

EAST AFRICAN SUCCULENTS.

PART II.

By PETER R. O. BALLY.

The first part of EAST AFRICAN SUCCULENTS contained—besides a general introduction—descriptions and illustrations of East African Crassulaceae, represented in the collections of the Herbarium at the Coryndon Memorial Museum.

Since its publication Mr. P. J. Greenway, Systematic Botanist, E.A.A.R. Station, Amani, and Mr. S. A. Thomas, Botanist, Agricultural Department, Uganda, have very kindly contributed all available information on indigenous succulents from the records of their respective herbaria.

I am thus in a position to give a far more comprehensive survey of the known East African succulents, and I begin Part II with an additional list of East African Crassulaceae.

N.O. CRASSULACEAE (continued).

BRYOPHYLLUM.

With few exceptions the genus *Bryophyllum* is restricted to Madagascar. *Bryophyllum* has four-petalled, tubular, flowers which brings it close to the genus *Kalanchoe*, but they are pendent like those of the five-petalled *Cotyledon*. A characteristic which has given the genus its name (*Bryophyllum* means "sprouting leaf") is that many of them produce plantlets along the leaf margins.

Bryophyllum pinnatum S. Kurz, (syn: *B. calycinum* Salisb.).

Is found at present in most tropical countries, and it can be considered as naturalized in East Africa, where it has been observed in and around native villages along the coast. The plant grows two to four feet in height and has fleshy, sometimes irregularly-pinnate leaves with crenate margins from which numerous plantlets are developed. The pendent flowers are $1\frac{1}{2}$ to 2 inches long and they are conspicuous for their large bell-shaped calyx and orange petals.

CRASSULA (continued).

Crassula alba Forsk.

A succulent herb, grows to one foot high and has small white flowers. It is locally common on Mt. Elgon, Debasien, and Imatong Mountains, in Uganda.

Crassula alba Forsk., var. *puberula* A. Rich.

Occurs in Kigezi, Uganda.

Crassula muscosa (L.) Roth.

A dwarf plant, hardly more than $\frac{1}{4}$ inch in height, of moss-like appearance, but definitely succulent, has an almost cosmopolitan distribution. It is found on the Canary Islands, on the Mediterranean Coast, in Western Europe up to Belgium and in the Netherlands, in British India, Sokotra, from Abyssinia to Natal, in the Cameroons, in Angola and South-West Africa. In East Africa it is found commonly in sandy areas which are regularly flooded. The white flowers are mostly five-petalled, the fruits contain one to two seeds.

Crassula phyturus Mildbr.

Is a small, fleshy herb not unlike clubmoss in appearance; the few flowers grow from the leaf axils; they are small five-petalled stars. It is found on the Eastern Slopes of Mt. Elgon, in forest, at 10,000 ft.

Crassula Vaillantii (Wild.) Schoenl.

Is closely allied to *C. aquatica* (see Part I, pag. 12). The flowers are four-petalled, and the fruits hold more than two seeds. It is a small succulent herb which prefers damp places. The distribution of this plant ranges from Europe through Abyssinia to East Africa.

Crassula Zimmermannii Engl.

The plant is 3 to 5 inches high, branched more or less symmetrically above the root, with stem segments about $\frac{3}{4}$ inch long. The fleshy, lanceolate leaves are up to 1 inch long near the base, and $\frac{1}{4}$ inch wide. The flowers grow on slender stems from the leaf axils as well as from the end of the branches. The flowers are white and measure about three-eighths of an inch in diameter. The plant differs from *C. Volkensii* (see Part I, pag. 12) only through its slightly hairy, very thin flower stalks. (Fig. 1, *Crassula Volkensii* Engl.) Western Usambara, below Mbalu, 4,500 ft. on rocks.

Crassula Zimmermannii Engl., var. *Uhlighii* Engl.

From Teita Hills, near Bura, in Kenya Colony, has thinner and longer flower stalks which are up to $1\frac{1}{2}$ inch long, and narrower and slightly longer leaves.

KALANCHOE (continued).

Kalanchoe Goetzei Engl.

The plant is 10 to 20 inches high. The fleshy leaves are to $2\frac{1}{2}$ inches long and 1 inch wide. The flower cymes are double, about $2\frac{1}{2}$ inch long, developed from the leaf-axils. The tube of

the flower is three-eighths of an inch long. It occurs in the Kinga Mountains in Tanganyika, near Ussangu, on the Msimasi Swamp.

Kalanchoe obtusa Engl.

Of shorter growth than other species, this plant attains a height of 4 inches only; the fleshy leaves are nearly circular and about 1 inch in diameter.

The inflorescence is a many flowered cyme. The plant occurs in Tanganyika Territory.

Kalanchoe sp.

Is another small *Kalanchoe*, which rarely exceeds 7 inches in height. The growth is somewhat decumbent, with the flowering stems erect. The dark-green, fleshy leaves are obovate, up to $1\frac{1}{2}$ inch long and $\frac{3}{4}$ inch wide. The flowers are a bright-orange tipped with red. It occurs in Tanaland, near Kolbio, in the half shade of shrubs.

Kalanchoe sp.

A very fleshy plant with thick large leaves, with a velvety, glandular surface. The leaves, which attain a length of 7 inches and a width of $3\frac{1}{2}$ inches, are developed close to the ground, while the ascendant flowering stem bears few and much smaller leaves. The flowering cyme, which bears purple glandular hairs, grows to $1\frac{1}{2}$ ft. high. The multiflowered cyme is a dense cluster at first and unfolds into several double cymes, densely set with orange, red-tipped flowers. The plant is locally common on the Escarpment, South of the Ngong Hills, Kenya Colony, on rocky soil. Fig. 2.

Kalanchoe sp.

Similar in appearance to the above, it is more upright in growth, the leaves are a darker green and the leaf stalks thinner and longer. The flowering cymes are denser, and are developed not only terminally, but also from leaf axils.

It occurs in the Mara River area, Kenya Colony.

Kalanchoe sp., (Museum No. 4832).

See Part I, pag. 14, has now been identified as *Kalanchoe lanciniata* D.C. Fig. 3.

Kalanchoe spp.

Several other unnamed species from East Africa await description.

SEDUM (continued).

Sedum epidendrum Hochst.

First found in Abyssinia, the plant occurs also on Mt. Elgon in Kenya Colony. The much branched plant bears few, very thick, smooth, elongated leaves which are 1 to 2 inches long. The small flowers grow in few-flowered, rounded heads; it is an epiphyte on trees.

Sedum sp.

A new species from Kigezi in Uganda, has not yet been described.

N.O. FICOIDACEAE (AIZOACEAE).

In the widely accepted system of classification of Hutchinson's Families of Flowering Plants the family name *Aizoaceae* has been replaced by *Ficoidaceae*, and the succulent genera *Sesuvium* and *Trianthema* have been included.

MESEMBRYANTHEMUM.

More than two thousand species of "Mesembs" are known from Southern Africa and with modern research the genus is split up into new genera. In outward appearance they vary greatly; they range from shrubby perennials with fleshy leaves, to small very succulent annuals, some of which exemplify the most amazing mimicry which is encountered in plant life: they imitate the outward shape and colouring of the pebbles among which they grow to such perfection that it is nearly impossible to detect them on the ground; it is only during their short flowering season that their brilliantly coloured flowers give them away.

A characteristic of many mesembryanthema are the crystal-clear papillae which cover their green parts; they are most conspicuous in *Mesembryanthemum crystallinum* L., which originates from the Cape, but which has established itself in many other parts of the world and is now quite common on the Mediterranean coasts. The whole plant looks as if it had been dipped into crystalline sugar or as if it were covered with icicles, hence the popular name of "ice plant." Fig. 4 shows a specimen which was found growing as an escape in a Nairobi garden.

Another extreme form is shown in the genus *Fenestraria* from the deserts of South-West Africa, whose erect, club-like leaves are buried in sand up to their blunt ends which are modified into one large "window," or lens, which acts as a protective filter against the fierce radiation of the sun.

EAST AFRICAN SUCCULENTS

PART II

BY PETER R. O. BALLY

Plates 9 to 14

PLATE 9.



FIG. 1.
Crassula Volkensii Engl.



FIG. 2.
Kalanchoe sp.



FIG. 3.
Kalanchoe lanciniata D.C.



FIG. 4.
Mesembryanthemum cristalinum L.

PLATE 10.

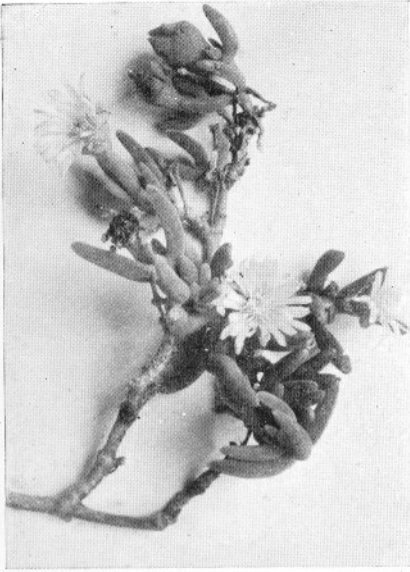


FIG. 5.
Mesembryanthemum nakuruense Engl.



FIG. 6.
Talinum cuneifolium (Vahl) Willd.

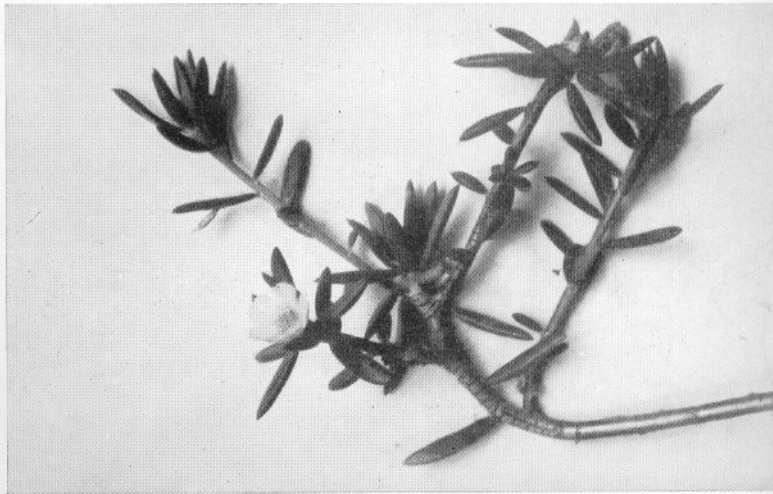


FIG. 7.
Portulaca foliosa Ker.

PLATE 11.

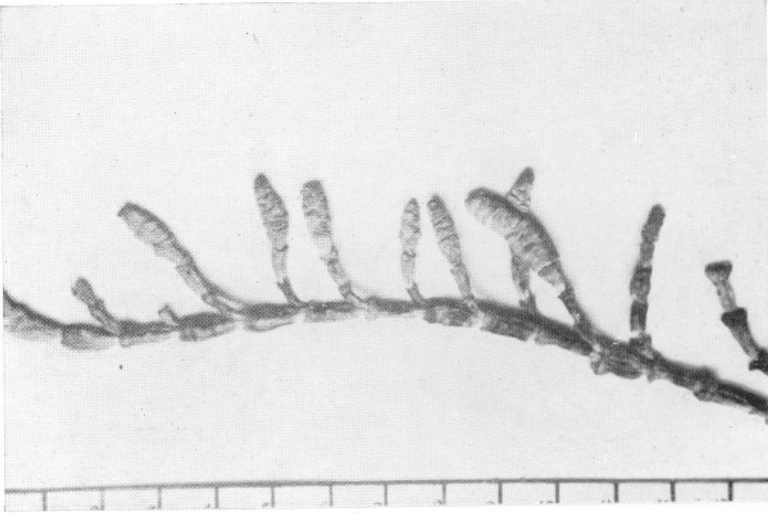


FIG. 8.
Arthrocnemum indicum Moq.

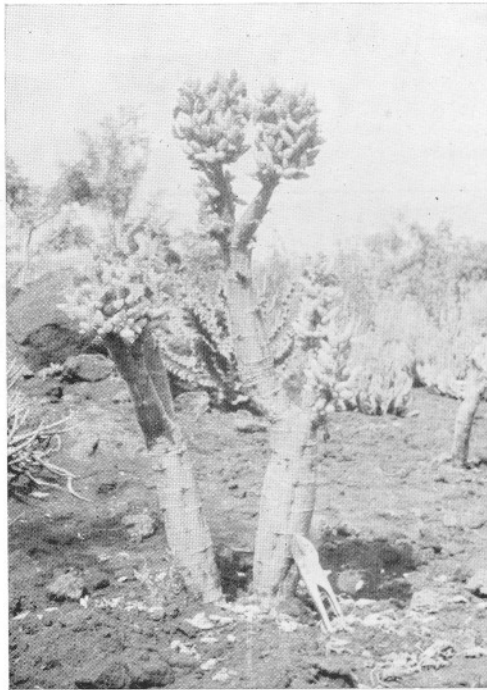


FIG. 9.
Adenia keramanthus Harms.

PLATE 12.



FIG. 10.
Adenia globosa Engl.



FIG. 11.
Adenia globosa Engl.

PLATE 13.



FIG. 12.
Momordica rostrata A. Zimm.



FIG. 13.
Gerarardanthus macrorhizus Harv.

PLATE 14.



FIG. 14.
Rhipsalis cassytha Gaert.

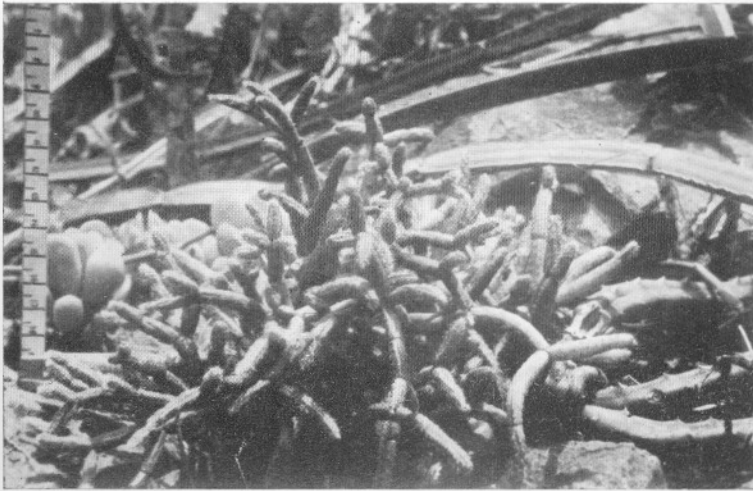


FIG. 15.
Rhipsalis sp.

The mesembryanthea found in East Africa resemble one another closely; they belong to a sub-shrubby type with elongated fleshy leaves.

Mesembryanthemum nakurense Engl.

Has a fairly wide distribution in Kenya Colony and it is also found in Tanganyika. It is a decumbent, shrubby herb, which grows rarely more than 1½ feet in height; it seems to prefer crevices in rocks and one often sees its tortuous branches spread over the surface of rock faces. The leaves are elongated, rather like small sausages, slightly triangular in cross-section, about 2 inches long.

They are covered—as are all other green parts—with small, regularly set, clear papillae, which look, when seen through a magnifying glass, very much like the scales on a lizard's body.

The flowers appear as many-petalled stars, up to 1 inch in diameter, usually white, with a yellow centre formed by the anthers; magenta—and red-petalled flowers have also been recorded from the Masai Reserve, in the vicinity of Narok. The flowers are set in a curious, fleshy calyx; they open in the morning and are closed by noon. Fig. 5.

Mesembryanthemum Oehlerii Engl.

Is recorded from the hills of Niasekera and from Lasa mountain in Tanganyika. It is closely allied to *M. nakurense*, but seems to have shorter and more clustered leaves and branches.

Mesembryanthemum Schimperii Engl.

Although known from Urarut District in Abyssinia only, it is possible that this allied species might be found in Northern Kenya Colony. The flowers are set on a much longer and more slender stem, the tips of the leaves bear a small tuft of bristles.

Mesembryanthemum abyssinicum Regel.

Is recorded from Kohaito plateau in Eritrea might also appear in Northern Kenya Colony.

SESUVIUM.

Sesuvium portulacastrum L.

A succulent herb of the seashores, especially near river mouths, with procumbent slender stems and elongated fleshy leaves. The plant is halophytic (preferring brackish soil). It grows in large interwoven mats. The flowers are purplish or rose, on short peduncles growing from the leaf axils; sometimes

the whole plant is of a purplish-red colour. In view of its peculiar mode of life in the brackish water zone, *Sesuvium* is of no interest to the gardening amateur, though it is of importance as a vegetable to the coastal peoples.

TRIANTHEMA.

Trianthea sedifolium Vis.

A prostrate, much branched herb with fleshy, needle-like leaves; it is common in the dry areas of Northern Kenya Colony on waste land in sandy soil.

Trianthea salsoloides Fenzl.

Is not unlike the former species and is found in similar surroundings. Both species of *Trianthea* are of no interest to the gardener.

N.O. PORTULACACEAE.

Contrary to *Ficoidaceae* which have evolved mainly in South Africa, the family of *Portulacaceae* seems to have originated in America, from where eight genera are known. Only a small number of species of *Talinum* and of *Portulaca* are indigenous to East Africa.

With few exceptions they are of modest appearance, though during their short flowering period they may enliven a barren corner in a rockery.

TALINUM.

Succulent herbs or rarely shrubs with fleshy leaves and with comparatively large flowers either in racemes or solitary. The roots are tuberous and often large.

Talinum cuneifolium (Vahl) Willd.

A semi-succulent perennial which grows up to 3 feet in height, sparsely branched from a tuberous root. It produces long, loose racemes bearing five-petalled flowers, about $\frac{3}{4}$ inch in diameter, mostly of a bright magenta, but sometimes pale-pink or greenish-white.

The plant is very common in East Africa in areas of low rainfall. Fig. 6.

Talinum taitense Pax et Vatke.

A scandent, yellow flowered succulent shrub which climbs into trees up to 20 feet high; the fleshy leaves are 2 inches long and about 1 inch wide. The distribution of this rare plant is restricted to Ndi Mountain in Kenya Colony, and to the south-western part of the Uмба steppe.

Talinum caffrum (Thunb.) Eckl. et Zeyh.

A low, succulent perennial, decumbent, or erect, up to 3 feet tall, with a tuberous rootstock. The flowers are solitary in the leaf axils; they are pale lemon-yellow and the petals taper into a finely pointed tip. In Kenya, the plant occurs in dry areas between Stony Athi and Sultan Hamud, and it extends down to South Africa.

Talinum carinatum A. Peter.

A bulbous-rooted perennial herb with slender decumbent stems and solitary yellow, rarely white flowers in the axils of the leaves. Found in Tanganyika Territory.

PORTULACA.

The East African species are fleshy, decumbent, or erect herbs with hairy, sometimes woolly, stipules at the joints. The flowers are terminal, either solitary, or in few-flowered heads, some of them quite showy.

Portulaca oleracea L. Purslane.

A much branched, prostrate, succulent herb with spatulate leaves and very small, yellow flowers. The plant is locally common on sandy soils, especially in abandoned cultivations. In cultivation it soon attains a more robust appearance (var. *sativa*) and is known as such as the potherb purslane. Though of Old World origin, it is now distributed in all warm climates.

Portulaca foliosa Ker.

This species is a perennial herb with fleshy, sausage shaped leaves. It is found in a procumbent form as well as an erect plant; the growth is robust, and the flowers quite large and showy, about $\frac{1}{2}$ inch in diameter, and bright-yellow. Fig. 7.

Portulaca pilosa L.

Although originating from tropical America, this delicate *Portulaca* is found naturalized in many parts of the African continent. It is known from Durban, and from various parts of East Africa, far away from cultivated districts. It is a procumbent herb with very slender fleshy leaves and with small, bright-red flowers. The stipules at the nodes are long, woolly filaments.

Portulaca quadrifida L.

Very widely distributed in East Africa, common on bare soil and on rocky ground. It is a spreading, prostrate procumbent herb with narrow fleshy leaves with conspicuously woolly stipules at the joints. The yellow flowers are five petalled, small, but larger than those of *P. oleracea*.

N.O. CHENOPODIACEAE.

All succulent species in this family are halophytes (loving saline or brackish soil) and they are found in the more open flats and on the margins of mangrove swamps along the coast and also on salt pans and in the neighbourhood of salt lakes in the interior. Most of them are small, insignificant herbs with inconspicuous flowers, and their dependence on saline soils makes them unsuited for the succulent garden.

ARTHROCNEMUM.

Arthrocnemum indicum Moq.

A procumbent leafless succulent herb which throws up many fleshy fruiting spikes in which the flowers are wholly hidden; it is locally dominant in the sandy soil of salt creeks and in very open mangrove swamps. It is found on most tropical African coasts, and also in India. Fig 8 (from dried specimen).

SALICORNIA.

Salicornia herbacea L.

In general appearance and with its flowers sunk into the fleshy stems, this halophytic succulent herb is similar to *Arthrocnemum* in many ways, though it is of erect growth. Its distribution is very wide: it is known from the coasts of Europe, Africa, and America. It prefers the same localities as does *Arthrocnemum*, but it is rare on the East African coast.

SUAEDA.

Suaeda monoica Forsk.

A much branched, succulent evergreen shrub up to 20 feet tall. The flowers are inconspicuous, small and green, the fruits are round berries, which turn red when ripe. The sausage shaped, fleshy leaves are up to 1 inch in length. It is found very locally along the coast, and up-country in patches on saline soils; thus it is locally dominant in some places near Mkomazi and near Himo in Tanganyika Territory.

N.O. PASSIFLORACEAE.

ADENIA.

In this family it is the genus *Adenia* only which has evolved forms which store water in their stems such as the rambling climber *Adenia venenata* Forsk., a fairly common climber in East Africa. Its stem has developed into a thick, fleshy trunk which ascends high into trees. Other semi-succulent forms found in East Africa are *Adenia Volkensii* Harms., and *Adenia*

keramanthus Harms., Fig. 9, with erect non-climbing, fleshy and inflated stems. It shows well the bulging fleshy stems and the bell-shaped flowers which bear no outward resemblance to the highly ornamental flowers of *Passiflora*.

In East Africa there is one species only of *Adenia* which has all the characteristics of a true succulent, i.e., reduction of leaves to a minimum, inflation of trunk out of all normal proportions, and a coating of chlorophyll-bearing cells on the whole surface.

Adenia globosa Engl.

Is one of the most striking forms of East African plant life and of adaptation to conditions of drought. The trunk, while of a fairly symmetrical globular shape in immature specimens (Fig. 10), develops into an immense, shapeless lump, attaining a diameter of 6 feet and over. The root system is weakly developed, but from the upper part of the trunk it sends long climbing branches high up into trees. They support themselves by means of 1 to 2 inches long, green, horny tipped thorns, which are modified tendrils. The minute three-lobed leaflets appear only on the young shoots during the season of growth. The tubular, pale yellow-green flowers are in clusters in the axils of the thorns.

In waterless regions the natives make use of the plant for the storage of water. The trunk is of a soft, fleshy texture throughout, built up of moisture storing cells. Rainwater stored in the hollowed-out trunk will remain fresh for long periods, and it is quite protected against evaporation by the walls of living tissue.

The opening is often closed with a stopper of wood to prevent animals from getting at the water-supply. (Fig. 11).

The plant occurs in the dry areas of Southern Kenya Colony and Northern Tanganyika from coast level to 3,000 feet and it is locally common.

N.O. CUCURBITACEAE.

Some members of this family have evolved an erect, soft, comparatively short but voluminous trunk above ground, and on account of this feature they deserve mention in an enumeration of indigenous succulents.

In *Dendrosicyos socotrana* of Socotra Island, the trunk attains a height of 7 to 8 feet, and a diameter of 3 feet. The branches are pendent and they have no tendrils.

None of the East African *Cucurbitaceae* compare with such dimensions; their trunks rarely exceed 1 foot in height.

There are several species of this type, all of them creeping or climbing plants with well-developed tendrils. Most common and widely distributed in the dry areas in East Africa is:

MOMORDICA.

Momordica rostrata A. Zimm.

The fleshy, irregularly-grooved trunk of this plant is found frequently at the base of shrubs, half hidden in the undergrowth; the long, slender, scandent branches climb over the surrounding vegetation, to which they cling with the aid of their tendrils, often smothering them with their dense foliage, and with a profusion of deep yellow, maroon-centred flowers. (Fig. 12.)

It is common in dry areas throughout East Africa.

GERARDANTHUS.

Gerardanthus macrorhizus Harv.

Is interesting from the succulent grower's point of view on account of the perfectly symmetrical vase-shaped trunk, but also for its attractive leaves, which are slightly fleshy, ivy-like in outline, and marked in two shades of green. The branches are thin, climbing and tendrilled. The flowers are small and insignificant, the fruits are characteristic, elongated, three-sided, and when dry they are often discovered by the rattling noise which the seeds produce inside the hull. (Fig. 13.)

Its distribution in East Africa is wide; it is found in the dry areas of South Kenya Colony and Northern Tanganyika.

N.O. CACTACEAE.

The *Cactaceae* with over 1,500 species are almost exclusively indigenous to America. A few species of the genus *Opuntia* have, however, established themselves very well in other tropical and sub-tropical countries, and *Opuntia ficusindica*, an excellent hedge plant with edible fruits, is found in many parts of East Africa.

This paper is concerned with indigenous succulents only, and the one genus represented in East Africa is:

RHIPSALIS.

Rhipsalis cassytha Gaertn.

At first glance the slender, drooping, cylindrical branches, with fruits the size and colour of those of our mistletoe, bear no similarity to our general conception of a number of the cactus family. Seedlings and young plants show, however, the usual

characteristics: they have erect, angular branches, armed with minute spines. The plant grows as an epiphyte on trees and on rocks, and it is locally common. The distribution is wide. It is known from the rain forests of the West Indies and of Brazil, in tropical West Africa from Liberia through the Cameroons and the Congo Basin to Angola, also on Lake Kivu and in Uganda, in the Chyulu Hills in Kenya Colony, in the Usambara and Uluguru Hills in Tanganyika, in South Rhodesia, and in Natal. It is possible that its wide distribution is due to the sticky juice of its fruit, which facilitates propagation by birds. (Fig. 14.)

Rhipsalis erythrocarpa K. Schum.

Very similar to *R. cassytha*, but with red berries and slenderer growth, this plant has been collected in Kibosho on the slopes of Kilimanjaro in Tanganyika, and near Thomson's Falls in Kenya Colony.

Rhipsalis spp.

Judging from habit character alone, there seem to be more species indigenous in Kenya. Fig. 15 shows a little erect plant with sturdier branches, and with small spines which are retained to maturity.

(To be continued)