

## **Examination of alkaloidal constituents of zanthoxylum usambarensis by a combination of ion-pair extraction and ion-pair chromatography using sodium perchlorate**

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### **Abstract**

Quaternary alkaloids of the stem of *Zanthoxylum usambarensis*, an important medicinal plant in Kenya utilized for the treatment of pneumonia and rheumatism, were examined by a combination of ion-pair extraction and preparative ion-pair high performance liquid chromatography (HPLC), in which sodium perchlorate was used as an ion-pair reagent. Quaternary bases were extractable from aqueous solution into 1,2-dichloroethane in the presence of perchlorate in acidic conditions. The phenomenon is explained in terms of ion-pair extraction between alkaloidal cation and perchlorate anion. The quaternary alkaloidal fraction thus obtained was well separated by means of ion-pair HPLC in which sodium perchlorate was also utilized. Furthermore, the solvent system was easily applied to preparative HPLC yielding the pure perchlorate of each alkaloid. Eight quaternary bases in *Z. usambarensis* were thus obtained and their structures were elucidated. One of them was a new quaternary base of the tetrahydropyroloberberine type, which was named (-)-usambarine.