LEAF VEIN AND APICAL BUD NECROSIS OF POTATO INCITED BY BACILLUS POLYMYXSA

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Potato plants grown in glass house frequently showed necrosis of leaf veins and apical buds during June-August. The veins on the ventral surface of the leaves became water-soaked and gradually turned necrotic and brown. The entire leaf or the leaflet curled downwards. The apical buds became bunchy and stunted. The growth and unfolding of the leaves were delayed. The partly expanded leaves were distorted and had necrotic margins.

On microscopic examination, the diseased tissue revealed presence of high bacterial population. Isolations were made from the diseased tissue by streak plate method on nutrient agar. The bacterial colonies appeared after 72 hr incubation at 28°C. The colonies were thin, white centred with translucent border and spreading. The margins were irregular. The bacterial cells were gram-negative rods motile by peritrichous flagella. Endospores were produced in abundance within 48 to 72 hr at 28°C. The spores were ellipsoidal, centrally located and distended the sporangium distinctly. The bacterium was facultative anaerobic, catalase positive, produced acid, gas and acetoin from glucose and liquified gelatin. On the basis of the above morphological and physiological characters the bacterium was identified as Bacillus polymyxa (Prazmowski) Migula.

The pure culture was inoculated on healthy potato plants at 5-leaf stage by spray method. After spraying the bacterial suspension the veins and apical buds were picked with fine needle tips. The inoculated plants were covered with polythene bags and incubated in glass house. After 24 hr of inoculation water-soaking was observed around injured points, and after 72 hr necrosis of leaf veins and buds became apparent. On reisolation the same organism was obtained.

Bacillus polymyxa was also isolated from rotten tuber tissues, the vascular tissues of apparently healthy tubers and healthy aerial stems. The bacterial cultures from all the five sources viz., (i) apical bud necrosis, (ii) veinal necrosis, (iii) rotten tuber tissues, (iv) vascular tissues of apparently healthy tuber and (v) vascular tissues of apparently healthy aerial stems were tested for their pathogenicity on aerial parts and tubers. All the cultures gave soft rot of tuber tissues but on aerial parts they produced necrosis of apical buds and leaf veins.

Thus it is concluded that B. polymyxa can incite necrosis of leaf veins and apical buds and tuber rot in potato plants. B. polymyxa has been earlier reported to be associated in tuber rot along with charcoal rot incited by Macrophomina phaseolina and also implicated in soft rot of potato tubers. Leaf vein necrosis has also been reported to be caused by B. subtilis.

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CUCURBITACINS AND MORPHOGENESIS IN CALLUS CULTURES

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Cucurbitacins, the tetracyclic triterpenoids, are widely distributed in the plants of cucurbitaceae and few other families. The cytotoxic, antitumour and antileukaemic activity of Cucurbitacins, particularly of A, B and E has been studied. The role of cucurbitacin on plant growth and differentiation is not definitely known. In plants, the effect of Cucurbitacins on hormone-induced growth has been reported. It inhibits growth induced by gibberellic acid (GA) and antagonizes GA-induced α-amylase activity. However, it fails to antagonize auxin-induced growth but prevents kinetin restoration of chlorophyll loss. In carrot callus cultures, inhibition of embryoid initiation and suppression of further development of the embryos already formed was recently reported on addition of Cucurbitacin B, E and 1 to the medium.

Extensive work carried out in this laboratory using numerous treatments, in which different growth substances were used, combinations tried and growth substances sequentially omitted, failed to induce buds or embryos in freshly isolated hypocotyl callus cul-
tures of Cucumis melo var. utilissimus Dutchie and Fuller, Cucumis melo Linn., Cucumis sativus Linn., Citrullus vulgaris Schrad., Momordica charantia. Linn. and Luffa acutangula (Linn.,) Roxb. However, with passage of time, in old cultures (23 months) of Momordica NAA (1.0 mg/l) plus adenine (33.75 mg/l) induced buds and plantlets and in 26-month old Cucumis melo utilissimus callus, NAA plus adenine treatment-induced embryos and benzyl adenine (BA) 1.0 mg/l plus indole 3-butyric acid (IBA) 1.0 mg/l produced buds and plantlets. These treatments were ineffective in early phase of the cultures.

In view of the failure of differentiation in freshly isolated callus tissues used and success in inducing shoot-bud formation in the old ones, effect of Cucurbitacin B and E was tested on the old cultures of Momordica & Cucumis and also in the Solanum nigrum morphogenetic system developed in this laboratory. Explants from stock cultures of S. nigrum were transferred to morphogenetic medium comprising basal medium of Murashige and Skoog containing BA (0.5 mg/l). Authentic samples of Cucurbitacin B & E were added at the concentrations of 0.05, 0.25 and 1.25 mg/l to the respective morphogenetic media of the three cultures. The cultures were grown under a photoperiod of 16 hr light with an intensity of 2000 lux at the culture level and at 25°C ± 1°C. Control sets were run simultaneously. Neither suppression nor acceleration of differentiation was observed in all the three materials. The result clearly indicated that failure of bud formation in fresh cultures of cucurbits in the numerous treatments tested was not due to adverse effect of Cucurbitacins, if present.

It has been reported earlier that bud initiation is preceded by starch accumulation. Induction of α-amylase activity by GA is well known. Gibberellins have been shown to repress shoot-bud formation in callus tissues. The presence of GA or GA-like substances in callus tissues has been reported. Thus, GA at an appropriate concentration in the tissues will reduce or inhibit shoot-bud differentiation. Cucurbitacins antagonize GA-induced α-amylase activity. Though not experimentally demonstrated, callus cultures of Cucurbits are likely to contain Cucurbitacins. If failure of bud induction in the early period of growth be considered to be due to the presence of effective levels of GA within the tissues, then it could be expected that the presence of cucurbitacin will counteract the effect of GA and may stimulate bud induction.

Further studies are being carried out to elucidate the regulatory role of Cucurbitacin, if any, in callus growth and differentiation.

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DIRECT AND INDIRECT EFFECTS OF GAMMA RAYS ON STIMULATION OF MORPHOGENESIS IN LONG TERM TISSUE CULTURE OF RICE (ORYZA SATIVA L.).

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Regeneration of plants from various explanted tissues of rice has been reported by several workers. However, the calli lose the capability to regenerate shoots during the course of subculture. For exploiting the benefits of tissues culture techniques, methods to maintain calli and induce regeneration of