Abstract

Absorption spectra of diquat and paraquat both oxidized and reduced forms were studied. The bipyridyls were determined in water, urine, lung, liver and sera and also in serum and liver from rats treated with the bipyridyls. The samples were processed through the 4 methods of different purification and/or concentrating steps and of the same final spectrophotometric step. The 4 methods were Knepil's, ion-exchange, ion-pairing and sulphosalicylic acid (SSA)-precipitation with second derivative spectrophotometry.

The bipyridyls were reduced by alkaline dithionite solution and the measurements of paraquat were done at its maximum peak at 600 nm (E_m = 13500 ± 300 $M^{-1}cm^{-1}$) or at 396 nm (E_m = 45500 ± 1500 $M^{-1}cm^{-1}$). Diquat was measured at 430 nm (E_m = 4900 ± 150 $M^{-1}cm^{-1}$) or at 379 nm (E_m = 30500 ± 1200 $M^{-1}cm^{-1}$). The measurements done at 600 nm and 430 nm were more precise [(0.65% CV at 600 nm(PQ); 0.42% CV at 430 nm(DQ)] and provided the determination of high concentrations of the bipyridyls. The measurements at 396 nm and 379 nm were more sensitive (0.1 mg/L (PQ) at 396 nm : 0.2 mg/L (DQ) at 379 nm)

All 4 methods were suitable for determining the bipyridyls in sera. Hemoglobin and bilirubin did not interfere with the determinations. The most suitable method for determination in urine was ion-exchange. In aqueous solution, the bipyridyls could not be reliably determined by SSA-precipitation with second derivative spectrometry. [26 ± 2 % recovery (PQ) : 44 ± 5 % recovery (DQ)]. In lung and liver, the determinations were acceptable by the 4 methods

In the study on adsorption of the bipyridyls, Fuller's earth adsorption was more effective than decalso by percent adsorption of 40 mg bipyridyls per 1.0 gm of Fuller's earth and 5.0 mg bipyridyls per 1 gm of decalso. The extent of adsorption to decalso was depended on mixing time and amount of decalso present.

In aqueous mixture, determination of paraquat at both 600 nm and 396 nm would be significantly interfered with if concentration of diquat was more than 50% of paraquat in the mixture. Diquat or paraquat in the aqueous mixture was individually determinable by spectrophotometry. This could be done by the use of the extinction coefficient values and the measurements at 2 wavelengths or more.