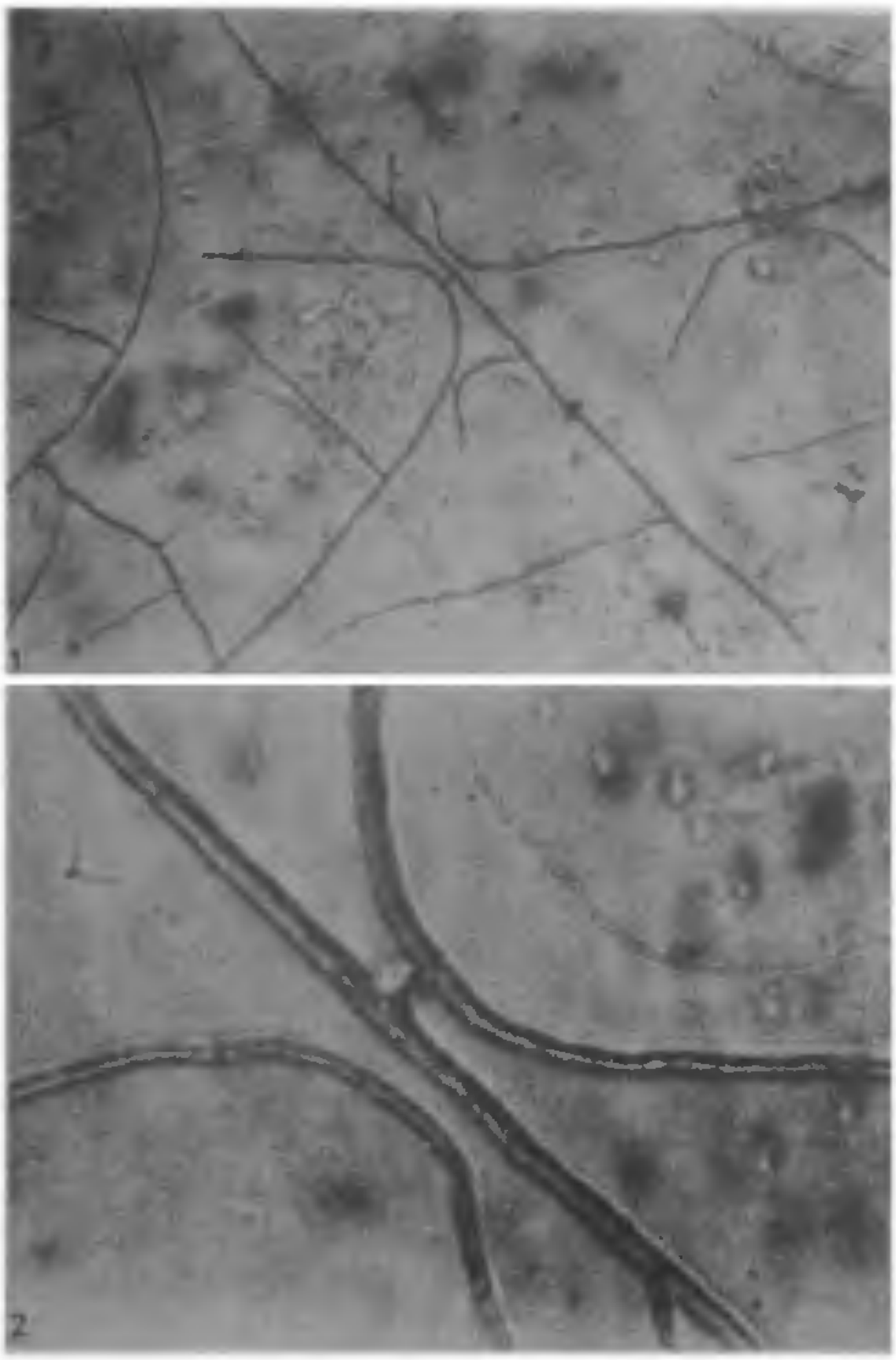

Figures 1, 2. 1. Anastomosis between two isolates of rice showing perfect fusion (× 100), **2.** Enlarged portion of the fused region (× 400).

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EFFECT OF MORPHACTIN ON SEED GERMINATION AND SEEDLING GROWTH OF TEA (*CAMELLIA SINENSIS* L.)

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MORPHACTIN (Chlorflurenol methyl ester) induced 100% germination at 100–250 μg/ml concentrations and exhibited supra-optimal effect at higher concentrations. It inhibited seedling growth resulting in a fleshy tap root with upwardly growing hook-like curvature at the root apex indicating its general apogeotropic action. The tap root produced abundant root hairs from the region of maturation.

Flurenol (9-hydroxy-9-flurenocarboxylate) is commonly referred to as morphactin. Morphactin should be considered not as a competitive 'anti-regulator' but rather as a 'polyvalent disturbing substance' acting in a way essentially detrimental to organization and correlation. On the other hand, morphactins possess a high degree of physiological tolerance compared to other synthetic active substances and are only temporarily active[1]. Morphactins, a versatile class of bioregulants, exhibit a wide range of diverse influence on plant growth and development[2].

Biclonal tea seeds were collected from the seed bari (orchard) located in New Area of Tocklai Experimental Station (Tea Research Association). Only sinkers were selected for experimentation. Seeds were surface-sterilized with 0.1% mercuric chloride before planting in sterilized sandfill earthenware pots. Seeds were soaked for 24 hr in respective concentrations of morphactin (0, 10, 50, 100, 250, 500 and 1000 μg/ml) before planting. Each treatment was repeated thrice, and for each repeat 25 seeds were used. Sands were kept moist by sprinkling with distilled water until the termination of the experiment. Germination percentage and seedling growth (root and shoot growth) were recorded after 14, 16 and 18th day of planting and subjected to statistical analysis.

Morphactin at the concentrations of 100 and 250 μg/ml induced 100% germination ($P < 0.01$). The next two higher concentrations 500 and 1000 μg/ml were supra-optimal (figure 1). Morphactin at 1000 μg/ml induced 90% germination against 76% at the control. Thus, even at the highest concentration 14% more germination was achieved.

Inhibition of germination due to morphactin treat-

ment has been reported earlier[1,3,4], although such inhibition is not always common. Thus, the germination of *Pisum sativum* and *Dolichos lablab* seeds was not inhibited even by 24 hr presoaking in morphactin solution even though seedling growth was affected considerably[5]. This corroborates with the present findings. Morphactin significantly stimulated germination of intact tea seeds probably because it imparted some effect on sclerotesta (stony seed-coat causing mechanical hindrance to the emergence of radicle) of the seeds during 24 hr soaking which helped in loosening the seed-coat and in emergence of the radicle and the plumule. However, as soon as it reached the young embryonic axis, it inhibited mitosis resulting in retardation of root and shoot growth.

Both root and shoot growth in the morphactin-treated seeds were significantly inhibited (figures 2 and 3). The magnitude of inhibition increased with the rise in concentration. Thus, the root growth after 18th day measured 19.66 mm in the control against only 8.66 mm at 1000 μg/ml. Similarly, the shoot growth after 18th day in the control was 6.66 mm as against 4.33 mm after treatment with 1000 μg/ml of morphactin. The inhibition was directly correlated with the rise in concentration. The growth inhibition, both in root and shoot was highly significant ($P < 0.01$). This was in conformity with the findings of other workers[6-9].

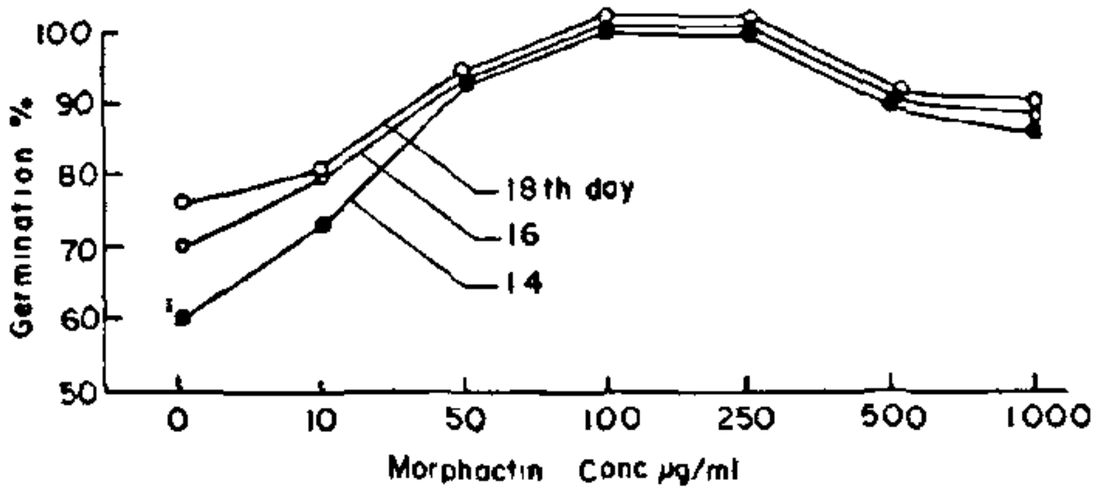

Figure 1. Action curves of germination percentage at different morphactin concentrations.

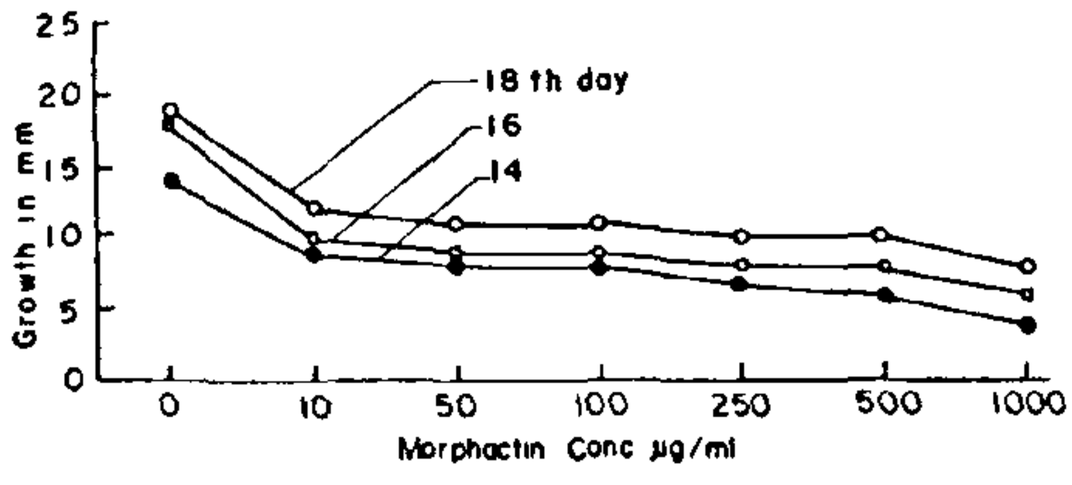

Figure 2. Action curves of root growth at different morphactin concentrations.

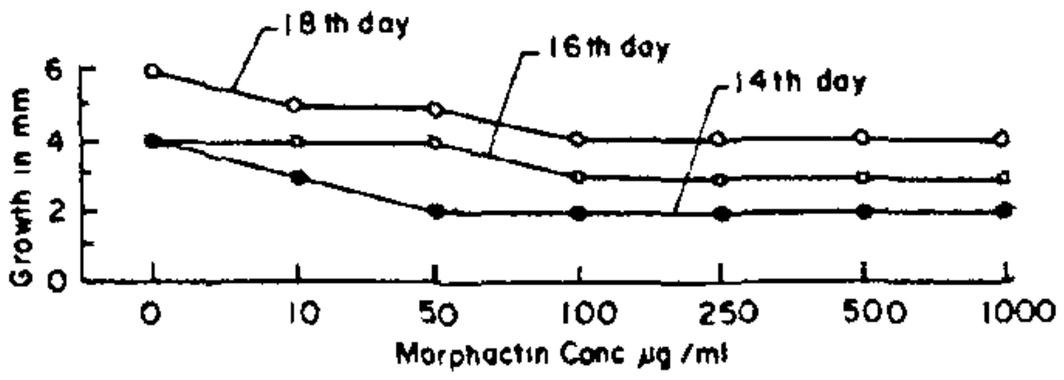

Figure 3. Action curves of shoot growth at different morphactin concentrations.

The tap root became fleshy, with abundant root hairs arising from the region of maturation. An upwardly growing hook-like curvature at the root apex was a distinct and general impairment. The curvature was due to morphactin's apo-geotropic action on root growth. Apo-geotropism caused by morphactin had been reported both in several mono- and dicot species[10]. The fleshiness of tap root might be due to the fact that after uptake of morphactin via seeds, it was transported and distributed in the plant, not strictly in polar but also in basi- and acropetal manner. Thus, it inhibited and modified the development and growth, especially in case of new growth[4]. Thus, morphactin could be utilized effectively to modify seed germination and seedling growth in tea.

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