INTRODUCTION

The genus *Bauhinia* (Leguminosae) consists of about 300 species, distributed in most tropical countries, including Africa, Asia, and America.[1] Species of the genus *Bauhinia* are present as trees, shrubs and vines, and in Brazil are used by the population as hypoglycemic agents.[2] Multiple biological activities are allocated to *Bauhinia* species such as antidiabetic, diuretic, hypocholesterolemic, antimicrobial, analgesic, antioxidant, larvicidal, acetylcholinesterase, anti-inflammatory, among others. Chemical compositions of essential oils of *Bauhinias* are cited in the literature, among them *Bauhinia aculeata*, *B. brevipes*, *B. forficata*, *B. longifolia*, *B. pentandra*, *B. rufa*, *B. variegata*, *B. unguiculata* and *B. acuruana*. The *B. pentandra* species inhabits the Caatinga and Savannah biomes and is known in the Northeast region of Brazil as “mororó”. Literature reports the chemical composition of its essential oil from Rio de Janeiro-Brazil.[8] Therefore, the aim of this work is to identify the chemical composition of the essential and fatty oils from the leaves of *B. pentandra* species collected in the Medicinal Garden of Plants-Federal University of Ceará (UFC)-Brazil, whose composition was different from already reported.

MATERIALS AND METHODS

Plant material

*Bauhinia pentandra* (Bong.) D. Dietr. leaves were collected at Medicinal Plants Garden, UFC. A voucher specimen (number 53444) is deposited in the Herbarium Prisco Bezerra of the Department of Biology, UFC.

Essential oil extraction

The fresh leaves (162 g) were subjected to hydrodistillation process in Clevenger-type apparatus for 5 h. The hydrodistilled volatiles were dried over anhydrous sodium sulfate and stored in a freezer at 4°C until the analysis procedure. The experiment was performed in triplicate.

Fixed oil extraction

The air-dried leaves (55 g) were extracted with hexane at room temperature for 5 days, followed by filtration and concentration under reduced pressure to yield a crude extract (0.924 g; 1.7%).

Saponification

To the crude hexane extract (923 mg) was added MeOH (15 mL) and KOH (923 mg), which reacted for 1 h under reflux. After cooling, the mixture was diluted with H₂O (40 mL) and extracted with hexane (2 mL × 50 mL). The aqueous phase was acidified to pH 3 with concentrated
HCl and extracted with EtOAc (2 mL × 50 mL). The combined EtOAc fractions were dried (Na₂SO₄) and concentrated under reduced pressure to give fatty acids (344 mg).

**Methylation**

Fatty acids (344 mg) were refluxed for 1 h in MeOH (10 mL) in the presence concentrated HCl (1 mL). After cooling, the mixture was diluted with H₂O (30 mL) and extracted with CH₂Cl₂ (3 mL × 30 mL). The combined CH₂Cl₂ fractions were dried (Na₂SO₄) and concentrated under reduced pressure to give methyl esters (221 mg). The crude reaction was chromatographed on a column Si gel, eluted with hexane, followed by CH₂Cl₂, and fractions were analyzed by thin-layer chromatography and gas chromatography-mass spectrometry (GC/MS).

**Gas chromatography-mass spectrometry**

Analysis of the oils was performed on a Shimadzu/QP2010 GC/MS instrument employing the following conditions: RTX-5 (5% phenyl e 95% dimethylpolysiloxane) capillary column (30 mm × 0.25 mm, 0.25 μm film thickness); carrier gas: Helium (1 mL/min); column temperature: 40°C–180°C at 4°C/min then of 180°C–280°C at 20°C/min and held at 280°C for 10 min, for essential oil and RTX-5 (5% phenyl e 95% dimethylpolysiloxane) capillary column (30 mm × 0.25 mm, 0.25 μm film thickness); carrier gas: Helium (1.46 mL/min); column temperature: 80°C–280°C at 5°C/min then of 280°C–300°C at 20°C/min and held at 300°C for 5 min, for fatty oil. The retention indices Kovat’s were calculated using a series of standard n-alkane (C7-C30). The identification of compounds was performed by comparing their mass spectra with those of NIST08 library; retention indices, and published data.¹²

**RESULTS AND DISCUSSION**

The essential oil yield from fresh leaves was 0.01%. The results of GC/MS analysis Table 1 shows the presence of 6 components [Figure 1], which 5 were sesquiterpenes (1–5, 37.17%) and 1 diterpene (6, 58.78%), representing 95.95 ± 1.02% of the total composition. The main constituent was phytol (6, 58.78% ±8.51%), which was not reported in the previous study.⁹ Beyond of phytol, germacrene D (3, 8.40 ± 1.04%) and elixene (4, 11.73 ± 1.52%) are first recorded in B. pentandra. Germacrene is an important component identified in the essential oil with significant biological activities.¹³

From the fatty oil, 11 components were identified, representing 85.53% of the total composition. The results of GC/MS analysis [Table 2] from methylated derivatives showed that the major components were methyl hexadecanoate (29.03%),

| Table 1: Chemical composition of the essential oil from the leaves of B. pentandra |
|--------------------------------------------------|----------|--------|-------|
| Constituents                                    | R.T. (min) | KI*  | Area (%) |
| β-caryophyllene (1)                             | 25.960    | 1428  | 13.64±5.37 |
| α-humulene (2)                                  | 27.068    | 1463  | 2.66±0.61  |
| Germacrene D (3)                                | 27.977    | 1492  | 8.40±1.04  |
| Elixene (4)                                     | 28.499    | 1509  | 11.73±1.52 |
| Caryophyllene oxide (5)                         | 31.201    | 1594  | 0.74±0.68  |
| Phytol (6)                                      | 39.847    | 2123  | 58.78±8.51 |
| Total                                           |           |       | 95.95±1.02 |

*KI on RTX-5 capillary column. R.T.: Retention time; KI: Kovats index

| Table 2: Chemical composition of the fixed oil from the leaves of B. pentandra |
|--------------------------------------------------|----------|--------|-------|
| Constituents                                    | R.T. (min) | KI*  | Area (%) |
| Methyl dodecanoate                              | 15.118    | 1498  | 4.13   |
| Methyl tetradecanoate                           | 19.797    | 1725  | 5.72   |
| Methyl 9(Z)-9-hexadecenoate                     | 23.620    | 1904  | 1.46   |
| Methyl hexadecanoate                            | 24.225    | 1931  | 29.03  |
| Methyl heptadecanoate                           | 26.030    | 2023  | 0.78   |
| Methyl (9Z,12Z,15Z)-9,12,15-octadecatrienoate    | 27.800    | 2117  | 28.93  |
| Methyl octadecanoate                            | 28.089    | 2132  | 10.58  |
| Methyl 9(Z,12Z)-9,12-octadecadienoate           | 28.510    | 2152  | 0.91   |
| Methyl 18-methylnonadecanoate                    | 31.546    | 2327  | 2.04   |
| Methyl docosanoate                              | 34.842    | 2529  | 1.39   |
| Methyl tetracosanoate                           | 37.893    | 2730  | 0.56   |
| Total                                           |           |       | 85.53  |

*KI on RTX-5 capillary column. R.T.: Retention time; KI: Kovats index

Figure 1: Terpenoids identified in the essential oil extracted from B. pentandra (leaves fresh)
methyl (9Z,12Z,15Z)-9,12,15-octadecatrienoate (28.93%) and methyl octadecanoate (10.58%), or palmitic, linolenic and stearic acids, respectively. The major compounds identified in the fatty acids are considered healthy for the human consumption. This is the first report in the literature component of the fixed oil of this species.

Analysis of chemical constituents of less polar fraction of this species revealed the presence of components without toxicity. This species is used in the form of infusion in folk medicine, therefore, is important to know the chemical constituents, especially of leaves.

CONCLUSION

Analysis of essential oil allowed the identification of six compounds, being the phytol (6, 58.78 ± 8.51%) the major constituent. Of the identified compounds, three are being reported for the first time in the species: germacrene D (3), elixene (4) and phytol (6).

The study of fatty acid profile in the hexane extract from leaves presented as major components the palmitic (29.03%), linolenic (28.93%) and stearic (10.58%) acids. To the best of our knowledge, this is the first report on the chemical composition of the fixed oil this species.

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