlich's)

Delosperma litorale Nov. assay. (Xanthydrol)

Delosperma pageanum (Same plant tested Christmas 1994) 2 Nov. 1995. Dark band (Xanthydrol)

Delosperma pageanum Dec. assay (Ehrlich's)

Delosperma tradescantioides Nov. assay. (Ehrlich's)

Delospermas are mostly water. Water content was determined to be 95% by weight in young *D. cooperi*. This means that a kilogram of fresh plants will yield 50 grams of dry material. Intact leaves and pieces of leaves retain water so well that even if they are heated at 110° for several days they will not dry appreciably. Only if chopped finely or crushed will they dry readily.

Only a few of the *Delosperma* species that we have assayed showed DMT or 5-MeO-DMT to be present in any substantial amount. Since there often are other unidentified alkaloids present as well as the well-known potential for dangerous substances including substantial amounts of oxalic acid we would discourage random bioassay.

Our assay is targeted specifically at tryptamines so ***many*** other substances could also be present which we did not detect.

Since we have not yet performed isolation and characterization of the suspected alkaloids we must stress that our observations should be considered strong indications of their probable presence rather than proof of their presence.

Appleseed's General Assay Procedure

Samples extracted by simmering 2 hours in hot aqueous hydrochloric acid (pH 3) and allowing to cool for 12 hours before basifying with concentrated ammonia and extracting with methylene chloride.

TLC was run on Whatman silica gel 60 plates divided into lanes.

Developing solvent was Methylene chloride-Methanol-Concentrated Ammonia (80:15:1).

Detection was with either Ehrlich's reagent or 0.1% Xanthydrol reagent (0.1 g Xanthydrol in 95 ml EtOH and 5 ml concentrated HCl.

(Tryptamines turn purple and methoxylated tryptamines turn blue with Xanthydrol.)

Reference standards initially used ***Psychotria viridis*** leaf isolate for DMT.

Pure and relatively pure DMT and 5-MeO-DMT were also used as additional reference standards as they were available.

Screening for potential β-carbolines was done using extracts of ***Banisteriopsis caapi*** and/or a mixture of harmine and harmaline isolated from ***Peganum harmala*** (via Hasenfratz's method) as reference standards (using UV to visualize.) We found none.

Other members of the Aizoaceae

Nananthus species and ***Rabeia*** species

Many former *Nananthus* species have been transferred to the Genus *Rabeia*.

Treat like *Delosperma*. Many have thick tuberous roots which must be allowed room in order for the plant to thrive. Most are said to be frost tolerant but we have not shared this experience. They do not like being water logged or being in full sun. They do like some sun and bright light the rest of the time. They do not fare well in either Central Texas' summer heat or winter extremes. In spite of their reputation as lovers of sun and heat, these might be better approached as summer cooled greenhouse plants.

In spite of Emboden's mention of ***Nananthus albinotus*** as being psychoactively employed we must wonder if this was an accurate identification of the actual species used.

With the one minor exception of observing faint traces of DMT in a November 1995 assay of ***Nananthus aloides***, the target alkaloids were not observed in any of the *Nananthus* or *Rabeia* spp. assayed.

Apparently at least *Nananthus wilmaniae* may be employed as a fermentation organism source as HARGREAVES 1998 notes that it has been listed as a *moervygie* ("*yeast mesemb*") by SMITH 1966.

Presence of an occasionally dark non-migrating Ehrlich reactive smear at the origin was frequently observed. Our only assays of *Nananthus albinotus* ie *Rabeia albinota*, showed no target alkaloids present. Our summers are much too hot and our winters too wet and consequently most *Nananthus* and *Rabeia* species did not survive for summer and fall assays, or else their growth did not produce enough material for later assays.

Summary of other Aizoaceous TLC alkaloid screening

Plate #88 Spring 1994:

Nananthus transvaalensis **[Note 10]** No alkaloids observed

Nananthus aff. ***broomii*** No alkaloid observed.

Nananthus aloides No alkaloids observed

Psychotria viridis **standard** Nice DMT band; weaker one of lower Rf present.

Plate #89 Spring 1994:

Rabeia albipunctata (Skinny leafed form) (Non-migrating dark smears at origin) No bands observed in tlc field.

Rabeia albipunctata (Fat leafed form) (same dark smears) No bands observed in tlc field.

Rabeia albipuncta (same dark smears) No bands observed in tlc field.

Rabeia albinota ? **Naudesberg Pass** (same dark smears) No bands observed in tlc field.

Psychotria viridis **standard** Nice DMT band and one lighter of lower Rf.

Plate #91:

Aizoaceae (***Mestoklema*** **sp**.) No alkaloids observed.

Psychotria viridis **standard** Nice dark DMT band and dark one with long horns near origin

Plate #107 Assay 29 July 1994:

All samples in this set except for DMT standard had non-migrating smears at the origin. In the case of many of the *Desmanthus* samples they were very dark and broad. Samples dried at 105°F.

Rabeia albipunctata (whole plant-not in good health) 4 July 94 (Non-migrating faint smears at origin) No alkaloids observed in tlc field.

Psychotria viridis **standard**. Nice DMT band somewhat darker one of low Rf. Very dark smear at origin.

Plate #124 December 1995 Assays:

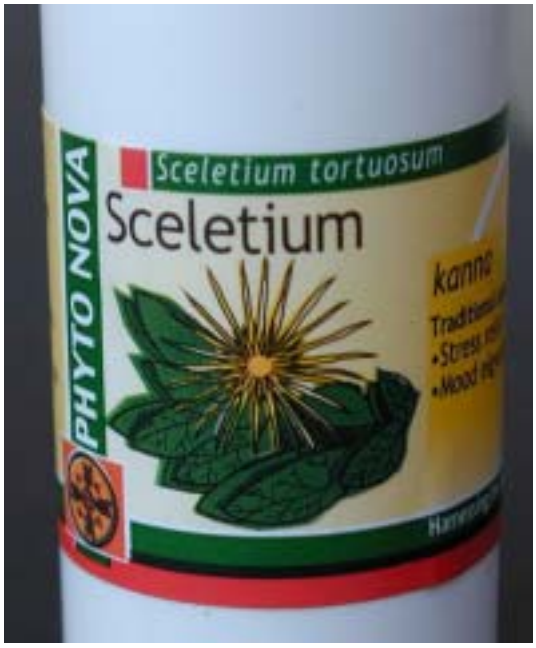
Rabeia albinota Fall 1994 (Sample kept frozen after drying.) No alkaloid observed.

Nananthus aloides 2 Nov. 1995 Faint DMT band and faint ones of higher and lower Rf.

Used pure reference standards and also ***P. viridis*** isolate.

Nananthus albinotus **now** ***Rabeia albinota*** **showing seedpod lower left**

commercial tablets of ***Sceletium tortuosum*** **Marketed as an OTC SSRI**



Some Other Succulents Held to be Sacred, Medicinal or Useful

Monadenium lugardae N.E.Br.

This plant is known as '*Mahumula*' or '*Tshulu*' among the Chopi, and '*Mhlebe*' by both the Swati and Zulu. [Watt & Breyer-Brandwijk 1962]

While not members of the *Aizoaceae*, we decided to include plants such as the Euphorbiaceous *Monadenium* simply because they are succulents and there seemed no better place for them.

Emboden 1972 and Watt & Breyer-Brandwijk 1962 mention that a piece of the root of this plant is chewed and swallowed ("*before a big* '*indaba*' ") to produce visions used for divining and prophetic purposes by the *sangomas*, ritual diviners and oracles of the Piet Retief region of the Eastern Transvaal. Watt & Breyer-Brandwijk 1962 says that in sufficient quantities the roots are believed to produce hallucinations and delirium. They and Watt 1967 state that the plant is widely used as medicine in the Piet Retief area.

Monadenium lugardae **(above)**
Deloserma **sp. Kalkkraal (right)**

Monadenium lugardae is incorporated into a gonorrhea remedy in Portuguese East Africa and said to be poisonous and emetic if taken alone.

It is believed by the Zulu and the Swati that to touch the plant or to lie in its shadow will bring certain and violent death. Watt & Breyer-Brandwijk comment that their informant found this belief so strong that local people refused to believe the plant [that he had collected] was genuine simply because he was able to handle it without harm.

They further mention that the latex from young growth is believed to be anesthetic and used in the ceremony of *throwing the bones*. Plant ash is rubbed into scarifications to relieve pain and is used for rheumatism by the Nyanja.

The eating of the root is said to cause a burning in the mouth & esophagus and to produce rapid death.

There are no alkaloids reported from this species which have been proven or even indicated to be capable of inducing hallucinations. Bioactive components are known; Smith *et al.* 1996 cited Gundidza 1985, 1990 & 1991. Insecticidal activity has been reported; Smith *et al*. 1996 cited Gundidza 1986. Further work is needed.

Watt 1967 suggests ***Monadenium guentheri*** Pax.* (Tanganyika), ***Monadenium heteropodium*** N.E.Br. (Tanganyika), ***Monadenium invenustum*** N.E.Br. (South Africa), and ***Monadenium schubei*** Pax.* (South Africa and Tanganyika) be investigated for similar properties. (All but *M. invenustum* are readily available as ornamental plants.)

Monadenium invenustum is used internally as a leaf decoction, by the Kamba, for "febrile and chest affections"; Watt & Breyer-Brandwijk 1962

Monadenium schubei latex, mixed with food, is used by the Pare in Tanganyika as a mild purgative; Watt & Breyer-Brandwijk 1962

Monadenium lugardae is a very attractive plant with smooth diamond shaped bumps on a green stem. Many times, similar species of *Monadenium* are sold; misrepresented as *M. lugardae*. Most specialist suppliers are aware of the problem and offer the true species. *M. lugardae* is perhaps the most readily available species but a number are in cultivation among collectors.

One 1995 mail-order catalog listed 9 species of *Monadenium* and one additional variety as retail stock.

At least 4 more species are also readily available.

Some examples:

Monadenium heteropodum
Tanganyika 67.0084

Monadenium ritchei

Monadenium schubei

When actively growing and flowering *Monadenium* grows leaves (and small odd flowers) at the top.

Full sun is tolerated but they will do far better with partial sun. They will survive even in low light conditions as house plants but will not grow very much.

Water should be withheld from them when the leaves are absent but during hot weather or whenever leaves are present, they should be watered heavily and as frequently as the soil dries out.

They can often handle light freezes but should be protected from temperatures below 28° F. Most succulent references say protect them below 45° F.

It is best to use a cactus-type soil with excellent drainage but it should be richer than that for most cacti.

Easily grown and propagated. Both clusters of stems and masses of tuberous roots are rapidly formed. Usually growth is fast and they also rapidly form many tuberous roots. Clumps can be root divided; they also root well from cuttings.

Prevent them from becoming root-bound in order to maintain good health. Either place them in a larger pot or break the plant into smaller ones, dividing the roots as you do so. All Euphorbiaceous species with freely bleeding white sap should have the cut ends first rinsed in clean water to remove excess sap and then be allowed to dry long enough for the milk to coagulate before being replanted.

I do not know if the juice is toxic to contact or not. While never having experienced any problems, I would prefer to err on the side of caution and urge you to prevent skin contact with any milky white succulent juice and to promptly wash any that does occur with soap and warm water. *Euphorbia* spp. in particular can be quite toxic and sometimes are also intensely caustic.

As *Monadeniums* resemble other *Euphorbias* and also have freely bleeding white milky sap, I have never judged them safe enough to sample.

I first bought this plant on an urge, unlabeled and unrooted, several years before reading Emboden. Unless finding reliable verified reports of ritual use and a nonlethal dose in humans, I have no plans to bioassay this one.

Monadeniums are very nice plants to have around. Weird and beautiful; they are easily grown. Many commercial suppliers exist. We recommend them highly as an addition to any plant collection.

Euphorbiaceous plants are known or reputed to be, at least occasionally, incorporated as additives, or else used as supplemental additions or even substitutes, to traditional hallucinogenic sacraments.

Plant said to be so used include ***Alchornea castaneifolia*** and ***Hura crepitans*** which are sometimes admixture plants incorporated into ayahuasca.

Pedilanthus tithymaloides finds use as an ingredient in the purported San Pedro brew known as *cimora*. Assorted *Pedilanthus* species are employed in ethnomedicine, added to ayahuasca or else incorporated into the San Pedro brew.

Alchornea floribunda and ***Elaeophorbia drupifera*** **[Note 11]** are associated with Iboga. Some, such as the latter two, are apparently active and used on their own or with each other.

Alchornea latifolia Sw. was shown by Durand *et al*. 1962 to contain the neurotransmitter GABA.

Sebastiania pavonia is rumored to be hallucinogenic. See Schultes & Hofmann 1980 & 1992 and Ott 1993 & 1994 & 1995.

Chemical and pharmacological work are needed. All are probably toxic

Mildbraedia fallax Hutch. is said to be irritant, emetic, purgative, and narcotic by Watt & Breyer-Brandwijk, its active principle is said to be the highly volatile methylamine. Methylamine has also been reported from ***Mercurialis annua*** L.

Euphorbias in general should be considered highly toxic. The milky sap of those such as ***Euphorbia officinarum***, ***E. orabensis*** and ***E. resinifera*** cause serious harm if contacting the eyes or wounds, yet many are used medicinally. See Watt & Breyer-Brandwijk 1962 for a nice discussion of the African Euphorbiaceae. The Moroccan ***Euphorbia resinifera*** is used to produce a resinous gummy exudate when the corners of the stems are notched and the milky sap allowed to bleed and dry. This "*euphorbium*" is a drug known from ancient times as a healing substance and is still employed in veterinary medicine. 'Euphorbium' is similarly obtained from ***E. canariensis*** and ***E. antiquorum***. See Jacobsen 1960

Euphorbia decussata is said by Hargreaves 1998 to be used in making honey-beer. The Korana name for it is *bi:bib* [it is also known as *kirrimoer sikkirie*]. It appears to be used as a fermentation organism source as it is believed to be a "*kareemoer*" plant [*karee*: honey-beer (Khoikhoi) and *moer*: yeast (South African Dutch)] Hargreaves cited Englbrecht 1936 & White et al. 1941. The use of *Euphorbia davyi* in *khadi* making is said to produce a very strong brew. It is known as *tschoo-takhadu* in Botswana. Hargreaves 1998 cited Hargreaves 1993

"Narcotic effects" have been reported (in Ghana and South Africa) from ***Euphorbia convolvuloides*** Hochst., ***Euphorbia helioscopia*** L., ***Euphorbia pubescens*** Vahl. and ***Euphorbia tiruealli*** L.; Watt 1967 refers to: Ainslie 1937, Burtt-Davy 1913, Steyn 1929, Steyn 1933 and Van der Walt & Steyn 1940.

Not all *Euphorbias* are poisonous. ***Euphorbia esculenta*** (from Willowmore, South Africa) is used for cattle fodder. ***Euphorbia hamata*** (from Little Namaqualand) is known by the Afrikaaners as 'Beeskraag' (Oxen's Strength). It is claimed that when these plants are fed to fatigued oxen they are enabled to work as strongly as ever. See Jacobsen 1960.

Numerous Euphorbiaceous plants are used in ethnomedicine.

Euphorbia pennicillata Millsp. finds its roots used as a purgative in Peru. Yacovleff & Herrera 1935

A couple of the Mexican species:

Euphorbia maculata Linn. has its juice applied for ringworm and other skin diseases. It's common name is "*Yerba de la Golodrina*." Holmes 1921

Phyllanthus lathyroides H.B.&K. Leaf decoction is used to wash eye infection. A poultice made from moistened leaves is applied to boils. Leaf tea is used as an emetic. Common name: "*shka-nin-du*" (Mazatec in Mexico). Schultes 1969: page 142.

A variety of medicinal applications are known involving other succulents.

Aloe africana, ***Aloe ferox***, ***Aloe perryi***, ***Aloe succotrina*** and ***Aloe vera*** are perhaps the best known sources for their bitter principle aloin which finds use as a powerful laxative drug. ***Aloe arborescens*** (Barbados Aloe) and ***Aloe vera*** are well known and widely used as a topical burn treatment.

Aloe vera juice, taken internally, is also widely used in folk medicine for treating ulcers and gastroenteritis. Its active principle acemannan has been approved by the FDA for veterinary use (injected) to help localize and nodulate tumors to make them easier to remove surgically. There is also the interesting veterinary study by Sheets and coworkers in the March 1991 issue of *Molecular Biotherapy*, in which they reported a successful treatment of a significant fraction of cats afflicted with feline leukemia using intravenous acemannan.

For related articles on medicinal uses of *Aloe vera*, see:

Gribel & Pashinski 1986

McAnalley *et al.* 1988

Perry *et al.* 1991

Pulse & Uhlig 1990

Soeda 1969

And, for a list of references on studies involving Aloe juice or extracts for treating burns, cancers, inflammation, diabetes, ulcers, infections and hepatic lesions, see Hedendal

Many different succulents from several families are used world wide as sources of sugar and other carbohydrates for brewing alcoholic beverages. Probably the most famous is ***Agave atrovirens***, the source of, what is generally held as the Mexican national drink, 'pulque'.

A number of the Mesembryanthemums find their leaves consumed for thirst by both people and animals due to their high water content.

Numerous succulents are eaten as food.

Several of the Mesembryanthemums are used as local foods in South Africa. Some, such as ***Carpobrotus acinaciformis*** L.Bol. and ***Carpobrotus edulis*** L.Bol. are cultivated for their sweet fruits ('Hottentot Figs'). ***C. deliciosus*** L.Bol., ***C. fourcadei*** L.Bol. and ***C. muirii*** L.Bol. are also used for their fruit.

Lithops hookeri Schw. and ***Mesembryanthemum crystallinum*** L. are both eaten as food.

Nananthus aloides Schw. roots are also eaten by humans.

An herbarium note presented by von Reis Altschul 1973 [entry number 932] indicates that ***Trianthema portulacastrum*** is used as a vegetable in Siam.

Tetragonia expansa and ***Tetragonia tetragonioides*** are widely cultivated for food and usually are known as New Zealand spinach, Malabar spinach or sea spinach. Others, such as ***Tetragonia schenkii*** Engl., have proven livestock toxicity. (Fatal to sheep in experimental dosages of 250 and 500 grams.)

Many Aizoaceous members have a substantial oxalic acid content. Many are a good source of ascorbic acid. Besides various alkaloids in varying amounts, they often contain a variety of mineral and organic salts and sometimes small organic acids which can cause problems in grazing animals **[Note 12]**

In spite of this, they are highly prized as essential grazing material in many parts of southern Africa.

Stock are known to safely eat: ***Dactylopsis digitata*** N.E.Br., ***Drosanthemum floribundum*** Schw., ***Drosanthemum lique*** Schw., ***Eberlandzia spinosa*** Schw., ***Galenia africana*** L., ***Lithops hookeri*** Schw., ***Mestoklema tuberosum*** N.E.Br. and var. ***macrorhizum*** N.E.Br. Goats are said to eat ***Pleiospilos bolusii*** N.E.Br. and ***Pleiospilos simulans*** N.E.Br.

The Portulacaceous ***Anacampseros rhodesica*** N.E.Br. has been used (in Rhodesia) as an ingredient in beer making Watt 1967 refers to Wild 1953. It is also thought to have narcotic effects of its own. Watt refers to Dornan 1927-1930. ***Anacampseros papyraceae***, ***A. rhodesica*** & ***A. ustulata*** are said by Hargreaves 1998 to have been listed under the name *moerhoutjie* by Smith 1966 implying their use was as a yeast source. Similarly ***A. alstoni*** is also said to be used for yeast. The use of ***Anacampseros rhodesica*** has been outlawed in Zimbabwe.

Clearly both the Mesembryanthemums and a broad range of succulents bear much closer scrutiny and evaluation.

Miscellaneous Notes on other members of the Aizoaceae

A number of Aizoceous plants are used medicinally or else thought or known to be poisonous. A mention of species thought to contain mesembrine was presented earlier.

A brief list of some of the Aizoaceae follows; more information can be found by consulting Watt & Breyer-Brandwijk 1962, our source for most of the following information or see pages 233 & 234-235.

Conophytum spp. were mentioned earlier as suspected narcotic plants.

Corbichonia decumbens Excell. is used by the Zulu as a root decoction for biliousness and in larger amounts as an emetic.

A ***Drosanthemum*** species ("*prob*. ***Drosanthemum hispidum*** Schw.") proved toxic to rabbits in experiments. It was found to have a moisture content of 62% and an oxalic acid content of 26.6%. ***Drosanthemum floribundum*** is proven to be an excellent feed for stock, ewes, lambs and ostriches in spite of the possible identification of mesembrine by Zwicky.

Galenia africana L. is chewed by the Hottentots for toothaches; said to cause blisters if too much is used.

Hymenocylus smithii L.Bol.: a 720 gram dosage was proven to produce death in sheep within 8 hours.

Khadia acutipetala N.E.Br. roots are used in the Transvaal for making 'kaffir beer' and the leaves for a hot water extract, used by the southern Rhodesian Manyika for application to sore eyes.

Mesembryanthemum aitonis Jacq. is suspected of causing poisoning in cattle. Experimental administration produced pharmacological effects but not death in a dosage of 4 kilograms.

Mesembryanthemum mahoni N.E.Br. ("*which is now either* ***Delosperma mahoni*** *N.E.Br. or* ***Glottiphyllum linguiforme*** *N.E.Br.*") roots are used by the Bantu for making an intoxicating beer. It is sometimes used by Europeans for breadmaking but this is considered a dangerous practice.) [Jacobsen 1960 considers ***M. mahoni*** to be ***Delosperma mahonii***.]

Mestoklema tuberosum N.E.Br. is similarly used for brewing intoxicating beverages and occasionally for bread making, by Europeans. It apparently is a better source of yeast than ***M. mahonii***. Hargreaves 1998 comments that it tested positive for an alkaloid (apparently unidentified) but appears to lack reports of intoxicating effects.

Interestingly, a ***Pleiospilos*** species was determined to have a pharmacological activity similar to *Sceletium* (when prepared similarly and chewed). Anonymous 2004

Psilocaulon absimile N.E.Br. was noticed to be responsible for livestock poisoning and found to contain several principles capable of killing animals. Dry plant contains 8.66% oxalic acid and also 4.5% piperidine **[Note 13]**. Moisture content was found to be 67.75%.

Ruschia saxicola L.Bol. is suspected in livestock deaths but oral evaluations in rabbits were negative.

Sceletium anatomicum L.Bol. This was prepared "*In the early days*" by the Hottentots by beating the whole plant together, twisting this and allowing the mass to ferment. It was chewed to quench thirst and is said to be intoxicating if chewed immediately after fermentation. Hottentots prized it for increasing strength. It is said to be narcotic and is used as a sedative by native people in the Willowmore district. Steyn was unable to observe these effects in animal studies. The plant is chewed by the Bushman as an intoxicant. Bushman mothers also use it to quiet infants. One drop of the fresh juice is claimed to produce as much as 5 hours of sleep in a baby. The intoxicating effect observed in Bushman users is said to be "*marked and persistent*."

Sceletium tortuosum N.E.Br. is also chewed by the Hottentots for toothache. It was also used as mentioned above for *S. anatomicum* It is said to be narcotic only after fermentation. It is used as a narcotic in the Queenstown district. The aerial portions of the plant is combined with those of ***S. expansum*** and used under the name '*kougoed*' by the Bushman in Namaqualand. Herre 1971 commented that there was still a commercial market locally for this plant.

Trichodiadema stellatum is used for brewing beer and for bread making. Hargreaves 1998 notes that it is believed to contain an intoxicating alkaloid ("*probably mesembrine*")

Positive general alkaloid tests in the Aizoaceae, (by Zwicky):
Aptenia cordifolia Schw.
Aridaria splendens Schw.
Aridaria umbelliflora Schw.
Delosperma cooperi L.Bol.
Delosperma ecklonis Schw.
Delosperma lehmannii Schw.
Delosperma subincanum Schw.
Drosanthemum floribundum Schw.
Drosanthemum hispidum Schw.
Lampranthus scaber N.E.Br.
Mesembryanthemum crystallinum N.E.Br.
Mestoklema tuberosum N.E.Br.
Oscularia caulescens Schw.
Prenia relaxata N.E.Br.
Ruschia congesta L.Bol.
Ruschia multiflorum Schw.
Ruschia rubricaulis L.Bol.

Ruschia tumidula SCHW.
Sceletium expansum L.BOL.
Sceletium tortuosum N.E.BR.
Trichodiadema intonsum SCHW.
Trichodiadema stellatum SCHW.
From WATT & BREYER-BRANDWIJK 1962: page 4.

All of the above and also ***Lampranthus glomeratum*** N.E.Br. and ***Glottiphyllum lingueforme*** N.E.BR. are considered by HERRE 1971 to contain at least some Mesembrine. He offers no references to support this.

A point to remember is that *mesembrine* (*mesembrin*) as was isolated and named by HARTWICH & ZWICKY in 1914 was an amorphous base that most likely was actually a mixture of alkaloids.

Mesembs reported to contain mesembrine alkaloids:
Carpobrotus acinaciformis (L.) L.Bol.
Carpobrotus edulis (L.) L.Bol. (unconfirmed)
Drosanthemum floribundum SCHW.
Drosanthemum hispidum SCHW. (unconfirmed)
Sceletium anatomicum (HAW.) L.BOL. (unconfirmed)
Sceletium expansum (L.) L.BOL.
Sceletium namaquense L.BOL.
Trichodiadema barbatum SCHWANTES (unconfirmed)
Trichodiadema bulbosum (MILLER) SCHWANTES (unconfirmed)
Trichodiadema intonsum (HAW.) SCHWANTES (unconfirmed)
FESTI & SAMORINI 1995

Mesembryanthemum Reviews:
FESTI & SAMORINI 1995
SMITH *et al.* 1996

Miscellaneous Notes on some additional Aizoaceous Chemistry

Note that the alkaloids mentioned by SMITH *et al*. 1998 were all at trace levels except for *Sceletium tortuosum* and *Aptenia cordifolia*, *Delosperma pruinosum* & *D. minimum* which had much lower concentrations than did the *Sceletium*. Unidentified alkaloids were present at low to moderate levels in *D. cooperi*, *D. pottsii* & *Lampracanthus aureus*

Aptenia cordifolia **(L.f.) SCHWANT.**
4'-O-demethylmesembrenol,
mesembrine & **3 unidentified** alkaloids
SMITH et al. 1998

Bergeranthus scapiger **(HAW.) N.E.BR**
4'-O-demethylmesembrenol & **mesembrenone**
SMITH et al. 1998

Channa (the prepared drug) was determined to contain **mesembrine**, **mesembrenone** and **channanine** by BODENDORF & KRIEGER 1957 [from JEFFS et al. 1969]
Alkaloid content said to range from 1-1.5% with mesembrine at 0.7% and mesembrenine at 0.2%
POPELAK & LETTENBAAUER 1967
See comments earlier from SMITH *et al*. 1998

Conophytum **spp.**
Said to contain **dopaxanthin**. [citing WYLER 1979 which simply mentions it.]
vulgaxanthin I
i.e. (4-[[(4-Amino-1-carboxy-4-oxobutyl)imino]ethylidene]-1,2,3,4-tetrahydro-2,6-pyridinedicarboxylic acid)
SOUTHON & BUCKINGHAM cited PIATELLI *et al.* 1965 and SINGER *et al*. 1980. (But meaning SINGER & ELBE 1980). All of these isolated this compound from beets rather than *Conophytum*!

Conophytum lekkersingense

Aptenia cordifolia
bottom right

Delosperma cooperi* (Hook.f.) L.Bol. forma *cooperi
4'-O-demethylmesembrenol, **mesembrenone** & **1 unidentified** alkaloid
***Delosperma lebombense* (L.Bol.) Lavis**
Mesembrenone & **2 unidentified** alkaloids
***Delosperma minimum* Lavis**
4'-O-demethylmesembrenol, **mesembrenone** & **2 unidentified** alkaloids
***Delosperma obtusum* L.Bol.**
4'-O-demethylmesembrenol
***Delosperma pruinosum* (Thunb.) J.Ingram**
4'-O-demethylmesembrenol, **mesembrine**, **mesembrenone** & **2 unidentified** alkaloids
***Delosperma pottsii* (L.Bol.) L.Bol.**
4'-O-demethylmesembrenol, **mesembrine**, **mesembrenone** & **4 unidentified** alkaloids
Delosperma rogersii* (Schoenl. & Berger) L.Bol. var. *rogersii
4'-O-demethylmesembrenol & **2 unidentified** alkaloids
Smith et al. 1998

***Drosanthemum floribundum* (Haw.) Schwant.**
1 kg. of the flowers were found to contain the pigments: **caffeyl-feruloyl-betanin** (12 mg.), **caffeyl-feruloyl-isobetanin** (5 mg.), **caffeyl-betanin** (7 mg.) and **caffeyl-isobetanin** (4 mg.) (all are acylated betacyanins)
Impellizzeri *et al.* 1973

Drosanthemum hispidum* (L.) Schwant. var. *hispidum
4'-O-demethylmesembrenol & **mesembrenone**
***Drosanthemum bicolor* L.Bol.**
4'-O-demethylmesembrenol, **mesembrenone** & **1 unidentified** alkaloid
Smith et al. 1998

***Glottiphyllum longum* (Haw.) N.E.Br.**
10 grams of flower petals yielded 3 mg. of the orange betaxanthin pigment, **dopaxanthin**.
Impellizzeri *et al.* 1973

Glottiphyllum longum* (Haw.) N.E.Br var. *longum
1 unidentified alkaloid Smith et al. 1998

Glottiphyllum longum

***Lampranthus aureus* (L.) N.E.Br.**
4'-O-demethylmesembrenol, **mesembrenone** & **2 unidentified** alkaloids
Lampranthus blandus
Mesembrenone & **2 unidentified** alkaloids
***Lampranthus coccineus* (Haw.) N.E.Br**
Mesembrenone & **1 unidentified** alkaloid
***Lampranthus deltoides* (L.) Wijnands**
1 unidentified alkaloid
***Lampranthus roseus* (Willd.) Schwant.**
Mesembrenone & **1 unidentified** alkaloid
Lampranthus spectabilis* (Haw.) N.E.Br. subsp. *spectabilis
4'-O-demethylmesembrenol, **mesembrenone** & **2 unidentified** alkaloids
Smith et al. 1998

Lampranthus aureus

Mesembryanthemum conspicuum
Mesembryanthemum edule
Mesembryanthemum floribundum
Mesembryanthemins (Structures unknown. Glycosides of betanidin or isobetanidin. Pigments. I-III are recognized.
Southon & Buckingham cited Piatelli *et al.* 1964

Oscularia deltoides
1 unidentified alkaloid Smith et al. 1998

***Ruschia lineolata* (Haw.) Schwant.**
1 unidentified alkaloid Smith et al. 1998

Sceletium expansum (as ***Mesembryanthemum expansum***)
Mesembrine Merck 9th cited Hartwick & Zwicky 1914 and Rimington *et al.* 1938

***Sceletium joubertii* L.Bol.**
0.1% total crude alkaloid (dry weight?)
Hordenine (from aerial parts)
(S)-Joubertiamine (from aerial parts)
(4-[2-(Dimethylamino)ethyl]-4-(4-hydroxyphenyl)-2-cyclohexen-1-one)

2,3-Dihydrojoubertiamine (from aerial parts)
(4-[2-(Dimethylamino)ethyl]-4-(4-hydroxyphenyl)-2-cyclohexanone)
Dehydrojoubertiamine (trace alkaloid from aerial parts)
(4-[2-(Dimethylamino)ethyl]-4-(4-hydroxyphenyl)-2,5-cyclohexadien-1-one)
ARNDT & KRUGER 1970
Joubertinamine (0.009% by fresh weight)
i.e. (4-(3,4-Dimethoxyphenyl)-4-[2-(methylamino)ethyl]-2-cyclohexen-1-ol or 4-(N-methyl-amnoethyl)-4-(3,4-dimethoxyphenyl)cyclohexyl-2-en-1-ol)
PSOTTA *et al.* 1979

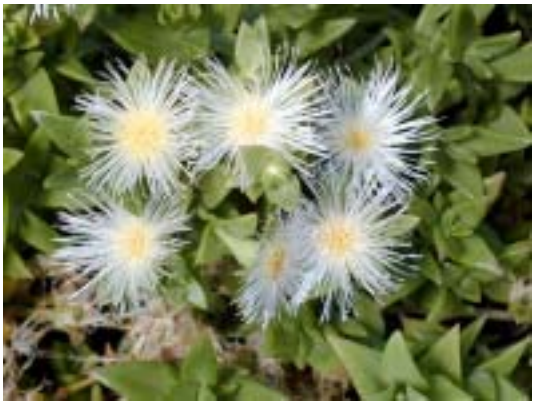
Sceletium joubertii
Photo by Kamm

***Sceletium namaquense* L.BOL.**
4-[3,4-dimethoxyphenyl)-4-[2-(acetylmethylamino)ethyl] cyclohexanone [i.e. 4-[2-(Acetylmethylamino)ethyl]-4-(4-hydroxy-3-methoxyphenyl)-2,4-cyclohexadien-1-one according to SOUTHON & BUCKINGHAM]
4-(3-Methoxy-4-hydroxyphenyl)-4-[2-(acetylmethylamino)ethyl] cyclohexadienone [i.e. 4-[3-(Acetylmethylamino)ethyl]-4-(4-hydroxy-3,4-dimethoxyphenyl)-2,4-cyclohexadien-1-one according to SOUTHON & BUCKINGHAM]
JEFFS *et al.* 1982
N-Acetyl-N-methyl-N,7a-secomesembrine (minor component)
N-Methyl-4'-O-demethyl-N,7a-secomesembradienone (minor component)
SOUTHON & BUCKINGHAM cited JEFFS 1981
Sceletium Alkaloid A_4
i.e. (3a-(3,4-Dimethoxyphenyl)2,3,3a,4,5,9b-hexahydro-1-methyl-1H-pyrrolo[2,3-f]quinoline) (small amounts)
CAPPS *et al.* 1977, JEFFS *et al.* 1971c, 1974a & 1982
Sceletium Dihydropyridone base (not named in reference)
SOUTHON & BUCKINGHAM cited JEFFS *et al.* 1982
Mesembrenone (AKA Mesembrenine or Mesembrinine)
CAPPS *et al.* 1977 & JEFFS *et al.* 1982
SOUTHON & BUCKINGHAM cited POPELAK *et al.* 1960
[4'-O-Demethylmesembrenone
SOUTHON & BUCKINGHAM cited JEFFS *et al.* 1974 but the only reference to this compound included in their experimental section was that isolated from *S. strictum.*]
Δ^7-Mesembrenone
(-)-Mesembrine
(-)-Mesembrane (minor alkaloid)
(-)-3'-Methoxy-4'-O-methyljoubertiamine (minor alkaloid)
CAPPS *et al.* 1977 & JEFFS *et al.* 1982
(-)-3'-Methoxy-4'-O-methyljoubertiaminol
JEFFS *et al.* 1982
Sceletenone (minor alkaloid)
JEFFS *et al.* 1974a
Tortuosamine
CAPPS *et al.* 1977 & JEFFS *et al.* 1982
N-Formyltortuosamine
JEFFS *et al.* 1974a & JEFFS *et al.* 1982
(not observed by CAPPS *et al.* 1977; used only to prepare a reference sample of tortuosamine)
N-Acetyltortuosamine
Dihydropyridone base related to Sceletium alkaloid A_4
JEFFS et al. 1982
Unidentified alkaloids
CAPPS *et al.* 1977 & JEFFS *et al.* 1974a & 1982

***Sceletium strictum* L.BOL.**
Channaine (Thought to probably be an artifact derived from dimerization of normesembrenone following racemization)
ABOU-DONIA et al. 1978 (See also JEFFS 1981; review)
Mesembrenol
JEFFS et al. 1970, JEFFS *et al.* 1974b & JEFFS et al. 1978
JEFFS et al. 1971a (70-90% of total alkaloid: used whole plants; 1-2 years old from seed)
O-Acetylmesembrenol
4'-O-Demethylmesembranol
4'-O-Demethylmesembrenol
JEFFS et al. 1970
4'-O-Demethylmesembrenone
JEFFS *et al.* 1974a & JEFFS et al. 1978
Mesembrine (N-Methyl-3a-(3',4'-dimethoxyphenyl)6-oxo-*cis*-octahydroindole)
JEFFS et al. 1971a [1% of total alkaloid (used whole plants; 1-2 years old from seed)]
JEFFS et al. 1970 (used 3 year old plants)
JEFFS *et al.* 1974b & JEFFS et al. 1978
(also observed in JEFFS et al. 1971b)
N-Demethylmesembrenol
SOUTHON & BUCKINGHAM cited KRUGER *et al.* 1971
Mesembrenone (AKA Mesembrenine or Mesembrinine)
JEFFS et al. 1970 & JEFFS *et al.* 1974b
(Also observed in JEFFS et al. 1971b)

N-Demethyl-formylmesembrenone
KARLE 1977 (investigated structure) cited KARLE 1976 as isolating it.
N-Demethylmesembranol
SOUTHON & BUCKINGHAM cited CAPPS *et al.* 1977 but this citation is apparently in error
(-)-Mesembranol (AKA Mesembrinol)
JEFFS et al. 1970 & JEFFS et al. 1978
Also observed in JEFFS et al. 1971b and by
SHAMMA & RODRIGUEZ 1965 (from JEFFS et al. 1969)
SOUTHON & BUCKINGHAM cited SMITH *et al.* 1961
Sceletenone
JEFFS et al. 1978

***Sceletium subvelutinum* L.BOL.**
N,N-Dimethyltyramine (Hordenine)
O-Methyljoubertiamine [i.e. (4-[2-(Dimethylamino)ethyl]-4-(4-methoxyphenyl)-2-cyclohexen-1-one)] [also by NIEWENHUIS *et al.* 1981]
O-Methyldehydrojoubertiamine
O-Methyldihydrojoubertiamine [NIEWENHUIS *et al.* 1981]
Dehydrojoubertiamine
Joubertiamine
Dihydrojoubertiamine
HERBERT & KATTAH 1990



Sceletium tortuosum

Sceletium subvelutinum
Photo by Kamm

***Sceletium tortuosum* N.E.BR.**
4'-O-demethylmesembrenol, **mesembrine**, **mesembrenone** & **2 unidentified** alkaloids [4'-O-demethylmesembrenol, mesembrine, mesembrenone were present in a ratio of 8.1:100:69.4]
SMITH et al. 1998
Sceletium Alkaloid A_4 [i.e. (3a-(3,4-Dimethoxyphenyl)2,3,3a,4,5,9b-hexahydro-1-methyl-1H-pyrrolo[2,3-f]quinoline.)]
SNYCKERS *et al.* 1971 citing unpublished results of F.O. Snyckers, H.W. Pretorius & A. Weichers.
Channaine (Thought to probably be an artifact derived from dimerization of normesembrenone following racemization)
ABOU-DONIA et al. 1978
See also JEFFS 1981; review.
Mesembrine
[MERCK 9th cited HARTWICK & ZWICKY 1914 and RIMINGTON *et al.* 1938. See comments earlier.
Mesembrinone
SNYCKERS *et al.* 1971 citing unpublished results of F.O. Snyckers, H.W. Pretorius & A. Weichers.
Mesembranol (AKA Mesembrinol)
SNYCKERS *et al.* 1971 citing unpublished results of F.O. Snyckers, H.W. Pretorius & A. Weichers.
SOUTHON & BUCKINGHAM cited SMITH *et al.* 1961.
Tortuosamine
SNYCKERS *et al.* 1971 citing unpublished results of F.O. Snyckers, H.W. Pretorius & A. Weichers.

Sceletium tortuosum
Photo by Kamm

Endnotes for Some other Succulents

Note 1: The name Mesembryanthemum is used for the genus which includes the common 'Ice Plants' (usually *Mesembryanthemum crystallinum*) now found as road side plantings and well established along the western coast of the United States. More frequently it is used to describe a multigeneric group, known as 'ice plants" or 'living stones', which are known collectively as the mesembryanthemums. Some, such as *Lithops* spp. are very popular among cactus and succulent collectors. Many suppliers specialize in these fascinating succulents.

Note 2: Observations being mentioned are ours. The published literature has reported DMT's presence in all except *D. leptolobus* which is lacking any in-depth or formal analysis despite its ongoing use as a sacramental hallucinogen in humans.

Note 3: Most members of the MESEMBRYANTHEMACEAE have been transferred to the AIZOACEAE, the rest have been scattered throughout other families.

Note 4: Another South African genus of Mesembryanthemums, ***Conophytum*** spp., have been "*reported to have narcotic properties*." by WATT 1967. His reference, WATT & BREYER-BRANDWIJK 1962 mentioned that the genus was considered to have narcotic properties by the late Dr. Louis Leipoldt. Apparently this was otherwise unpublished.

I can locate no chemical or pharmacological evaluations of these beautiful little clump formers. There is little chance that these little 'living pebbles' would ever be confused with any of the other mesembs discussed here.

Conophytum species are readily and widely available. (There are 290 described species.) They are somewhat tricky as they require a period of dormancy, similar to that of *Lithops*, when they appear to be dry and shriveled dead plant remnants. Removal of this apparently dead growth at any point will usually kill these plants. They must not be watered during the rest period but may require occasional light mistings to keep them alive.

They grow readily from seed; many suppliers exist.

Be certain to study their growth requirements well before attempting to grow these amazing 'living stones'.

Note 5: Both OTT and AARDVARK reported full activity from 25 grams of pounded (or finely ground) root bark that was soaked in two changes of cold neutral water; each for less than an hour.

When questioned, at a *Botanical Preservation Corps* seminar on Maui during January of 1994, Dr. Dennis McKenna said ***Mimosa hostilis*** was thought to be active due to the presence of similar lignins but we have been unable to find any published work which proves (or supports) this except for ***Virola***.

The oral activity of ***Mimosa hostilis*** roots was an unexamined area pharmacologically until amazingly recently. See the 1999 *Entheogen Review* 8 (1): 22-24, for successful bioassays of cold water infusions reported by Jonathan Ott and David Aardvark.

(*Mimosa ophthalmocentra & M. verrucosa* are also known to be used traditionally for *jurema* preparation.)

Note 6: The first stage is often characterized by aggression in some reports but even in early reports, mentioned in SAFFORD 1916b, on page 553, it has also been noted that the tendency towards aggression in the first stage was present primarily in tribes of a militant and warlike nature and was absent in traditionally less violent societies. The second stage, when large amounts are used, of the lighter intoxication being followed by a fitful sleep and delirium is encountered more uniformly in the anthropological and ethnopharmacological literature.

Note 7: *Khadi* appears to involve multiple plants including the fruits of *Grewia* species. *Grewia* species have been reported to contain many alkaloids including traces of β-carbolines. See ROSLER *et al* 1978. The production of the brew *khadi* is known to have arisen after the introduction of sugar by the Europeans but there is a distinct possibility that the plants involved reflects a prior ethnomedicinal familiarity to indigenous people. While the primary intoxicant in *khadi* appears to be alcohol, the complex of plants involved and the potential pharmacological interactions is an area in serious need of in-depth study.

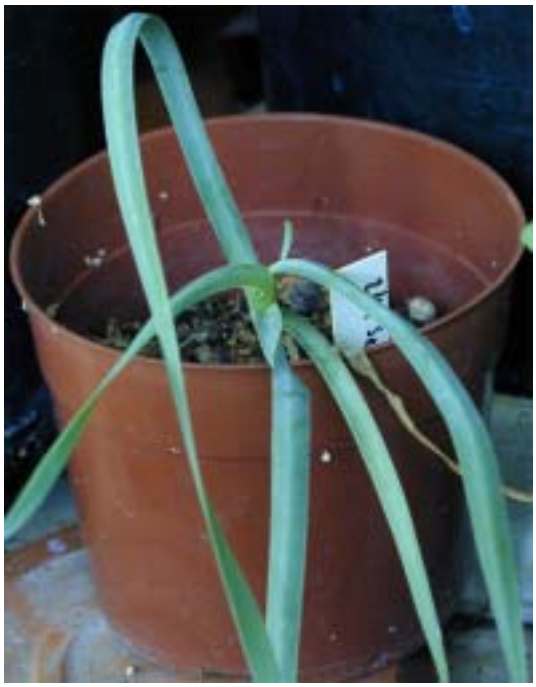
Note 8: On a specimen [DIETERLAN 142b] in the herbarium of the Agricultural Research Station in Maseru, Lesotho.

It was given a local common name of *Khadi*.

Note 9: "*Acculturation*"; Such a polite word for what is quite literally a deliberate if not systematic cultural extermination.

A very few of the many intriguing but poorly investigated African medicinals:

Boophane distacha (L.f.) HERB. [AMARYLLIDACEAE] Bulbs are used in initiation ceremonies by the South African Basuto. It is known to contain alkaloids but more work is needed to define their activity in humans. Ingestion of a bulb decoction has been proven to cause hallucinations; DESMET 1996 cited LAING 1979. NYAZEMA 1984 & GELFAND *et al.* 1985 list it as having traditional use in Zimbabwe to arouse animal spirits; DESMET 1996.



young *Boophane distacha*

Ferraria glutinosa (Bak.) Rendle [IRIDACEAE] roots are said to have been used by the !Kung of the Kalahari to help enter an altered state of consciousness in trance dances. It is believed to help activate '*num*' (the energy which originates from the gods) when used in conjunction with a complex proces of purification, diet & ritual. This may still be used by some but at least one group has apparently lost the knowledge of preparation and dosages in recent years when such information failed to be passed on by their elders. See Richard KATZ 1982. See also DOBKIN DE RIOS 1986 and WINKELMAN & DOBKIN DE RIOS 1989.

"*gwa*" is a root I do not know an identity for. It is used by the !Kung of the Kalahari to help induce '*kia*'; an altered state of consciousness considered to be a prerequisite for healing practices. KATZ 1982

Hartogia capensis L. f. (CELASTRACEAE), (from South Africa), the leaves of which are chewed for thirst, fatigue prevention and appetite suppression. WATT 1967 cites WATT & BREYER-BRANDWIJK 1962.

Lichtensteinia interrupta E. MEY. (from the Cape Province), the roots of which are used to make a narcotic drink. WATT 1967 cites DRAGENDORFF 1898.

Mitragyna africana (RUBIACEAE) was once used as a leaf infusion by the Dyidé, a Bambara spirit medium cult, with applications as an initiatory catalyst and sacrament similar to those of the well known African sacrament Iboga (*Tabernanthe iboga*). Both its use and the Dyidé themselves were "*suppressed*" by the government in the 1940's and driven to exist amidst great secrecy in remote areas of Mali. See IMPERATO 1977 who cited G. CHEVON 1931. A hallucinatory principle has not been identified.

Mostuea gabonica BAILLON & ***Mostuea stimulans*** A.CHEV. HERB. [LOGIANACEAE] (from Fernan-Vaz region of Gabon) Roots are chewed as an aphrodisiac and to prevent sleep during drumming and dancing [DESMET 1996 cited CHEVALLIER 1946 & 1947] Alkaloids similar to gelsemine and sempervirine have been reported from the root bark of *M. stimulans* (0.33% total alkaloid content in rootbark) but neither was actually positively identified. DESMET 1996 cited PARIS & MOYSE-MIGNON 1949].Gelsemine & sempervirine both occur in the common landscape plant *Gelsemium sempervirens* (L.) AIT which is suspected of causing visual hallucinations and has formerly been used as a stimulant but fell into disfavor due to a "*dangerous*" reputation. [*Gelsemium* is believed similar to but weaker than strychnine in its action. Strychnine is reputed to be hallucinogenic at sub-convulsive dosage levels] See MERCK Index.

Pancratium trianthum HERB. [AMARYLLIDACEAE] Bulbs are claimed to be rubbed into cuts made on the head to induce visual hallucinations (by the !Kung in Botswana) SCHULTES & HOFMANN 1980.

Schumanniophyton klaineanum (PIERRE) A. CHEV. bark is chewed in small amounts to prevent sleep. (In Gabon) Large dosages are said to produce "*an exceptional degree of aphrodisiac action*" and to be harmful to the health. WATT 1967 cites WALKER 1953.

Voacanga bracteata [APOCYNACEAE] (from Gabon) has an herbarium voucher with an annotation that the bark is used to get "*high*". DESMET 1996 cited BISSET 1985.

Interesting overviews for many of these and other African medicinal plants can be found in WATT 1967 and in WATT & BREYER-BRANDWIJK 1962. See also DESMET 1999.

There is also the poorly understood complex of stimulants cooked with food and eaten in huge amounts by Masai warriors to attain courage, bravery and endurance; often leading to a frenzied state of CNS overload and eventual exhaustion. This has been variously said to include: *Acacia* spp. (*Acacia nilotica*, *A. seyal* bark & *A. abyssinica* roots), *Albizia anthelmintica* bark, *Cissus quandangularis*, *Embelia kilimandschrika* ENGL. (bark), *Maesea lanceolata* FORSK. (fruit and/or roots), *Myrica* spp., *Pappea capensis* (bark) & others. LEHMANN & MIHALYI 1982

Note 10: HARGREAVES lists *ntsakoro* and *motsoko* as common names in Botswana and notes that it does not appear to be used as a fermentation organism source.

Note 11: This plant was also a seldom used ordeal poison in the Ivory Coast region. Common names included *baga*, *do*, *dohe*, *douo*, *faman*, *gbo*, *klatou*, and *tene*. In some tribes, the accused had the latex spread on their eyes and guilt was pronounced if there was damage to the cornea. ROBB 1957

Note 12: Due also to their high salt and mineral content many generate a highly basic ash which finds many uses in local medicines and soap making. ***Mesembryanthemum crystallinum*** is widely prized both as ash and as plants for soap making. The use of the fresh plant for cleaning is thought by some researchers to be due to their saponin content but as WATT & BREYER-BRANDWIJK point out this is no doubt substantially enhanced by the alkali nature of the plant itself. Sodium and potassium salts have been isolated from the leaves with yields of **43% by dry weight**.

Note 13: T.A. Henry p. 1, citing: 1935 *Ber.* 36: 2218; 1927 *Helv. Chim. Acta* 10: 593; 1934 *S. Afr. J. Sc.* 31: 184.

Piperidine is also found in: *Petrosimonia monandra* Author? 1939 *J. Gen. Chem.* URSS 9: 1687

(N-Methylpiperidine is found in *Girgensohnia*.)

Sceletium sp. nova
An unnamed *Sceletium* collection determined by human bioassay to be at least as active as *S. tortuosum*

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A *Delosperma* fruit showing its seeds

***Delosperma britteniae* ? Coegakop showing empty fruit**

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Sceletium tortuosum
With food
Photo by Kamm

Sceletium tortuosum
Without food
Photo by Kamm

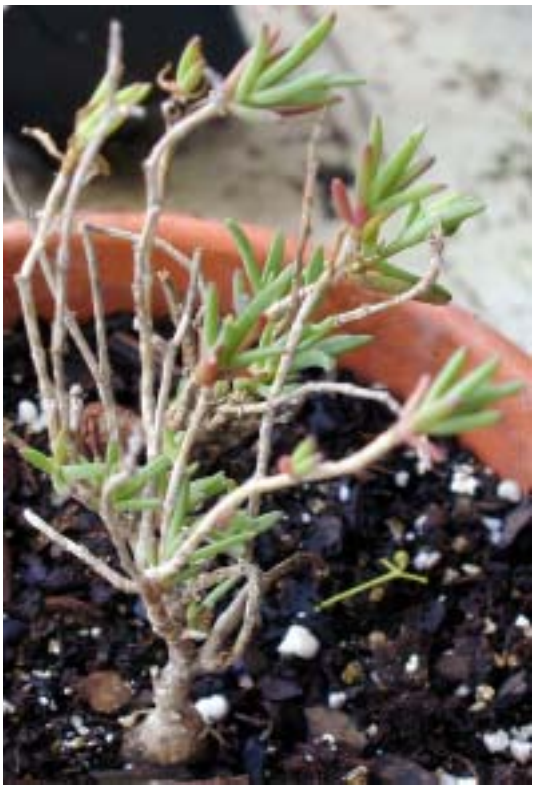
Some *Delosperma* species still in need of analysis

***Delosperma* sp. Hanburg 24095**

Delosperma steytlerae

***Delosperma crassum* Grootfraatwater**

Delosperma macei



Delosperma ecklonis

Delosperma bosseranum
upper left

Delosperma bosseranum has been reported to be active in human bioassays; similar to *Sceltium*
by t s tantra (web post)

Delosperma tradescantioides

lower right photo Huntington Botanical Gardens
lower left photo by Mary