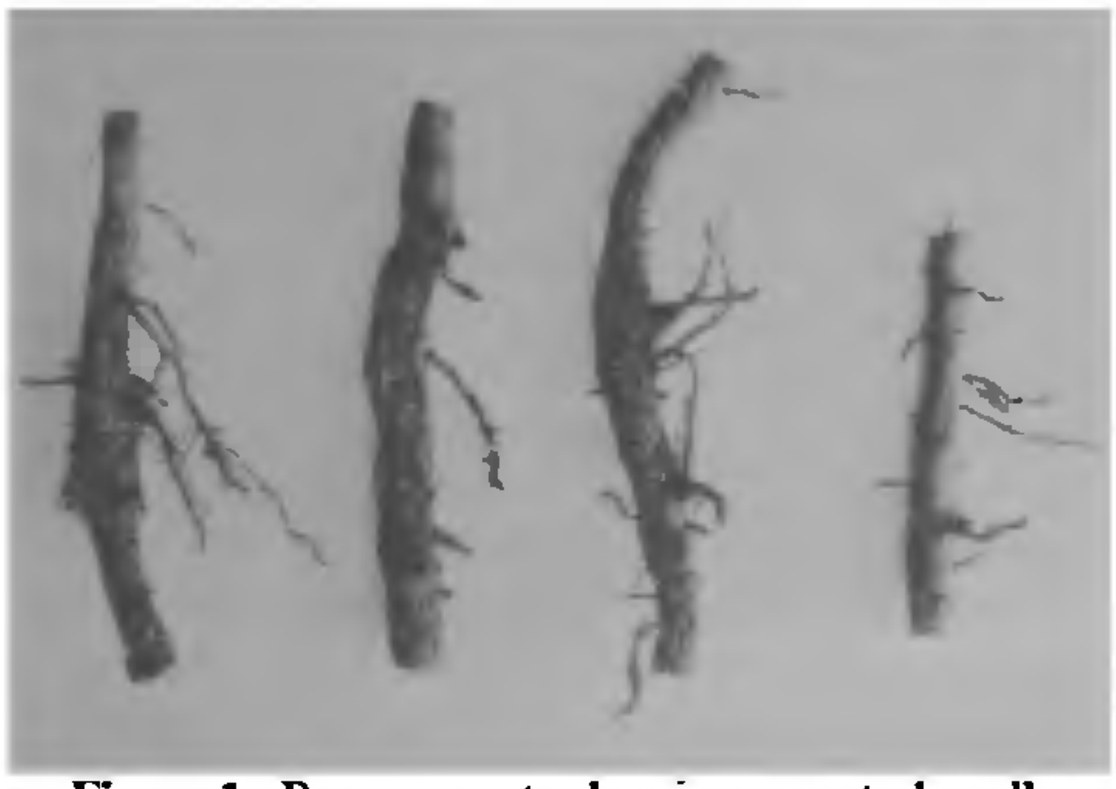

Figure 1. Banana roots showing nematode galls.

Meloidogyne spp. and *Helicotylenchus* sp. around rhizosphere of banana have been recorded earlier[2,3]. However, severe damage to banana plantations by root-knot nematode, *Meloidogyne incognita* under field conditions has not been reported so far.

Considering the pathogenic nature of the root-knot nematode, it is essential to take necessary precautions to prevent its spread to other banana growing areas through infested soil and roots adhered to suckers.

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CYTOLOGICAL AND OTHER EVIDENCES FOR THE TAXONOMIC POSITION OF *NYCTANTHES ARBOR-TRISTIS* L.

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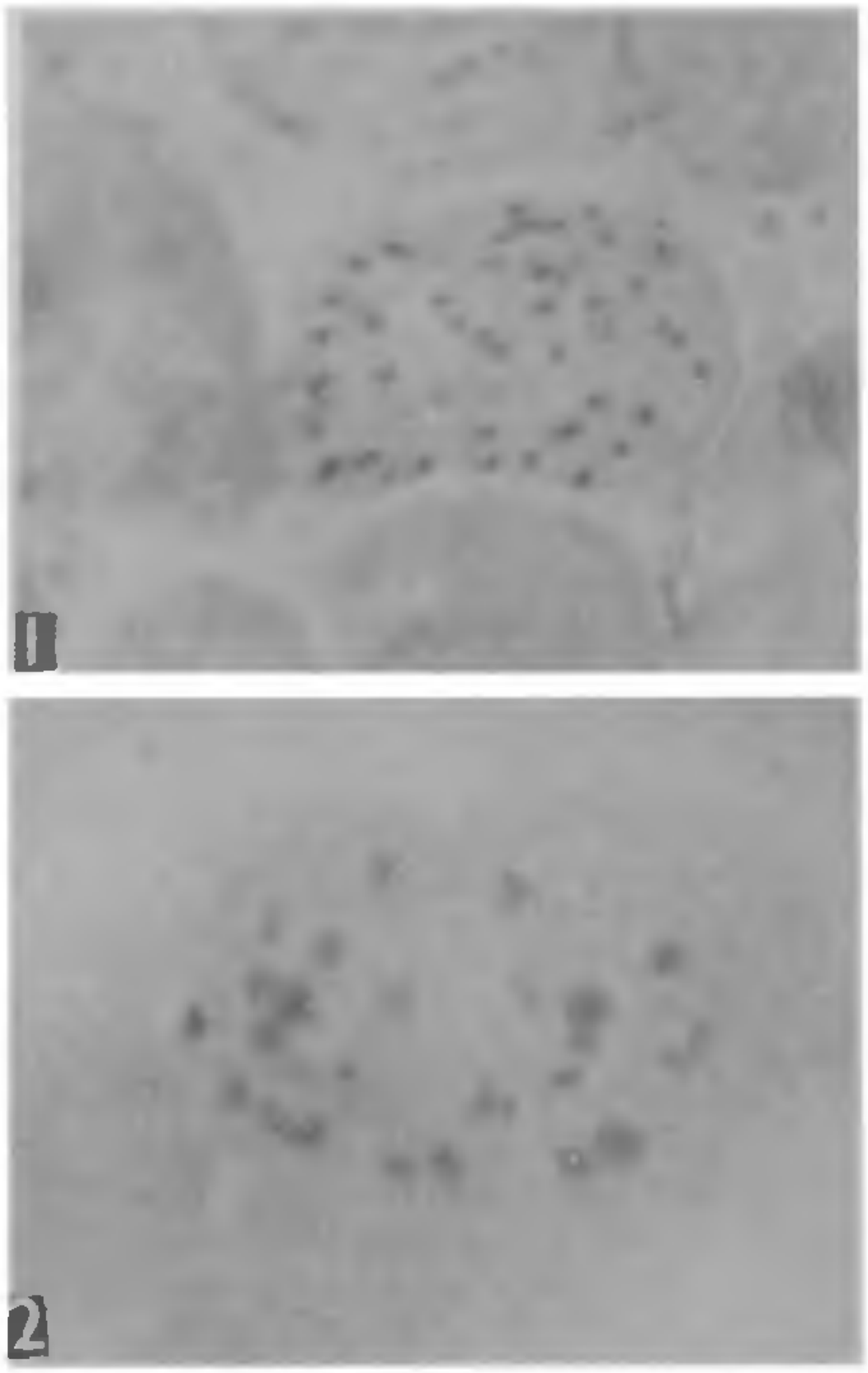
THE taxonomic position of *Nyctanthes* is controversial. Bentham and Hooker[1] and Gamble[2] placed this genus in Oleaceae. Stant[3] compared it with *Lantana* suggesting its affinity to Verbenaceae. Airy Shaw[4] supporting a verbenaceous relationship of *Nyctanthes* assigned the genus to a subfamily, Nyctanthoideae. All these studies were based on resemblances in morphological characters of vegetative parts. As there is no report of its cytology or chromosome number cytological investigations were undertaken presently with the object of throwing additional light on its taxonomic position.

Since root tip materials were not readily available somatic chromosome number of *N. arbor-tristis* was investigated by making squash preparations of shoot tips pretreated with 0.03 % solution of 3-amino-1,2,4-triazole[5] making use of the unique property of this chemical selectively inhibiting chloroplast development[6,7]. Pretreated shoot tips were fixed at 4.30 p.m. in 1 : 3 acetic acid : alcohol and stained by lactopropionic orcein[8]. Meiotic chromosome number was investigated by making smears of pollen mother cells from flower buds fixed at 10.30 a.m. in 1:1:3 chloroform : acetic acid : alcohol to which a few drops of ferric acetate were added. The PMCs were stained in two drops of propionocarmine (previously prepared by dissolving 4 g carmine in 200 ml 45 % propionic acid by boiling for 8 hr in a reflex condenser and filtering after cooling) on a slide which was gently warmed for 1 min during smearing and pressed between blotting papers to wipe out excess stain applying uniform pressure over the cover slip which was immediately sealed and observed.

By the above methods the somatic chromosome number of *N. arbor-tristis* is determined to be $2n = 44$ and its meiotic number to be $n = 22$ bivalents (figures 1 & 2). Since the chromosomes of *Nyctanthes* are extremely small a meaningful karyotype analysis is found to be difficult.

It may be pointed out that the chromosome number $2n = 44$ or $n = 22$ of *N. arbor-tristis* observed in the present study is comparable to that in the genus *Lantana* which also has $2n = 44$ chromosomes[9,10] and may be drawn in support of a verbenaceous affinity of



Figures 1 and 2. 1. Shoot tip cell of *Nyctanthes arbortristis* showing $2n = 44$ chromosomes at metaphase, **2.** Pollen mother cell showing 22 bivalents and 3 nucleoli at diakinesis × 1500.

Nyctanthes put forward on grounds of morphological and anatomical features[3,4]. However, while suggesting a similarity between chromosome numbers of *Nyctanthes* and *Lantana* one should take into account the fact that $2n = 44$ is not unique to *Nyctanthes* but other genera, *Menodora*, *Syringa*, *Osmanthus* and *Ligustrum* belonging to Oleaceae[9,10] also have $2n = 44$. Therefore, classifying *Nyctanthes* as a member of either Verbenaceae or Oleaceae on the basis of chromosome number would be arbitrary and misleading and more confirmatory evidences should be called for. Among the anatomical evidences one important feature of *Nyctanthes* showing verbenaceous affinity as pointed out by Airy Shaw[4] is the quadrangular nature of its stem. But it may be remembered that quadrangular stem is found in *Myxopyrum smilacifolium* and *Jasminum primulinum* also of Oleaceae.

Concluding a phylogenetic relationship of *Nyctanthes* to *Lantana* or to Verbenaceae based on their resemblances in vegetative characters can be preposterous. Sexual characters being more conservative a comparison of their floral structure and biology would be more dependable. In the present investigation the following contrasts are observed between *Nyctanthes* and *Lantana* representing Verbenaceae. In general, floral morphology of *Nyctanthes* is well comparable to oleaceous flower but much less to verbenaceous. In *Nyctanthes* the flowers are arranged in cymose head (oleaceous); in *Lantana* they are in racemose head (verbenaceous). The flower of *Nyctanthes* is actinomorphic (oleaceous) while that of *Lantana* is zygomorphic (verbenaceous). The number of stamens in *Nyctanthes* is two which is a characteristic feature of Oleaceae while in *Lantana* they are four (didynamous) and characteristically verbenaceous. The shape and architecture of stamens and the anatomy of anther in *Nyctanthes* are the same as in members of Oleaceae and not as in *Lantana* in which they are not oleaceous but strictly verbenaceous. Pollen and seed in *Nyctanthes* are highly sterile much like in the jasmines[11] both having a long history of domesticated propagation through vegetative means while *Lantana* grows wild and propagates sexually having fertile pollen and seed. Pollen of *Nyctanthes* is tricolpate and rough typical of Oleaceae while that of *Lantana* is tetra-, tri- or monocolpate and smooth as in other members of Verbenaceae. Stomata in *Nyctanthes* are predominantly anomocytic; in *Lantana* they are diacytic or paracytic. Studies on amino acid composition of *Nyctanthes* along with representatives of Oleaceae and Verbenaceae[12] have shown that *Nyctanthes* possesses high matching coefficients with many members of Oleaceae and low matching coefficients with Verbenaceae members. Further, if fragrance could be a criterion of phylogenetic relationship *Nyctanthes* should be very close to the sweet smelling jasmines and far removed from *Lantana* with its obnoxious aroma.

In view of the above findings we believe that *Nyctanthes* must belong to Oleaceae.

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MORPHACTIN-INDUCED DEVELOPMENT OF ROOTS IN THE SEEDLINGS OF CASTOR (*RICINUS COMMUNIS* L.)

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MORPHACTINS, the derivatives of fluorene-9-carboxylic acid have inhibitory effect in root initiation[1–11]. There are some other instances where they promote rooting[12–15]. However, their activity changes with season as well[7]. This paper gives an account of the findings on rooting of castor seedlings as induced by a morphactin.

Mature and healthy seeds of castor (*Ricinus communis* L.) were soaked in 500, 300, 250, 150, 125, 100, 75, 50, 10, 0.1 ppm solutions of morphactin EMD-7311, and water (control). After 24 hr, they were washed with distilled water and then planted in earthenware pots. Each pot contained 10 seeds. They were exposed to diffused sunlight and watered at regular intervals of time. After 10 days of growth, the seedlings were carefully removed from the pots. The length of the radicle, the number and the length of lateral roots, and the percentage of seedlings with apogeotropic roots was determined. The average of 5 seedlings is given in table 1.

The experimental data clearly indicate that higher concentrations (500–50 ppm) of morphactin proved to be extremely ineffective in promoting growth of the radicle. Elongation of the radicle in comparison to control was increased only at fairly low concentrations of 10 and 0.1 ppm. But this increase too, did not seem to be greatly significant. At 300, 250, and 125 ppm, radicle tips of all the seedlings were considerably swollen and became almost spherical in shape. From these swollen tips, lateral roots developed in clusters. The root formation was however, completely inhibited at 500–250 ppm. There was a progressive increase in the length from the higher to lower concentrations. Hence, the shortest radicle length was found at 500, and the longest at 0.1 ppm.

Thickening of the roots of caster seedlings by a morphactin (EMD-7301 W) has also been reported by

Table 1 *Effect of morphactin on seedling of castor*

Concentration (ppm)	Length of Radicle (cm)	No. of Lateral Roots	Length of Lateral Roots (cm)	% of Seedlings showing (–)geotropism
EMD. 500	3.00 ±2.04	0	0	0
300	3.20 ±2.46	0	0	0
250	4.70 ±2.24	0	0	0
150	5.02 ±2.34	7.0 ±1.00	1.12 ±0.54	40
125	5.25 ±1.82	8,0 ±3.55	1.25 ±0.21	10
100	6.10 ±4.12	9.0 ±4.55	1.66 ±0.24	10
75	6.50 ±1.96	11.0 ±3.00	3.40 ±0.48	20
50	10.20 ±2.56	19.4 ±8.55	3.43 ±0.41	60
10	12.75 ±4.32	19.7 ±4.81	5.80 ±1.16	40
0.1	12.75 ±5.66	32.6 ±8.73	6.70 ±0.24	20
0	12.00 ±1.04	19.0 ±6.89	5.80 ±0.50	0