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Short report

Radical scavenging, antioxidant and cytotoxic activity of Brazilian *Caatinga* plants

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Abstract

Extracts of 32 plants from the Brazilian northeastern semi-arid region called *Caatinga* were evaluated through DPPH radical scavenging assay, β-carotene bleaching, and brine shrimp lethality tests (BST). Among the extracts studied *Byrsonima* cf. *gardneriana*, *Mascagnia coriacea*, *Cordia globosa*, *Diodia apiculata* and *Hypenia salzmannii* showed the highest activities in DPPH radical scavenging test. In the β-carotene bleaching test the highest activities were observed for *Passiflora cincinnata*, *Chamaecrista repens*, *B.* cf. *gardneriana*, *Rollinia leptopetala*, *Serjania glabrata*, *Diospyros gaultheriifolia*, *C. globosa*, *Mimosa ophtalmocentra*, *M. coriacea* and *Lippia* cf. *microphylla*. In contrast, *R. leptopetala*, *Zornia* cf. *brasiliensis* and *Leonotis nepetifolia* were the most active species in the BST.

Keywords: Antioxidant activity; Brine shrimp test; Brazilian medicinal plants

1. Plants

Plant species listed in Table 1 were collected in the region called *Caatinga* in northeastern Brazil in March 2003. A voucher of each species is deposited in the Herbarium Lauro Pires Xavier in the Universidade Federal da Paraíba and Universidade Estadual de Feira de Santana's Herbarium.

2. Uses in traditional medicine

The plants studied are employed as medicine by the local population in the Brazilian northeastern region. They are used as laxative, sedative, for dermatitis, anti-inflammatory, colds, asthma, eczema, influenza, anti-

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Table 1
Radical scavenging, antioxidant and cytotoxic activity of the methanol extracts of *Caatinga* plants

Plants	Part used	Yield extract (%)	Radical scavenging activity (DPPH assay)		Antioxidant activity (β-carotene bleaching test)		BST (brine shrimp lethality test)	
			IC_{50} in mg/ml	95% Confidence interval	% AA at 10 mg/ml	95% Confidence interval	LC_{50} in μg/ml	95% Confidence interval
Acnistus arborescens L., Schltdl. (Solanaceae), (Agra 5790)	Aerial parts	1.4	16.2	14.5–18.4	34.8	25.1–44.5	141.4	129.0–155.3
Allamanda blanchetii A. DC. (Apocynaceae), (Agra 5673)	Aerial parts	1.7	3.7	3.3–4.3	47.1	27.4–66.7	373.1	227.0–601.6
Blainvillea rhomboidea Cass. (Asteraceae), (Agra 5888)	Aerial parts	4.0	10.7	9.6–12.0	36.2	30.8–41.6	426.2	394.8–462.5
Byrsonima gardneriana A. Juss. (Malpighiaceae), (Agra 947)	Aerial parts	10.6	0.3	0.09–0.7	63.2	56.7–69.7	243.9	220.9–269.9
Cardiospermum corindum L. (Sapindaceae), (Agra 5858)	Aerial parts	7.0	2.3	2.0–2.6	41.4	33.4–49.5	142.9	108.9–188.3
Chamaecrista repens (Vog.) H.S. Irwin et Barneby var. *multijuga* (Benth.) H.S. Irwin et Barneby (Caesalpinaceae), (Agra 5924)	Aerial parts	6.1	2.0	1.3–3.1	68.3	61.5–75.0	269.3	256.0–282.9
Cnidoscolus phyllacanthus Pax et Hoff. (Euphorbiaceae), (Agra 5997)	Aerial parts	1.5	13.2	12.2–14.3	39.3	21.8–56.8	89.7	63.2–127.3
Cordia globosa (Jacq.) Kunth. (Boraginaceae), (Agra 4969)	Aerial parts	8.5	1.03	0.96–1.11	55.0	45.8–64.2	201.0	112.6–361.0
Cordia multispicata Cham. (Boraginaceae), (Agra 5741)	Aerial parts	2.5	2.2	1.8–2.6	42.7	35.3–50.0	227.5	145.8–354.4
Crescentia cujete L. (Bignoniaceae), (Agra 5838)	Aerial parts	3.5	10.3	7.1–16.6	38.3	24.5–52.1	723.3	471.0–1109.2
Croton moritibensis Baill. (Euphorbiaceae)	Aerial parts	9.6	5.5	4.8–6.4	45.4	33.0–57.9	31.0	15.7–40.8
Diodia apiculata (R. et S.) K. Schum. (Rubiaceae), (Agra 5874)	Aerial parts	4.9	1.3	1.2–1.6	20.1	16.5–23.8	459.1	310.0–678.7
Diospyros gaultheriifolia Mart. et Miq. (Ebenaceae), (Agra 5626)	Aerial parts	4.6	5.5	4.1–7.6	56.1	52.4–59.9	883.0	767.1–1015.4
Herissantia crispa L. (Brizicky) (Malvaceae), (Agra 5868)	Aerial parts	3.1	3.9	3.5–4.4	45.6	28.8–62.3	281.2	155.2–515.6
Hypenia salzmannii (Benth.) Harley (Lamiaceae), (Agra 5926)	Leaves and stems	7.0	1.5	1.4–1.7	25.8	22.0–29.6	159.1	131.7–192.9
Ipomea hederifolia L. (Convolvulaceae), (Agra 5838)	Leaves and stems	16.0	2.7	2.5–2.9	33.7	29.3–38.2	177.9	114.0–278.9
Ipomea martii Meissn. (Convolvulaceae), (Barbosa 2249)	Aerial parts	4.9	4.4	3.9–4.9	34.5	20.4–48.6	125.6	82.1–192.4
Jacquemontia densiflora (Convolvulaceae), (Agra 5923)	Aerial parts	6.4	4.1	3.8–4.5	44.6	40.8–48.5	193.8	76.2–491.1
Lantana canescens Kunth (Verbenaceae), (Agra 5859)	Aerial parts	3.4	3.1	2.5–3.9	36.9	33.3–40.4	127.4	52.2–311.0
Leonotis nepetifolia (L.) R. Br. (Lamiaceae), (Agra 5621)	Aerial parts	3.0	6.5	5.7–7.4	47.9	33.9–62.0	19.8	13.5–28.9
Lippia cf. *microphylla* Cham. (Verbenaceae), (Agra 5693)	Leaves and stems	5.6	3.2	2.9–3.4	50.1	39.6–60.5	73.7	63.9–84.9
Mascagnia coriacea Griseb. (Malpighiaceae), (Agra 5836)	Aerial parts	6.0	0.3	0.31–0.37	50.2	33.7–66.7	423.7	215.2–838.7
Mimosa ophtalmocentra Mart. ex Benth. (Mimosaceae), (Agra 5933)	Aerial parts	12.3	6.2	5.9–6.5	52.2	34.8–69.7	185.1	103.5–325.3
Nicandra physalodes (L.) Gardn. (Solanaceae), (Agra 5891)	Leaves and stems	3.9	4.2	3.4–5.4	46.7	43.9–49.4	48.2	30.4–75.1
Passiflora cincinnata Mast. (Passifloraceae), (Agra 5873)	Aerial parts	4.5	22.3	18.8–27.3	70.1	57.6–82.6	266.9	193.2–369.4
Pilocarpus spicatus A. St.-Hill. (Rutaceae), (Agra 5788)	Leaves and stems	11.7	3.6	2.9–4.4	38.6	34.9–42.2	95.2	61.5–148.4
Rollinia leptopetala R. E. Fr. (Annonaceae), (Agra 5700)	Leaves and stems	5.5	3.5	3.1–4.0	57.3	44.9–69.7	0.6	0.2–1.8
Serjania glabrata Kunth (Sapindaceae), (Barbosa 2266)	Aerial parts	1.1	2.8	2.6–3.1	57.1	48.8–65.5	248.0	197.4–313.9
Sidastrum paniculatum (L.) Fryxell (Malvaceae), (Agra 586)	Aerial parts	2.3	5.3	5.0–5.7	39.2	32.5–46.0	317.2	251.6–400.0
Tocoyena formosa (Cham. et Schltdl.) (Rubiaceae), (Agra 5734)	Leaves and stems	3.1	13.2	11.9–14.7	43.7	34.8–52.7	332.0	267.6–413.0
Vernonia chalybaea Mart. ex D.C. (Asteraceae), (Agra 5835)	Aerial parts	5.8	6.0	5.7–6.3	17.7	8.6–26.8	377.8	228.4–662.5
Zornia cf. *brasiliensis* Vog. (Fabaceae), (Barbosa 2235)	Aerial parts	2.1	25.1	19.0–35.8	46.6	43.1–50.2	7.2	4.5–11.4

hemorrhoid, diuretic, anti-rheumatism, for menstrual disorders, anti-hypertensive, digestive, hair tonic, and kidney disease [1,2].

3. Previously isolated classes of constituents

A. arborescens [3], *C. phyllacanthus* [4,5], *Cordia globosa* [6], *T. formosa* [7], *P. spicatus* [8,9] and *C. cujete* [10] were previously examined for their biologically activities and chemical constituents. In these studies were isolated cytotoxic withanolides and favelines, antifungal iridoids, coumarin with gGAPDH inhibitory activity and cytotoxic naphtoquinones, respectively. *B. rhomboidea* was found to contain sesquiterpene lactones, while *Rollinia leptopetala* contains dammarane derivatives and alkaloids [11,12].

4. Tested material

Methanol extracts were prepared at room temperature.

5. Studied activity

Radical scavenging activities of plant extracts were determined through spectrophotometry using 1,1-diphenyl-2-picrylhydrazyl (DPPH) scavenging radical assay [13]. The antioxidant activity of MeOH extracts was evaluated with the β-carotene bleaching test in a linolenic acid suspension as previously described with slight modifications [14]. Brine shrimp lethality test was performed according to Serrano et al. [15] with minor modifications [16].

6. Statistical analysis

All assays were developed in triplicate and the test results were analyzed using the two-tailed Student's *t*-test at a significance level of $P<0.05$ and DPPH IC_{50} values with 95% confidence intervals were determined using the regression method with the Analyse-it software (Table 1). BST LC_{50} values with a 95% confidence interval were determined using the probit analysis method of Stats Direct statistical software (Table 1). When required the results were found by extrapolation of the straight line.

7. Results and discussion

Among the extracts studied (Table 1) the highest scavenging activities (lowest IC_{50}) were observed for *Byrsonima gardneriana* (0.3 mg/ml), *Mascagnia coriacea* (0.3 mg/ml), *C. globosa* (1.03 mg/ml), *Diodia apiculata* (1.3 mg/ml) and *Hypenia salzmannii* (1.5 mg/ml) when compared with the butylated hydroxyanisole (BHA) [IC_{50} $(34.1\pm 0.6)\times 10^{-3}$ mg/ml].

The activity was evaluated measuring the protection against oxidation in β-carotene bleaching test at a concentration of 10.0 mg/ml. The highest activities were observed for *Passiflora cincinnata* (70.1), *Chamaecrista repens* (68.3), *B. gardneriana* (63.2), *R. leptopetala* (57.3), *Serjania glabrata* (57.1), *Diospyros gaultheriifolia* (56.1), *C. globosa* (55.0), *Mimosa ophtalmocentra* (52.2), *M. coriacea* (50.2) and *Lippia microphylla* (50.1) (Table 1). The butylated hydroxytoluene (BHT) (1.0 mg/ml) presented AA of 84.3 ± 13.9.

The extracts with LC_{50} values higher than 200 mg/l in the brine shrimp test can be considered inactive [17]. In accordance with this criterion, about 50% of the species presented positive results ($LC_{50}<200$ mg/l) (Table 1). However, other authors [15] consider this value as low. The most active species in BST were *R. leptopetala* (0.6 μg/ml), *Zornia* cf. *brasiliensis* (7.2 μg/ml) and *L. nepetifolia* (19.8 μg/ml).

8. Conclusions

No extracts were found to exhibit comparable radical scavenging or antioxidant activities with commercial antioxidants. Nevertheless, *P. cincinatta*, *C. repens*, *B. gardneriana*, *S. glabrata*, *D. gaultheriifolia*, *C. globosa* and *M. coriacea* showed AA and low toxicity in the BST.

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