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Essential Oil of *Auxemma glazioviana* Taub. (Boraginaceae): Chemical Composition, Antibacterial and Antioxidant Activities

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Abstract: The composition of the essential oil obtained from powdered heartwood of by hydrodistillation process were investigated by GC/MS, allowed identified with being the most abundant compound. The oil was evaluated for their antioxidant and antibacterial activities against seven strains of bacteria. The results revealed that essential oil of *A. glazioviana* exhibited a moderate antibacterial effect and a significant antioxidant activity.

Key words: *Auxemma glazioviana,* essential oil, α-bisabolol, antibacterial activity, antioxidant activity

INTRODUCTION

Auxemma glazioviana (Boraginaceae) popularly know as pau branco louro is a typical tree of Ceara State, Brazil (Arraes and Queiroz, 1969). Their barks have been used in folk medicine as cicatrizant. This biological activity probably can be attributed to the high content of allantoin (Pessoa *et al*., 1995). Phytochemical analysis previously of the ethanol extract of heartwood allowed the isolation of terpenoid quinones, characterized as cordiachromes: meroterpenoids benzoquinones found in several species of *Cordia* and *Auxemma* (Moir and Thomson, 1972, 1973). This compound showed several biological activities including anticarcinogen, inhibition of platelet, toxicity to sea urchin egg and antioxidant (Leyva *et al*., 2000; Ferreira *et al*., 1999; Costa-Lotufo *et al*., 2002; Ferreira *et al*., 2003).

MATERIALS AND METHODS

Heartwood of *Auxemma glazioviana* Taub. (Boraginaceae), was collected locally Quixadá, Ceará, Brazil in Aprill 2003. Voucher specimen (No. 18639) had been deposited, at the herbarium Prisco Bezerra of the Department of Biology, Universidade Federal do Ceará.

Extraction of essential oil: The essential oil from *A. glazioviana* was obtained by hydrodistillation of the powdered heartwood (400 g) using a Clevenger-type glass apparatus for 2 h. The oil was dried over anhydrous sodium sulphate, yielding 0.63%.

Essential oil analysis: Analysis of the oil was performed on Hewlett-Packard 5971 GC/MS instrument employing the following conditions: dimethylsiloxane DB-5 fused silica capillary column (30 m×0.26 mm, 0.1 m film thickness); carrier gas: helium 1 mL min^{-1}; injector temperature: 250°C; detector temperature 200°C ; column temperature 35-180°C at 4°C min^{-1}, then 180-250°C at 10°C min^{-1}; mass spectra: electronic impact 70 eV. Individual components were identified by computer library MS searches using retention indices as a preselection routine and visual inspection of the mass spectra from literature for confirmation (Craveiro *et al*., 1984).

Antimicrobial assays: Experiments were done using know procedure (NCCLS, 2001). The agar diffusion technique was used for the determination of the antimicrobial activities of the essential oil using the following microorganisms: *Staphylococcus aureus* (ATTC 12692), *Pseudomonas aeruginosa* (ATCC 15442), *Proteus vulgaris (*ATCC 13315), *Streptococcus* β-*hemolitico* (ATCC 6314), *Klesibiella pneumonie* (ATCC 10031), *Escherichia coli* (ATCC 25922) and *Salmonella typhimurium* (ATCC 13314). The culture medium used was Mueller-Hilton agar. After incubation for 24 h at 36°C, plates were examined for detection of inhibition zone and measured in millimeters. Standard commercial substances were used as positive control (amikacin and ampicilin). The Minimal Inhibitory Concentration (MIC) were determined using 25 μg of essential oil dissolved in

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$CHCl_3$, starting with a concentration of and diluting it by successive two-fold dilutions of the stock solution. Experiments were done in triplicate.

Antioxidant activity: Essential oil was assessed on the basis of the radical scavenging effect of the stable DPPH free radical. One milliliter of the 60 μM DPPH ethanol solution was added to of samples solutions of different concentrations and allowed to react at room temperature. After (30 min) the absorbance values were measured at 517 nm using a spectrophotometer and converted into the percentage antioxidant activity using know procedure. Activities of compounds were compared with Trolox and vitamin C used as positive controls by comparing the absorbance with that of the blank (100%) containing only DPPH and solvent (Ozgen *et al*., 2002; Usia *et al*., 2002; Hegazi *et al*., 2002). The results are shown in Table 3.

RESULTS AND DISCUSSION

The identification of the essential oil components was accomplished by comparison of their GC-MS retention indices as well as their mass spectra with corresponding data of authentic compounds or of components of reference oils. Thirteen compounds were identified, representing 94.3% of the total oil contents: α-muuroleno (1.7%), γ-cadineno (2.2%), δ-cadineno (2.6%), α-calacoreno (1.3%), globulol (2.8%), Viridiflorol (3.6%), 1,10-di-epi-cubenol (1.8%), T-muurolol (15.9%), 1-epi-cubenol (3.5%), β-eudesmol (1.5%), α-cadinol (9.4%), cadaleno (1.7%) e α-bisabolol (46.3%).

Antibacterial activity was assayed against seven bacteria: *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Streptococcus α-hemolitico*, *Klesibiella pneumonie*, *Escherichia coli* and *Salmonella typhimurium* and results are listed in Table 1. MIC (minimum inhibitory concentration) values were determined with six of selected microorganisms and the results are presented in Table 2. The essential oil was effective against bacteria *Salmonella typhimurium*, with MIC 10 at concentration of 2.5 μg mL^{-1}.

The essential oil was also tested as antioxidant properties using DPPH (1,1-diphenyl-2-picryl-hydrazil) assay using TROLOX and Vitamin C as positive control and the results are represented in Table 3.

Table 1: Antimicrobial activity of essential oil from heartwood of *Auxemma glazioviana*

	Zone of inhibition (mm)			Control	
Microorganisms	24 h	48 h	TWEEN 80	Ampicilin	Amikacin
Salmonella typhimurium	16 mm	15 mm	-	+	+
Staphilococcus aureus	25 mm	25 mm	-	-	+
Escherichia coli	-	-	-	+	+
Pseudomonas aeroginosa	25 mm	23 mm	-	+	+
Klebsiella pneumone	15 mm	15 mm	-	+	+
Streptococcus –hemoliticus	16 mm	16 mm	-	-	+
Proteus vulgaris	10 mm	10 mm	-	-	+

Diameter of inhibition was expressed in mm used concentration from oil from heartwood of *A. glazioviana*: 20 μL; Amikacin and Ampicillin (40 μg); (+) = Active; (-) = Not active

Table 2: Minimum inhibitory concentrations (μg mL^{-1}) of the essential oil from heartwood of *Auxemma glazioviana*

	MIC (μg mL^{-1})				
Microorganisms	10	5	2.5	Amikacin	Ampicilin
Salmonella typhimurium	20	12	10	+	+
Staphilococcus aureus	22	10	-	+	-
Escherichia coli	-	-	-	+	+
Pseudomonas aeroginosa	20	11	7	+	+
Klebsiella pneumone	25	9	-	+	+
Streptococcus –hemoliticus	19	8	-	+	-
Proteus vulgaris	12	10	-	+	-

Value are the diameter of inhibitory zone (mm); (+) = active; (-) = not active

Table 3: The DPPH free radical scavenging activity of essential oil from heartwood of *Auxemma glazioviana*. The DPPH free radical scavenging effect was measured by the absorbance of DPPH radical at 520 nm in a reaction containing the test sample and 60 μM DPPH*

	Concentration (mg mL^{-1})					
	1.000		0.250		0.125	
Treatment	Activity	(%)	Activity	(%)	Activity	(%)
Control	0.2700	0.000	0.2700	0.000	0.2700	0.000
Trolox	0.0082	96.96	0.0154	94.26	0.0162	94.00
Vitamin C	0.0070	97.25	0.0150	94.59	0.0164	93.92
Essential oil	0.0560	79.26	0.0650	75.93	0.0850	68.52

*Results are expressed as mean±SD

CONCLUSION

α-bisabolol (46.3%) was also found as a major component in the oil of *A. glazioviana*. The essential oil was effective against bacteria *Salmonella typhimurium*, with MIC 10 at concentration of 2.5 μg mL^{-1}. This study confirms that the essential oil of *A. glazioviana* possesses antioxidant and antimicrobial properties *in vitro*.

The results reported here can be considered as the first information on the antimicrobial and antioxidant properties of *A. glazioviana*, an endemic species of the Ceara State flora. This may also contribute to the knowledge about the antimicrobial and antioxidant properties of *Auxemma* sp.

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