

## *Sansevieria tubiformis*: A new species and gorgeous survival artist from Zimbabwe

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### Abstract

The authors describe a new taxon that had initially been thought to be *Sansevieria metallica* var. *nyasica* and later *S. longiflora*. However, it is actually a new, endemic species from Zimbabwe with extraordinary and to date totally unknown faculties. Each year during the dry season in winter (between April and October) this new species folds parts of its flat leaves into a watertight tube in the ground and uses the remaining parts of the leaves to collect condensed fog and convey this moisture slowly to its roots. Such an unusual property has never been observed before in *Sansevieria*.

### Introduction

In the subtropical oceanic highland climate of Zimbabwe grows a *Sansevieria* with a surprising survival strategy. Initially we thought it was *Sansevieria longiflora* after its discoverer Dave Richards had identified it as *S. metallica* var. *nyasica* first. Collected plants behaved rather strangely also in cultivation. During the dormant period in winter (between April and October) the plants rolled nearly 50% of their leaves into a tube beginning from their base. Up to a length of 20 cm these tubes were hidden in the ground and they were watertight. It is not surprising that *Sansevieria* fold and slightly roll in their leaves during dry periods and/or seem to turn them into petioles. It had always been assumed that this mainly serves for reducing the surface open for transpiration and thus helps the species to survive. We understood which astonishing technique this plant is using only when visiting the type locality several times. Although it is exposed to full sunshine all of the time and to complete dryness for a period of approximately six months the water level in the tight tubes was up to 20 cm high. Where did the water come from? The answer is very simple. Fog that occurs during the night until the early morning condenses at the upper part of the leaves and drop by drop it runs down the slightly rough surface into the watertight tube and is then slowly taken up by the root during daytime. In summer, when it starts raining again, the plant unfurls its leaves and opens the tube almost completely because then, obviously, water supply from the ground is ensured once more. At the end of the dry season, when the tropical rainfalls occur, this may also lead to such water levels in the tubes before the plant opens them, of course.

However, it would not be justified to say that this plant depended directly on fog for its water supply since the condensed moisture is first transported to the roots - probably it is then taken up with minerals dissolved in the water.



**Fig. 1** – *Sansevieria* sp. R 2098 in Daves Richards' garden in Harare.

**Fig. 2** – Group of plants that are not linked with each other.

**Fig. 3** – Fully formed watertight tube.

**Fig. 4** – Entire plant, flowering, with formed tube.

**Fig. 5** – Inflorescence, upper part.

**Fig. 6** – Inflorescence with individual flowers.

**Fig. 7** – Measurements.

**Fig. 8** – Part of the inflorescence (5 flowers per cluster)





## Taxonomic treatment

*Sansevieria tubiformis* P.A.MANSF. & M.J.SPINDL. **sp. nov.** (fig. 1–9)

### Diagnosis

*Sansevieria tubiformis* aff. *S. longiflora* differs from it by its rolled up, seemingly petiole-shaped leaves and an inflorescence protruding from and surrounded by this tube. The inflorescence has five flowers per cluster.

### Type

Zimbabwe, collected near the 31 km road mark, south of Mutare along the road to Birchenough Bridge in full sunshine without shade from 6 am until 6 pm. (07/01/2004) David John Richards – R 2098. (Holotype: SRGH) (G.P. AS 11504-C) (**Fig. 9a–9e**)

### Etymology

(*tubiformis* = lat. tube-shaped) refers to the leaves which are temporarily rolled into tubes turning into watertight tubes in adult plants.

### Description

**Plant:** Perennial, acaulescent with underground rhizome up to 5 cm thick.

**Leaves:** 1-3, lanceolate to elongate lanceolate, straight upright up to 1.20 m long, 12-15 cm wide and 5 mm thick, dark, bottle green with light-green to grey zigzag-like bands on the adaxial side and light-green to light brownish zigzag-like bands on the abaxial side. Leaf surface with fine lines, slightly rough, abaxial side more rough, leaf margin red-brown with a hard tip. The leaves are able to roll into a watertight tube with a diameter of 25 mm beginning from the base up to a length of 45 cm for the dry season lasting several months.

**Inflorescence:** Elongated thyrses with a cyclic cluster-like partial inflorescences with 5 densely arranged flowers per cluster, 1.30 m long, fertile part 58 cm, inflorescence axis diameter 15 mm at the base with up to 5 triangular, 4-6 cm long bracts, develops inside the leaves rolled into a tube.

**Flowers:** in a cyclic cymose partial inflorescences; peduncles apically articulate, 5-6 mm long; flowers greenish white; flowers 50-55 mm long, perianth tube 28-30 mm long, lobes 22-25 mm long, recurved, filaments as long as the lobes or shorter, style 50 millimetres long, anthers open 4-5 mm long, greenish to greenish-yellow.

**Fruit:** berry-like, single- to tri-lobed, round, orange, diameter 8-10 mm.

**Seeds:** size 5-7 mm, rotund.

[sub-section *Sansevieria*]

### Distribution and Conservation Status

Beside the first finding south of Mutare other habitats were found at the Nyarungwe approximately



30 km west of Birchenough Bridge near the A9 (Mutare-Masvingo Road), -19.93500° S, 32.04420° E, 1048 m above sea level. (26/11/2015) Manfred Josef Spindler - MJS 112015. All finds as of to date were only small patches of interlinked groups of plants discovered south of Mutare in the area around the Save River. Since these groups of plants were always restricted to few individuals we propose to classify *Sansevieria tubiformis* as endangered according to IUCN (vulnerable VU).

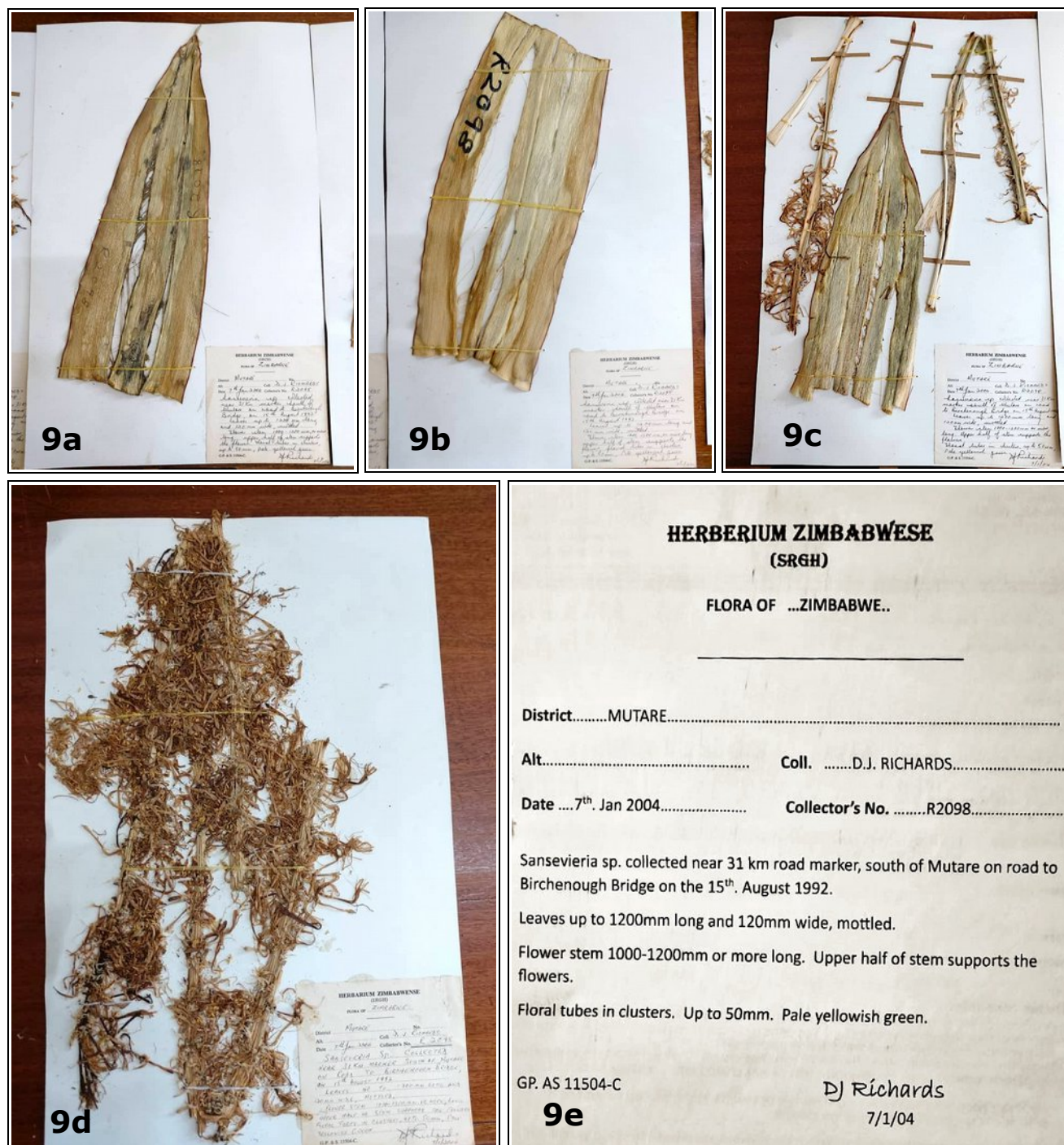


Fig. 9a–9d – *Sansevieria tubiformis*, David John Richards – R 2098. (Holotype: SRGH) (G.P. AS 11504-C).

Fig. 9e – *Sansevieria tubiformis*, Copy of the inscription on the herbarium specimens.





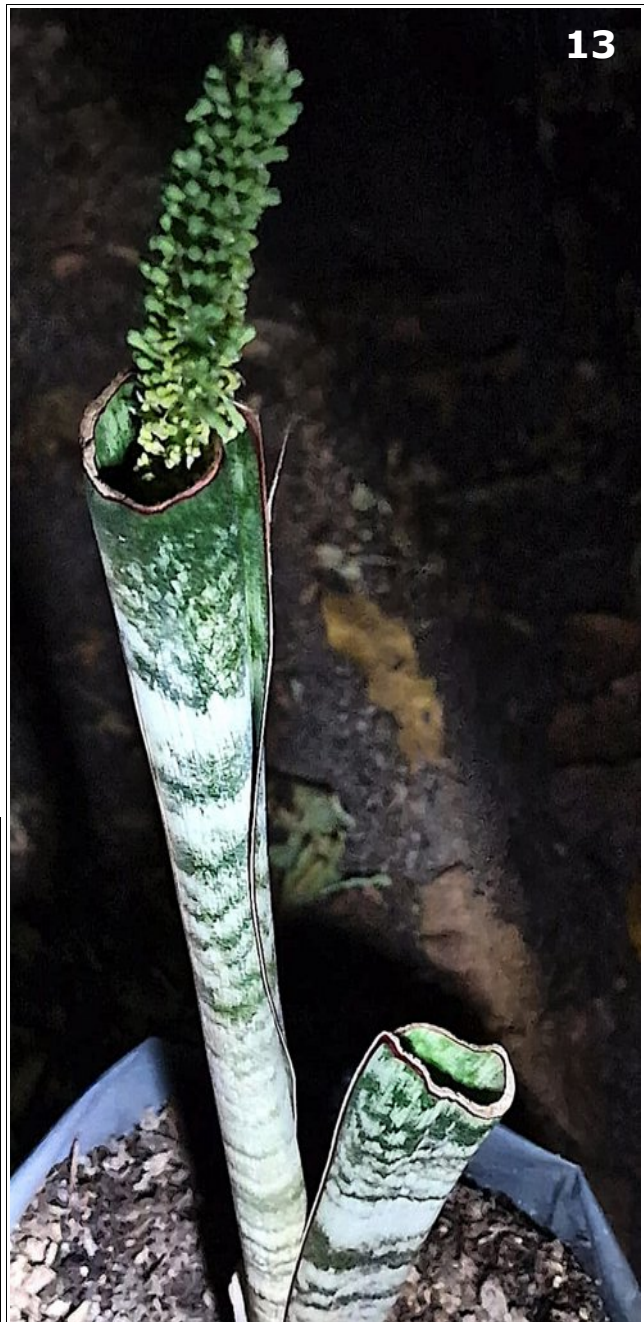
**Fig. 10** – *Sansevieria tubiformis* Leaf pattern.

**Fig. 11** – *Sansevieria tubiformis* connected group with different characteristics of the tube.

## Discussion

To date the assumption had always been that the transformation of the leaf base into a canaliculated petiole in the *Sansevieria* genus was only a reduction of the leaf surface and thus a reduction of transpiration. *Sansevieria tubiformis*, however, puts us right there because it shows that the faculty to turn a part of the leaves temporarily into a watertight tube follows a totally different agenda. An agenda that is obviously due to the ecological pressure since *S. tubiformis* grows not just in full sunshine but it has to survive six months without any rain in addition to that. The slightly rough leaf surface obviously promotes the transport of even smallest drops of condensed water from the upper, almost unfolded leaf surface to the lower part of the leaf that is folded into a tube. Where plants are growing in a group always the oldest stem forms the longest watertight tube. This makes us assume that it supplies the other stems with water during the dry season. (**Fig. 11**) At the end of the dry season, when *S. tubiformis* opens its tube somewhat so that the residual water can run off, adult plants form an inflorescence inside the tube. (**Fig. 13**) Often a new leaf appears from the rhizome at the bottom of the tube to grow into a new stem. In cultivation or at locations with better water supply often the tubes are not that tight in winter.





**Fig. 12** – After the dry season, *Sansevieria tubiformis* opens the watertight tube because the plant's supply is ensured by rain.

**Fig. 13** – *Sansevieria tubiformis* A plant that had lost parts of its leaves due to browsing by animals that has formed a complete inflorescence nevertheless. The watertight tube is clearly perceivable..

**Fig. 14** – *Sansevieria tubiformis* – The three plants clearly show the different formation of the tubes depending upon each plant's age. The red line indicates the ground level.

**Table 1:** Comparison of features of *Sansevieria tubiformis* and representatives of the sub-section *Sansevieria*.

Species	<i>S. tubiformis</i>	<i>S. longiflora</i>	<i>S. metallica</i> var. <i>nyasica</i>
Feature according to	The present article	Brown (1915)	Brown (1915)
Rhizome diameter [mm]	50	25	10–25
Rhizome bark, color	beige, orange	brownish, orange	light red to brown
Leaves per stem	1–3	4–6	1–3 (4)
Length of leaves [mm]	900–1200	380–460	450–1500
Width of leaves [mm]	120–150	75–90	50–120
Adaxial side of leaves	rough	glabrous	glabrous
Basic color of adaxial side of leaves	bottle-green	dark green	canaliculated, dull dark green
Basic color of abaxial side of leaves	bottle-green	dark green	NA
Leaf pattern	light green to light grey zigzag-like bands	pale green scattered spots	paler spots that nearly disappear in old plants
Inflorescence total length [mm]	1300	330–700	450–1200
Diameter of inflorescence [mm]	15	NA	4–10
Involucral bracts	5	5–7	3–6
Length of involucral bracts [mm]	40–60	25–70	13–100
Fertile part	580	80–400	NA
Flowers per cluster	5	2–3	2–4
Scent	grass-like	strong scent	NA
Flower color	pale yellowish green	greenish-white or white	greenish white or tinged red
Perianth tube [mm]	28–30	90–100	15–17
Lobes [mm]	22–25	34–38	19

## Acknowledgements

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