

Fig. 1. A, a mass of callus formed from the leaf-sheath which was excised from the older rice plant and incubated on the agar medium containing 8 ppm 2,4-D. $\times 6$. B, callus tissue proliferated from the excised node of older rice plant. The induction medium containing 8 ppm 2,4-D. $\times 2$. C, masses of callus tissues burst out from the epidermis of the excised coleoptile using medium containing 6 ppm 2,4-D. $\times 4$. D, two groups of callus are differentiated from the scutellum and cotyledonous node using medium containing 2 ppm 2,4-D. $\times 4$. E, a root tip is swollen and collapsed to form callus using medium containing 0.5 ppm 2,4-D. $\times 100$. F, transverse section of callus induced young leaf-sheath of rice showing masses of callus tissue grow from the external region of immature vascular bundles. $\times 200$. G, an enlarged photomicrograph of differentiating vascular bundle of callus induced leaf-sheath showing a group of meristematic cells initiated from the meristematic cells near the immature vascular tissues. $\times 400$. H, a transverse section of callus induced node of rice showing callus tissues formed the meristematic cells of procambium. $\times 200$. iv: immature vascular bundle, ct: callus tissue, pc: procambium, v: vascular bundle, ivt: immature vascular tissue, p: pith.

very closely by the immature vascular tissues of the differentiating vascular bundle. A cross section of callus induced node shows that masses of callus tissues arise from the meristematic cells of procambium (Fig. 1H).

The excised coleoptiles were implanted in the medium containing 6 ppm 2,4-D and incubated in darkness at 28°C for three weeks. The surface of the coleoptiles were proliferated to form callus (Fig. 1C). Similarly the calli

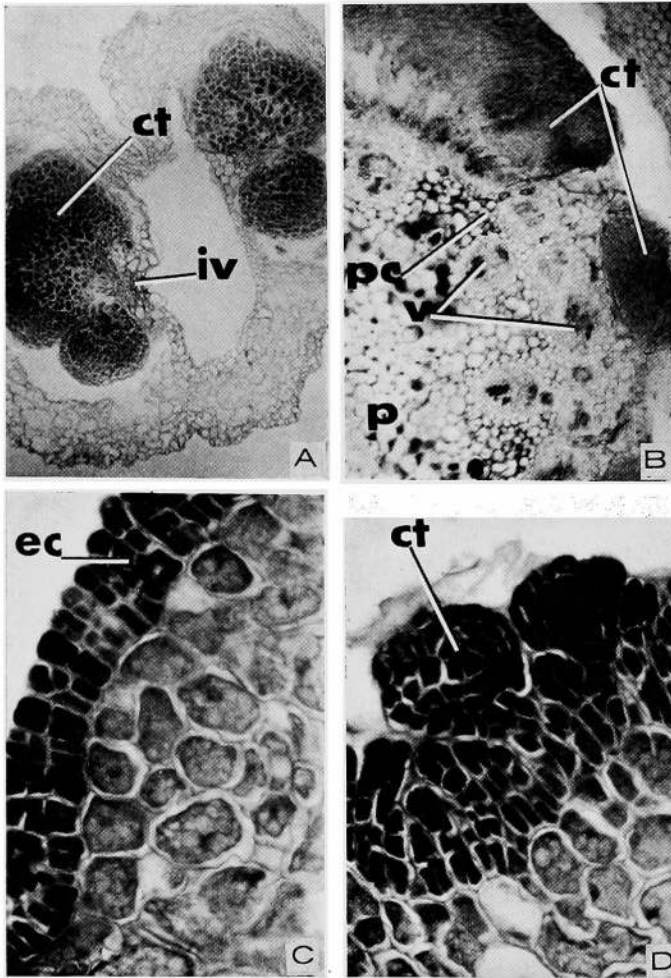


Fig. 2. A, a transverse section of coleoptile of rice showing two groups of callus tissues was formed from the meristematic cells of the external differentiating vascular bundle. $\times 200$. B, a transverse section of callus induced cotyledonous node of rice showing callus tissues grow from the procambium and the external phloem region. $\times 200$. C, a section of the scutellum of rice embryo cultured on the medium containing 6 ppm 2,4-D showing the epidermis cells being activated into meristematic cells. $\times 400$. D, a section of callus tissues are initiated from the activated epidermis cells of scutellum. $\times 400$.

were formed from cotyledonous node and scutellum of germinated seeds which were incubated in the medium containing 2 ppm 2,4-D (Fig. 1D). Further investigations show that the callus tissues were initiated from the meristematic cells near the differentiating immature vascular bundle of the coleoptile (Fig. 2A). In cotyledonous node the callus tissues initiated from the meristematic cells of procambium sometimes initiated from the peripheral meristematic tissues of the external phloem region (Fig. 2B). However, the callus tissues were formed by the vigorous cell divisions of the epidermis cells of the scutellum (Figs. 2C, D).

The meristematic portion of the root tips of seedlings were swollen to

