



## ALKALOIDS OF *Annona muricata* L

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### Abstract:

The content of alkaloids in the leaves of *Annona muricata* L collected in the Republic of Guinea was studied for the first time. The extraction of the alkaloids was carried out in a conventional manner, separately on the leaves. The contents of gross total alkaloids extracted are particularly low in the leaves (0.125% by mass of the dried plant material). Separation of alkaloids was carried out by chromatography on silica columns. 9 alkaloids were isolated and identified from the leaves. The main isolated alkaloids are aporphinoids (aporphins, noraporphins, oxo-aporphins, dehydro-aporphine) and benzyltetrahydroisoquinolines. Isolated alkaloids have been identified by examining their spectral data and their physical constants; possible confirmation has been brought by comparison with genuine specimens. Alkaloids: anonaine (3), roemerine (4), azimylobine (5), isoboldine (8), and liriodenine (9) were identified by direct comparison with the control of each of these alkaloids previously isolated from *Liriodendron tulipifera* L (Magnoliaceae).

**Keywords:** Annonaceae, *Annona muricata* L, Alkaloids: coclaurine (1), N-methyl-coclaurine (2) - benzyltetrahydroisoquinolines; anonaine (3), asimilobine (5), xylopine (6) - noraporphines; roemerine (4), isolaurelina (7), isoboldine (8) - aporphines and oxoaporphine – liriodenine (9).

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### Introduction

*Annona muricata* L (in English "sour-sop", local language "sop-sop", in Russian "сметанное яблоко") Annonaceae belongs to the family, is a medicinal fruit plant widely distributed in the Republic of Guinea, its height is 7-9 meters, Annonaceae fruit in fruit trees belonging to the family (4,5-7 kg) is an alkaloid-preserving plant [ 1-3].



Picture . *Annona muricata* L (sour – sop)

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It is known from the scientific literature that the alkaloids of plants of the genus *Annona*

are quite well studied in the world and alkaloids have been isolated, mainly belonging to the group of aporphinoids [4 - 7].

### Methods and Results

We studied the composition of alkaloids from the leaves of *Annona muricata* L collected from the botanical garden of Conakry (Republic of Guinea). The extraction of the alkaloids was carried out in a conventional manner, separately on the leaves. The contents of gross total alkaloids extracted are particularly low in the leaves (0.125% by mass of the dried plant material).

The total alkaloids obtained from the leaves were separated into phenolic and non-phenolic bases. The separation of each of the two groups of alkaloids was then carried out by chromatography on silica collones. A total of 9 alkaloids have been isolated. All these alkaloids are known to be isoquinoleic in nature and belong to three related structural types: benzyltetraisoquinoline, and aporphinoid (noraporphine, aporphine, oxoaporphine ). They were identified by examining their spectral data and their physical constants; a possible confirmation was brought by comparison with authentic samples.

The alkaloids: anonaine (3), roemerine (4), asimilobine (5), isoboldine(8) and liriodenine (9) were identified by direct comparison with a control of each of these alkaloids previously isolated from *Liriodendron tulipifera* L (Magnoliaceae) by us [8].

**Base 1.**  $C_{17}H_{19}NO_3$  phenolic natures crystal, mp 218 – 220°C (aseton) coclaurine (1 )we have identified that [7, 9].

**Base 2.**  $C_{18}H_{21}NO_3$  colorless crystalline base, mp 177 – 178°C (acetone),  $[\alpha]_D +25^\circ$  (EtOH). By directly comparing base 2 with N-methylcoclaurine (2) isolated from the plant *Ziziphus jujuba* Mill (mp, Rf and IR spectra), we found that they are exactly the same substance [9, 11].

**Base 3.**  $C_{17}H_{15}NO_2$  mp 120 – 122°C. Mass-spectrum, m/z: 265 (M+ ), 264 (M – 1)+ (100%),

250, 236, 235, m++132,5. Anonaine (3) we have determined that [7, 11,12].

**Base 4.**  $C_{18}H_{17}NO_2$  mp 102 – 103°C ,  $[\alpha]_D - 77^\circ$ (EtOH). We identified that this alkaloid is the same as roemerine (4 ) [8,13,14,16].

**Base 5.**  $C_{17}H_{17}NO_2$ , mp. 175-176°C (aseton),  $[\alpha]_D - 210^\circ$ C (CHCl<sub>3</sub>). We compared this alkaloid with its actual sample and found that asimilobine (5) [8, 12,15].

**Base 6.**  $C_{18}H_{17}NO_3$  mp 124 – 126°C (aseton). UV- pectrum ( $\lambda_{max}$ , EtOH): 219,282 nm (lgε 4,49; 4,25) similar to the izolaureline spectrum. Mass –spectrum of this basis m/z: 295 (M+ ), 294 (M – 1)+ , 280 (M – 15)+ , 266 (M – 29)+ , mm++ 147,5 noraporphine characteristic for alkaloids, it differs from the isolaureline spectrum by 14 units of mass. From this it can be assumed that the basis 6 is norizolaurelin. Indeed, we made 6 according to the method of Gess, methyl izolaureline. So we determined that the basis 6 is xylopine (6) [ 11].

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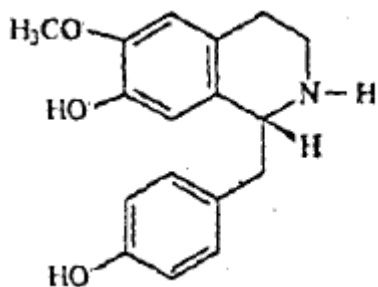
**Base 7.**  $C_{19}H_{19}NO_3 \cdot HCl$  chlorhydrate isolated in the case, mp 244- 246°C and we identified it with isolaureline (7 ) [5,11].

**Base 8.**  $C_{19}H_{21}NO_4$  mp 125 – 126° C (benzene),  $[\alpha]_D + 42^\circ$  (EtOH). UV- pectrum ( $\lambda_{max}$ , EtOH): 220,280, 313 nm (lgε 4,50; 4,20; 4,18). Mass – pectrum, m/z: 327 (M+ ), 326 (M – 1)+ (100%), 312 (M – 15)+ , 310 (M – 17)+ , 296 (M – 31)+ , 284 (M – 43)+ , 269, 253, m+ + 163,5. According to these data, base 8 was identified as isoboldine [10,13,14 ].

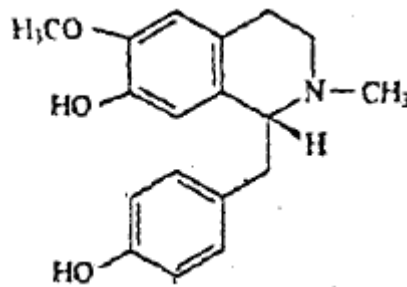
**Base 9.**  $C_{17}H_9NO_3$ , m.p. 273 - 275°C (CHCl<sub>3</sub>), optically inactive, yellow crystalline substance. We directly compared this alkaloid with liriodenine isolated from the plant *Liriodendron tulipifera* L (9) and found that these are exactly the same alkaloids [8,17-19].

**Alkaloids isolated from *Annona muricata* L**

**1. Benzyltetrahydroisoquinolines**

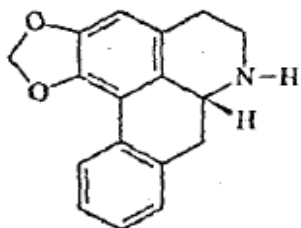


**1. Coclaurine**

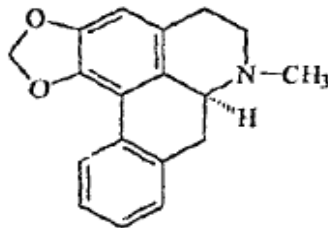


**2. N-methylcoclaurine**

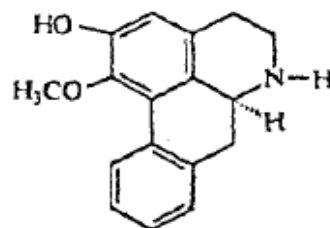
**2. Noraporphin and aporphins**



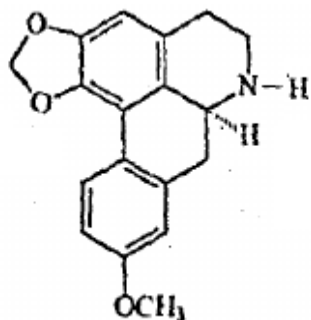
**3. Anonaine**



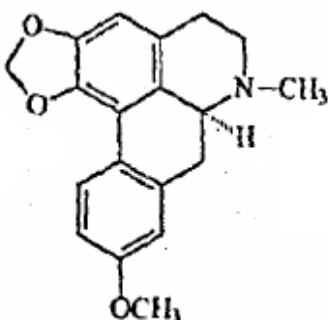
**4. Roemerine**



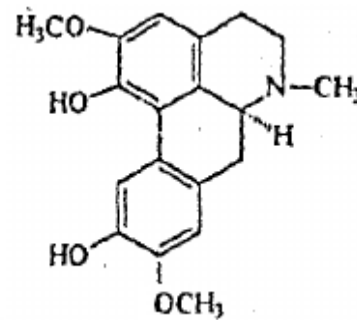
**5. Asimilobine**



**6. Xylopine**



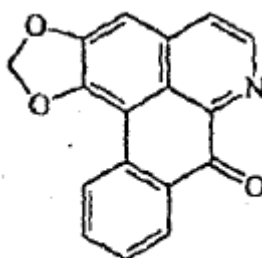
**7. Isolaureline**



**8. Isoboldine**

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**3. Oxoaporphin.**



**9. Liriodenine**

**Conclusion**

The content of alkaloids in the leaves of *Annona muricata* L collected in the Republic of Guinea was studied for the first time. Extraction of alkaloids was carried out by the conventional method, separately on the leaves. Received gross extracted alkaloids 0.125% (by weight of dried plant material). A total of 9 alkaloids have

been isolated. The main isolated alkaloids are aporphinoids (aporphins, noraporphins, oxoaporphins and benzyltetrahydroisoquinolines). Among which anonaine (3), roemerine (4), asimilobine (5), xylopine (6), isolaureline (7), isoboldine (8), and liriodene (9) were isolated by us for the first time.

### Experimental part

The column chromatographies were carried out on silica 60 (Merk 9385); thin layer chromatography (ccm) on Kieselgel G. Merck 7730 with solvent systems: benzene-ethanol (4: 1) and ethyl acetate-ethanol (5: 1) [20].

**Separation of alkaloids from the leaves of *Annona muricata* L.** We extracted the leaves of 2.5 kg of the *Annona muricata* L tree collected from the botanical gardens of Conakry (Republic of Guinea). As a result of conventional chloroform extraction, 0.125% of the mixture of alkaloids was obtained in relation to the dry weight of the plant leaf. Mixtures of alkaloids were divided into phenolic and non-phenolic parts.

From the phenolic fraction of the mixture of alkaloids, 4 bases were isolated by chromatography on a silica gel column, and from the non-phenolic part – 5 (five). The isolated alkaloids were identified using spectral data, physical constants of alkaloids, chemical transformations, and comparison with reliable samples.

As a result, the following 4 phenolics were identified: coclaurine (1), N-methylcoclaurine (2), asimilobine (5) and isoboldine (8); and 5 non-phenolic alkaloids: anonaine(3), roemerine (4), xylopine (6), isolaureline (7) and lirio-denine (9)

**Methylation of xylopine(6) by the method of Gess.** 0.035 g of xylopine (6), 2 ml of 85% HCOOH and 2 ml of formalin were placed in a flask and refluxed and the mixture was boiled on a sand bath for 4 hours. Then the reaction mixture was

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cooled and diluted by adding 2-3 ml of water. The solution was made basic with 25% ammonia solution and extracted with ether. Evaporating the ether, we obtained an alkaloid identical to isolaureline(7).

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