analysed for Aldicarb residues (Jhonson and Stansburg, 1966). The Aldicarb content of soil residues are presented in Table I.

TABLE I

Days after application	Residues of Aldicarb (ppm)	
	0·5 kg	1·0 kg
1	1·35	2·12
15	0·26	0·73
30	0·19	0·60
45	0·09	0·42
60	0·05	0·11
75	ND	0·09

The results indicated that the insecticide had persisted in soil up to 60 days for 0·5 kg ai/ha and 75 days for 1·00 kg ai/ha and the levels of residues were 0·05 and 0·09 ppm respectlvely. The degradation in the first fortnight was very rapid and thereafter the dissipation was gradual. Studies conducted by Andrews *et al.* (1971) with S-methyl C^{14} aldicarb also revealed that 0·05 to 0·07 ppm of aldicarb were detected after 90 days of application in sandy loam soil. Bull *et al.* (1970) in their studies with S^{35} aldicarb and highlighted the importance of soil texture and moisture content of soil. There was no difference due to pH but at 100% field capacity moisture level the decomposition to non-toxic products was rapid.

The results of aldicarb residues in bhendi fruits are presented in Table II.

TABLE II

Pickings	Residues in ppm		Tolerance level in ppm
	0·5 kg	1·0 kg	
I picking (50th day)	0·12	0·17	0·20
II picking (55th day)	0·08	0·13	0·20

The results revealed that for both the doses, the residues in fruits were found to be less than the permissible tolerance level of 0·2 ppm as fixed by the FDA of USA and hence can safely be used for the plant protection work of bhendi crop.

Dept. of Soil Science, and Agrl. Chemistry, Tamil Nadu Agrl. University, Coimbatore 641 003, Tamil Nadu, *September* 5, 1975,

K. RAJUKKANNU.
R. REGURAJ.
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FAILURE OF THE DEOLONE ROAD BRIDGE ON THE SONE RIVER, SHAHDOL DISTRICT, MADHYA PRADESH

THE Deolone road bridge situated on the Sone river, in Shahdol District, Madhya Pradesh, failed on August 22,, 1975, during floods after 25 years of service. It was 230 m. long and 12 m. high multispan bridge which stood on 21 tough cement concrete piers. It broke so badly, that right abutment and adjacent 19 piers have been knocked out. Out of the broken piers, 7 are holding ground, while all the others appear to have succumbed to the scouring action of the flowing water.

The Deolone bridge was aligned across the strike of the country rocks, so that different rock types are met with, along its foundation. The main rock-types present are quartzites, shales and limestones, all belonging to the Basal stage of the Semri Series (Lower Vindhyan). They are dipping at 70° to NW. Only 200 m. downstream of the bridge, the Sone river turns abruptly and cuts across the quartzite ridge forming a water-gap. On examination, this water-gap was found to have been formed along a transverse shear-zone[1] in the rock-beds.

The nature of the Sone river course in this area has been studied by the author and it is found that the river is engaged in down-cutting its channel[2]. The thinly bedded shales which exist in the river-bed along the Deolone bridge, are very weak and disintegrate easily into small fragments. It is therefore sensitive to the scouring action of the flowing water. Further, as the shale strata are steeply inclined and disposed parallel to the flow of the water, the rate of erosion has been comparatively rapid. A transverse shear-zone exists in the rock-beds just down stream of the bridge, where the river takes a sharp turn in an effort to follow it. A 24 m. deep pool is dug up by eddying currents in the shear-zone which has supported the bed erosion near the bridge.

The position of the right abutment of the Deolone bridge was critical, because it was placed near

the junction of the shale and quartzite, just at the base of the quartzite ridge. Here the strata, whose strike is parallel to the thrust of the river water, are dipping into the river channel. Since displacement easily takes place parallel to the bedding planes, the valley-wall on which the right abutment was sitting had a tendency to slide into the river.

During floods, the pressure of water-currents near the bridge got concentrated towards the right bank, as the quartzite ridge which exists at the right bank does not allow the flood water to spread but confines it into the river channel. As a result, the river-bed is dug asymmetrically, deeper towards the right bank. This has increased the instability of the right abutment of the bridge.

In all cases the scour is intensified during flood periods. Nothing definite has yet been known about the relation between the depth of scour and the rise of flood water above the ordinary level. However, in some experiments the depth of the river bed scoured was found to be about one-third the amount of water surface rise[3]. During the flood in the Sone river which occurred on August 22, 1975, and, which is responsible for the failure of the Deolone bridge, the water surface rose to about 17 m. and therefore the bed erosion must have been quite deep.

Thus it may be concluded that the foundation of the bridge piers which was in shales, had progressivety been eroded by the running water and the foot-hold of the bridge got weaker day by day. On August 22, 1975, when the river was in flood, the bridge lost ground and collapsed into the river. This is a clear cut example, where the bridge failure has occurred as a result of its construction on a geologically defective site.

Department of Applied Geology, K. M. BANGAR*.
Government Mining Polytechnic,
Shahdol, Madhya Pradesh,
September 16, 1976.

* *Formerly Lecturer, Engineering College, Rewa.*

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STIMULATORY EFFECT OF THE NEUROACTIVE SUBSTANCE ON ISOLATED COCKROACH HEART

EARLIER studies indicated that certain drugs and insecticides increased the frequency of heart beat[1,2]. It has been reported that application of the insecticides is likely to release certain toxins lethal to insects from the nervous system[3,4]. Sudershan and Naidu[5] (1967) working on isolated cockroach heart found that a specific toxin released into cockroach blood by malathion and pyrethrum, increased the heart beat frequency. In the present investigation attempts have been made to isolate the neuroactive substance from endrin treated cockroach blood and to study its effect on the isolated cockroach heart.

Laboratory reared male adult *Periplaneta americana*, L. was used for the experiments. The isolated cockroach heart technique described by Krijgsman *et al.*[1] (1950) was employed. LC_{90} of endrin dissolved in ethanol was injected intraperitoneally to cockroaches. Four hours after the treatment, blood was collected by centrifugation and the neuroactive substance was isolated from blood as described by Sternburg *et al.*[4] (1959). Test solutions were prepared in ethanol (wt/vol) and incorporated into the physiological solution. Neuroactive substance and synergist combinations were made at the ratio of 1 : 1. The concentration of ethanol used was not detrimental to the isolated cockroach heart.

Addition of neuroactive substance ($1{\cdot}6 \times 10^{-6}$ and $3{\cdot}3 \times 10^{-6}$) induced an immediate increase in the heart beat frequency followed by rapid decline (Fig. 1). When it is mixed with piperonyl butoxide ($1{\cdot}4 \times 10^{-6}$ M) and sesamin ($1{\cdot}4 \times 10^{-6}$ M) slight initial stimulation was seen which sustained for some time (Fig. 2).

A detailed study of endrin on isolated cockroach heart[6] reveals that it acts at the cardiac ganglia by paralysing them and acetylcholine is not involved. In combination with the synergists, the effect of endrin is considerably increased thus suggesting synergism. The fact that no apparent change was noticed in the original action of neuroactive substance when mixed with piperonyl butoxide and sesamin, indicates that synergism is absent. The sustained action (Fig. 2) may be due to the effect of synergists on the heart. In the present communication it is difficult to assess whether degradation of neuroactive compound is taking place in the insect body as in the case of endrin. However, an enzyme which destroys biologically active substance has been reported from the blood of cockroach[4]. If it is true, the factor responsible for the degradation of neuroactive