of two weeks. When test plants attained full growth, the leaves on lower and middle branches displayed the symptoms of interveinal chlorosis and green vein-banding characteristics of anthocyanosis virus under glasshouse conditions.

The mechanical transmission of cotton red-leaf virus disease by using 0·05 M phosphate buffer, pH 7·5 plus reducing agents, *viz.*, 2–mercaptethanol (0·02 M) or DIECA (0·01 M) or Na_2SO_3 (0·1%) was negative. The transmission of virus causing red-leaf disease through 600 seeds collected from the infected H–4 cotton plants and determined by the growing-on test was negative. The results on graft, seed and mechanical transmission for the present disease are similar to the cotton anthocyanosis virus disease in Brazil, Costa[3].

The disease syndrome transmitted through grafting and insect vector resembled magnesium deficiency, (McMurtrey[6]) on cotton. However, the disease was not recovered with ten foliar sprays of $MgSO^4$. @ 100 ppm at three days interval. These results are similar to the one reported from Greece, Vretta-Kouskoleka and Kallinis[12]. On the basis of transmission studies. it is evident that the present cotton disease with interveinal reddening and green vein banding syndrome present in India is similar to the cotton anthocyanosis virus disease in Brazil. This disease is a new record for India.

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ROOT FORMATION FROM HYPOCOTYL CALLUS OF SAFFLOWER (*CARTHAMUS TINCTORIUS*)

MORPHOGENIC studies on safflower (*Carthamus tinctorius* L.) have not been conducted so far.[1] The morphogenesis in this plant utilising the technique of tissue culture has now been undertaken and the successful establishment of tissue culture and the formation of roots from hypocotyl callus have been desctibed.

Mature seeds of *Carthamus tinctorius* L. were washed with tap water and surface sterilized with 0·2% mercuric chloride solution for 5 minutes. The seeds were then washed with sterile distilled water and planted aseptically on White's modified medium (WM)[2], and on WM supplemented with various phytohormones: indole–3–acetic acid (IAA), 2, 4–dichlorophenoxyacetic acid (2, 4–D), naphthaleneacetic acid (NAA), kinetin, and gibberellic acid (GA_3). The hypocotyl of the seedling developed on WM was also planted on WM containing the above growth substances. The cultures were maintained at 25±5° C in diffuse light under 50–60% relative humidity.

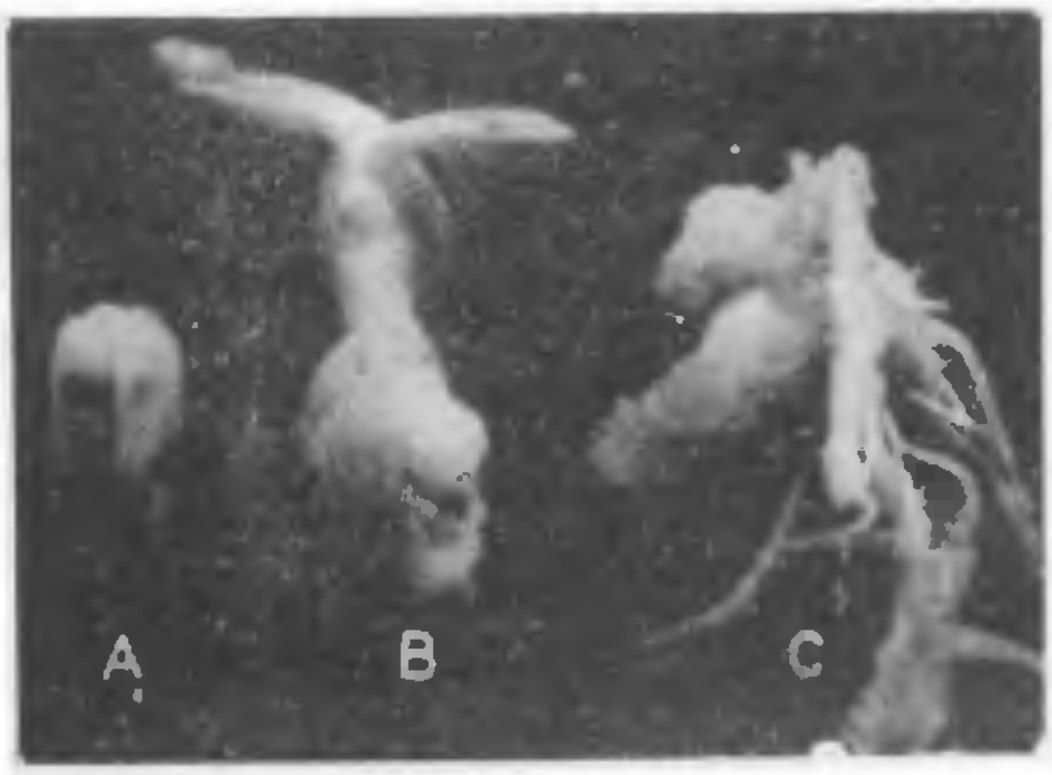

FIG. 1A–C. *Carthamus tinctorius* L. A. Mature seed; B. One-week-old culture of seedling on WM + 2, 4–D (5 ppm) showing hypertrophy and callusing of radicle and hypocotyl; C. 3-week-old culture of callus on WM (transferred from WM + 2, 4–D) showing root differentiation, × 2·3.

The seed (Fig. 1A) germinated within 5 days on WM and developed into a normal seedling. The seedling developed on WM + GA_3 (5 ppm) showed a hypertrophied primary root with secondary roots differentiated approximately at right angles. No secondary roots were observed in the seedlings deve-

loped on WM + kinetin (5 ppm), and the growth of even primary root was impaired to a great extent. Normal germination of the seed was checked on the auxin–containing media. Within a week of implantation on WM + 2, 4–D (5 ppm), the seed showed callusing after much hypertrophy of the radicle and hypocotyl (Fig. 1B). A similar callus from the radicle was also observed on WM + IAA (5 ppm) and NAA (5 ppm). The hypocotyl segments from seedlings grown on WM and planted on WM + 2, 4–D (5 ppm), likewise, exhibited callusing within a week. The callus continued to grow indefinitely on this medium. When the callus grown on WM + 2, 4–D (5 ppm) was transferred on WM, profuse rooting was observed after about 2 weeks from the callus surface (Fig. 1C).

In carrot (*Daucus carota*) also, 2, 4–D induces callusing and it has to be deleted from the medium to bring about profuse embryogenesis[3]. In the present study though embryogenesis has not been observed, rhizogenesis occurs by a similar deletion of 2, 4–D from the medium. Further work is in progress to induce the differentiation of embryoids and shoot buds in the culture of various plant parts of *C. tinctorius*.

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* This note is humbly dedicated to the memory of the late Professor H. E. Street (died December 4, 1977), one of the pioneers of the plant tissue culture.

ORGANOGENESIS IN TISSUE CULTURES OF A LAC HOST *MOGHANIA MACROPHYLLA*

Moghania macrophylla (Willd.) O. Ktze. is a wild shrub which serves as a host for the lac insect[1]. The lac insect thrives on the sap of young twigs of only specific angiosperms. In the present communication we describe the organogenesis in tissue cultures of one such host, namely *Moghania macrophylla*.

Seeds of *M. macrophylla* from the Indian Lac Research Institute, Namkum (Ranchi) were cultured on White's modified medium (WM)[2] and on WM supplemented with various phytohormones as described by Nag and Pandey[3].

The seed (Fig. 1A) shows epigeal germination. On WM it showed normal germination forming a seedling (Fig. 1E) after about 3 weeks. A more or less similar seedling was formed on WM + GA_3 (5 ppm). On WM + 2, 4–D (5 ppm) seedling formation was checked, the cotyledons callused after about 2 weeks (Fig. 1B). The callus was unorganised and grew indefinitely on this medium. On WM + NAA (5 ppm) the plumule developed into a miniature shoot (Fig. 1D) of limited growth; the cotyledons exhibited callusing and numerous (up to 15 per cotyledon) roots differentiated from the callus. On WM + IAA (5 ppm) roots developed either directly from the cotyledons or after callusing. No shoot bud formation was observed on the auxin-containing media. On the other hand, on WM + kinetin (5 ppm) root formation was completely inhibited (Fig. 1C); and 3–6 adventitious shoot buds developed from the juncture of the cotyledons and the epicotyl after about 3 weeks of culture. These buds remained dwarfed on the above medium, but developed into shoots on transfer to WM + IAA (2·5 ppm) + kinetin (5 ppm).

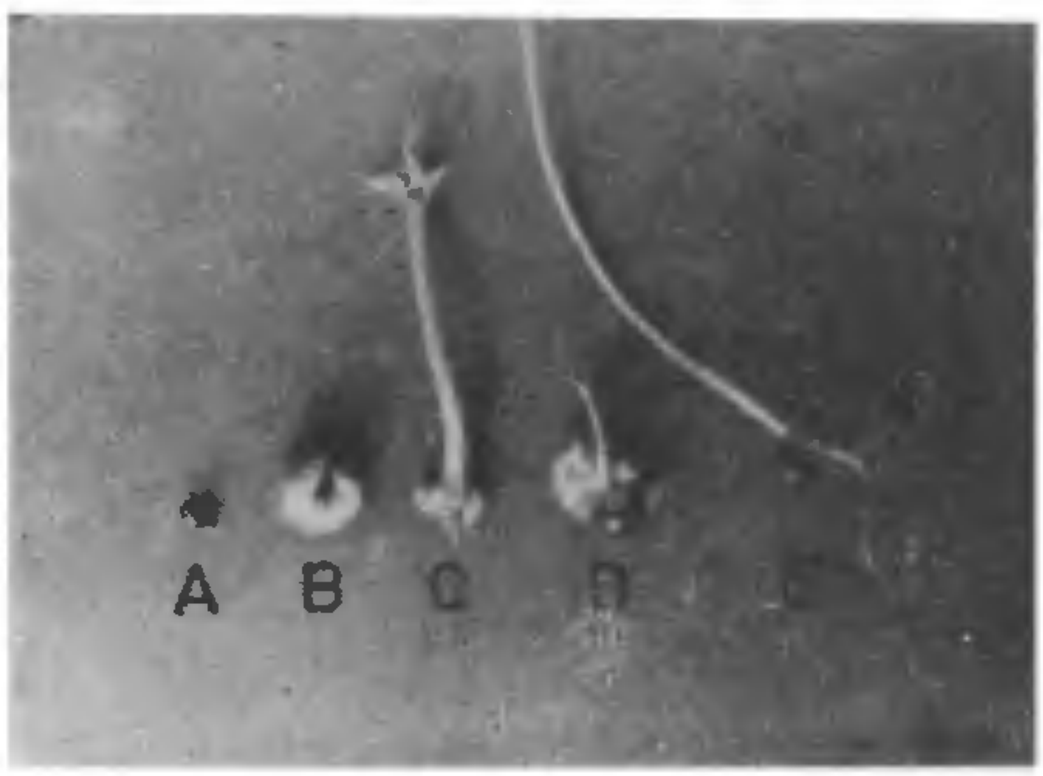

FIG. 1A–E. *Moghania macrophylla*. A. Mature seed; B. 2-week-old culture on WM + 2, 4–D (5 ppm) showing callusing of coryledons; C. 3-week-old culture on WM + kinetin (5 ppm), note the inhibition of root formation; D. 3-week-old culture on WM + NAA (5 ppm) showing callused coryledons and a miniature shoot; E. 5-week-old culture on WM, apical portion of the seedling not seen, note the well-developed root. × 0·5.

The stem segments from seedlings grown on WM and planted on WM + IAA (5 ppm) showed profuse rooting from all over the surface of the explant. It is interesting to note that roots differentiated even from the internode region of the stem without callusing. The present findings thus show that in *M. macro-*