Polygonum type. The antipodals generally degenerated by anthesis. Fertilization of the egg and triple fusion were generally completed before 6 h after pollination (Fig. 3). There was considerable variation in different flowers with respect to the time of fertilization. This can be easily explained since groundnut flowers vary greatly in length. The egg and zygote had very dense cytoplasm.

Compared to conventional section cutting, study of acetocarmine squashes is faster and accurate, since embryo sacs could be observed in their totality. This method of studying fertilization in groundnut should be useful in studies of interspecific hybridization. The genus *Arachis* L. contains about 40 species which are valuable sources of disease and insect resistance. However, successful hybrids could be obtained between the cultivated and wild species only in a few cases[5,6]. The reasons for the failure of the crosses are not always clear. Using the acetocarmine squashes, it should be possible to study the entry of pollen tubes into the embryosacs, the presence or absence of fertilization and the mechanism of embryo and seed failure in interspecific crosses. More detailed studies on the cytology of reproduction in the different botanical varieties of groundnut and wild *Arachis* species are under progress.

The authors are grateful to the Indian Council of Agricultural Research for supporting this project under their scheme 'Creation of Professorial Chairs'. The authors are also thankful to Dr. M. S. Swaminathan and Dr. H. K. Jain for their interest.

National Research Centre, U. R. MURTY.
Indian Agricultural N. GANGAPRASADARAO.
Research Institute,
Regional Station,
Hyderabad 500 030, *February* 2, 1979.

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CHARACTERIZATION OF RICE RAGGED STUNT VIRUS DISEASE IN INDIA

DURING November 1978, a few plants of Taichung (Native) 1 in the green house of All India Coordinated Rice Improvement Project (AICRIP), Rajendranagar, Hyderabad, developed typical symptoms of rice ragged stunt. The occurrence of ragged stunt virus disease has been reported from Indonesia[2], Philippines[3], and Thailand[4]. Heinrichs and Khush[1] also reported the possible presence of rice ragged stunt virus disease in India and Sri Lanka on the basis of their observation of infected plants. The present investigation confirms the presence of rice ragged stunt virus disease in India as the first established record and deals with its transmission by Nilaparvata lugens (Stal).

The symptoms of infected plants with rice ragged stunt virus included stunting and ragged leaves (Fig. 1 *a*) which ranged from 1–4 per plant, the raggedness was mostly observed on one side of the leaf and seldom on both the sides. In addition to these symptoms, twisting of the tip of the leaves and vein swellings (Fig. 1 *b*, *c*), delay in flowering, production of nodal branches mostly at the time of panicle emergence, incomplete emergence of panicles which bore mostly unfilled grains were also observed.

FIG. 1 *a-c*. *a*. Taichung (Native) 1 infected with ragged stunt virus. *b*. Vein swelling on the infected leaf and leaf twisting. *c*. Leaf tip twisting and raggedness on the leaf margin.

Transmission studies were conducted with seedlings of Taichung (Native) 1. Sap, soil and seed transmission studies gave negative results. The disease could readily be transmitted only by brown plant hopper *N. lugens* but not by green leaf hopper and white-backed hopper, *Nephotettix* spp. and *Sogatella* spp. Under present conditions, Taichung (Native) 1 plants which were inoculated at 2-3 leaves stage by *N. lugens*, after giving an acquisition feeding of 3 days, on the diseased plants took 15-31 days to produce the typical symptoms of twisting of leaves followed by ragged leaf margins. The details of transmission by *N. lugens*, etc., will be published elsewhere.

We are thankful to Dr. R. Seetharaman, Project Director, All India Coordinated Rice Improvement Project, Rajendranagar, Hyderabad, for his keen interest and encouragement in this work. Thanks are also due to the United States Department of Agriculture for granting a PL 480 scheme, under which the present work has been carried out.

A. GHOSH.
V. T. JOHN.
P. C. REDDY.

All India Coordinated Rice Improvement Project,
Rajendranagar,
Hyderabad 500 030 (A.P.), India.
February 17, 1979.

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QUANTITATIVE CHROMOSOMAL CHANGES IN CULTURED CELLS OF *DIGITALIS LANATA* EHRH.

Digitalis lanata is an important medicinal plant cultivated extensively in Europe and Western Asia since it is the only commercial source of the cardiac glycoside digoxin. The species is diploid with $2n = 56$, and contains digoxin 0·150–0·302% dry weight of the plant. Various inter-specific hybrids of *D. lanata* with *D. purpurea*, *D. lutea* and *D. grandiflora* were raised by different workers[1–3], but all these hybrids contain digoxin within the range found in *D. lanata*. In the present studies, haploid and a series of polyploid and aneuploid numbers have been raised in cultured cells of *D. lanata* through long-term subculturing for evolving the higher digoxin yielding genotypes.

Suspension cultures were initiated from seedling roots of *D. lanata*. The explants were sterilized and placed in liquid Murashige and Skoog's[4] basal medium supplemented with 2 mg/litre 2, 4-dichlorophenoxyacetic acid. First subculturing of the resulting suspension cultures was done after eight days, while the subsequent transfers were made every three or four day intervals upto 30 months. The cultural conditions and cytological technique were the same as reported earlier for *Citrus*[5].

Seedling root apices of *D. lanata* revealed a homogeneous population of diploid cells with $2n = 56$ (Fig. 1). The chromosome constitution of 30 month old subcultured cells of the explants were found to have changed drastically. Only 48·4% cells were diploid, while others were haploid, polyploid and aneuploid, ranging between 28 and 112 chromosomes (Fig. 2). Architectural changes of the chromosomes could not be detected due to their high number and minute size that varied from 1·0 to 2·2 μ.

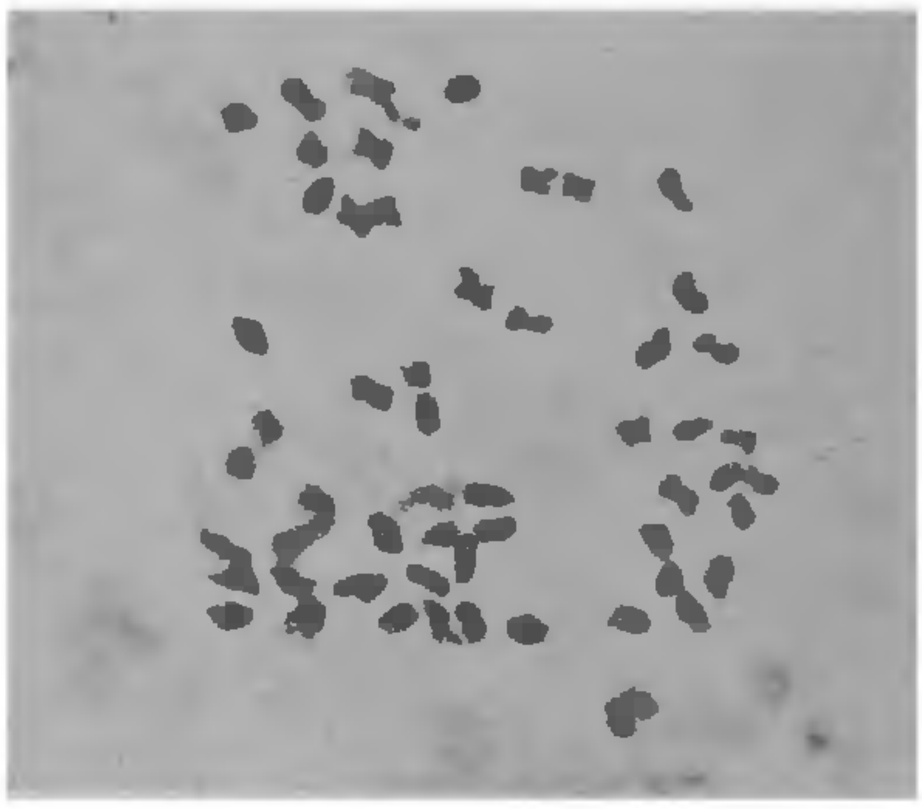

FIG. 1. Metaphase plate showing $2n = 56$ (diploid) in root apex cell of *D. lanata*, × 1,850.

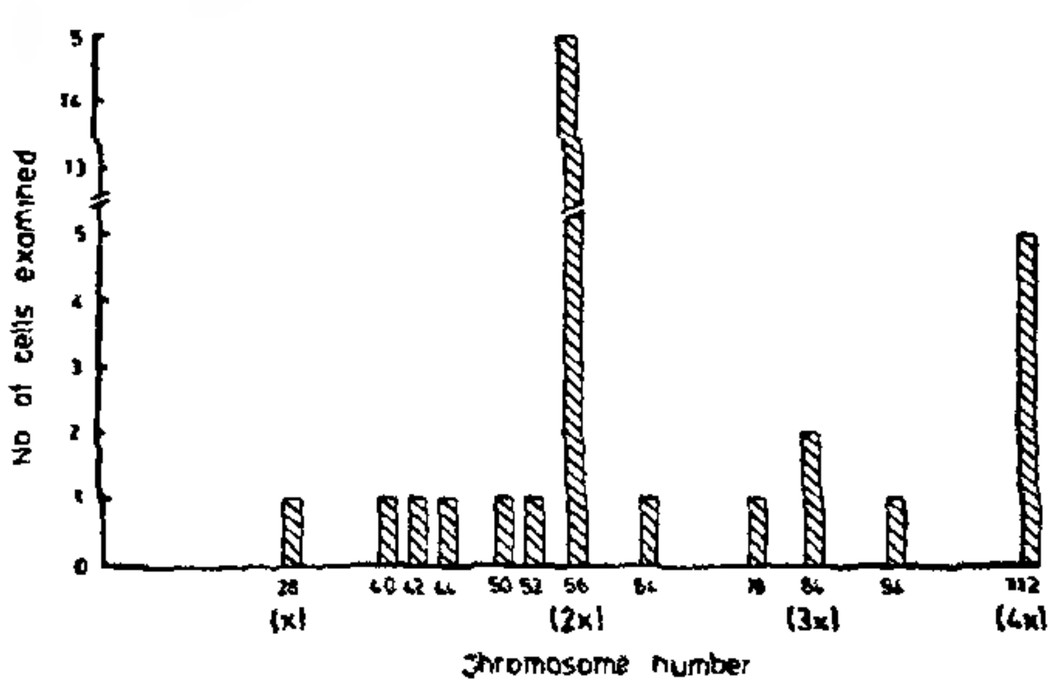

FIG. 2. Chromosome numbers and their frequencies in 30 month old subcultured cells derived from seedling roots of *D. lanata*.

The frequency of numerical variation of chromosomes in suspension culture of *D. lanata* increased with aging. In the 30 month old subcultures, haploid, polyploid and aneuploid cells were predominant. The polyploid numbers probably originated due to either nondisjunction of chromosomes or simply by the failure of cytokinesis with subsequent nuclear fusion[6–7]. For the haploid and aneuploid numbers, the multipolar separations and other segregational irregularities of chromosomes seemed to have been responsible.

Variation of chromosome number within plants obtained through tissue culture has been reported in a number of cases, such as tobacco[8], sugarcane[10–11], rice[12] and scented geraniums[13]. The literature review on these plants suggests a novel approach