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Notes on the Flora of Taiwan (30)—*Arisaema nanjenense* T.-C. Huang & M.-J. Wu *sp. nov.* (Araceae)

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ABSTRACT: A new species, *Arisaema nanjenense* T.-C. Huang & M.-J. Wu *sp. nov.* is proposed here. This new species and related taxa of *Arisaema* are discussed. Detailed descriptions of external morphology, pollen features and chromosome number are provided with an illustration and a photo. This new species may question the validity of *A.* section *Fimbriata* Engler.

KEY WORDS: ***Arisaema nanjenense*, New species, Taxonomy.**

INTRODUCTION

It was during spring vacation when the senior author went to do field study with the sophomore students of the Botany Department, National Taiwan University at Nanjenshan to Kentin National Park, Pingtung County on April 3, 1997. Along a mountain path, he collected one male plant of an *Arisaema* at 3.1 km from Nanjenshan local control station. After careful review of previous papers (Hayata, 1915, 1916, 1920; Huang, 1960, 1962, 1972; Liu & Huang, 1978; Murata, 1984, 1990; Ohashi, 1981; Ohashi *et al.*, 1983; J.-C. Wang, 1992, 1996; Y.-F. Wang, 1996), he returned to Nanjenshan with the junior author to examine more plants in the field, and collected one old plant for further investigation. We then decided, based on our new finding, to propose the *Arisaema* as a new species (Fig. 1).

MATERIALS AND METHODS

Both young (male) and old (monoecious) plants were collected for morphological studies including pollen features and chromosome counts. Pollen grains were prepared by the method proposed by Erdtman (1952). The acetolyzed grains were dehydrated in an ethanol series and dried in the air. After dried grains were coated with gold, they were examined and microphotographs were taken with SEM, Hitachi S-520. The root tips were pretreated with 0.002 M 8-hydroxyquinoline for 4-5 hours at a temperature of 18-20 ℃, then fixed in 1:3 acetic ethanol overnight and hydrolyzed in pectinase and squashed in propionic orcein. Chromosome counts were done with aid of Leitz DMRB.

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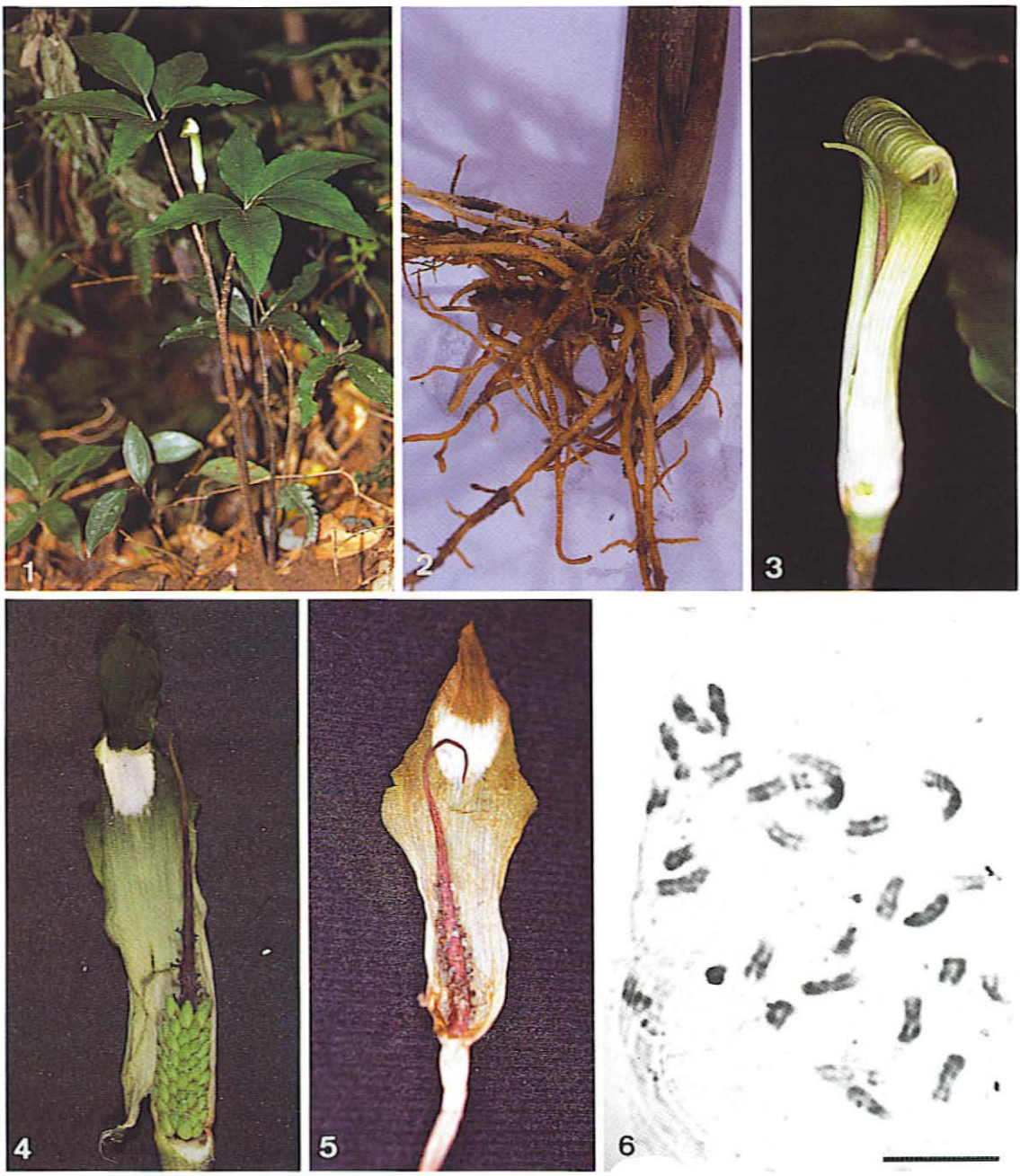


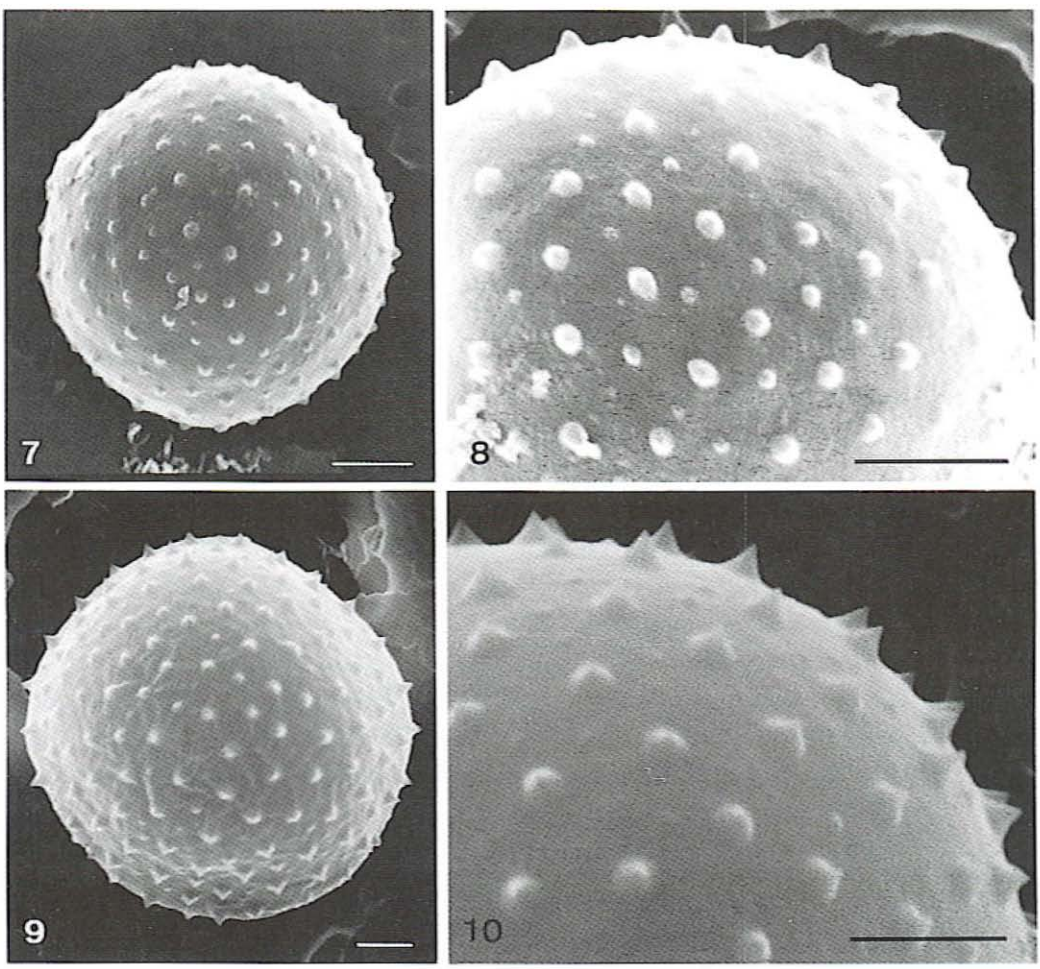
Figs. 1-6. The habitat, inflorescences and chromosomes of *Arisaema nanjenense* (*Huang & Wu 16982*, in Figs.1-4 and 6; *Huang 16978*, in Fig. 5). Fig. 1: A plant growing along roadside in shade of broadleaved forest Fig. 2: The rhizome and fibrous roots of the plant. Fig. 3: The inflorescence of a monoecious plant with glabrous appendage tip, with spathe opened artificially. Fig. 4: Open inflorescence of monoecious plant showing both staminate and pistillate flowers. Fig. 5: Open inflorescence of male plant showing staminate flowers, with faded brownish spathe. Fig. 6: Metaphase chromosomes, 2n=28. Scale bar equal to 10 cm in Fig 1, 1 cm in Figs. 2-5 and 10 μm in Fig. 6.

RESULTS

Pollen morphology (Figs. 7-10)

The pollen grains are inaperturate, spheroidal, with spinulate exinal ornamentation, the spinules in two sizes, distributed evenly and intermixed.

The pollen size measured from dioecious male plant (monoecious male plant measurements in parentheses) is 9.0-10.0 μm (13.8-15 μm) in diameter, the spinules are 0.25-0.35 μm (0.4-0.5 μm) long and 0.30-0.40 μm (0.4-0.5 μm) in diameter in large sizes or 0.10-0.15 μm (0.1-0.2 μm) long and 0.15-0.20 μm (0.1-0.2 μm) in diameter in short ones, with a density *ca.* 21-31 (16-18) per 5×5 μm^2 area.



Figs. 7-10. Pollen grains of *Arisaema nanjenense* T.-C. Huang & M.-J. Wu *sp. nov.*, showing the pollen extracted from male flowers of dioecious plant in Figs. 7 and 8 (*Huang 16978*), and from monoecious plant in Figs. 9 and 10 (*Huang & Wu 16982*). Scale bar=2 μm.

Chromosome number (Fig. 6)

The chromosome numbers of *Arisaema* have been reported as 2n=28 (Huang, 1962 Hotta, 1971; Murata, 1985, 1990; J.-C. Wang 1996), 2n= 56 (J.-C. Wang, 1996) and 2n=84 (Murata, 1990). This species has a chromosome number of 2n=28.

Taxonomic treatment

There are two other closely related species in Taiwan. They can be identified by the following key and Table 1.

Key to species of *Arisaema* in Taiwan

1. Spadix appendage glabrous at both tip and base of appendage; leaflets 5; stem rhizomatous ..... *A. nanjenense*
1. Spadix appendage hairy at least on tip; leaflets 3-5
   2. Spadix appendage hairy on basal part; leaflets 3; stem tuberous ..... *A. matsudae*
   2. Spadix appendage glabrous on basal part; leaflets 3-5; stem rhizomatous ..... *A. grapsospadix*

Arisaema nanjenense T.-C. Huang *et* M.-J. Wu, *sp. nov.* Figs. 1-11 南仁山天南星

PINTUNG COUNTY. Nanjenshan, *T.-C. Huang & M.-J. Wu 16982* (monoecious plant, holotype, TAI)

Affine A. grapsospadix Hay. et A. matsudae Hay. sed apice appendicis glabro differt.

Herba succulenta sempervirens, monoecia vel dioecia rhizomate subterraneo ad 60 cm alata. Rhizoma (Fig. 11-1) *4.5 cm longa. Pseudocaulis 4.5 cm longus 1.5 cm crassus. Cataphylla 2, fusca, 7.5-19.5 longa. Folia una ad duo; petiolus 12.5-15 cm longus. Folia ternata pedatim 5-foliolata petiolula 0.4-0.5 cm, 1.0-1.5 cm et 2.8-3.0 cm longi e basi sursum ad apicem foliolata suprema; lamina succulenta membranacea glabra supra nitida atrovirens inferiora viridula, ovato-lanceolata ad oblongo-ovata apice aristatis aristis 2.5-3.0 mm longis basi obtusa foliolata terminalia 13-14.6 cm longa 6.2-6.3 cm lata, foliolata lateralia obliqua 10-13.2 cm longa 4-5.6 cm lata; nervi reticulati usque 10 nervis lateralibus, margine integra, undulata vel revoluta. Inflorescentia* (Figs. 3-5) *spadix foliola breviora vel aequantia; pedunculus teres 7-7.5 cm longus 3 mm crassus; spatha viridis fauce semilunato albo maculato 5.3-8 cm longa, tubus spathae cylindricus 4.5-6.3 cm longus 1 cm crassus, limbus spathae triangulatus apice aristato 2.2 cm longo 2.3 cm lato; spadix 4.5-6.3 cm longa. Planta juvenis floribus masculo* (Fig. 5), *axes males 3.5 cm longis. Planta vetiores flore supra males infero femineo* (Figs. 3-4); *flores males masculini rubri antheris 4(-5) cellulis, filamentis 0.6-1.0 mm longis, axes males 1.5 cm longa; flores feminei pallide virides; stigma punctata glabra; ovarium conicum spadix axis oblique 1-cellatum; ovula 3-5 basales orthotropodes; axes feminei 2.1 cm longi; appendix spadicis filiforma glabra 2.4-2.7 cm longa inclusa apice ad 1 mm crassa.*

Hab.: In silvis frondosis ad 250 m spura mare Pingtung Nanjenshan, 13 April 1997, T.-C. Huang et M.-J. Wu 16982 (Holotypus, TAI.), 3 April 1997, T.-C. Huang 16978 (Paratypus, TAI), 13 April 1997, T.-C. Huang et M.-J. Wu 16981 (Paratypus, TAI).

Evergreen, fleshy, monoecious or dioecious herbs, up to 60 cm tall including the length of leaves. Stem (Fig. 2) subterranean, rhizomatous, 4.5 cm long, 1.5 cm thick. Pseudostem terete, up to 37 cm long. Cataphylls two, brown, 7.5-19.5 cm long. Leaves 1-2; petioles 12.5-15 cm long. Leaflets ternate, 5-pedately compound; petiolules 0.4-0.5 cm, 1.0-1.5 cm, and 2.8-3.0 cm long from basal leaflet to terminal one; blades fleshy membranous, glabrous shining dark green above, pale green below, ovate-lanceolate to oblong-ovate, the apex aristate, the aristae 2.5-3.0 mm long, the base obtuse and oblique, the terminal leaflet 13-14.6

cm long, 6.2-6.3 cm wide, the lateral leaflets oblique, 10-13.2 cm long, 4-5.6 cm wide; veins reticulate, prominent on lower surface, the lateral veins up to 10, connected with marginal veins to subapical leafy apex; margin entire or remotely undulate and revolute. Inflorescence (Figs. 3-5) a spadix, shorter than or even with leaflets; peduncle terete, 7-7.5 cm long, 3 mm thick; spathe green on both surfaces with a semilunar white blotch in throat, 5.3-8 cm long, the spathe-tube cylindrical, 4.5-6.3 cm long, 1 cm wide, the spathe-blade (limb) triangular, with acute-aristate apex, 2.2 cm long, 2.3 cm wide; spadix 4.5-6.3 cm long, young plant with male flowers (Fig. 5) only, the staminate floral axis 3.5 cm long; old plant with the staminate flowers above and the pistillate flowers below (Figs. 3-4); staminate flowers red, sparsely arranged, the anthers 4(-5)-celled, the filament 0.6-1.0 mm long, the staminate axis 1.5 cm long; pistillate flowers (ovary) pale green, densely arranged, ascending; style none; stigma with dotted head, glabrous; ovary conical slanting to spadix-axis, 1-celled; ovules 3-5, basal, orthotropous, the pistillate axis 2.1 cm long; spadix appendage filiform, smooth in 2.4-2.7 cm long, the tip less than 1 mm thick and included in spathe.

Habitat: An indigenous plant, growing along roadside through shaded broadleaved forest, at altitude of 250 m high.

Specimens examined:

PINTUNG COUNTY. Nanjenshan, 13 April 1997, *T.-C. Huang and M.-J. Wu 16982* (Holotype, TAI), and *16981* (Paratype, TAI), and 3 April 1997 *T.-C. Huang 16978* (Paratype, TAI).

Note: The holotype plant (Figs. 1 & 11) is very hard to interpret whether this new species is one plant with five leaves and 25 leaflets or three plantlets borne from the same subterranean rhizome as bamboo shoots arise from its subterranean rhizome. But, we consider it to be a rhizome with 3 plantlets; the innermost plantlet bears one spadix, two leaves which have 5 pedately compound leaflets per leaf, two cataphylls and a pseudostem (Figs. 2 & 11-1a); the middle plantlet bears one leaf with 5 leaflets without cataphyll and pseudostem (Fig. 11-1b); and the outermost plantlet bears one male spadix and two leaves which have 5 pedately compound leaflets per leaf without cataphyll and pseudostem (Fig. 11-1c). All three plantlets clasped tightly inward, but were arose independently from different parts of the rhizome.

DISCUSSION

The pollen size from male flowers of dioecious plant is smaller than from those of monoecious plant, with 9-10 μm versus 13.8-15 μm in diameter.

This plant is very similar to *Arisaema grapsospadix* and *A. matsudae* of *A.* section *Fimbriata* Engler (1920), but it can be distinguished by the following morphological characters (Table 1). The three species share many common characteristics such as the leaflet with aristate apex, the lateral veins connected by marginal veins, the same shape of greenish spathe with a semilunar white spot in the throat, and the filiform appendage and spadix included in the spathe. If we consider that *A. nanjenense* is a member of the *A. grapsospadix* complex, then the spadix with fimbriate appendage as sectional character for *A.* section *Fimbriata* Engler might be inappropriate.

Fig. 11. *Arisaema nanjenense* T.-C. Huang & M.-J. Wu *sp. nov.* Rhizome with 3 plantlets in 1, showing inne plantlet in 1a, middle plantlet in 1b and outer plantlet in 1c. Habit in 2. Lower surface of leaf in 3. A mal spadix of dioecious plant in 4. Male flower of dioecious plant in 5. Spadix of monoecious plant in 6. Femal flowers of monoecious plant in 7. Longitudinal section of ovary showing ovules in 8. Male flower o monoecious plant in 9 (*Huang & Wu 14981* in 4 and 5; *Huang & Wu 14982* in 1-3 and 6-9).

Table 1. Morphological distinctions among the *A. grapsospadix* complex (boldface for common characteristics).

Taxa / Characters	*nanjenense*	*grapsospadix*	*matsudae*
Ovary shape	conical	ellipsoid	ovoid
Stigma	dotted	**mammilate with cilia**	**mammilate with cilia**
Appendage tip of male flower on dioecious plant	glabrous	**penicillate**	**penicillate**
Appendage base of female flower on monoecious plant	**glabrous**	**glabrous**	penicillate
Root	**rhizomatous**	**rhizomatous**	tuberous
Sex	♂ **or** ♂**&**♀ **flower(s) on the same spadix**	♂ **or** ♂**&**♀ **flower(s) on the same spadix**	♂ or ♀ on the other spadix
Ovary attachment	**oblique**	**oblique**	perpendicular
Leaflet No.	**5**	**3-5**	3
Shape of leaflets	**ovate**	lanceolate	**ovate**
Apex of leaflets	**aristate**	acuminate-aristate	**aristate**
Height of spadix	**shorter than or even with leaflets**	exceeding	**shorter than or or even with leaflets**
Pollen size	9-15 μm	15 μm (Wang, 1996)	-
Spinule length	0.1-0.5 μm	1.2-1.7 μm (Wang, 1996)	-
Spinule density	16-31	6.7 (Wang, 1996)	-

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臺灣植物誌之觀察(30)－南仁山天南星(天南星科)

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摘　　要

本文提出一新種植物－南仁山天南星(*Arisaema nanjenense* T.-C. Huang & M.-J. Wu *sp. nov.*)，並與其相近的天南星屬分類群一併討論。除詳細描述其外部形態、花粉特徵和染色體數目外，並附有插圖及照片。此一新種之提出對 *A.* section *Fimbriata* Engler. 之實質性產生質疑。

關鍵詞：南仁山天南星、新種、分類。

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