Phoenicopsis-like leaves was, and that another was not, Ginkgoalean. Whether the same peculiarity existed in Palaeozoic members of the group it is difficult to say. In fact the attribution of many of the older leaves, such as species of *Psygmophyllum*, *Rhipidopsis* and other genera, to the Ginkgoales is still open to doubt. But if this character is found among any of these Palaeozoic forms it would strongly support their reference to that group. In an interesting paper recently published Dr. O. Posthumus [1] has shown that certain fossil fern leaves (*Dictyophyllum*, *Camptopteris*) resemble those of some living Dipteridineae in a peculiar twist in the base of the lamina: a welcome corroboration of their dipterid affinities, already suspected on other grounds.

It is indeed strange how these little peculiarities sometimes tend to persist through geological time.

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[1] Posthumus (1928).

CHROMOSOME NUMBERS OF SOME SOLANACEOUS PLANTS OF BENGAL

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Vilmorin and Simonet (14) in a recent paper have given a comprehensive account of the chromosome numbers of species belonging to the family Solanaceae. Their investigation deals mainly with the European species and adds considerably to our knowledge of the chromosome number of Solanaceous plants. As nothing was known of the chromosome complements of the Solanaceous plants of Bengal, the present investigation was undertaken with the idea of adding some more data to that collected by workers abroad, and incidentally re-examining the question of polyploidy in the genus Solanum, in the light of the results obtained. The chromosome number of some of the species which had already been determined by other workers, were re-investigated once again, as it was thought that the cytological history of the plants might not be the same.

Material and Methods.

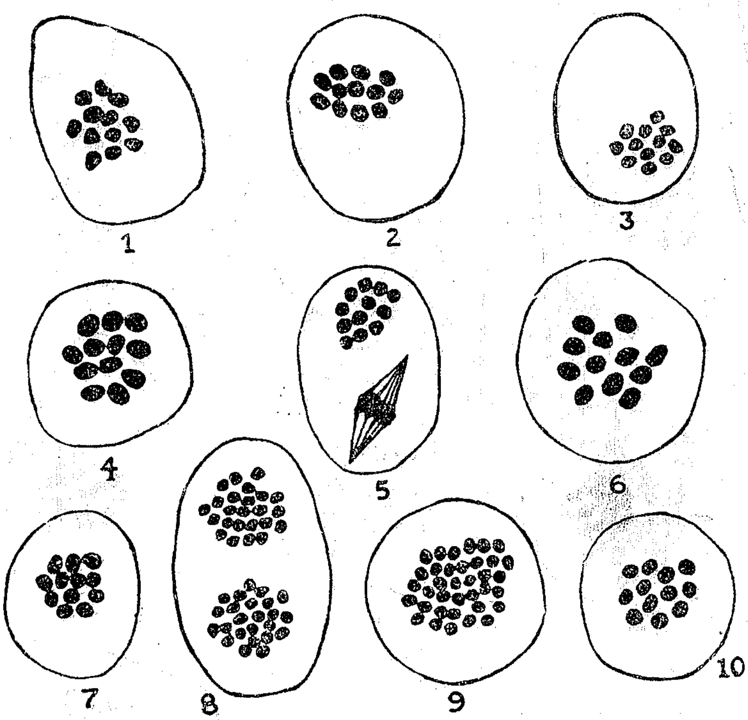
The material used in this investigation was collected from different localities round about Calcutta. The material was fixed on bright days between 11 a.m. and 3 p.m., in the field. To facilitate penetration of the fixing fluid the calyx and the top of the corolla were removed from the flower buds, leaving the base of the corolla as a ring round the ovary, bearing the epipetalous stamens. They were first dipped in Acetic-alcohol (1 : 2), to remove the waxy coating from the stamens, and then fixed in Allen's modified Bouin's fluid. The material was then dehydrated, cleared and embedded in the usual way. Sections were cut 8 to 10 μ thick and stained with Haidenhain's iron alum haematoxylin.

Belling's iron aceto-carmine method was also employed to obtain conformatory results with fresh material. This method worked satisfactorily with all the species.

Observations.

The chromosome numbers of the species investigated were chiefly computed from the meiotic stages of the microspore mother cells. Check counts were taken from flowerbuds of the same, and different plants, to eliminate any possible source of error.

It will be noted from the above table that the different species of Solanum have 12 as the haploid chromosome number. *Solanum nigrum* L., however, gave very interesting results, and showed distinct polyploidy within the species. Jorgenson and Crane (9) who corroborated Winkler's (15) observations have shown that *Solanum nigrum* L. has 36 haploid chromosomes. They also found that *S. nigrum* var. *Gracile* Raddi, which resembles *S. nigrum* L. in all morphological characters

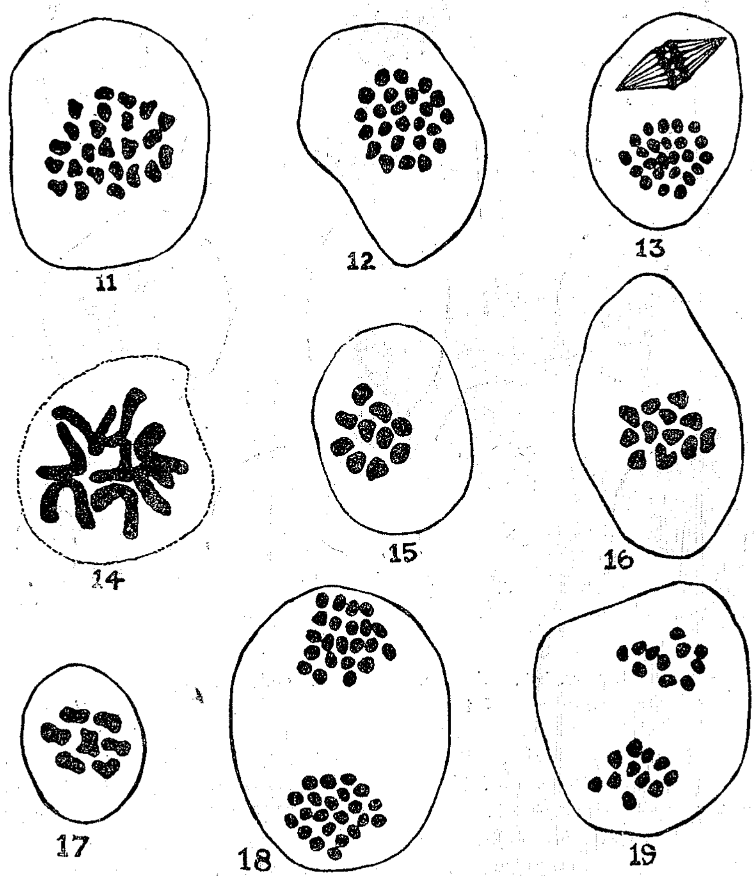


Text-figure I. Figs. 1–9, Solanum. 10. Lycopersicum.

1. *Solanum indicum* L. Heterotypic metaphase. 2. *Solanum xanthocarpum* Schrad & Wendl. Heterotypic metaphase. 3. *Solanum torvum* Swartz. Heterotypic anaphase polar view. 4. *Solanum micranthum* Wild. Heterotypic metaphase. 5. *Solanum verbescifolium* L. Homotypic metaphase. 6. *Solanum trilobatum* L. Heterotypic metaphase. 7. *Solanum nigrum* L. (2n). Heterotypic metaphase. 8. *Solanum nigrum* L. (4n). Homotypic metaphase. 9. *Solanum nigrum* L. (6n). Heterotypic metaphase. 10. *Lycopersicum esculentum* Mill. Heterotypic metaphase. × 1,100.

excepting in their more slender habit and more even outline of the leaves has also 36 haploid chromosomes. Vilmorin and Simonet (14) found a plant, identical with *S. gracile* Otto, (equivalent to *S. gracile* Link), which resembles *S. nigrum* L. in all morphological characters but possesses 12 haploid chromosomes.

Critical observations of *S. nigrum* L. for over two seasons have brought to light the hitherto unnoticed fact that plants identified as *S. nigrum* L. by Prain (12), Hooker (8) and others, differ considerably in both morphological and cytological characters. The important morphological characters of the three types of *S. nigrum* L. with their chromosome numbers, and also the morphological characters of *S. nigrum* L. (n = 36) as given by Jorgensen and Crane (9) are given below in Table II.



Text-figure II. Figs. 11. *Physalis peruviana* L. Heterotypic metaphase. 12. *Physalis minima* L. Heterotypic metaphase. 13. *Withania somnifera* Dun. Homotypic metaphase. 14. *Cestrum nocturnum* L. Mitotic division in the embryo sac. Metaphase, polar view. 15. *Nicotianaplumbaginifollia* Viv. Heterotypic metaphase. 16. *Datura fastuosa* L. Heterotypic metaphase. 17. *Petunia nyctagi-niflora* Juss. Heterotypic metaphase. 18. *Salpiiglossis sinuata* Ruiz. Homotypic metaphase. 19. *Brunfelsia americana* Sw. Homotypic metaphase. × 1,100.

The following table gives an account of the plants that had been worked out, their chromosome numbers, and the names of the investigators.

Table I.

Chromosome Numbers in Solanaceae.

Name of the plant.	Haploid chromosome number	Investigator.
Solanum xanthocarpum Schrad and Wendl.	12	Jorgensen (10) Vilmorin and Simonet (14) and Present writer.
„ *indicum* L.	12	Present writer.
„ *verbascifolium* L.	12	„
„ *torvum* Swartz.	12	„
„ *trilobatum* L.	12	„
„ *micranthum* Willd.	12	Jorgensen (10) and Present writer.
„ *nigrum* L.	12	Present writer.
„ „	24	„
„ „	36	Winkler (15), Jorgensen and Crane (9), Vilmorin and Simonet (14) and Present writer.
Lycopersicum esculentum Mill.	12	Winkler (15). Lesley (11), Jorgensen and Crane (9), Vilmorin and Simonet (14), Cooper (4) and Present writer.
Physalis peruviana L.	24	Vilmorin and Simonet (14) and Present writer.
„ *minima* L.	24	Present writer.
Withania somnifera Dun.	24	Present writer.
Datura fastuosa L.	12	Belling and Blakeslee (1), Vilmorin and Simonet (14) and Present writer.
Cestrum nocturnum L.	*Ca* 8	Present writer.
Nicotiana plumbaginifollia Viv.	10	Christoff (3) and Present writer.
Petunia nyctaginiflora Juss.	7	Ferguson (6), Derman (5) and Present writer.
Salpiglossis sinuata Ruiz.	22	Vilmorin and Simonet (14) and Present writer.
Brunfelsia americana Sw.	11	Present writer.

TABLE II.

Morphology of Polyploid forms of *S. nigrum* L.

——	DIPLOID *S. nigrum* L.	TETRAPLOID *S. nigrum* L.	HEXAPLOID *S. nigrum* L.	*S. nigrum* L. AS DESCRIBED BY JORGENSEN AND CRANE.
Habit and Branching.	Slender habit, internodes more elongated. Main stem very short, lateral branches given out almost from the ground level.	Main stem short and divides into two branches from a little height giving the appearance of pseudo-dichotomous branching.	Varying habit, either like diploid or tetraploid plants.	Branching almost pseudo-dichotomous and numerous small shoots develop from the axils of the leaves.
Nature and arrangement of leaves.	Spirally arranged, pseudo-opposite on the flowering stems. Petiolated, ovate. Margin slightly dentate.	Spirally arranged, pseudo-opposite on the flowering stems. Ovate, petiolated. Margin markedly dentate.	Spirally arranged, pseudo-opposite on the flowering stems. Ovate petiolated. Margin slightly dentate.	Spirally arranged, pseudo-opposite on the flowering stems. Ovate. Margin usually dentate.
Infloresence ...	4–6 flowers. Peduncles 6–8 mm. Pedicels 3-4 mm.	5–7 flowers. Peduncles 8–10 mm. Pedicels 5-6 mm.	4-6 flowers. Peduncles 8–10 mm. Pedicels 5-6 mm.	5–11 flowers.
Flowers ...	7–9 mm. diameter.	11·5 mm. diameter.	11·5 mm. diameter,	......

—	DIPLOID *S. nigrum* L.	TETRAPLOID *S. nigrum* L.	HEXAPLOID *S. nigrum* L.	*S. nigrum* L. AS DESCRIBED BY JORGENSEN AND CRANE.
Petals	Slightly ligulate, almost free, united at the base. Yellow spot at the base. 3–4 mm. long.	Triangular, fused to about half their length. No yellow spot at the base and not ligulate. 5 mm long.	Slightly ligulate almost free, fused near the base. 5–6 mm. long. Inconspicuous yellow spot at the base.	Ligulate 3–4 mm. long. White with a yellow spot at the base. Almost free.
Sepals ...	Short and obtuse. 3–4 mm.	Short and obtuse. 3–4 mm.	Short and obtuse. 3–4 mm.	Short and obtuse.
Stamens ...	Filament and anther of unequal lengths. 0·5 mm. + 1·5 mm.	Filament and anther of equal lengths. 1·5 + 1·5 mm.	Filament and anther of unequal lengths. 2 + 1 mm.	Free, short filament.
Fruit	Globose, shining blue-black. 4–6 mm. diameter.	Globose, orange-red. 5–6 mm. diameter.	Globose, dull-purplish black 6–8 mm. diameter.	Globose, shiny and bluish black. 5–8 mm. diameter.
Stem and hairs ...	Green with few ribs. Hairs very few, on stem and under surface of leaves and veins.	Green with purplish tint, prominent ribs. Hairs present, specially on younger parts, stems and veins.	Green with purplish tint, occasional ribs.	Few scattered hairs. Mostly occur on stems and veins of leaves.
Measurement of Pollen (average of 100 grains).	23.5μ	28.5μ.	29.5μ.	......
Haploid chromosome number.	n = 12	n = 24.	n = 36	n = 36

It will be seen from the above table that though the diploid and hexaploid plants resemble each other somewhat closely, yet in the latter the floral parts are markedly larger than in the former. Besides, the berry colour is very characteristic of the three types, and the plants can be discriminated readily in the field by this character alone. The tetraploid plants differ greatly from the other two types and has morphological characters approaching very near to *S. luteum* Mill., (= *S. tomentosum Lam)* as described by Jorgensen and Crane (9), from which it differs, however, in the size of the sepals and by the absence of the yellow spot at the base of the petals. As the diploid type of *S. nigrum L.* (n = 12) does not resemble (in all external features) *S. nigrum L.* (n = 36) of the previous investigators it is difficult to say whether the diploid type represents *S. gracile* Otto (n = 12), which according to Vilmorin and Simonet (14) closely resembles *S. nigrum L.* (n = 36) in all external characters.

It has been pointed out by several investigators that the polyploids differ from each other in both morphological and cytological characters. From Table II it will be seen, however, that though there is some difference in morphological characters between the polyploids, no gigantism of vegetative organs or cells have been noted. Gershoy (7) in Viola has shown that with each higher number of chromosome in the polyploids, the chromosome size decreases, while the volume of the nucleus and the pollen grain increases. Blakeslee and Belling have also found that increase in volume of pollen grains is associated with increase in chromosome number in the polyploid mutations of *Datura*. Measurement of pollen grains and pollen mother cells in the polyploids of *S. nigrum L.* however, failed to reveal any relationship with chromosome numbers and dimension of pollen grains.

It has also been pointed out by several investigators that the tetraploids are less fertile than the diploids. According to Sansome (13), in Tomato 75 per cent of the pollen grains in tetraploid plants are fertile as compared to 100 per cent. in the diploids, and a fruit of tetraploid produces, on average, only 20 seeds as compared with 90, per fruit, of a diploid. In the tetraploid and hexaploid plants of *S. nigrum L.* a sterility of 10 to 16 per cent in the pollen grains have been observed. The polyploids all have been found to fruit equally vigorously under favourable conditions.

In the case of the other plants investigated, the determination of chromosome numbers of the previous investigators have been mostly confirmed. Of the plants whose chromosome numbers have been determined for the first time *Physalis minima*, was found to contain 24 haploid chromosomes as in *Physalis peruviana*. *Brunfelsia ameri-*

cana, showed 11 haploid chromosomes. Campin (2) appears to be the only investigator who has found this number in Solanaceæ, but he is not quite definite. Considering the fact that both *Brunfelsia* and *Salpiglossis* belong to the tribe Salpiglossoideæ the chromosome numbers 11 and 22 do not appear to be at all surprising. The chromosomes in *Cestrum* appear to be very irregular in their shape and as such it was rather difficult to obtain definite evidence as to their number from the meiotic divisions of the microspore mother cells, and the counts were made from nuclei undergoing mitotic divisions in the embryo-sac.

Summary.

The chromosome numbers of some of the Solanaceous plants commonly occurring in Bengal have been determined. The chromosome numbers of the following plants have been determined for the first time :—

Solanum indicum L. (n = 12)
Solanum verbascifolium L. (n = 12)
Solanum trilobatum L. (n = 12)
Solanum torvum Swartz (n = 12)
Withania somnifera Dun (n = 24)
Physalis minima L. (n = 24)
Cestrum nocturnum L. (n = *Ca* 8)
Brunfelsia americana I Sw. (n = 11)

Polyploidy within the species have been noted in *Solanum nigrum* L. (n = 12, n = 24 and n = 36). The morphological characters of the polyploids have been given. The close resemblance of the tetraploid form of *S. nigrum* with *S. luteum* Mill. has been indicated.

I desire to express my thanks to Mr. I. Banerji for his helpful suggestions, and continued interest during the progress of this investigation.

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