

## Source and Pharmacological Activities Of (-)-Anolobine and (+)-Anolobine

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**ABSTRACT:** Many species of Annonaceae, Magnoliaceae, Lauraceae and Menispermaceae are used in African traditional medicine. Two molecules, (-)-anolobine and (+)-anolobine, previously isolated from eleven species of Annonaceae, two Magnoliaceae, one Lauraceae and one Menispermaceae, present antibacterial, antileishmanial, trypanocidal, antiplasmodial and anti-acetylcholinesterase activities. This article provides an overview of sources and the pharmacological functions of (-)-anolobine and (+)-anolobine.

**KEYWORDS:** (-)-anolobine, (+)-anolobine, Annonaceae, Magnoliaceae, Lauraceae, Menispermaceae

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### I. INTRODUCTION

Various constituents from Annonaceae, Magnoliaceae, Lauraceae and Menispermaceae are used for medical purposes [1,2,3,4,5]. In our previous study [2] we had identified two aporphine alkaloids from *Monodora brevipes* Benth. (Annonaceae). They were identified as (-)-anolobine and (+)-anolobine (Fig.1). These aporphine alkaloids had been also isolated from several plants with interesting and varied biological and pharmacological activities, including antibacterial, antileishmanial, trypanocidal, antiplasmodial and anti-acetylcholinesterase (Table 1). In this study, we focus on the part of plants where (-)-anolobine and (+)-anolobine had been isolated and on their biological and pharmacological activities.

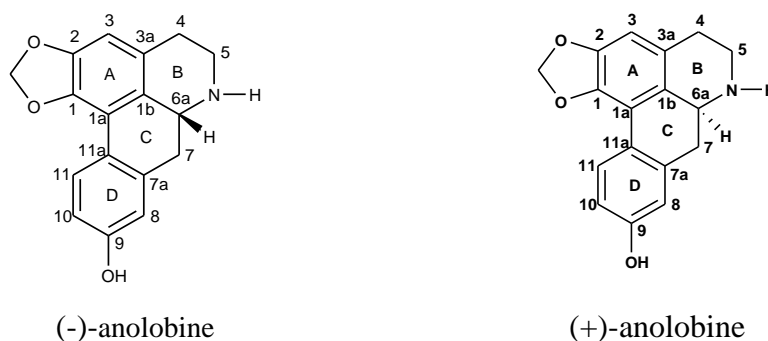


Figure 1: Chemical structures of (-)-anolobine and (+)-anolobine

## II. DISCUSSION

(-)-anolobine and (+)-anolobine had been previously isolated from several species of Annonaceae (*Annona cherimola*; *Annona glabra*; *Annona squamosa*; *Asimina triloba*; *Duguetia obovata*; *Fissistigma oldhamii*; *Goniothalamus amuyon*; *Guatteria goudotiana*; *Monodora brevipes*; *Monodora crispata*; *Polyalthia acuminata*) [1,6,7,8,9,10,11,12], Magnoliaceae (*Magnolia coco*; *Michelia champaca*) [13,14], Lauraceae (*Actinodaphne macrophylla*) [15] and Menispermaceae (*Stephania cepharantha*) [16]. Analogues of these compounds were also described in *Monodora junodii* [17], *M. tenuifolia* [18] and *Monodora angolensis* [19]. Indeed, aporphines are considered as strong chemotaxonomical markers of Magnoliales, deriving from (S)-reticuline, with or without inversion of the configuration at C-6a along their biogenetic pathway, as evidenced by the enantiomeric compounds (-)-anolobine and (+)-anolobine. Both series of enantiomers were encountered concomitantly in other *Monodora* species such as *M. junodii* [17]. Concerning (-)-anolobine and (+)-anolobine, they are found in several parts of plants (stem barks, leaves, roots, woods and branches). They possessed varied biological and pharmacological activities (antibacterial, antileishmanial, trypanocidal, antiplasmodial and anti-acetylcholinesterase) [2,12,15,20].

**Table 1: (-)-anolobine and (+)-anolobine isolated from plants and its pharmacological effects.**

Sources	Pharmacological effects
<b>Annonaceae</b> <i>Annona cherimola</i> ; <i>Annona glabra</i> ; <i>Annona squamosa</i> ; <i>Asimina triloba</i> ; <i>Duguetia obovata</i> ; <i>Fissistigma oldhamii</i> ; <i>Goniothalamus amuyo</i> ; <i>Guatteria goudotiana</i> ; <i>Monodora brevipes</i> ; <i>Monodora crispata</i> ; <i>Polyalthia acuminata</i> <b>Magnoliaceae</b> <i>Magnolia coco</i> ; <i>Michelia champaca</i> <b>Lauraceae</b> <i>Actinodaphne macrophylla</i> <b>Menispermaceae</b> <i>Stephania cepharantha</i>	Antimicrobial; antiplasmodial; antiacetylcholinesterase; antileishmanial; trypanocidal

**Table 2: Sources and parts of plants where (-)-anolobine and (+)-anolobine are isolated.**

Plants	Part of plant	Compounds	Pharmacological effects of (-) anolobine or (+)-anolobine
<i>Actinodaphne macrophylla</i>	Stem barks	anolobine (U*)	Antiplasmodial; antimicrobial
<i>Annona cherimola</i>	Stem barks	(-)-anolobine	NT*
<i>Annona glabra</i>	Leaves	(-)-anolobine	Anti-acetylcholinesterase
<i>Annona squamosa</i>	Roots	anolobine (U)	NT
<i>Asimina triloba</i>	Stem barks	anolobine (U)	NT
<i>Duguetia obovata</i>	Stem barks	(-)-anolobine	NT
<i>Goniothalamus amuyon</i>	Woods	(-)-anolobine	NT
<i>Guatteria goudotiana</i>	Stem barks	(-)-anolobine	NT
<i>Monodora brevipes</i>	Leaves	(-)-anolobine	Antileishmanial; trypanocidal
<i>Monodora crispata</i>	Leaves	(-)-anolobine; (+)-anolobine	Antileishmanial;trypanocidal Antileishmanial;trypanocidal
<i>Polyalthia acuminata</i>	Barks and leaves	anolobine (U)	NT
<i>Fissistigma oldhamii</i>	Woods	(-)-anolobine	NT
<i>Magnolia coco</i>	Stem barks	anolobine (U)	NT
<i>Michelia champaca</i>	Branches	(-)-anolobine	NT
<i>Stephania cepharantha</i>	Roots	anolobine (U)	NT

\*U: unspecified; NT: Not tested

## III. ANTIMICROBIAL ACTIVITY

Anolobine was the most active compound against gram positive bacteria with MIC<sub>90</sub> between 12 and 50 mg/L. It also showed activity against *Mycobacterium phlei* (MIC 6-25 mg/L). The action against susceptible microorganisms was bactericidal [20]. Anolobine induced chromosomal aberrations at relatively low concentrations as low as 2.5µg/mL.

## IV. ANTIPLASMODIAL ACTIVITY

Anolobine isolated from the barks of *Actinodaphne macrophylla* demonstrated *in vitro*, antiplasmodial activity against *Plasmodium falciparum* 3D7 with IC<sub>50</sub> value of 1.38 µM, comparable with the reference standard, chloroquine [15].

## V. ANTIACETYLCHOLINESTERASE ACTIVITY

(-)-anolobine isolated from *Annona glabra* leaves showed moderate inhibitory activity against acetylcholinesterase with IC<sub>50</sub> value of 22.4 µM [12].

## VI. ANTIPROTOZOAL ACTIVITY (Antileishmanial and Trypanocidal activities)

(-)-anolobine had shown varied levels of antiprotozoal activity against *L. donovani* promastigotes (IC<sub>50</sub> = 19.21 µM) and *T. brucei brucei* trypomastigotes (CL<sub>100</sub> = 114.95 µM) as well as (+)-anolobine (IC<sub>50</sub> = 14.59 µM against *L. donovani* promastigotes) and (CL<sub>100</sub> > 200.00 µM against *T. brucei brucei* trypomastigotes) [2].

## VII. CONCLUSION

The investigation of the biological properties of (-)-anolobine and (+)-anolobine, both previously isolated from natural source, has revealed their interesting pharmacological functions. Among these pharmacological functions, antibacterial, antileishmanial, trypanocidal, antiplasmodial, antiacetylcholinesterase and antimicrobial effects were revealed. However, there is lack of correlation between *in vitro* and *in vivo* studies on the effects of (-)-anolobine and (+)-anolobine. Toxicity and cytotoxic studies are missing too. For this reason, extensive pharmacological, chemical experiments and metabolism studies should be undertaken. Last but not least, this article aims to provide useful informations about (-)-anolobine and (+)-anolobine for researchers in this field.

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