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Chromosome Study of *Arisaema* of Taiwan¹

TSENG-CHIENG HUANG

Abstract. The chromosome number of most *Arisaema* plants was reported as $2n=28$. Since species of *Arisaema* vary greatly in morphological features, comparative studies of anatomical, cytological, and other characteristics among the populations are required for more realistic taxonomic revision of this group. Two Taiwan species of *Arisaema*, *A. formosana* Hay. and *A. consanguineum* Schott, have been studied by the writer. Their chromosome numbers, obtained in mitosis, were 28 and 14 respectively.

INTRODUCTION

Arisaema belongs to the family *Araceae*. The characteristics of members of this genus are: colonial, corm-bearing annual herbs, about 0.3-0.7 meter tall, rarely to 2.0 meters; leaves radical, 1-4, trifoliolate, palmately compound or pinnatifid; leaflets 3-15, lanceolate, linear-lanceolate, obovate-lanceolate and rhomboid, glabrous, with abundant calcium-oxalate crystals, the apex of leaflets acute or usually with filiform tip; inflorescence a spadix, subtended by a deciduous spathe with a cylindrical basal tube and a limb acute at the apex or with a long filiform tip, sometimes auriculate between the tube and the limb; spadix usually simple, included in or exerted from the spathe, sometimes compound or forked, these abnormal characteristics reversible (Figures 2-4); species dioecious, sometimes monoecious; if monoecious, the male flowers on upper part of spadix and female on lower part [sex-transformation from asexual condition through male spadix to female spadix was reported by Maekawa (1927)]; spadix usually with one appendage, sometimes two or three, linear, conical or clavate, glabrous or setose; male flowers distinct or two to five closely crowded with anthers oblong or subglobose; female flowers densely crowded with ovary 1-celled, ovules 1 to 8, basal, orthotropous, and style short or none; fruit a berry with one to several endospermous seeds; color of petiole and spathe various, from greenish to mottled dark brown, purple, black and green.

The generic characteristics, as listed above, thus suggest that the same species can be very variable in external features, especially in:

1. size of corm,
2. height of plant,

¹ I wish to express my sincere thanks to Dr. C. Y. Chao of the Botany Department of the National Taiwan University for his help in this study.

3. number of leaves,
4. size, shape and number of leaflets per leaf,
5. sex transformation,
6. dioecism versus monoecism,
7. color of petiole and spathe,
8. length of filiform tip on leaflet and spathe,
9. size and characteristics of spadix,
10. shape, size and amount of vesture of appendage of spadix.

Because of this prevalent variability, I was prompted to undertake a study of chromosomes in *Arisaema*. I began this study in May and June, 1961 at the Botany Department of the National Taiwan University, Taiwan, China. Because of my departure from Taiwan in September, 1961, to do graduate work in botany at the State University of Iowa, I was unable to complete the study. Seven species of *Arisaema* are reported from Taiwan. The chromosomes of three species had been counted by former workers, and I have counted the chromosomes of two other species. Two species remain unstudied.

MATERIALS AND METHODS

The following procedure was adopted from Johansen (1940) and Sass (1958):

1. fixation of both stamens and root tips in Farmer's fluid or Carnoy's fluid;
2. maceration with 1 N HCl for 30 minutes to 4 hours;
3. hardening in Carnoy's fluid for more than 5 minutes;
4. cutting a very small piece from the root tip and placing it on a clean slide;
5. staining with propionic-carmin (500 cc of 45% propionic acid and 3 gr. carmine);
6. smearing;
7. covering with a cover glass and destaining with 45% acetic acid;
8. sealing the edges of the cover glass with paraffin for a temporary slide;
9. photomicrography.

RESULTS

I selected flowers and root tips of *A. formosana* and *A. conanguineum* for this study. I failed to find meiosis, because these plants had started their flowering before the leaves opened, and the spadix was enclosed within the leaves. When both leaf and flower are open, the spadix has already matured. Therefore immature anthers cannot be harvested after the appearance of the spadix. Regarding this difficulty in *Arisaema*, the following statement is cited from a letter from professor Peter A. Hyppio, Uni-

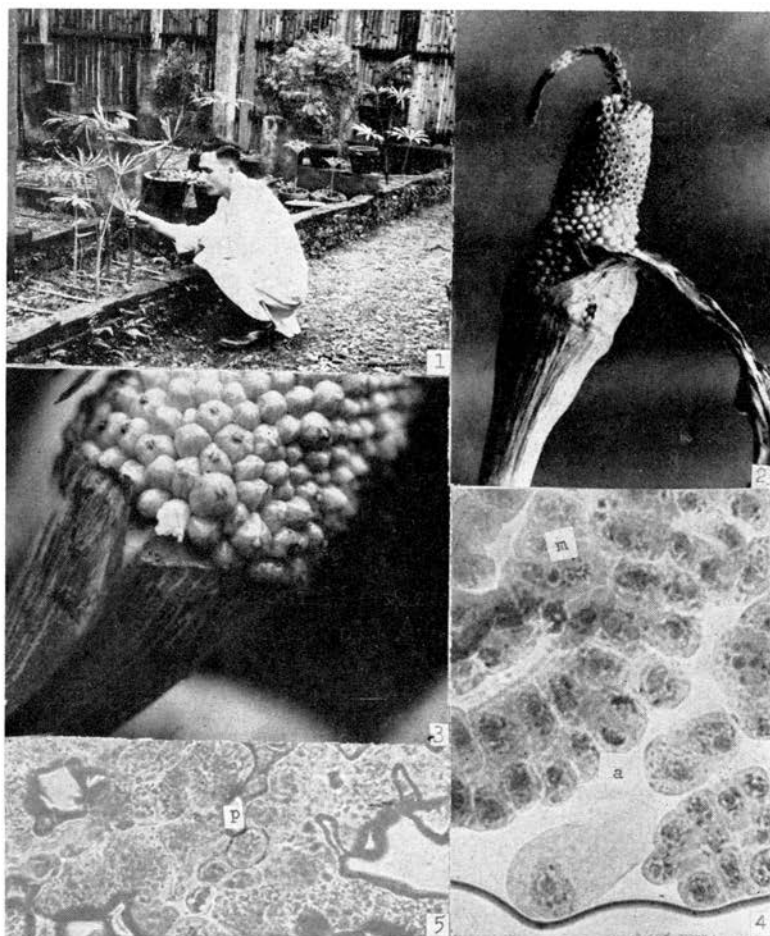


Figure 1. A picture showing some *Araceae* cultivated at the botanic garden of the Botany Department of the National Taiwan University, these plants are:
Arisaema consanguineum Schott
Arisaema consanguineum Schott var. *kelung-insularis* (Hay.) Huang
Arisaema formosana Hay
Arisaema ringens (Thunb.) Schott
Amorphophallus gigantiflorus Hay

Figure 2 & 3. Pictures showing the approach to a normal spadix in *Arisaema consanguineum* Schott var. *kelung-insularis* (Hay.) Huang. After cultivation, there is only one small spadix at the basal part of the large spadix. Formerly this plant produced a compound spadix (Huang, 1960).

Figure 4 & 5. Pictures showing phases of mitosis in *Arisaema formosana* Hay.
 a. anaphase
 m. metaphase
 p. prophase

versity of Michigan “——I have had no success in obtaining meiosis in my research materials. They (*Arisaema* spp.) go through meiosis and form pollen before the shoot emerges from the ground. But I have had fair success staining root tips especially with the Feulgen reaction——”. I have obtained from

the root tips of *A. formosana* and *A. consanguineum* the chromosome numbers $2n=28$ (Figures 4-5) and $2n=14$ respectively.

Table 1. The Chromosome Numbers of Taiwan *Arisaema*.

| Species | Chromosome Numbers | Examiners | Date of Examination |
|--|--------------------|------------|---------------------|
| <i>A. consanguineum</i> Schott ^{°°} | 14 | Huang | May, 1961 |
| <i>A. consanguineum</i> Schott var. <i>kelung-insularis</i> (Hay.) Huang | — | — | — |
| <i>A. formosana</i> Hay. | 28 | Huang | June, 1961 |
| <i>A. grapsopadix</i> Hay. | — | — | — |
| <i>A. heterophyllum</i> Bl. | c.140 | *Ito | 1942 |
| <i>A. ringens</i> (Thunb.) Schott | 28 | *Ito | 1942 |
| <i>A. taihokensis</i> Hosokawa | 28 | *Kishimoto | 1941 |

[°] data from Darlington & Wylie 1955.

^{°°} The material used for this species may have been mislabelled.

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B-Chromosomes and Pollen Size in Maize¹

PETER A. PETERSON AND ALAN MUNSON²

Abstract. Pollen grain size was used to measure the effect of the presence of a low number of B-chromosomes. The pollen grains of forty-two plants distributed among two classes—those with one to five B-chromosomes and those without B-chromosomes were measured. No significant differences could be detected between the mean pollen grain size of B and non-B-chromosome classes. There is an indication of an effect on the variance in pollen grain size of the B-chromosome class.

INTRODUCTION

Accessory chromosomes often called supernumerary or B-chromosomes are found among a wide range of plants and animals. The persistence and distribution of these accessory chromo-

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² Iowa State University, Ames, Iowa and Cornell College, Mt. Vernon, Iowa, respectively. The junior author was a participant in the 1961 National Science Foundation Undergraduate Research Participation program. Part of this investigation was supported by the Rockefeller Foundation.