

# Cytological Studies on *Narcissus*

## II. Karyotype of *Narcissus pseudo-narcissus*

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### Introduction

Karyological studies on *Narcissus pseudo-narcissus* has already been made by Sato<sup>1)</sup>, Fernandes<sup>2)</sup> and Kurita<sup>3)</sup>, however, the karyotype so far reported differ among each other. In the present report a detailed observation has been made to clarify the karyotype of *N. pseudo-narcissus*.

### Materials and Methods

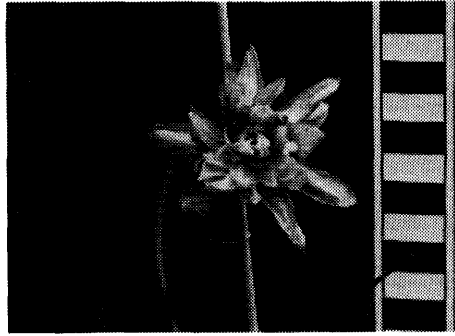
A cultivar of *Narcissus pseudo-narcissus* was used as material (Fig. 1). The bulbs of this plant were collected from three different gardens in Hiroshima Prefecture. From each garden ten clones were used for the experiment. Observations on the somatic chromosomes were made with the meristematic tissues of the root-tips. These root tips were treated with 0.001 mol/l aqueous solution of 8-hydroxyquinoline at 10°C for 24 hrs and fixed with 45% acetic acid at 10°C for 20 mins. After fixation, the root-tips were macerated in 1:1 mixture of 1 N-HCl and 45% acetic acid at 60°C for 10-20 secs and stained with 1% aceto-orcein.

The length and form of the individual chromosomes were compared by its relative length (R. L.) and arm ratio (A. R., long arm/short arm as determined by Levan et al<sup>4)</sup>). The arm ratio ranging from 1.0-1.7 will be grouped as having a constriction at the median region, 1.7-3.0 at the submedian region, 3.0-7.0 at the subterminal region and those more than 7.0 at the terminal region.

### Results and Discussion

#### *Karyotype*

The clones of *Narcissus pseudo-narcissus* collected from the three various gardens all showed the chromosome number to be  $2n=14$ . The karyotype was also found to be



**Fig. 1.** A flower of *Narcissus pseudo-narcissus* used as material. Segments in the scale indicate 1 cm.

similar between the clones and this is illustrated in Fig. 2. In Table 1 the measurements of one of the somatic chromosomes at metaphase are given. According to their length and size the 14 chromosomes can be grouped into 12 large chromosomes and 2 small chromosomes. The 12 large chromosomes can be further grouped into five homogeneous pairs and one heterogeneous pair.

1st pair: (No. 1, 2), the largest chromosome, the site of the constriction is submedian.

2nd pair: (No. 3, 4), median constriction.

3rd pair: (No. 5, 6), submedian constriction.

4th pair: (No. 7, 8), median constriction.

5th pair: (No. 9, 10), submedian constriction.

6th pair: (No. 11), submedian constriction.

(No. 12), median constriction.

The 2 small chromosomes were:

7th pair: (No. 13, 14), submedian constriction.

Kurita<sup>9)</sup> has reported that all of the 14 chromosomes of *N. pseudo-narcissus* can be evenly paired. However, in the present study out of the 12 large chromosomes, 10 chromosomes could be paired but the latter 2 chromosomes were found to be unpaired from the position of the centromere. Furthermore, the 13th chromosome had lightly stained heterochromatic segment at the distal end of the short arm, and the 14th chromosome had a darkly stained heterochromatic segment appearing at the distal end of the short arm. The reason for the variation in the intensity of staining remains unsolved. Therefore, further detailed investigation is necessary.

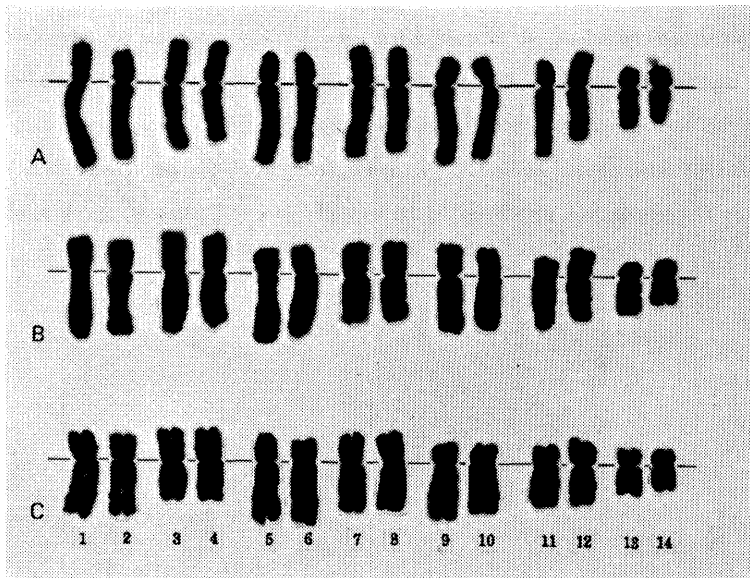


Fig. 2. Serial arrangements of the metaphase chromosomes in root-tip cells of *Narcissus pseudo-narcissus* from three different clones. Lines indicate the centromeric position.  $\times 2,250$ .

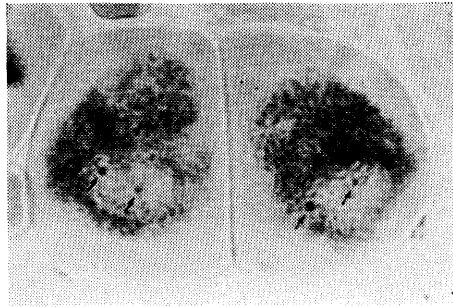
Table 1. Measurements of somatic chromosomes at metaphase in *Narcissus pseudo-narcissus*\*

Chromosomes	Length in $\mu\text{m}$			R. L.	A. R.	Form
	Short arm + Long arm = Total					
1	3.7	+	8.4 = 12.1	9.6	2.3	sm
2	3.1	+	6.7 = 9.8	7.7	2.2	sm
3	4.0	+	6.2 = 10.2	8.1	1.6	m
4	3.7	+	5.3 = 9.0	7.1	1.4	m
5	2.9	+	7.1 = 10.0	7.9	2.5	sm
6	2.7	+	7.1 = 9.8	7.7	2.6	sm
7	3.6	+	6.2 = 9.8	7.7	1.7	m
8	3.6	+	6.2 = 9.8	7.7	1.7	m
9	2.5	+	7.1 = 9.6	7.6	2.8	sm
10	2.7	+	6.7 = 9.6	7.6	2.5	sm
11	2.2	+	6.2 = 8.4	6.6	2.8	sm
12	3.3	+	4.7 = 8.0	6.3	1.4	m
13	1.8	+	3.6 = 5.4	4.3	2.0	sm
14	1.8	+	3.5 = 5.3	4.2	1.9	sm

\* Measurements were made on the karyotype A shown in Fig. 2.

### *Nucleolinus*

In the interphase nuclei of *N. pseudo-narcissus* (Fig. 3) one can observe two segments forming a nucleolinus within the nucleolus. Close observation reveals one of the segments to be more darkly stained than the other. This phenomena was constantly observed. In the interphase nuclei of *N. jonquilla*<sup>5)</sup> the two nucleolini, formed by the two nucleolar chromosomes appeared to be equally stained, that is, darkly stained, and



**Fig. 3.** Nucleolini (arrows) in interphase nuclei of the root-tip cell of *Narcissus pseudo-narcissus*. One of them was more darkly stained than the other.  $\times 2,250$ .

these nucleolini correspond to the satellites appearing at the distal ends of the smallest chromosomes of *N. jonquilla*. In the case of *N. pseudo-narcissus* the darkly stained nucleolinus may correspond to the darkly stained segment and the lightly stained nucleolinus to the lightly stained segment observed at the distal end of the small chromosome, respectively, but to clarify this observation further study must be made.

### Summary

Karyotype analysis was made on *Narcissus pseudo-narcissus*. It was found that the chromosome number is  $2n=14$  and composed of 12 large and 2 small chromosomes. The 12 large chromosomes could be grouped into five homogeneous pairs and one heterogeneous pair, and the 2 small chromosomes were observed to be heterogeneous. Therefore, four heterogeneous chromosomes were found in *N. pseudo-narcissus*.

### References

- 1) Sato, D. 1938. Karyotype alteration and phylogeny IV. *Cytologia* 9 : 203-242.

- 2) Fernandes, A. and R. Fernandes 1946. Sur la caryo-systematique du sous-genre *Ajax* Spach du genre *Narcissus* L. Acta Univ. Conimbrig 1-33.
- 3) Kurita, M. 1955. Cytological studies in *Narcissus*. II. The karyotype of 3 species with  $2n=14$  chromosomes. Mem. Ehime Univ. Sect. II. Ser. B, 2 : 71-76.
- 4) Levan, A., K. Fredge and A.A. Sanberg 1964. Nomenclature for centromeric position of chromosomes. Hereditas 52 : 201-220.
- 5) Hirahara, S. and S. Tatuno 1968. Cytological studies on *Narcissus*. I. Karyotype and nucleolus of *Narcissus jonquilla*. Cytologia 32 : 553-559.