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A new species of *Trianthema* (Aizoaceae) from the Kimberley region and a note on *T. triquetra*

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Abstract

Bittrich, V. A new species of *Trianthema* (Aizoaceae) from the Kimberley region and a note on *T. triquetra*. Nuytsia 7(2): 117-122 (1990). A new species of *Trianthema* is described, namely *T. kimberleyi* Bittrich & Jenssen, endemic to the Hall District of the Northern Botanical Province of Western Australia. Some observations on several forms of *T. triquetra* Willd. in Australia are provided: these differ mainly in leaf anatomy.

Introduction

The genus *Trianthema* L. (Aizoaceae) consists of about 20 species distributed in the tropics and subtropics, mainly in the southern hemisphere. Until now, twelve species have been recorded from Australia: ten of these are endemics (Prescott 1984).

The genus belongs to the subfamily Sesuvioideae (4 genera), which is characterized by circumscissile capsules, an aril completely sheathing the seed, Kranz anatomy of the leaves (with rare exceptions), and bracteate inflorescences (Bittrich & Hartmann 1988). The genus itself is defined by the monocarpellate gynoecium. Further characteristics are the large-celled hypodermis of the leaves (probably functioning as a water storage organ) and the often myxospermous seeds, where the mucus is produced by the swelling of the aril after moistening, a feature also found in the closely related genus *Zaleya* Burm.f. Jeffrey (1960) described two subgenera, *Trianthema* subgen. *Trianthema* and *Trianthema* subgen. *Papularia* (Forsk.) Jeffrey, distinguished by the number of ovules and the number of flowers per partial inflorescence. The new species described here is included in the subgen. *Trianthema*. *T. triquetra* belongs to the subgen. *Papularia*. However, it needs to be investigated whether the two subgenera defined by Jeffrey (1960) are also monophyletic groups and the characters mentioned by him provide synapomorphies for one or both of these subgenera.

Nearly all Australian species of *Trianthema* are annual herbs; only *T. turgidifolia* F. Muell. is more or less shrubby and perennial. A number of species are conspicuously hairy on all green parts (e.g. *T. pilosa* F. Muell., *T. rhynchocalyptra* F. Muell.); others are only sparsely pubescent or completely glabrous (e.g. *T. portulacastrum* L., *T. triquetra*). The new species belongs to the latter group and is closely related to *T. compacta* C. White, *T. glossostigma* F. Muell., and *T. oxycalyptra* F. Muell.

Trianthema kimberleyi Bittrich & Jenssen sp. nov. (Figure 1)

Herba annua, glabra, prostata, c. 5 cm alta et 20 cm diametro; folia opposita, carnosa, inaequalia, basaliter connata, saepe apiculata, lamina late obovata vel ovalis, c. 4-11 mm longa et 1.5-5 mm lata; petiolus c. 1-2 mm longus, basaliter cum vaginis membranaceis bidentatis; flores solitarii, breviter pedunculati; bracteae 2, membranaceae, apiculatae et denticulatae; tepala 5, basi connata, valvata, dorso viridia, intus albidarosea; stamina 10, 5 opposititepala, 5 alternitepala; stylus 1, c. 1.2 mm longus; ovarium simplex uniloculare, placentatione marginali, ovulis biseriatis; ovula 10-12; capsulae circumscissae, cum pedicellis, operculis conicis; semina c. 1.1 mm longa, brunneanigra, glabra, cum arillis omnino vaginata; embryo hippocrepicus; chromosomatum numerus 2n = 48.

Typus: c. 20 km south of the Great Northern Highway between Fitzroy Crossing and Halls Creek, 199 km west of Halls Creek. c. 2 km WSW of Christmas Creek homestead, Western Australia; near a small lake on flat hills in schistose rocks, 15 March 1989, *V. Bittrich & K. Jenssen* 18618 (holo: HBG; iso: CANB, K, PERTH).

Much branched, prostrate, *annual* herb c. 20 cm in diameter and 5 cm high, glabrous. *Branching* in the vegetative part of the plant monopodial, in the flowering region sympodial, the branches here of unequal diameter. *Leaves* opposite, flat, elliptical to obovate, 4-11 mm long and 1.5-5 mm broad, often with a short mucro at the apex, basally shortly connate, weakly papillose, succulent due to the large water-storing cells of the epidermis and hypodermis, reddish on the abaxial surface; leaves in the flowering region anisophyllous, with the thicker sidebranch in the axil of the larger leaf; petiole 1-2 mm long, basally expanded into a membranaceous sheath with two acuminate lobes. *Flowers* solitary, axillary, with an intense honey smell at anthesis; pedicels up to 2 mm long at anthesis, but elongated to up to 5 mm when fruiting, with two scarious, lanceolate, apiculate and denticulate bracts; perianth c. 7.5 mm in diameter, 5-partite; tube obconical, c. 2 mm long, with a whitish nectary disk inside at the base; lobes green outside, whitish-pink inside, valvate; stamens 10, 5 opposite and 5 alternate to the tepals, inserted at the mouth of the perianth tube; anthers pale pink, smooth; style 1, filiform with a row of short papillae on one side; placenta marginal with 10-12 ovules in 2 rows. *Capsule* dehiscing by circumscissile split about the middle, operculum subovoid; seeds 6-8, broadly ovoid or pyriform, c. 1.1 x 0.9 x 0.6 mm, brownish to black, smooth, completely sheathed by an aril, which swells slightly when moistened; embryo horseshoe-shaped, curved around the mealy perisperm. *Chromosome number* 2n = 48.

Distribution. Known only from the type locality in the southern Kimberley region where it is confined to the Hall District of the Northern Botanical Province of Western Australia.

Habitat. Grows on flat hills in schistose rocks.

Flowering and fruiting period. March to ?.

Conservation status. Rare.

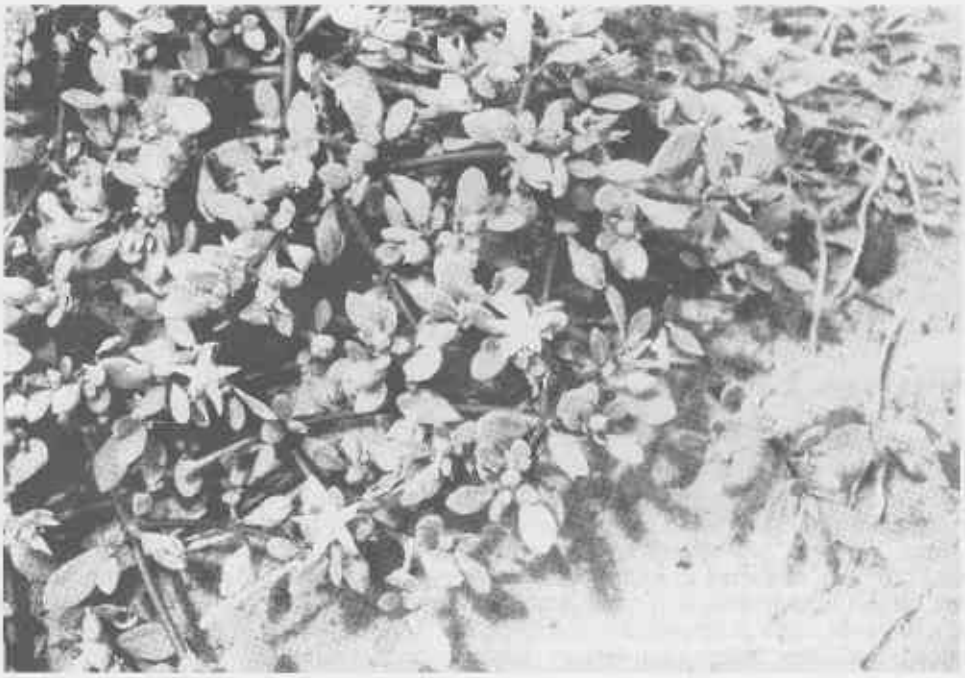

Figure 1. *Trianthema kimberleyi* at the type locality in the southern Kimberley region.

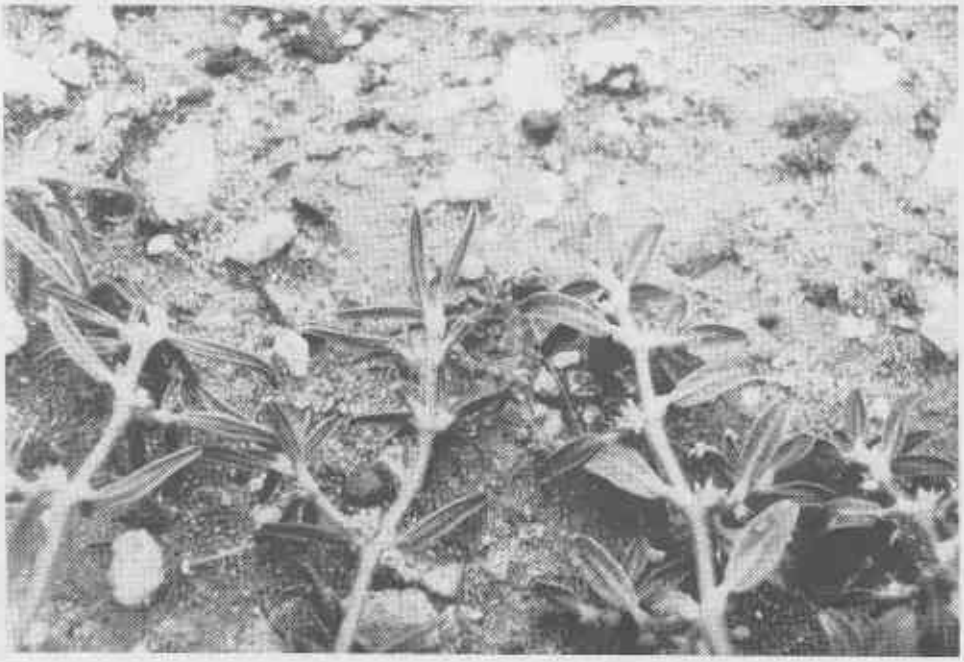

Figure 2. Two different forms of *Trianthema triquetra* occurring sympatrically in the southern Kimberley region near Fitzroy crossing (*Bittrich & Jenssen* 18612 (left), 18610 (right)).

Affinities. *Trianthema kimberleyi* is closely related to *T. compacta*, *T. glossostigma*, and *T. oxycalyptra*. It is distinguishable from these species by the ± valvate (instead of imbricate) tepals. Additionally, it differs from *T. compacta* by the mucronate, more succulent, always petiolate leaves, the constant number and regular arrangement of the stamens, and the aril, which does not swell after moistening in *T. compacta*; from *T. glossostigma* by the stamen number and the unsculptured testa (ribbed in *T. glossostigma*); from *T. oxycalyptra* by the absence of the dorsal unifacial mucro on the tepals, and the smooth aril, which is conspicuously papillate in *T. oxycalyptra*.

Etymology. The specific epithet refers to the distribution of the species, which is known at present only from the type locality in the southern Kimberley region of Western Australia.

Trianthema triquetra Willd.

Trianthema triquetra belongs to a group of species with its centre of distribution in the arid regions of southwest Africa, east Africa and India. As mentioned above, the species of this group belong to the subgen. *Papularia* (Forsk.) Jeffrey (characterized by two superposed ovules and usually clustered flowers), but up to now has not been assigned formal taxonomic rank, and still awaits critical revision. Differences between species described in the published Floras of the areas mentioned often are restricted to form and size of leaves, tepals and the perianth tube, characters which are subject to some plasticity dependent on water supply. Some taxa (species, subspecies or varieties), however, seem to be well circumscribed, but an investigation of the group over its whole distribution is necessary, before a satisfactory classification is possible.

The members of this group are characterized by smooth or papillose leaves and stems; and two-seeded circumscissile capsules, the circular operculae of which are depressed at the apex and partially enclose the upper seed. The dead tepals are generally hygrochastic and, when bending outwards after wetting, loosen the operculae which are then washed away by raindrops, thus functioning as dissemination units. The small, often inconspicuous flowers have only five stamens alternate to the perigon lobes. Also, form and sculpturing of the seeds are rather similar in all members of the group.

Trianthema triquetra contains two subspecies described from Africa and a number of varieties. In the treatment for volume 4 of the "Flora of Australia", Prescott (1984) describes two varieties only. Apparently it was assumed that only *T. triquetra* subsp. *triquetra* occurs in Australia, as no other subspecies are mentioned. Prescott (1984) notes considerable confusion in the use of the names of the two varieties (*T. triquetra* var. *triquetra* and *T. triquetra* var. *clavata* (J. Black) H. Eichler), which are mainly delimited by the different leaf form and degree of succulence. According to her, the variety with clavate, more succulent leaves is restricted to central Australia, and may only be a modification under extreme arid conditions. Such different forms, however, can also be found in northwest Australia, sometimes even occurring sympatrically (Figure 2). It was found in comparative cultivation that the different leaf forms are genetically fixed.

In Australia there occurs, however, a third form, which seems to be far less common than the former two and has been overlooked hitherto. The new form was recently collected by us in northwest Australia (*Bittrich & Jenssen* 18601, 18616, 18646; HBG, PERTH). The difference between the new form and the two other varieties lies in the leaf anatomy, which can be easily recognized in living plants, but only with difficulty in herbarium specimens. The varieties *Trianthema triquetra* var. *triquetra* and var. *clavata* develop a water-storing tissue adjoining the epidermis on the abaxial side of the leaf (Figures 2 & 3). Therefore, the chlorenchyme is developed on the adaxial side of the leaves only or in more succulent leaves (hence the varietal epithet "clavata") where it forms a semicircle around the water tissue. The leaves of the new form, however, show a central water-storing tissue only and have a chlorenchyme on both sides, thus being isobilateral in cross-section (Figure 3). In some leaves a very small gap in the chlorenchyme can be found on the abaxial side, visible as a narrow translucent band which either stretches from the base to the top of the leaf or is present only in the basal part. This is reminiscent of the strongly

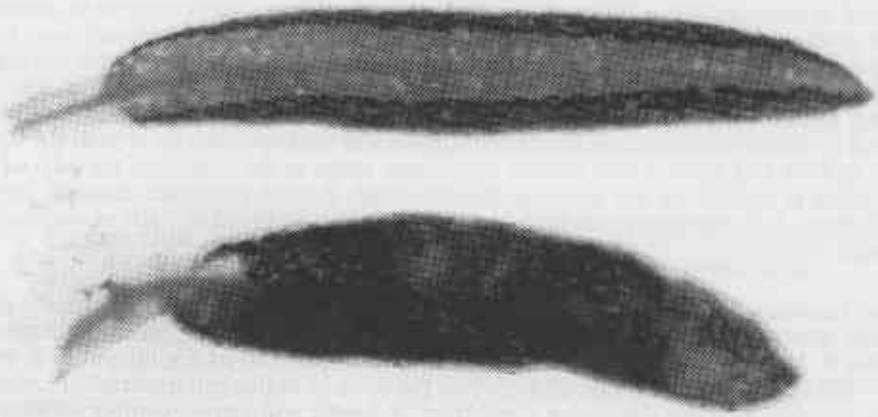

Figure 3. Leaves of two forms of *Trianthema triquetra* in abaxial view with different anatomy (*Bittrich & Jenssen* 18612 (above), 18601 (below)).

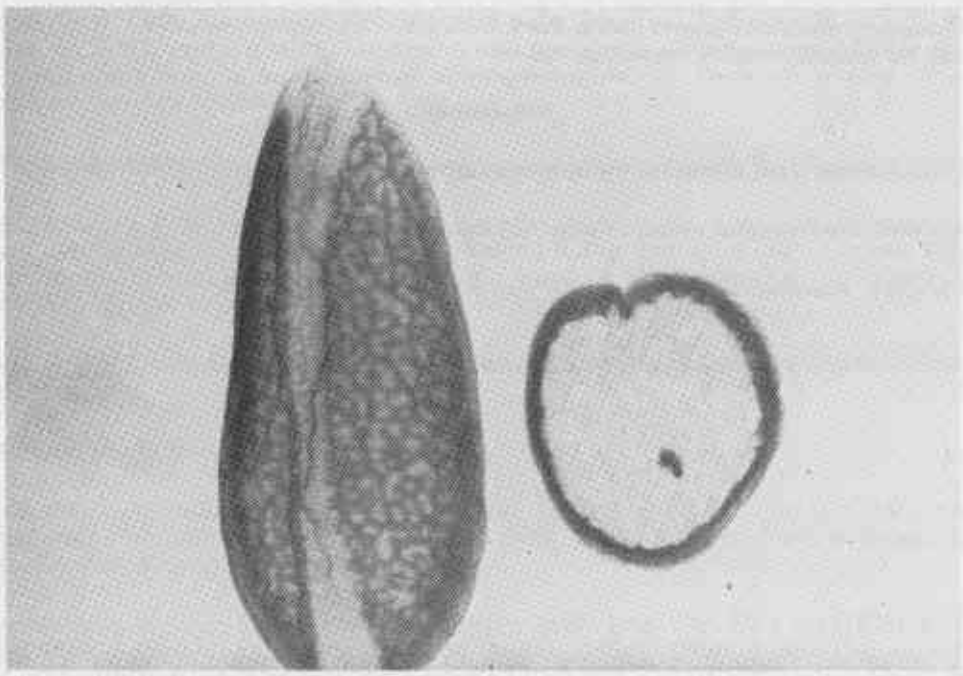

Figure 4. Leaf of *Trianthema turgidifolia* (*Bittrich & Jenssen* 18644) in abaxial view and cross-section.

succulent leaves of the closely related *T. turgidifolia* F. Muell., where at least part of the leaves on every plant also show a narrow translucent band on the abaxial side (Figure 4). In connection with the different position of the water-storing tissue and the chlorenchyme also the innervation of the leaves as seen in cross-section is different. In the first case, where a chlorenchyme is absent on the abaxial side of the leaves, vascular bundles are also absent in this part. In the second case, however, the primary and secondary vascular bundles lie more or less inside the central water-storing tissue, whereas the higher order bundles are arranged circularly at the periphery of the central water-storing tissue. This difference in pattern is not surprising, as all *Trianthema* species are characterized by Kranz anatomy, and the chlorenchyme and the kranzcells lie around the leaf veins (Figure 3). In both leaf types a very narrow translucent stripe in the middle of the adaxial side of the leaves often is visible, as the vascular bundles (with the chlorenchyme around) cross only occasionally here. It is interesting that both leaf types can also be found in African members of the species group.

A formal taxonomic treatment of the new form of *Trianthema triquetra* is still hardly possible, as long as the whole species group is insufficiently known. It is, however, probably identical with *T. glaucifolia* F. Muell. (type MEL 99963 from Queensland), treated as a synonym of *T. triquetra* by Prescott (1984), but this is difficult to decide on the basis of herbarium material. *T. triquetra* in Australia is variable in other characters (epidermis of leaves and stems, number of flowers per inflorescence, seed sculpture, length of the perianth tube, chromosome number), too, which need further investigation. At present it is even uncertain whether the name *T. triquetra* will persist in future, as the earlier described species *T. salsoloides* Fenzl ex Oliver is rather similar and might be an earlier name for the same taxon. In the future, attention should be paid to the differences described above in order to obtain more information about the distribution of the different forms.

Acknowledgements

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