The deep green colour resulting from treatment with 1 PC (isopropyl-N-phenyl carbamate) is from increased chlorophyll content[1]. However, growth substances which can retard chlorophyll breakdown are a few and using leaf discs from different species, it was established that there is specificity in response to the different growth regulators. For example, the effect of gibberellic acid on chlorophyll retention, in *Taraxacum* leaf discs formed the basis for a rapid bioassay for gibberllin[4].

The increase in chlorophyll content by pantothenic acid (20 PPM) in green gram seedlings grown in light was from 0·86 mg of control to 1·36 mg of pantothenic acid (0·46 mg) on the 4th day of seedling growth (Table II *b*) while it was only 0·35 mg on the 7th day. With riboflavin (20 PPM) treatment, on the other hand, there was no increase in the initial stage (4th day) but an increase of 0·438 mg (1·616-1·178 mg) was noticed on the 7th day (Table II *a*) when compared to control. The increase in protein content by pantothenic acid (Table II *b*) was 6 mg more than of control (from 67·32 to 73·32 mg), but reversal of chloramphenicol inhibited protein synthesis was 11·23 mg (from 59·87 to 71·10 mg) on the 7th day. With riboflavin, the increase in protein content was only 4·9 mg (from 94·60 to 99·5 mg) on the 7th day. Although it is difficult to comprehend an increase of 51·2 mg (from 98·8 to 150 mg) on the sixth day, that riboflavin increases protein synthesis was confirmed by its capacity to reverse chloramphenicol inhibited growth by Gopalarao and Rajakumar[5]. On the sixth day, the increase in protein content with pantothenic acid was 23·1 mg (from 49·53 to 72·63 mg) when compared to control. The reversal of chloramphenicol inhibited growth by riboflavin was about 9·0 cm[5] and that of pantothenic acid was 3·28 cm (from 10·20 to 13·48 cm) only on the 4th day. Riboflavin and pantothenic acid are similar in their action on chlorophyll and rotein synthesis as that of cytokinin. It is a well known fact that cytokinins are activators of DNA synthesis. Banerji and Laloraya[6] observed that cytokinins produce high ratio of protein nitrogen to soluble nitrogen. These two vitamins also resemble morphactins in stimulating protein synthesis unlike ABA (abscissic acid) which accelerates chlorophyll breakdown. Oorschot and Hilton[7] found that pantoate alone did nullify the inhibitions caused by cholro-substituted compounds such as α-chloropropionic acid and di or trichloro-substituted acids of acetic and propionic series. Riboflavin and pantothenic acid resemble in their effect on growth (in length). Earlier reports by Russians[8] concerning the activation of protein and chlorophyll synthesis by vitamins relate to nicotinic acid only.

Thus, the cytokinin-like behaviour of riboflavin and pantothenic acid was manifested by chlorophyll retention in *Bougainvillaea* and by increased protein content in green gram seedlings.

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## *CASNOIDEA INDICA* (THUNB.) A CARABID GROUND BEETLE PREDATING ON BROWN PLANT HOPPER, *NILAPARVATA LUGENS* (STAL) OF RICE

In the course of our investigation on natural enemies of brown plant hopper, *Nilaparvata lugens* (Stal), the carabid beetle, *Casnoidea indica* (Thunb.) was found to be an effective predator of the brown plant hopper of rice. Lim[1] and Otake *et al.*[2] reported *Casnoidea cyanocephala* and *casnoidea intersititial* respectively predating on brown plant hopper of rice.

The adult beetle predated on nymphs and adults of brown plant hopper of rice. They consumed all the parts except the legs and wings. They ran very quickly after the prey. They consumed on an average of 6·4 and 6·6 nymphs and adults of brown plant hopper respectively.

The beetle measures 6·5 mm in length and 2·5 mm in width. Body is reddish-brown and flat. Head is bluish-black and elongately rhombic. Antennae are filiform, slender and 11-segmented. Eyes are large and lateral.

Prothorax is prolonged and convex, sub-cylindrical. Scutellum is small, triangular and elongated. Elytra are with two pairs of blackish-blue band and two pairs of yellowish-white spots. Tarsi are 5-segmented with a pair of claws. The fourth tarsal segment is smallest and distinctly bilobed.

These beetles are terrestrial and short flier. They also run very rapidly and nocturnal in habit. This beetle is the first record from India.

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## A NEW SYSTEM FOR PLANT TISSUE CULTURE

THE growth and metabolism of a tissue culture is influenced by the conditions inherent in the chemical composition and physical nature of the medium. Attempts have been made to use chemically defined media in both solid and liquid culture conditions. Many cultures will grow more successfully as a callus on agar medium than as a cell suspension in liquid-culture, but liquid media are more easily standardised and maintained in a standard condition than the traditional agar form.

A possible optimum situation would be to grow a callus suported over a standard liquid medium, allowing for medium replacement without physically disturbing the callus. The "Millipore Sterifil Filtration" (manufactured by Millipore Corporation, U.S.A.) apparatus appears to provide a convenient assembly for such a system. This consists of a funnel, plastic filter holder and receiver flask designed as a closed system for sterilising fluids by filtration. The funnel acts as a growth chamber, and the receiver flask as the nutrient medium reservoir; these are connected through the filter holder containing a sintered glass disc supporting a bacterial filter. The units can be teflon tube linked to produce a multichamber arrangement in which the sterifil units are connected in pairs and in parallel to a continuous circulating medium supply line fed from a single large reservoir. The assembled apparatus can be autocalved with a cellulose filter in position. A levelling device is incorporated into the system to keep sinters in continuous contact with the medium and each unit contains a magnetic stirrer to ensure continued movement of the media over the sintered surface. Luer-taper slip ports in the growth chamber cover and nutrient medium reservoir make it possible to introduce fluids aseptically, and to vent the growth chamber funnel and reservoir flask with filtered air.

The system permits the undisturbed growth of callus for extended culture periods. Comparative growth experiments with callus cultures of *Parthenocissus*, *Rheum* and *Cassia* in sterifil units and agar based medium has indicated that the cultures retain a pattern of vigorous growth, for periods up to seven months in the growth chamber compared with a rate reduction after two months on the normal agar medium. Experimental conditions can be controlled more precisely in the growth chambers, and nutrient additives and chemo-precursors can be added to a part or the whole system. The use of bacterial filter prevents cross contamination from a single infected flask.

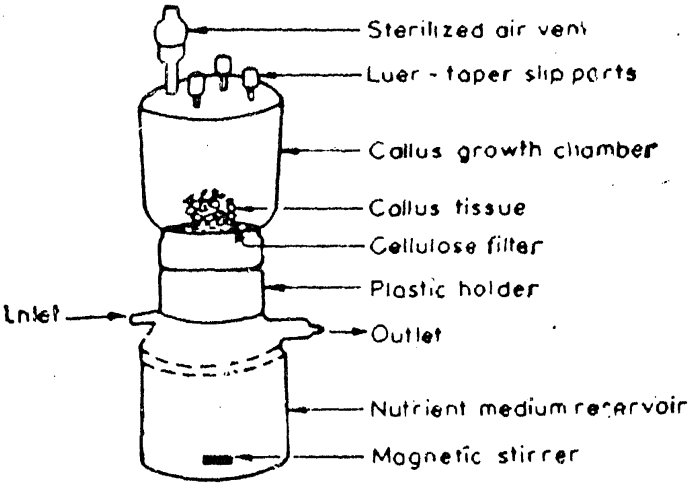


FIG. 1

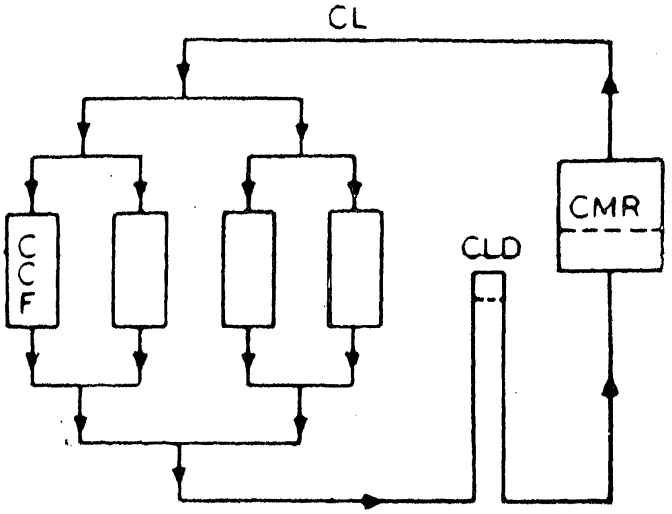


FIG. 2

The apparatus is simple to assemble and offers a continued callus culture growth for up to seven months, thus saving the need for frequent subculturing. In addition, it also help control the growth conditions more precisely. So far, no attempt has been made to introduce a chemostat, a turbidostat and a fermentor into this system[1].

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