

### PHOTOCHEMICAL ACTIVITIES OF PARTHENIUM CHLOROPLASTS

*Parthenium hysterophorus* Linn. (family—Compositae), a weed probably introduced into India through the wheat shipment from U.S.A.<sup>1</sup>, is fast spreading throughout the country, posing a serious health hazard to both humans and livestock<sup>2</sup>. Although studies have been carried out on the allergic<sup>3,4</sup> and toxic<sup>5</sup> nature of the weed as well as on its allelopathic dominance<sup>6</sup>, very few investigations are carried out on the photochemical aspects of this species<sup>7</sup>. Any attempt to control the spread of this weed must be based on the efficiency of the metabolism of the leaves. A thorough biochemical knowledge, collected on this plant species, would be more beneficial for achieving that purpose. With this motivation, some preliminary studies have been made with the isolated chloroplasts of *Parthenium* leaves. The characterization and efficiency of the photochemical systems of those chloroplasts are given in this note.

Chloroplasts were isolated by grinding in a porcelain mortar, the leaves collected from the young seedlings and extracting with a medium containing 50 mM PO<sub>4</sub> buffer (pH 7.2), 400 mM NaCl, 5 mM MgCl<sub>2</sub> and 1 mM EDTA.

Hill reaction was measured spectrophotometrically as described by Avron *et al.*<sup>8</sup>, using potassium ferricyanide as Hill oxidant. The reaction mixture (3.0 ml) contained (all mM) Na<sub>2</sub>HPO<sub>4</sub> 100 (pH 7.2), NaCl 300; MgCl<sub>2</sub> 10; K<sub>3</sub>Fe (CN)<sub>6</sub> 0.33 and chloroplast preparation containing 20 to 25 μg of chlorophyll. Light was supplied laterally at the site of reaction by a 300 watt projector lamp with appropriate filters. Chlorophyll was estimated according to Arnon<sup>9</sup>.

The optimum temperature for maximum ferricyanide reduction was 25° (Fig. 1). Either rise or fall in this optimum temperature, resulted in a decline of Hill reaction. There was about fourfold increase (from 36 to 216 μmole) in the ferricyanide reduced (mg chl<sup>-1</sup> hr<sup>-1</sup>) when the light intensity was raised from 100 to 1,000 ft. candles (Fig. 2). Further rise did not show any marked increase in the chloroplast activity. Apparently the climatic conditions, in and around Coimbatore, are most suited for the physiological activities of the weed, hence the observed profuse vegetation of this weed.

Under 1,000 ft. candle light intensity and at 25° C, the effect of various growth regulators<sup>10</sup> and herbicides on partial reaction of photosynthetic activities were studied. The plant growth regulators indole-3-acetic acid (IAA) and 2, 4-dichlorophenoxyacetic acid (2, 4-D) at lower concentrations increased the photochemical dye reduction by 23% and 18% respectively. Beyond the critical concentrations, there was the

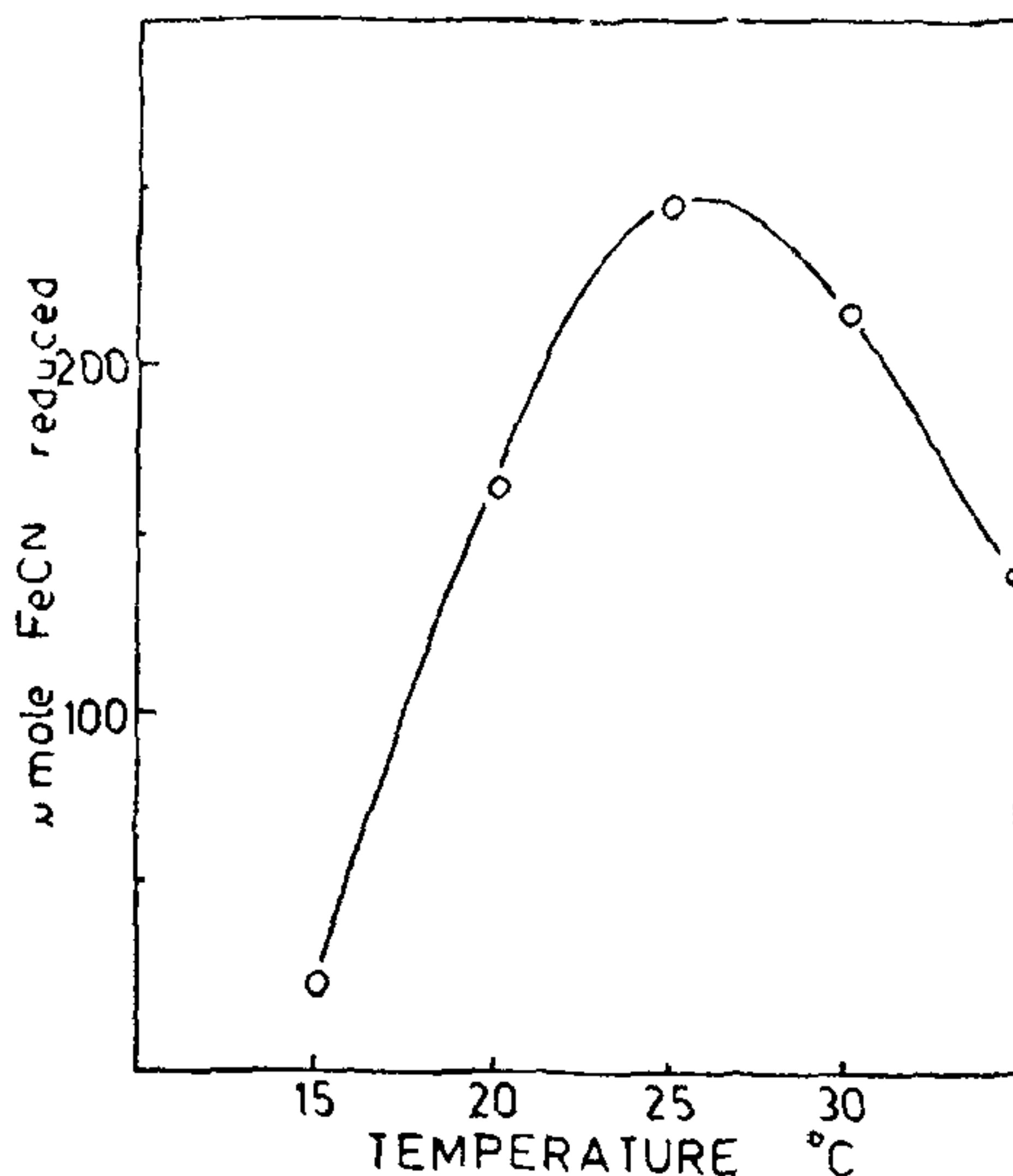


FIG. 1. Effect of temperature on Hill activity.

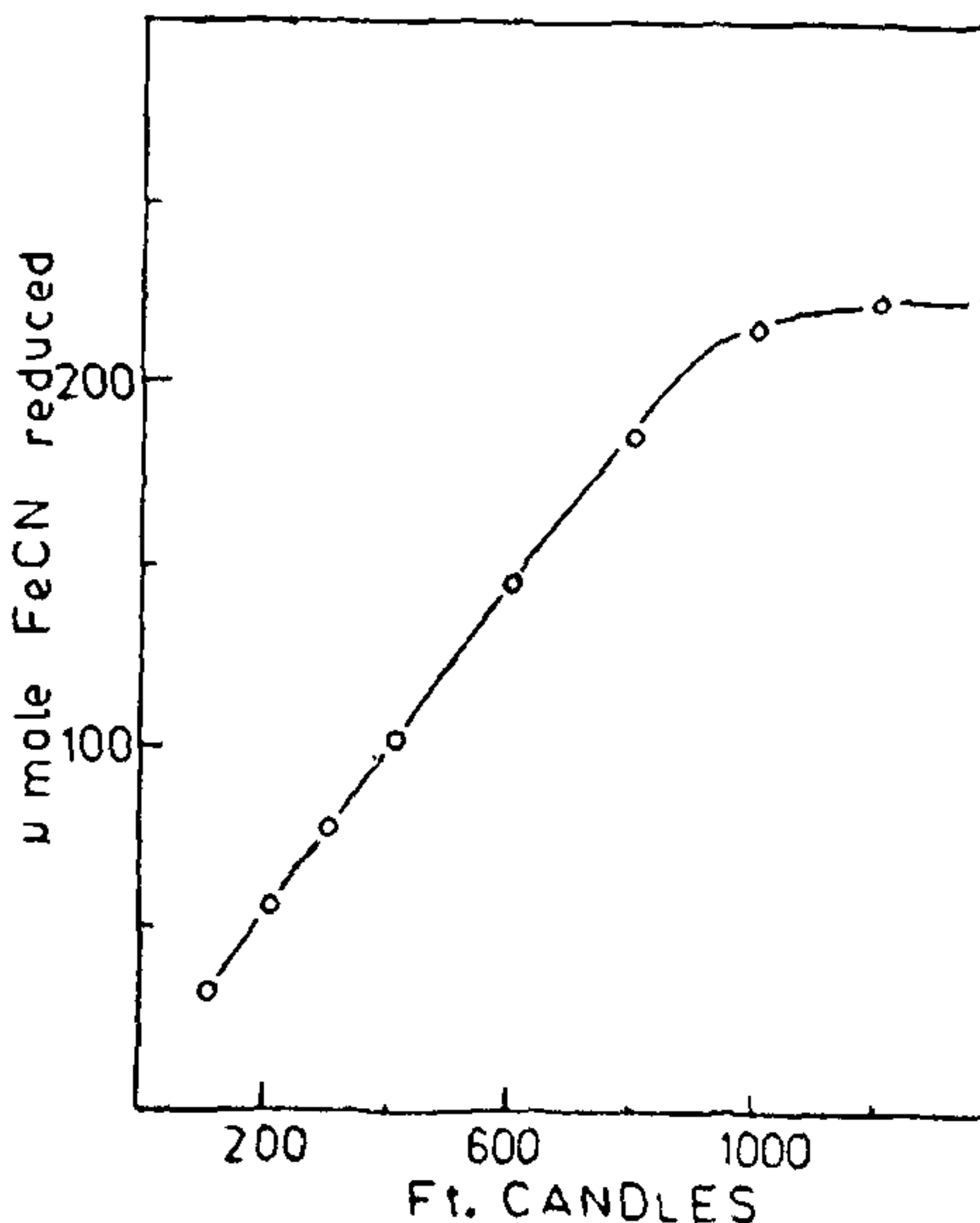


FIG. 2. Effect of light intensity on the photochemical activity of isolated chloroplasts.

inhibitory effect (Fig. 3). However, the herbicides dichlorophenyl dimethyl urea (DCMU), aminotriazole (AT) and simazine were inhibitory to the non-phosphorylating basal electron transport as measured

by ferriyanide reduction activity of the chloroplasts. The inhibition of the phenyl urea compound was always greater than other nonphenyl urea compounds.

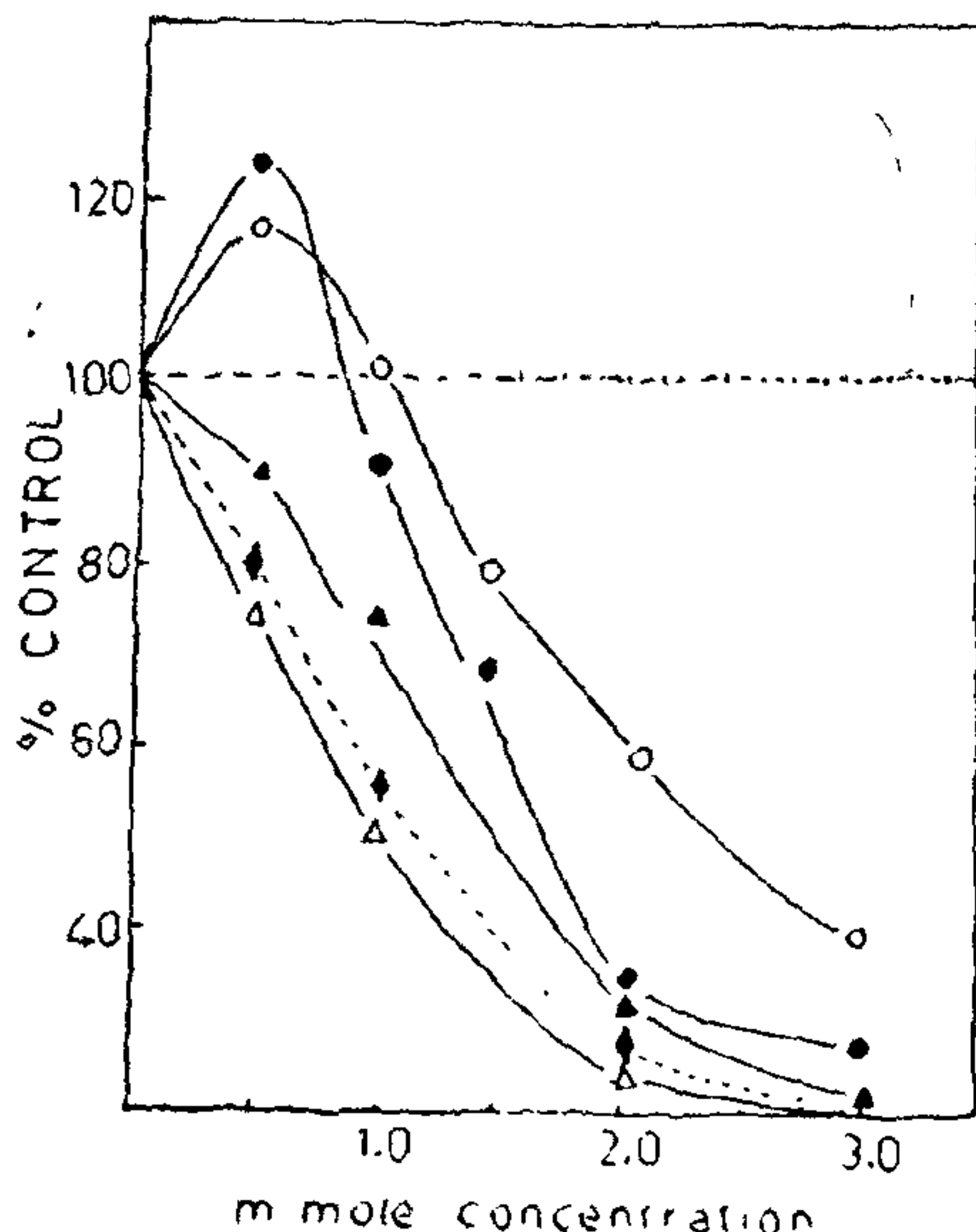


FIG. 3. Effect of growth regulators and herbicides on Hill reaction.

The various growth regulators and herbicides were used at concentrations indicated in the reaction mixture and incubated for 5 min prior to illumination.

- IAA
- 2,4-D
- △—△ DCMU
- ▲—▲ Amitrol
- ◆—◆ Simizine

Department of Botany,  
University of Madras,  
Autonomous PG Centre,  
Coimbatore 641 004,  
Tamil Nadu, India,  
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K. FRANCIS.

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### VIBRATIONAL SPECTRA OF BROMOANTIMONATES (III)

IN continuation of our work on bromoantimonate<sup>S</sup> (III)<sup>1-3</sup> we report here the results of Raman and far i.r. spectral studies on these compounds.

The preparation of these compounds has been described earlier<sup>1</sup>. The Raman and far i.r. data were recorded on solid samples at the Chemistry Department, University of Leicester, U.K. The spectral data are shown in Table I.

**Hexabromoantimonates (III):** The hexabromoantimonate (III) ion has a non-bonded pair of electrons in addition to the six bonded pairs. The interest in this ion and its analogues has been due to the nature of the non-bonded pair and attempts have been made to ascertain whether the lone pair of electrons is stereochemically active or not. A few X-ray studies have shown that these ions have nearly undistorted octahedral shapes<sup>4,5</sup> consequent to the stereochemical inactivity of the non-bonded pair. Hooper and James<sup>6</sup> have interpreted the spectra of  $(Et_2NH_2)_3SbBr_6$  in terms of the presence of undistorted octahedral  $SbBr_6^{3-}$ .

The vibration spectral data obtained for tris (*n*-dipropylammonium) hexabromoantimonate (III) are comparable to those obtained for tris (diethylammonium) hexabromoantimonate (III) by Hooper and James<sup>6</sup>. The band at  $251\text{ cm}^{-1}$  (i.r.) may be assigned to the cation mode as this value is higher than that expected for Sb-Br vibration. Following Hooper and James<sup>6</sup> the Raman bands at  $181$  and  $151\text{ cm}^{-1}$  may be assigned to  $\nu_1$  and  $\nu_2$  modes and the i.r. band at  $116\text{ cm}^{-1}$  to  $\nu_4$  mode. The bands at  $165$ ,  $150$ ,  $140$  and  $125\text{ cm}^{-1}$  may arise due to the overlapping of symmetric and asymmetric stretches.

The spectra of tris (*n*-butylammonium) hexabromoantimonate (III) are markedly different from those of the dipropylammonium salt but they are similar to those of bis (piperidinium) pentabromoantimonate (III) (Table I). From this similarity, it appears that the butylammonium salt may, in fact, be a double salt,  $(n-C_4H_9NH_3)_2SbBr_5 \cdot (n-C_4H_9NH_3Br)$ . The situation