and decay of ML intensity[6]. Table 1 shows that the ML intensity of the bones spans nearly one order of magnitude. The ML intensity of bones is much weaker as compared to that of sucrose crystals. The ML appears only during the fracture of bones. The rise and decay times of a ML pulse due to the motion of a single crack are of the order of a microsecond. Since the ML intensity of bones is very weak, the ML spectra could not be recorded.

It is known that bones exhibit piezoelectricity[10-12]. Thus, the ML in bones may be due to the piezoelectrification of the newly created surfaces. The ML excitation during the piezoelectrification of crystals is well understood[1]. Since ML intensity varies from bone to bone, further studies may be helpful in identifying the bones.

Table 1

Mechanoluminescence of various bones (specimen size 5 × 5 × 3 mm)

	Bone	Skeleton	Normalized ML intensity with respect to the ML per unit volume of sucrose crystals (impact velocity 378 cm/sec)
1.	Chicken	Leg (Fermer)	$(1 \pm 0.2) \times 10^{-5}$
2.	Man	Hand (Humerus)	$(1 \pm 0.3) \times 10^{-6}$
3.	Lamb	Leg (Femer)	$(5 \pm 1.2) \times 10^{-6}$
4.	Pork	Chest (Sternum)	$(2 \pm 0.3) \times 10^{-5}$
5.	Dog	Leg (Femer)	$(2 \pm 0.4) \times 10^{-6}$

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EFFECT OF TWO PESTICIDES ON OXIDATIVE METABOLISM OF COWPEA BACTEROIDS

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Of late application of pesticide to different crops is increasing. It also causes certain adverse effects on other biological systems. It has therefore become essential to find out the effects of these pesticides, especially on the beneficial ones like *Rhizobium*-legume symbiosis. Much research has been done on the influence of different pesticides on the metabolic activities of free-living *Rhizobium* spp.[1-3] But the effects of soil applied pesticides on the bacteroid metabolism are seldom studied. This paper reports the effect of soil application of two pesticides, Furadan and Basalin, on the oxidative metabolism of cowpea bacteroids.

Cowpea seeds were sown in a red soil (Alfisol order) treated with 0.2 and 10 ppm active ingradient of Furadan 3G and Basalin 48 EC. The plants were grown in mud pots under glasshouse conditions. Nodules were collected from the plants between flowering and pod-filling stage when active N_2 fixation occurs. The bacteroid suspension (20 mg/ml) was prepared by the method of Stovall and Cole[4].

The oxidation of five substrates namely acetate, pyruvate, citrate, succinate and fumarate (at 250 μ m/ml of bacteroid suspension) by the bacteroids was measured in the presence/absence of the pesticides under laboratory conditions[5].

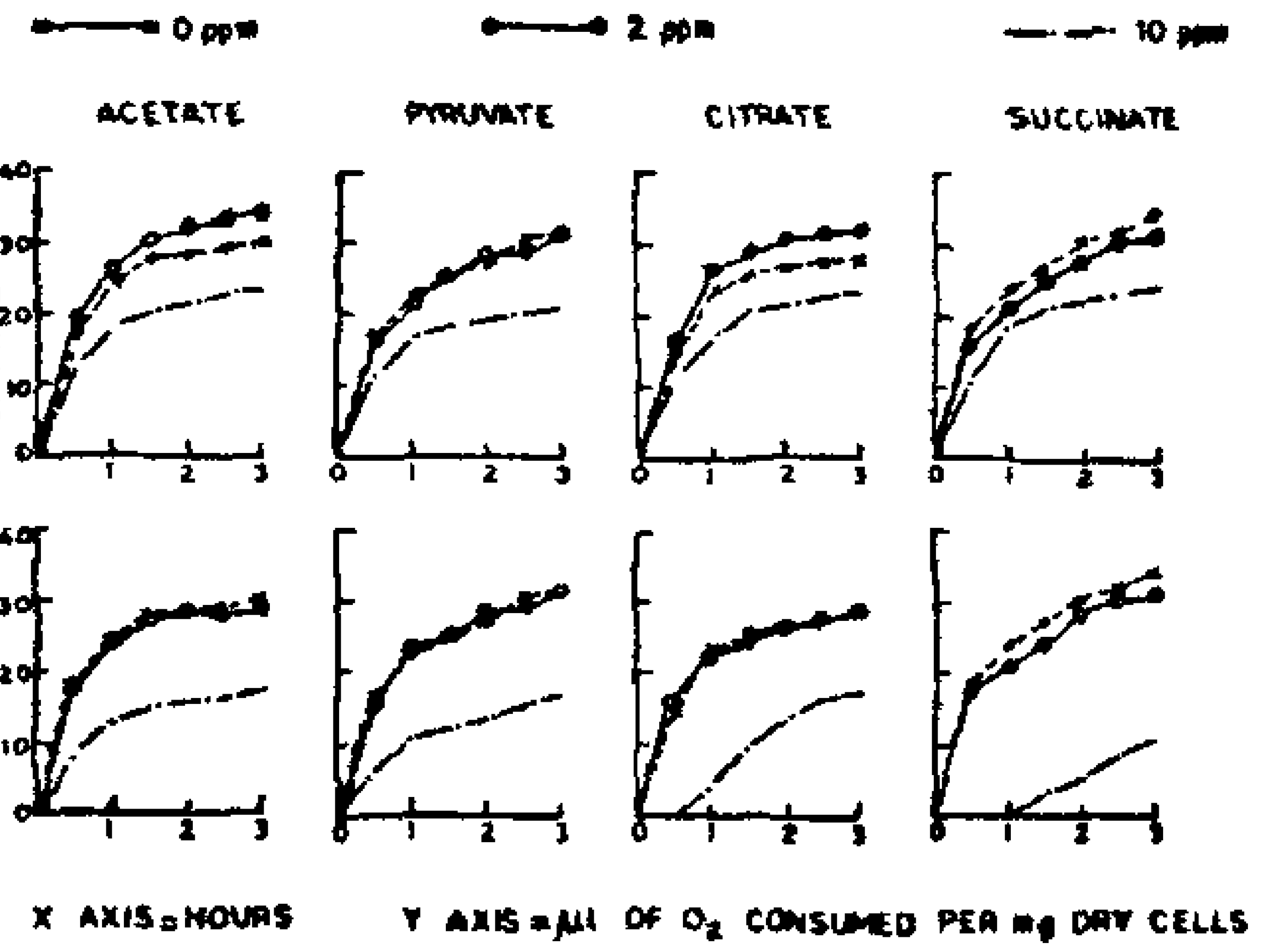

Figure 1. Effect of Furadan and Basalin on oxidative metabolism of cowpea bacteroids.

Soil application of furadan, even upto a level of 10 ppm had no significant effect on the oxidation of the substrates tried, except in the case of acetate where significant stimulation was observed (figure 1). The oxidation of all substrates except that of fumarate was significantly reduced in the presence of furadan *in vitro* at 10 ppm only, lower levels not exhibiting any inhibitory effect. Stimulation was noticed at 2 ppm level in acetate and citrate alone. Since Furadan persist less in soil[6], the chemical level at flowering stage might be too low to influence the bacteroids.

In Basalin, oxidation of all the five substrates by the bacteroids of 10 ppm soil treatment was significantly low, while that of 2 ppm showed no effect. Very similar results were also obtained *in vitro* studies. It is obvious that the nodule development and bacteroid metabolism could have been affected since the herbicide was applied right at the time of sowing and has longer persistence (more than two months as per the manufacturers report). It was observed that among the substrates tried the succinate oxidation at 0 ppm was maximum (more than 32 μl of O_2/mg dry cells) and it was more sensitive to Basalin than other substrates. This might be due to the succinate-stimulated acetylene reduction, by isolated bacteroids[7], indicating the key role played by succinate dehydrogenase in bacteroid metabolism. However, extensive research in this field is needed to explore these details.

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EFFECT OF SUBLETHAL CONCENTRATION OF METASYSTOX ON THE CIRCADIAN RHYTHM OF BIMODAL OXYGEN UPTAKE IN *CHANNA STRIATUS*

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Organophosphorus insecticides are widely used in crop protection. Indiscriminate application of these insecticides may affect non-target organisms including economically important freshwater fish. Recent studies have shown that metasystox, the most widely used insecticide against cotton pests inhibited various physiological activities in fresh water fish[1]. However, no information is available on the sublethal effect of metasystox on the respiratory rhythms of fish. Since fish exhibit clear-cut respiratory rhythms[2], an attempt has been made in the present work to study the sublethal concentration of metasystox on the circadian rhythm of bimodal oxygen uptake in an economically important air breathing fish, *Channa striatus*.

One hundred snakehead of both sexes weighing 10–15 g were collected from local freshwater sources and maintained in the laboratory in constantly running aerated tap water under a 12 hr light: 12 hr dark cycle (LD 12:12) at 29 ± 1°C for 15 days before starting the experiments. The fish were fed on chopped goat liver on alternate days. Feeding was discontinued a day before the fish were used in the experiments. The circadian rhythm of bimodal oxygen uptake was studied at 29 ± 1°C using respiratory chambers designed by Reddy and Natarajan[3]. The amounts of oxygen consumed under water and in air were separately determined for a day at regular intervals of 3 hr each. The oxygen content of the water was kept constant throughout the study (6.5 ± 0.2 mg/l). Oxygen obtained by the fish from water was measured using Winkler's method. Oxygen consumed from the gas