Since the pattern at 'N' also shows a trend parallel to that at 'M', a two-dimensional body is assumed as the source. The causative body is approximated to a thin dyke. The two profiles, CD and EF, are so chosen that the influence of adjoining anomalies is least on them. For the profile EF, the datum, as shown in Fig. 5, is chosen as indicated by the full length profile. The two profiles are interpreted by using the following rules[2]:

$$\frac{w_{1/2}}{h} = 2 \sec Q \quad (1)$$

$$\frac{w_{1/2}}{L} = \tan Q \quad (2)$$

where $w_{1/2}$ is the half width of the anomaly curve and L is the horizontal distance between the maximum and minimum anomaly points. For the profile CD (Fig. 4), using the above rules, a depth of 18 ft and an angle Q of 153° are obtained. A theoretical anomaly curve is calculated and the values are changed until the theoretical curve agrees with the observed anomaly curve. Finally the values, $h = 12 \cdot 6$ ft. and $Q = 105°$, are adopted and the corresponding theoretical curve is shown as a discontinuous curve in Fig. 4.

For the profile EF (Fig. 5) a depth of 15·7 ft. and a Q of 44° are obtained. The theoretical curve corresponding to the values obtained, which agrees well with the observed anomaly curve, is shown in the figure as a discontinuous line. The results of interpretation for all the profiles are presented in Table I.

TABLE I

Results of interpretation

Profile	*h* (feet)	*w* (feet)	Q°
AB	29·3	73·7	9
CD	12·6	..	105
EF	15·7	..	44

The charnockite body is observed in a road cut and followed with magnetic observations. The anomaly trends at 'M' and 'N' in the magnetic anomaly map are the expressions of subsurface extensions of the charnockite bands. The magnetic anomaly patterns at 'M' and 'N' indicate that the magnetic polarisation in the charnockite band at 'M' is more uniform than in the other at 'N'. The depths obtained and presented in Table I indicate that the two charnockite bands are at a shallow depth. The band at 'N' has a smaller width than that at 'M'. The angles of magnetisation, Q, obtained for the profiles CD and EF reflect the changes in the direction of magnetisation, from one point to another along the strike of the band.

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CYTOKININ-LIKE BEHAVIOUR OF SOME B VITAMINS IN *BOUGAINVILLAEA SPECTABILIS* WILLD., AND GREEN GRAM (*PHASEOLUS RADIATUS* L.)

No comprehensive investigation is carried out on the role of B vitamins on plant growth. Galston[1] has pointed out that nicotinic acid and IAA in the dark, favour root initiation while in the light these reagents favour shoot growth. Thus, there appears to be similarity in action of growth substances and vitamins. The present study has been designed to get more information in their action and to assign them the function of growth substances.

Leaf discs of *Bougainvillaea spectabilis* were soaked in 10 and 20 PPM of cytokinin, riboflavin and pantothenic acid in dark. Seeds of green gram var. Cultivar were subjected to presowing soaking in 10 and 20 PPM solutions of riboflavin and pantothenic acid for 24 h, after which they were allowed to grow in distilled water for 8 days in petridishes in a luminosity of 2,000 Lux. The vitamin treatment was given in darkness as the vitamin B_2 is light sensitive. The protein and the chlorophyll were estimated according to the methods of Lowry *et al.*,[2] and Arnon *et al.*,[3] respectively. Pantothenic acid (10 PPM) appears to retard senescence by decreasing the rate of chlorophyll breakdown in ithe dark (Table I). On the fifth day, the decrease in chlorophyll content in the control was from 0·286 to 0·196 mg while in pantothenic acid (10 PPM) treated leaf discs, it was from 0·275 to 0·214 mg (0·061 mg). The decrease with 20 PPM pantothemic acid was from 0·306 to 0·219 mg (0·087 mg). With riboflavin (20 PPM), the control of chlorophyll breakdown was more effective on the third day as compared with the fifth day (Table I). Cytokinin (kinetin) at 20 PPM was more effective than at 10 PPM in controlling chlorophyll breakdown (control = 0·096, kinetin 20 PPM = 0·064, kinetin 10 PPM = 0·082 mg decrease respectively on the fifth day when the fifth day value is subtracted from the second day value). Thus, it appears that pantothenic acid at 10 PPM was more effective than cytokinin at 10 PPM. Riboflavin was effective only at 20 PPM and at the initial state (third day only)

TABLE I

Chlorophyll content (mg/g f. wt.) of Bougainvillaea *leaf discs*

Treatment	0 days	2 days	3 days	4 days	5 days
	0·352±0·048				
Control		0·286±0·062	0·224±0·061	0·221±0·055	0·190±0·080
Cytokinin 10 PPM		0·306±0·021	0·276±0·082	0·233±0·07	0·224±0·094
Cytokinin 20 PPM		0·337±0·019	0·318±0·141	0·302±0·06	0·273±0·10
Riboflavin 10 PPM		0·195±0·21	0·152±0·062	0·139±0·072	0·132±0·090
Riboflavin 20 PPM		0·317±0·080	0·273±0·038	0·249±0·04	0·216±0·051
Pantothenic acid 10 PPM		0·275±0·074	0·265±0·021	0·238±0·079	0·214±0·038
Pantothenic acid 20 PPM		0·306±0·069	0·286±0·032	0·228±0·09	0·219±0·107

Note.—Leaf discs were kept in darkeness.

TABLE II *a*

Influence of riboflavin on growth, chlorophyll and protein contents in green gram seedlings

Days after sowing	Treatment	Growth (length in cm)	Chlorophyll content (mg/g. f wt.)	Protein content (mg/g dry wt.)
4 days	Control	15·30±0·63	1·901±0·051	112·50
	Riboflavin	18·00±0·51	1·691±0·059	95·00
5 days	Control	18·00±0·45	1·862±0·082	116·40
	Riboflavin	20·40±0·37	2·214±0·00	125·60
6 days	Control	19·40±0·45	1·821±0·030	98·80
	Riboflavin	21·00±0·45	2·075±0·00	150·00
7 days	Control	21·50±0·44	1·178±0·07	94·60
	Riboflavin	24·70±0·68	1·616±0·032	99·50

Note.—Published data incorporated here for comparison with data in Table II *b* (Ref. No. 9).

TABLE II *b*

Influence of pantothenic acid and its interaction with chloramphenicol on growth, chlorophyll and protein contents in green gram seedlings

Days after sowing		Control	Pantothenic acid (20 PPM)	Chloram-phenicol (20 PPM)	Chloramphenicol + Pantothenic acid
	Growth	12·44 ± 0·64	14·34 ± 0·156	10·20 ± 0·912	13·48 ± 0·251
4 days	Chlorophyll	00·86 ± 0·067	1·32 ± 0·267	0·71 ± 0·037	0·88 ± 0·074
	Protein	22·5 ± 1·06	27·06 ± 0·09	15·9 ± 0·42	17·73 ± 0·92
	Growth	15·10 ± 0·48	18·18 ± 0·425	3·54 ± 0·746	15·96 ± 0·233
5 days	Chlorophyll	1·97 ± 0·052	2·04 ± 0·02	1·09 ± 0·061	1·90 ± 0·083
	Protein	29·30 ± 0·81	32·0 ± 0·52	26·27 ± 0·29	30·53 ± 0·58
	Growth	18·10 ± 0·236	20·51 ± 0·257	14·38 ± 0·652	17·86 ± 1·279
6 days	Chlorophyll	2·01 ± 0·042	2·14 ± 0·06	1·77 ± 0·087	2·17 ± 0·12
	Protein	49·53 ± 0·58	72·63 ± 0·78	44·46 ± 0·69	57·77 ± 0·54
	Growth	20·24 ± 1·19	21·64 ± 0·848	15·89 ± 0·561	18·90 ± 2·18
7 days	Chlorophyll	2·12 ± 0·08	2·47 ± 0·13	1·39 ± 0·096	2·30 ± 0·06
	Protein	67·32 ± 0·90	73·32 ± 0·98	59·87 ± 0·88	71·10 ± 0·43

Note : Protein values in the control differ from those of Table II *a* as the variety is different.

The deep green colour resulting from treatment with I 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 *Bougainvilloea* 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.