

glassware in bulk and the risk of breakage of glassware and the high initial cost involved. Similar method has been used for a long time for the multiplication of biofertilizers like *Azotobacter* and *Rhizobium*.

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## EFFECTS OF VITAMINS ON GROWTH OF CULTURED NORMAL AND NEMATODE INDUCED ROOT GALL TISSUES OF *LYCOPERSICON ESCULENTUM* MILL.

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TISSUE culture techniques are being used to study the nutritional requirements of different tissues<sup>1-3</sup>. Most of the studies are confined to normal tissues only<sup>2,3</sup>. In the present report studies have been made to compare the nutritional requirements of normal (hypocotyl in origin) and nematode induced root gall callus of *Lycopersicon esculentum* Mill. Till to date there is no report on a nematode induced root gall callus cultures. However, there are some reports on cultures of virus<sup>4</sup>, bacteria<sup>5</sup> and insect<sup>6</sup> induced galls.

In the present study, the effect of 6 vitamins *viz* biotin, calcium pantothenate, choline chloride, cyanocobalamin, folic acid and riboflavin (0.5-10.0 mg l<sup>-1</sup>) have been studied on the growth of normal and

nematode induced, root gall tissues of *L. esculentum* Mill., an important vegetable crop.

The callus (normal) was isolated from the segments of hypocotyl (ca 1.0-1.5 cm long) and root galls (ca 0.2-0.5 cm diameter) on Murashige and Skoog's<sup>1</sup> (MS) medium with 0.08 mg l<sup>-1</sup> of kinetin and 10.0 mg l<sup>-1</sup> of NAA. After surface sterilization with 0.1% mercuric chloride, explants (hypocotyl and gall) were thoroughly washed and cultured. Medium was jelled with 0.8% BDH agar and the pH was adjusted to 5.8 prior to autoclaving at 1.06 Kg./cm<sup>2</sup> for 15 min. Observations were recorded after 30 days of incubation in the dark at 26° ± 2°C and 55% relative humidity. Experiments were repeated thrice and the arithmetic mean along with standard deviation of fresh weight of 6 replicates was calculated. In control experiments, the vitamin in question was eliminated.

In controls, the growth of gall tissue was better (10.00 ± 0.20 g/flask) in comparison with normal tissue (8.70 ± 0.17 g/flask). On addition of biotin and riboflavin, the growth of normal and gall tissues decreased continuously with increasing levels. Growth was less than in the controls except at 0.5 mg l<sup>-1</sup> of either vitamin. Poor growth of the tissues on riboflavin has also been noted in *Nigella*<sup>7</sup>. In all the cases the growth of gall tissue was better than normal tissue.

Growth increased very slightly on calcium pantothenate and choline chloride (0.5-5.0 mg l<sup>-1</sup>) in comparison to controls. On cyanocobalamin, the growth of the normal tissue decreased continuously in comparison to controls; however, the growth of gall tissue was slightly higher than the controls on 0.5-1.0 mg l<sup>-1</sup> but on further increase in cyanocobalamin the growth decreased.

Folic acid proved better than any other vitamins as the maximum growth of normal tissue (10.1 ± 0.2 g/flask) and gall tissues (12.6 ± 0.3 g/flask) was observed on 1.0 mg l<sup>-1</sup> and 2.5 mg l<sup>-1</sup>, respectively (table 1). Folic acid was found to be most essential for the growth of *Nigella* tissue and interactions of vitamin and hormones resulted in best growth of the tissue<sup>7</sup>.

In all cases the growth of normal tissue did not exceed the growth of gall tissue. It may be due to the fact that gall tissues have more endogenous auxin, which may be a factor in improved growth of gall tissue.

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**Table 1** Effect of optimal concentration of different vitamins when incorporated in MS-medium separately, on growth of normal and gall tissues of *Lycopersicon esculentum* Mill.

| Vitamin incorporated in the MS-medium | Tissue Type                                 |                  |                         |   |                   |                         |
|---------------------------------------|---|------------------|-------------------------|---|-------------------|-------------------------|
|                                       | Normal Tissue                               |                  |                         | Gall Tissue                                 |                   |                         |
|                                       | Optimal concentration (mg l <sup>-1</sup> ) | Fresh weight (g) | Standard deviation (SD) | Optimal concentration (mg l <sup>-1</sup> ) | Fresh weight (gm) | Standard deviation (SD) |
| Biotin                                | 0.5   | 9.1              | ±0.2                    | 0.5   | 11.2              | ±0.2                    |
| Calcium                               | 2.5   | 9.3              | ±0.1                    | 5.0   | 11.0              | ±0.2                    |
| pantothenate                          |   |                  |                         |   |                   |                         |
| Choline chloride                      | 2.5   | 9.9              | ±0.2                    | 5.0   | 11.9              | ±0.2                    |
| Cyanocobalamin                        | 0.5   | 9.2              | ±0.2                    | 1.0   | 10.7              | ±0.2                    |
| Folic acid                            | 1.0   | 10.1             | ±0.2                    | 2.5   | 12.6              | ±0.3                    |
| Riboflavin                            | 0.5   | 9.0              | ±0.1                    | 0.5   | 10.9              | ±0.2                    |

(Values are mean ± SD of 6 replicates)

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### A NEW CHROMOSOME NUMBER OF $2n = 33$ FOR *AMARYLLIS BELLADONNA* L.

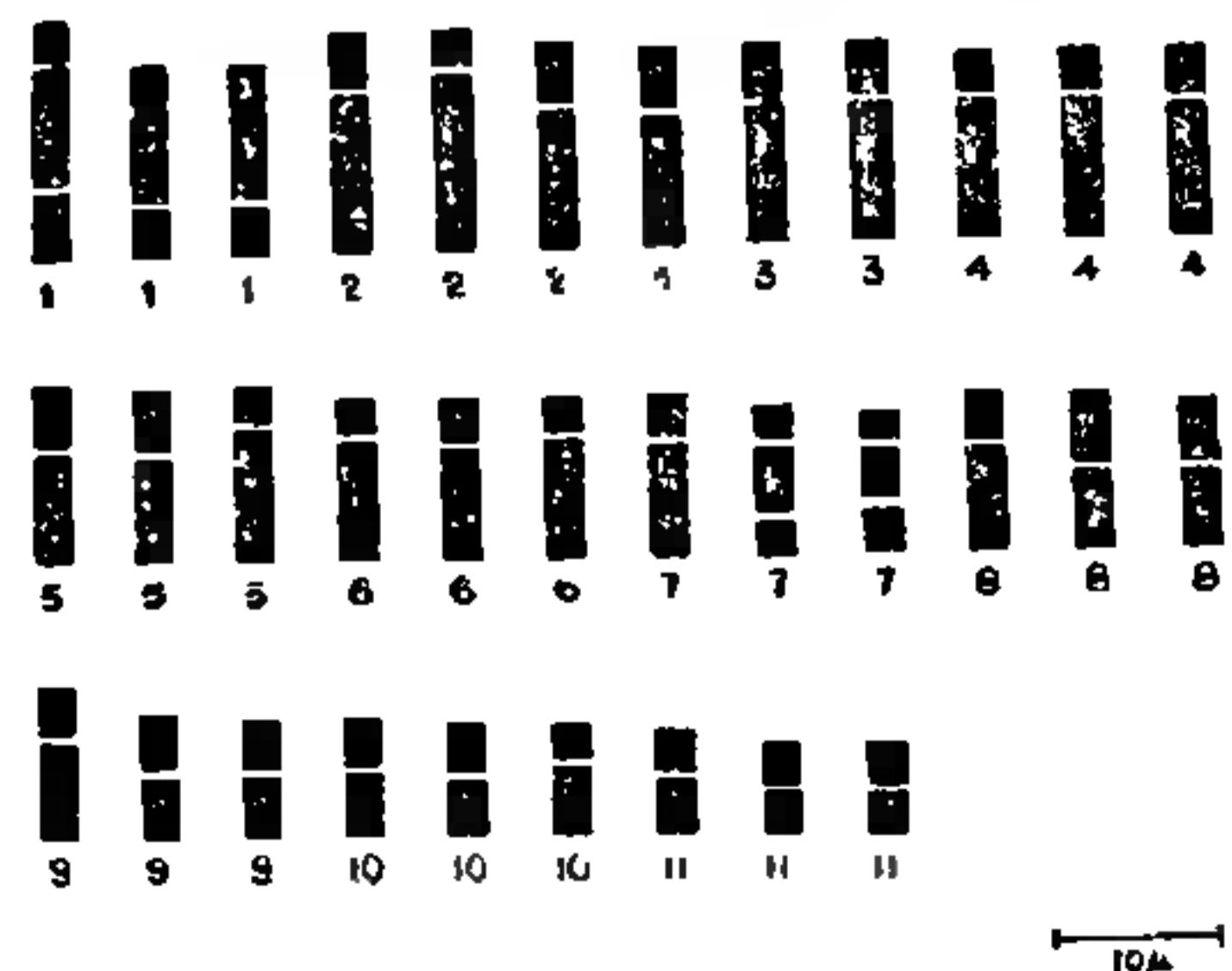
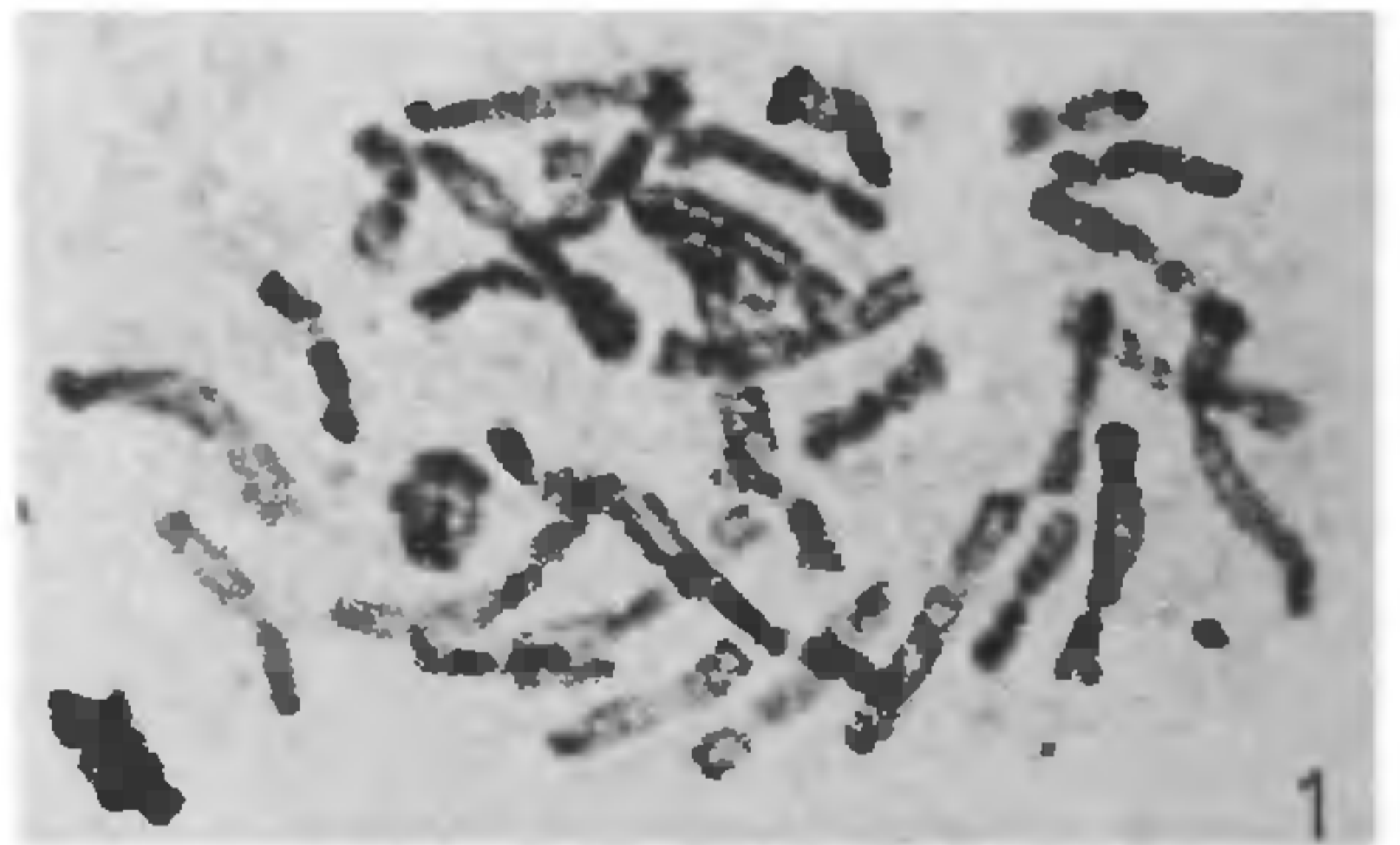
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*AMARYLLIS BELLADONNA*, a horticultural genus of the family Amaryllidaceae is commonly grown in India and other subtropical-tropical areas of the world for its large, colourful and often pleasantly scented flowers. A thorough study of the available literature revealed the record of only two chromosome numbers,  $2n = 20, 22$  for the species<sup>1-9</sup>. In the present investiga-

tion a new chromosome number of  $2n = 33$  is observed in a cultivar obtained from Darjeeling, the karyomorphology of which is described here.



Figures 1, 2. 1. Karyotype of *A. belladonna* with 33 chromosomes × 2680, 2. Idiogram.