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989. NICOTIANA WALPA

Solanaceae

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Illustrations by Deborah Lambkin

Summary. The Australian species *Nicotiana walpa* is newly described here from plants collected at the Uluru-Kata Tjuta National Park in the Northern Territory, Australia, and illustrated from plants cultivated at the Royal Botanic Gardens, Kew. Its discovery, ecology, cytology and cultivation are discussed.

Our studies on the evolution of Australian species of *Nicotiana* section *Suaveolentes*, have taken us to many parts of the Australian outback. When visiting the Red Centre of Australia (Northern Territory) in August 2016, we were given permission by several indigenous communities to collect *Nicotiana* specimens on their land. That year, the winter conditions for growth of these and other desert plants had been optimal, and we were enthralled by the fabulous displays of wildflowers, the green leaves contrasting beautifully with the terracotta-red sands.

One of the highlights of our visits was exploring the sacred lands around Uluru, the famous landmark in the centre of Australia. The Park rangers kindly arranged contact with the local people and together with two knowledgeable women we went on the hunt for native tobacco at Uluru. We had been expecting to find four species of *Nicotiana* in the Uluru-Kata Tjuta National Park: *N. excelsior* J. M. Black (Chase & Christenhusz, 2018a), *N. gossei* Domin (Chase & Christenhusz, 2018b), *N. ingulba* J. M. Black (Chase *et al.*, 2021) and *N. occidentalis* subsp. *obliqua* (N. T. Burb.) M. W. Chase & Christenh. (Chase & Christenhusz, 2018c). We soon found flowering populations of all these, but to our surprise we encountered a fifth species (Plate 989), which we observed in many places growing around Kata Tjuta on the Valley of the Winds hiking trail. Kata Tjuta (a name that translates as ‘many heads’ and was previously known as Mount Olga) lies about 50 km from the much better-known Uluru



Plate 989 *Nicotiana walpa*

DEBORAH LAMBKIN



Fig. 1. Fields of pink mulla mulla *Ptilotus exaltatus* Nees (Amaranthaceae) near the sacred domed rocks (bornhardts) at Kata-Tjuta. Photograph Maarten Christenhusz.

(previously known as Ayer's Rock), and both sites are visited by thousands of tourists each year. Kata Tjuta is as impressive as Uluru and an important sacred site for the local Anangu people. These massive domed rocks or bornhardts (https://en.wikipedia.org/wiki/Kata_Tjuta) are composed of conglomerate sandstone, and the tallest is 546 m above the surrounding plain (186 m taller than Uluru). The Valley of the Winds trail circumnavigates the site and offers impressive views of this magnificent set of outcrops across the vast dune scape of the Red Centre that surrounds these isolated mountains. A second trail takes visitors into the head of Walpa Gorge, which lies between two of the individual bornhardts. Now that we have studied the herbarium collections of most of the Australian herbaria, we have identified only three other specimens of this species collected at Kata Tjuta. This surprises us because we observed a population of more than 1000 individuals of this large species (more than a metre tall) immediately next to the main carpark for the Valley of the Winds trail, where the start

of the trail crosses over a small watercourse (Figs 2 and 3). Two, *Lazarides & Palmer 101* and *522* (CANB), were collected at Kata Tjuta in 1988. We also observed this same species at the remote and impressive Tnorala (formerly called Gosse's Bluff), where it was previously collected under the name *N. gossei* (Carr 2136, MEL, collected in June 1978). Situated about 200 km to the northeast of Kata Tjuta in the lands of the Western Arrernte people, Tnorala is a highly eroded, 140-million-year-old meteor impact crater that is still 5 km in diameter. Undoubtedly, *N. walpa* exists at other sites, but given the paucity of previous collections it must only appear under a set of highly infrequent environmental conditions. We were very lucky to have been present in one of these unusual years.

The local national park rangers at Kata Tjuta told us they had never seen it before and were just as surprised about our find as we were. We are therefore pleased to present this species here as new to science.

NOTES. *Nicotiana walpa* would presumably be considered similar on morphological grounds to *N. simulans* N.T.Burb., but the two previous collections at Kata Tjuta mentioned above were found among the undetermined material in the national herbarium at Canberra (CANB). In two cases, this species has been identified as *N. gossei*, which can be explained by the fact that in both species the petiole is winged with a slightly auriculate base, but these auricles are much better developed in *N. gossei*. The two species are otherwise dissimilar. *Nicotiana walpa* is a member of a clade of species related to *N. stenocarpa* Wheeler (Chase & Christenhusz, 2018d), along with several other undescribed similar species (Chase *et al.*, submitted). We are still studying these other species to determine their ranges and distinguishing features, and they will be described later.

Nicotiana walpa can be distinguished from the other species in this group by its habit, particularly the abruptly attenuate leaf bases, and vestiture with the large multicellular hairs on the upper stems and leaf margins. Its leaves are perhaps more discoloured than other species. It has a chromosome number of $n = 20$, which so far has been the number found in all species of this clade.



Fig. 2. Plants of *Nicotiana walpa* growing under *Melaleuca* along the Valley of the Winds Trail at Kata-Tjuta. Photograph Maarten Christenhusz.



Fig. 3. A plant of *Nicotiana walpa* growing atypically in a stream bed in full sun. Photograph Maarten Christenhusz.

CULTIVATION. *Nicotiana walpa* germinates poorly unless treated with an aqueous gibberellic acid solution (1 mg/ml) prior to sowing. In fact, we tried several times to germinate them without gibberellic acid, but not a single seed germinated. Seeds are sown on the surface of a nutrient-rich, well-aerated medium (a mix of compost and sand) and kept moist but not wet throughout the growing season. They require good light and temperatures above 20°C. The plants are annuals, but numerous seeds are produced over the season. In nature, it appears to persist for long periods in the soil seed bank and infrequently germinates when some undiscovered set of conditions occurs. Flowers are self-compatible and regularly self-pollinate, producing fruits and seeds without insect visitation.

Nicotiana walpa M.W.Chase, Dodsworth & Christenh., **sp. nov.** (Fig. 4).

Type. AUSTRALIA. Northern Territory: Uluru-Kata Tjuta National Park, Valley of the Winds trail, by bridge over a small creek near the carpark, partly under mulga, 25°17'6"S, 130°43'36"E, 600 m, August 15, 2016, *Chase & Christenhusz 16116* (holotype K; isotypes NT, CANB).

This new species is similar and related to *Nicotiana stenocarpa* Wheeler in general habit, vestiture and flower morphology, but it differs in leaf shape, in particular the abruptly attenuate and discolourous lamina and moderately auriculate leaf bases, the latter causing it to be identified in the past as *N. gossei* Domin, a species with much larger flowers and different silky vestiture.

DESCRIPTION. Erect, herbaceous, *annual herbs*, forming a rosette, but with numerous large leaves in the basal portion of the stems. The main *stem* has some minor branching, but then from near the base producing a series of additional strong stems, eventually forming a multi-stemmed plant. *Basal leaves* in a rosette and, especially on the base of the stems, with winged petioles up to *c.* 6 cm long, the wing 1.5–2.0 cm across, blades 7.4–12.5 × 15.2–17.4 cm, ovate, widest near the base, abruptly attenuate, the apex obtuse in the basal leaves to acuminate in those higher up, margins entire, undulating, ciliate, often strongly bullate, especially on the petiole and base, upper leaves sessile often with a somewhat auriculate base. *Vestiture* on the stem base and leaf margins composed of short and long hairs interspersed with long, multi-cellular hairs with a swollen base with a green inclusion, some with a small glandular head, the leaf veins below with long multicellular hairs, above with sparse short hairs, upper stems to the apices with short non-glandular hairs interspersed with longer, multicellular hairs, the pedicels with glandular hairs and multicellular spikey hairs, with a swollen persistent

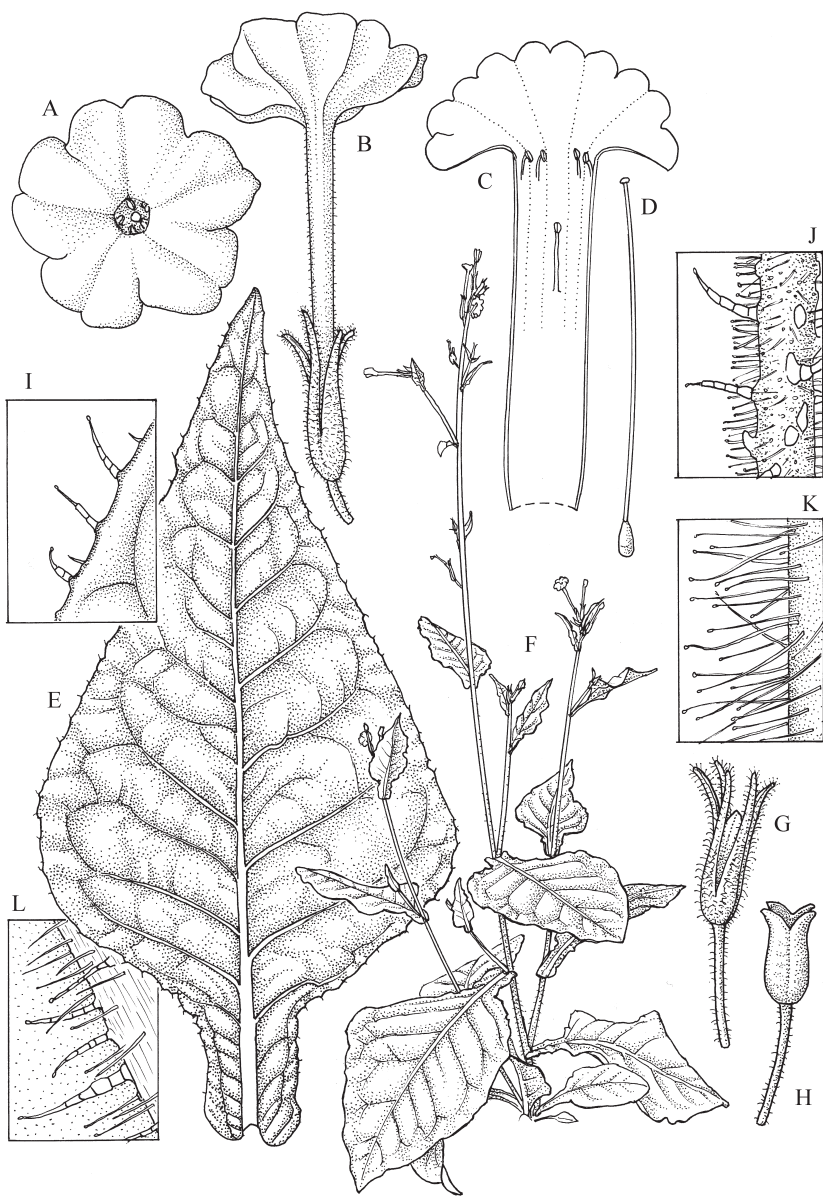


Fig. 4. *Nicotiana walpa*. A, corolla, face view, $\times 2\frac{1}{4}$; B, flower, $\times 2\frac{1}{4}$; C, corolla, opened out, $\times 2\frac{1}{4}$; D, style and ovary, $\times 2\frac{1}{4}$; E, leaf, $\times \frac{3}{4}$; F, habit; G, fruit, with calyx, $\times 2\frac{1}{4}$; H, fruit, calyx removed, $\times 2\frac{1}{4}$; I, leaf edge hairs, $\times 12$; J, upper stem hairs, $\times 12$; K, lower stem hairs, $\times 12$; L, leaf margin, underside, $\times 12$. Drawn by Deborah Lambkin from specimens cultivated at Kew.

base cell. Inflorescence bracts sessile, linear lanceolate, *c.* 0.5–2.3 cm long, the apex acuminate. *Calyx* 1.2–1.0 × 0.2 cm, one slightly longer and one shorter, the tips acuminate, slightly flaring, 0.2–0.3 cm longer than the fruit. *Corolla* tube 2.2–3.5 cm long (from tip of the calyx), 0.20–0.25 in diameter, with no throat cup, the limb 1.8–2.6 cm across, the lobes slightly cleft, 0.8–1.0 cm long; four *stamens* of the same length at the throat of the floral tube and the fifth *c.* 5 mm deeper in the tube. *Fruit* a dry capsule splitting in four lobes, surrounded by the persistent calyx, which is slightly longer and enlarged at maturity. Chromosome number: *n* = 20 (Chase *et al.*, 2021b).

DISTRIBUTION. Australia. Northern Territory: it has been found thus far only at Kata Tjuta and Tnorala, but presumably occurs at other sites between these two.

HABITAT AND ECOLOGY. In slightly shaded sites under mulga (*Acacia aneura* F.Muell. ex Benth.), usually along streams or other alluvial sites, occasionally in full sun, 600–720 m. *Nicotiana walpa* occurs in slightly acidic soils, which are typical of sandstone conglomerates like Kata Tjuta. Annual rainfall is about 300 mm per year, and only five days per year are cloudy. These plants germinate after rains in the Australian winter and flower in the following spring. When temperatures become too hot and water availability dwindles, the plants go to seed and die. Seeds can lie dormant in the seedbank until another favourable season occurs. Summers are typically without rainfall and 30–35°C, whereas most of the annual rainfall is in the winter when the temperature can fall below 0°C (<http://www.bom.gov.au/>), thanks to the generally high elevation of the Red Centre.

PHENOLOGY. Flowering and fruiting from August to October in wet years only.

ETYMOLOGY. In Pitjantjatjara, the language of the Anangu people, *walpa* means wind. It was therefore also given as the name of one of the gorges at Kata Tjuta, Walpa Gorge, a place associated with dreamtime legends. The main trail at Kata Tjuta is the Valley of the Winds trail, so this reference to the wind seems appropriate for this species.

ADDITIONAL SPECIMENS STUDIED. Northern Territory: Kata Tjuta, along the Valley of the Winds Trail on the N side, under *Acacia aneura* (mulga) by a small watercourse, 600 m, 25°17'12''S, 130°44'53''E, 14 August 2016, Chase & Christenhusz 16105 (K, NT, CANB); Kata Tjuta, locally common in creek line in red alluvium with *Acacia* spp., Asteraceae spp., *Lepidium* sp., *Erodium* sp. and *Rumex vesicarius*, annual herb, 55 cm high some plants to 105 cm high; stems with a glandular pubescence; leaves in a basal rosette, discolourous, 25.3°S, 130.7333°E, 18 August 1988, Lazarides & Palmer 522 (CANB); Gosses Bluff, *c.* 120 km W of Alice Springs, 26 June 1974, Carr 2136 (MEL); Tnorala (Gosses Bluff), in the crater, along, but not in, small creek, mostly in shade under mulga (*Acacia aneura*), 200–300 plants, most without stem leaves, winged and weakly auriculate petioles, both glandular and eglandular hairs, a single

flowering specimen seen, many with inflorescence partially eaten, 715 m, 23°49'3''S, 132°18'57''E, 8 August 2016, Chase & Christenhusz 16 156 (K, NT, CANB).

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