PORTABLE APPARATUS FOR PAPER ELECTROPHORESIS

ITS APPLICATION TO PRELIMINARY ANALYSIS OF CURARIZING ALKALOIDS IN PLANTS AND CURARES*

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The possibility of a rapid analysis of organic mixtures, offered by paper electrophoresis, has been described in a previous paper[1].

With this method the presence of alkaloids can be detected in botanic samples up to two hours after they have been gathered, and it may also be utilized for the identification of other substances in extracts.

In the systematic study of South American *Strychnos* alkaloids, one of the problems facing the botanist, who is often collecting samples far away from human habitation, is to determine whether they contain alkaloids at all and, if so, in appreciable quantities[2].

Chromatic reactions are not always feasible in the case of crude plant extracts owing to the presence of resins and soluble proteins, which may give similar responses. However, by first submitting the extracts to paper electrophoresis, it is possible to separate in one hour alkaloids from the other constituents, and then detect them by specific reactions.

Performing paper electrophoresis in the field, however, usually presents difficulties since it requires a direct current supply of about 300 volts and 2–10 mA. Hence our aim was to design a not too cumbersome portable apparatus with which paper electrophoresis is possible even in places not provided with electric power.

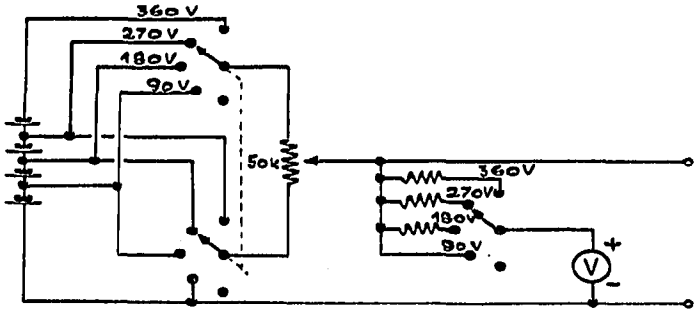

Fig. 1. Electrical circuit of the portable electrophoresis apparatus.

The apparatus consists of a 360 volts dry battery generator adjustable by means of a potentiometer and read on a voltmeter according to the circuit shown in the diagram (Fig. 1).

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References p. 185.

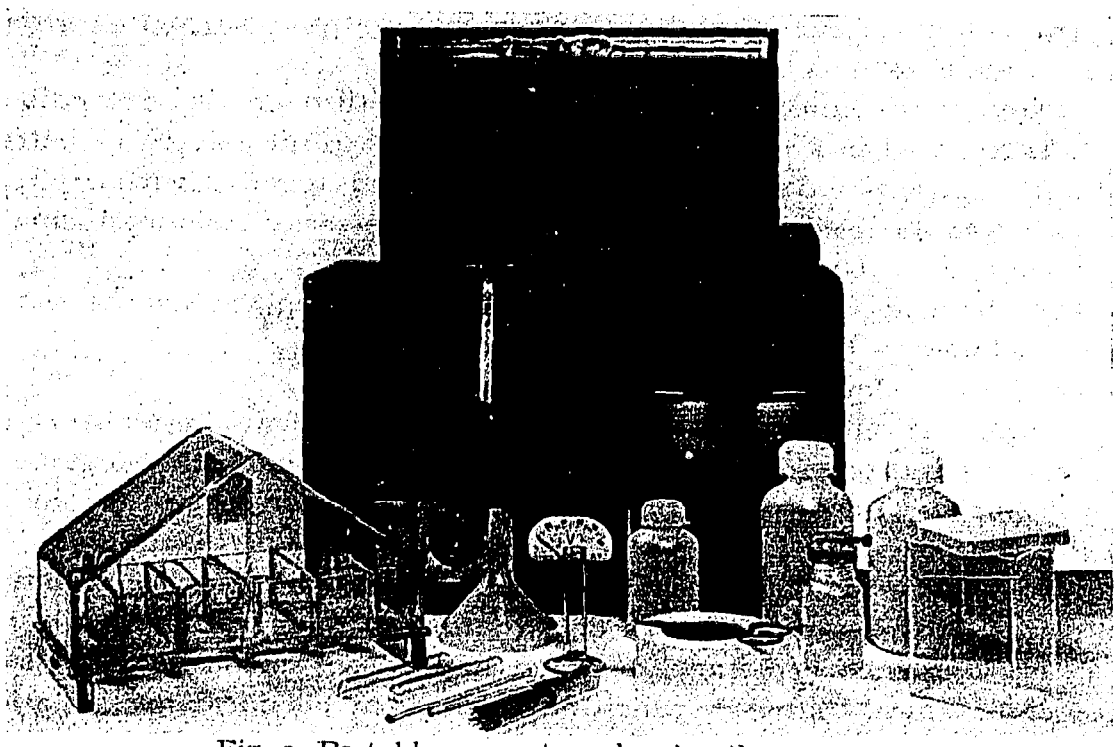

Fig. 2. Portable apparatus, showing the contents.

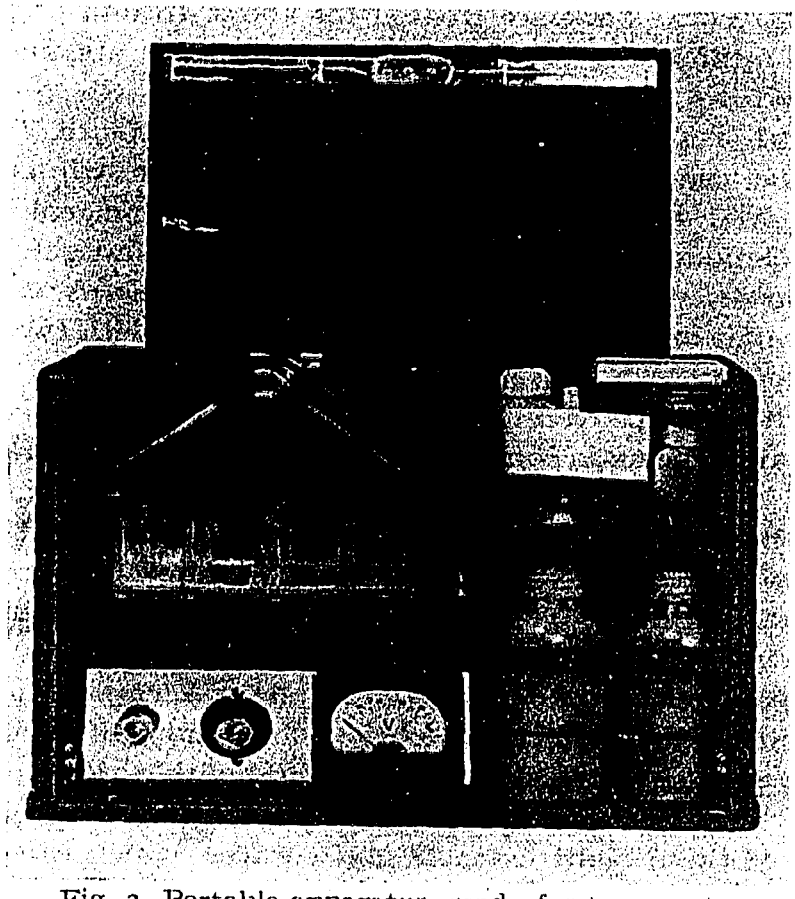

Fig. 3. Portable apparatus, ready for transport.

The Durrum moist chamber[3], built in perspex and provided with a platinum or carbon electrode is used as electrophoretic apparatus.

This chamber is connected to the power supply through two extendible wires. The whole is enclosed in a metal box, in which four 250 ml polythene bottles containing buffer solutions and reagents may also be placed, together with a roll of Whatman No. 1 paper for electrophoresis, and other accessories (scissors, screwdrivers, glass rods, capillary tubes, funnel, etc.).

The size of the apparatus is 35 × 27 × 16 cm; its weight, reagents, buffers and accessories included, is 6.650 kg (see Figs. 2 and 3).

The box can be closed and handled easily.

This equipment though planned for chemical requirements may also be used for clinical diagnostic purposes in the analysis of blood serum and other organic liquids.

For this purpose, in places where current is available a rectifier may be used instead of the dry battery.

With this device the botanist will be able to detect the presence of active principles in plants on the spot. The work of gathering samples will be greatly reduced, for it will no longer be necessary, as often happened previously, to collect great quantities of botanical material, which on subsequent chemical investigation may prove to be quite useless; moreover, by operating with small quantities of the bark of a given plant the variation may be followed up in the field.

0.1–0.2 g of *Strychnos* bark are treated for about 10 min in 2–3 ml of tartaric acid solution. By means of a capillary tube a few drops are placed on a strip of Whatman No. 1 paper for electrophoresis.

5% acetic acid or a Britton buffer are used as electrolyte. The electrophoresis is carried out in the usual manner; after drying, the paper strip is examined in U.V. light and then sprayed with ceric sulphate or iodoplatinic reagent.

Using this technique crude plant extracts may be investigated. In this way we have examined tartaric extracts of *S. Froesii* and *S. guianensis*, which yielded after electrophoresis a series of bands similar to those obtained with two purified alkaloids as described previously[4].

This method has also proved useful for studying artificial mixtures of alkaloids such as Indian curares, the main constituents of which can thus be rapidly determined.

For example, when studying a curare from Iquitos (Peruvian Amazonia) and using a solution obtained by diluting the drug with tartaric acid solution, we were able to observe the presence of an intense band (100 mm; pH 2; 15 V/cm; 1.30 h), which with the iodoplatinic reagent became strongly U.V.-absorbing and which we identified as tubocurarine.

Further, the paper electrophoresis (pH 12; 3 h; 15 V/cm) of the curare of *Macusi indios* shows several bands (one of which is fluorescent); of these, one turns blue (120 mm) and two pinkish purple (58 mm; 110 mm) with ceric sulphate reagent.

The band that turns blue contains curarine, as was proved by spectrophotometry.

The analysis of these plant extracts and curares, which can be carried out in one hour at most and which reveals the alkaloid group present, proves the effectiveness

References p. 185.

of the reported method for the rapid analysis and detection of active principles in biological materials.

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