# จำนวนโครโมโซมของพืชวงศ์ขิงในประเทศไทย

# Chromosome numbers of some Zingiberaceae in Thailand

*Surapon Saensouk (สุรพล แสนสุข)**
*Piyaporn Saensouk (ปิยะพร แสนสุข)***

## บทคัดย่อ

จำนวนโครโมโซมของพืชวงศ์ขิงในประเทศไทยจากปลายรากจำนวน 11 ชนิด พบว่ามีจำนวนโครโมโซมอยู่ระหว่าง 2n = 22-30 โดยมี 5 ชนิดเป็นการศึกษาจำนวนโครโมโซมครั้งแรก ได้แก่ *Curcuma* sp. (2n = 30), *Kaempferia fallax* (2n = 22), *K. gilberti* (2n = 22), *K. larsenii* (2n = 22) และ *Zingiber montanum* (2n = 22)

## Abstract

Chromosome numbers of 11 species of Zingiberaceae from Thailand were determined in root tips. The somatic chromosome numbers range from 2n = 22-30. Five species are recorded for the first time, i.e. *Curcuma* sp. (2n = 30), *Kaempferia fallax* (2n = 22), *K. gilberti* (2n = 22), *K. larsenii* (2n = 22) and *Zingiber montanum* (2n = 22).

**คำสำคัญ:** จำนวนโครโมโซม, พืชวงศ์ขิง
**Keyword:** Chromosome number, Zingiberaceae

* *Lecturer, Nong Khai Campus, Khon Kaen University, Nong Khai 43000, Thailand.*
** *Lecturer, Department of Biology, Faculty of Science, Mahasarakham University, Kham-Riang, Kuntarawichai, Mahasarakham 44150, Thailand.*

## Introduction

The authors have studied the Zingiberaceae in Thailand for several years during which several expeditions were made to collect materials for taxonomic and cytological studies. The family Zingiberaceae is a large and important monocotyledon family and is conspicuous throughout the tropics. It comprises of 52 genera and c. 1,300 species with the center of diversity in South and Southeast Asia (Larsen et al., 1998). In Thailand there are c. 25 genera comprising nearly 290 species (Larsen, 2003). The chromosome numbers are known in a few taxa in this family. For example, Darlington & Wylie (1955) listed the chromosome numbers of some Zingiberaceae (2n = 22-66). Goldblatt (1988) collected the data of chromosome numbers of Zingiberaceae and reported it as being 2n = 22-63. Larsen et al. (1998) reported chromosome numbers of several species of Zingiberaceae (2n = 20-98). Many botanists reported chromosome numbers of Thai Zingiberaceae i.e. Eksomtramage & Boontum (1995), Sirisawad & Apavatjrut (1995), Eksomtramage et al. (1996 & 2002), Weerapukdee & Krasaechai (1997), Saensouk et al. (1998), Saensouk & Jenjittikul (2001), Saensouk & Larsen (2002) and Saensouk & Chantaranothai (2003). The objective of this study is to investigate the chromosome numbers and to record cytogenetical basic data of Thai Zingiberaceae.

## Materials and Methods

Chromosome number studies were made from root-tips of 11 species of Zingiberaceae. They were pretreated in saturated solution of Paradichlorobenzene (PDB) for 4 hours at 12$^0$C (Eksomtramage & Boontum, 1995). After that, they were fixed in fresh solution of ethanol and glacial acetic acid (3:1, v/v) for one hour at room temperature. The root-tips were washed in 95%, 70% ethanol and hydrolyzed in 1N HCl for four minutes at 60$^0$C respectively, the specimens were washed in tap water before staining and squashing in aceto-orcein (Darlington & La Cour, 1966). Chromosome numbers of 20 cells of each species were determined at well spread metaphase stage. Cells observations were done under light microscope with the eyepiece and the objective power of x10 and x100 that made most of cells studies at x1000.

The species examined were *Curcuma rhabdota* P. Sirirugsa & M. Newman, *C.* sp. (mosaic leaves), *Kaemperia angustifolia* Rosc., *K. elegans* (Wall.) Bak., *K. fallax* Gagnep., *K. gilberti* Hort., *K. larsenii* P. Sirirugsa, *K. parviflora* Wall. ex. Bak., *Zingiber montanum* (Koenig) Link ex Dietr., *Z. officinale* Rosc. and *Z. ottensii* Val.

## Results

The somatic chromosome numbers of 11 species of Zingiberaceae are reported. Five species are recorded for the first time i.e. *Curcuma* sp. (mosaic leaves), *Kaempferia fallax*, *K. gilberti*, *K. larsenii* and *Zingiber montanum*. Somatic numbers counted were found ranging from 2n = 22 to 2n = 30, (Table 1 & Figures 1-11).

## Conclusion and Discussion

Six species of *Kaempferia* that are diploid plants except *K. angustifolia* is diploid and triploid plants. Three species; *K. fallax*, *K. gilberti* and *K. larsenii* are recorded in the study for the first time.

*K. elegans* and *K. parviflora* have chromosome numbers of 2n = 22, which are not different from the previous studies (Mahanty, 1970 and Eksomtramage et al., 1996 & 2002). The chromosome numbers of *K. angustifolia* is 2n = 22 and not different from earlier studies by Mahanty (1970) but chromosome numbers of this species was 2n = 33 which is recorded previously by Eksomtramage et al. (1996). In this investigation, two *Curcuma* species: *C. rhabdotha* has chromosome number of 2n = 24, which is recorded previously by Eksomtramage et al. (2002). The somatic chromosome numbers of *C.* sp. (mosaic leaves) is newly recorded. Three species of *Zingiber* were examined in the study. The chromosome numbers of all species are 2n = 22 which is not different from the previous studies (Darlington & Wylie, 1955, Goldblatt, 1988 and Eksomtramage et al., 2002). But *Z. montanum* (2n = 22) from this study is firstly recorded, (Table 1 & Figures. 1-11).

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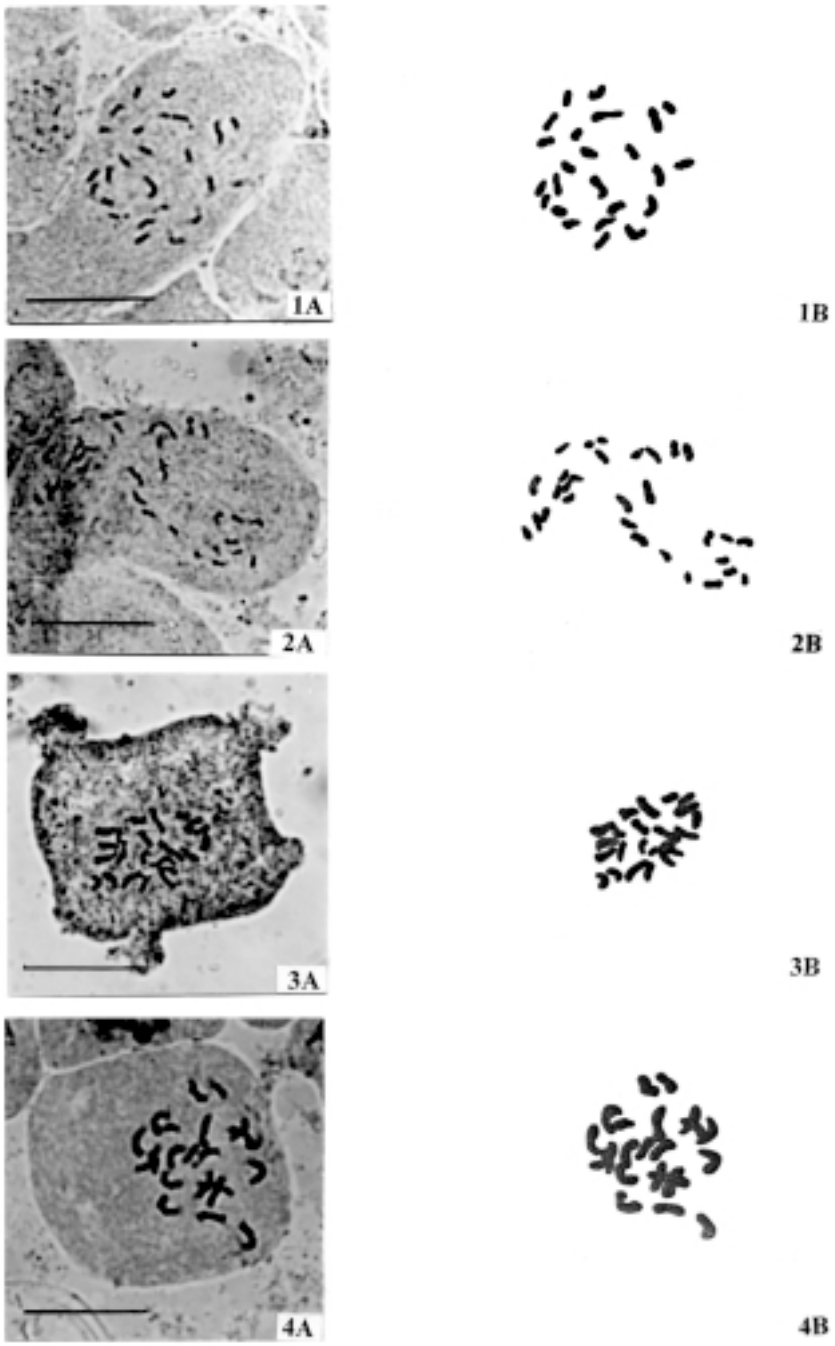
**Table 1** The chromosome numbers of some Zingiberaceae in Thailand.

| Species | Chromosome numbers (2n) | Previous recorded | | |
|---|---|---|---|---|
| | | n | 2n | Authors |
| 1. *Curcuma rhabdotha* | 24 | - | 24 | Eksomtramage et al. (2002) |
| 2. *C.* sp. | 30 | - | - | - |
| 3. *Kaempferia angustifolia* | 22 | -<br>- | 22<br>33 | Mahanty (1970),<br>Eksomtramage et al. (1996) |
| 4. *K. elegans* | 22 | - | 22 | Mahanty (1970),<br>Eksomtramage et al. (2002) |
| 5. *K. fallax* | 22 | - | - | - |
| 6. *K. gilberti* | 22 | - | - | - |
| 7. *K. larsenii* | 22 | - | - | - |
| 8. *K. parviflora* | 22 | - | 22 | Eksomtramage et al. (1996) |
| 9. *Zingiber montanum* | 22 | - | - | - |
| 10. *Z. officinale* | 22 | - | 22 | Darlington & Wylie (1955),<br>Goldblatt (1988),<br>Eksomtramage et al. (2002) |
| 11. *Z. ottensii* | 22 | - | 22 | Goldblatt (1988) |



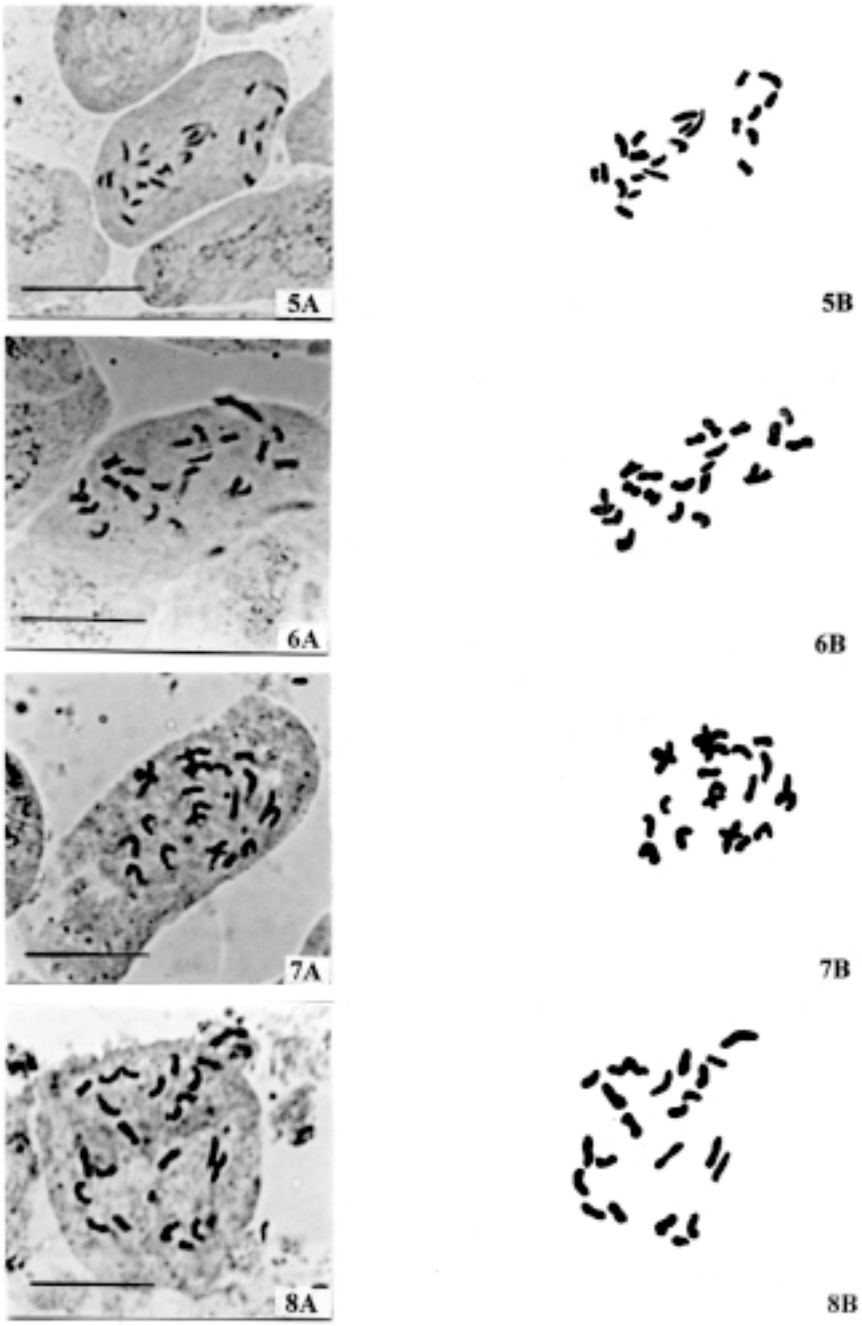

**Figures 1–4.** Chromosome at metaphase stage; A = Photos, B = Drawing (Scale bar = 20 μm)

Figure 1. *Curcuma rhabdotha* (2n = 24)

Figure 2. *C.* sp. (mosaic leaves; 2n = 30)

Figure 3. *Kaempferia angustifolia* (2n = 22)

Figure 4. *K. elegans* (2n = 22)



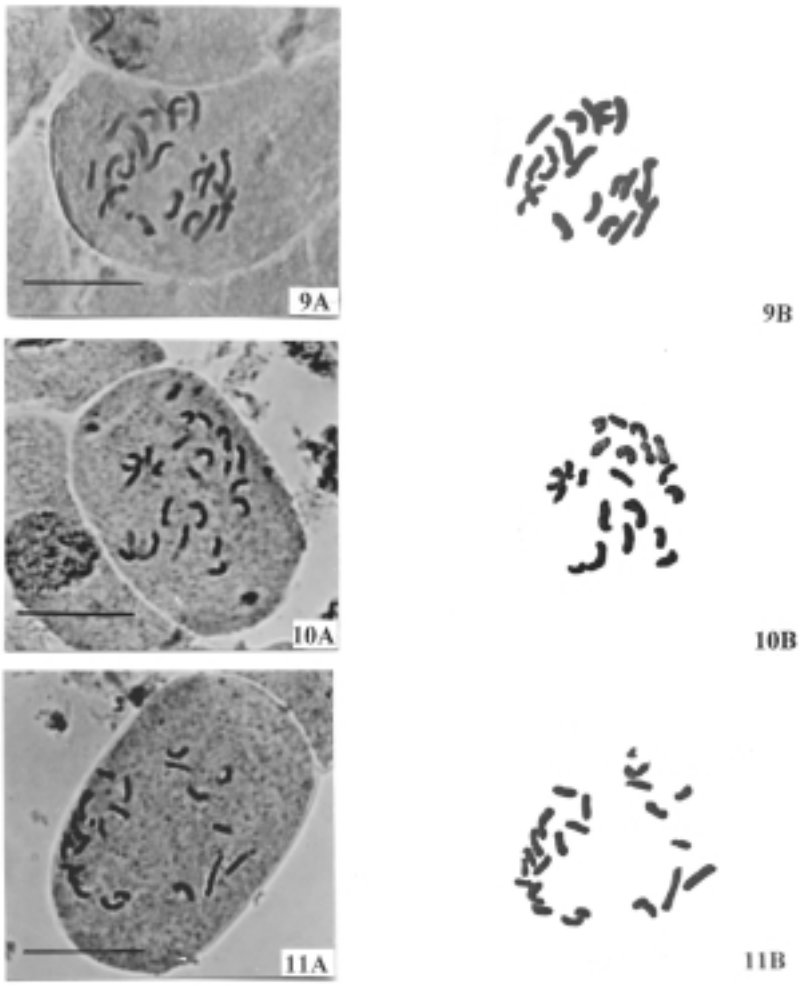

**Figures 5-8.** Chromosome at metaphase stage; A = Photos, B = Drawing (Scale bar = 20 μm)

Figure 5. *Kaempferia fallax* (2n = 22)

Figure 6. *K. gilberti* (2n = 22)

Figure 7. *K. larsenii* (2n = 22)

Figure 8. *K. parviflora* (2n = 22)




**Figures 9-11.** Chromosome at metaphase stage; A = Photos, B = Drawing (Scale bar = 20 μm)

Figure 9. *Zingiber montanum* (2n = 22)

Figure 10. *Z. officinale* (2n = 22)

Figure 11. *Z. ottensii* (2n = 22)