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SHORT COMMUNICATION

Cameroonian medicinal plants belonging to Annonaceae family: radical scavenging and antifungal activities

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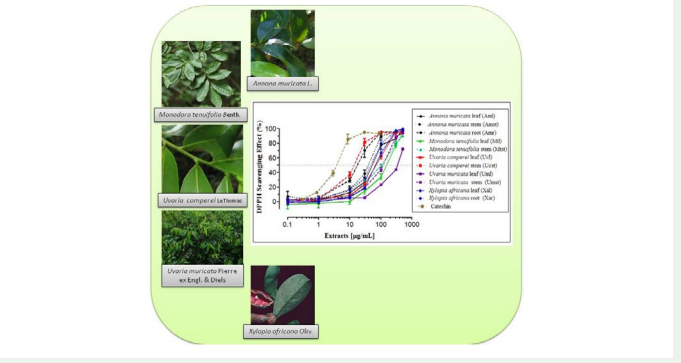
ABSTRACT

The free-radical scavenging activity of ethanolic and methanolic extracts of leaves, stems and roots of *Annona muricata*, *Monodora tenuifolia*, *Uvaria comperei*, *Uvaria muricata* and *Xylopia africana* was evaluated using DPPH and ORAC assays. Further, phytochemical analysis, total phenolic and total flavonoid contents were also determined. Moreover, the antifungal activity of extracts was studied. The findings indicated that *A. muricata* and *U. comperei* extracts own antiradical activities and moderate antifungal properties.



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1. Introduction

Plant-based medicine continues to play a key role in healthcare systems of many regions worldwide; particularly, in Africa, where drugs are not always available to whole population (Kpodar et al. 2015). The present research regards five Cameroonian plants belonging to Annonaceae family, viz. *Annona muricata* L., *Monodora tenuifolia* Benth., *Uvaria comperei* Le Thomas, *Uvaria muricata* Pierre ex Engl. and Diels and *Xylopia africana* Oliv., which are scanty

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known in the Occident (Table S1). On this regard, *A. muricata* is an exception being widely known also for its edible fruits. Further, several studies reported its hypoglycaemic and antihypertensive effects and its potential as anticancer (Adefegha et al. 2015). Otherwise, few data are available about *M. tenuifolia*, which is employed in traditional medicine to treat many diseases, including dermatitis, diarrhoea and headache (Tsabang et al. 2012; Ekeanyanwu and Njoku 2015). Furthermore, to our knowledge, there are no publications on *U. comperei* and *U. muricata*, and only one on *X. africana* (Harborne 1999). It is well-known that oxidative stress is involved in cellular damage. Further, the reactive oxygen species (ROS) are also involved in defence against microbial pathogens, which in turn use ROS for destruction of host tissues. Also, the expanding number of immunocompromised patients contracting deadly opportunistic yeast infections is a real concern. Therefore, the selected medicinal plants were investigated in order to define their antiradical and antifungal properties.

2. Results and discussion

The phytochemical screening of the extracts revealed the presence of several chemical groups (Table S2), well-known for their biological activities (Yuan et al. 2016). Phenols and glycosides were detected in all extracts, highlighting the wide-spread synthesis of these compounds in the plant tissues, whereas anthocyanins were absent throughout. Anthraquinones were detected in leaf, stem and root extracts of *A. muricata*, and also in *U. comperei* stem, *U. muricata* leaf, and *X. africana* leaf extracts (Table S2). Recently, other authors reported the presence of anthraquinones, tannins, flavonoids and terpenoids in *A. muricata* leaf extract even alkaloids were also detected (Gavamukulya et al. 2014). The third most detected class of secondary metabolites was that of flavonoids, which was absent only in *U. muricata* stem and *X. africana* leaf extracts. Further, saponins, tannins and triterpenes were sporadically detected. As reported in Table 1, the highest amount of phenols (TPC) was

Table 1. Antiradical capacity and phenolic and flavonoid contents of the selected Cameroonian plant extracts.

Medicinal plant	Tissue	DPPH EC_{50} (μg/mL)	ORAC TEAC[c] (μmol/g)	TPC GAE[d] (mg/g)	TFC QE[e] (mg/g)
Annona muricata	Leaf[a]	54.5	7121 ± 233	2.5 ± 0.2	13.6 ± 0.3
	Stem[a]	40.3	9105 ± 305	15.5 ± 0.4	4.5 ± 0.1
	Root[a]	18.8	11481 ± 302	21.7 ± 0.3	3.2±0.7
Monodora tenuifolia	Leaf[a]	144.2	7999 ± 311	4.4 ± 1.4	11.7 ± 0.8
	Stem[a]	294.1	8003 ± 236	2.9 ± 0.5	2.1 ± 0.3
Uvaria comperei	Leaf[b]	74.6	9555 ± 547	26.8 ± 3.2	20.4 ± 1.7
	Stem[b]	12.9	9588 ± 578	46.9 ± 4.9	4.6 ± 0.8
Uvaria muricata	Leaf[a]	331.7	7024 ± 158	11.3 ± 2.7	8.9 ± 0.4
	Stem[a]	111.7	9105 ± 333	18.2 ± 2.2	0.9 ± 0.5
Xylopia africana	Leaf[b]	72.0	6874 ± 661	26.1 ± 4.7	0.05 ± 3.8
	Root[b]	53.7	10015 ± 425	27.2 ± 3.0	4.7 ± 0.7
Catechin	–	3.6	144095 ± 7434	–	–

Notes: The scavenging activity on 1,1-diphenyl-2-picryl-hydrazyl radical (DPPH), the Oxygen Radical Antioxidant Capacity (ORAC), the Total Phenolic Content (TPC), and the Total Flavonoid Content (TFC) assays are reported as mean ± standard error of mean of at least three experiments (see Supplementary Material).

[a]ethanolic extract

[b]methanolic extract

[c]Trolox Equivalent Antioxidant Capacity

[d]Gallic Acid Equivalent

[e]Quercetin Equivalent

[–]not applicable.

detected in *U. comperei* stem extract, while the highest level of flavonoids (TFC) was found in the leaf extract. Generally, the TFC was higher in leaf extracts than in the other tissues, independently of the plant species. This finding supports the theory that flavonoids have defensive role against UV and thus, are widely available in the foliage (Zahid et al. 2017). Using HPLC-DAD detection (Figure S1), chlorogenic acid and catechin were identified in leaf, stem and root extracts of *A. muricata,* and in leaf extract of *X. africana*. Furthermore, catechin was detected in *U. comperei* stem and *X. africana* root extracts. None of the other standards detected, such as caffeic acid, gallic acid, herniarin, imperatorin and quercetin, were identified in the plant extracts. Even if the abundance of phenolic compounds in *A. muricata* has already been reported (Gavamukulya et al. 2014; George et al. 2015), for the first time, chlorogenic acid and catechin were identified in *A. muricata* and *X. africana* extracts and catechin in *U. comperei* stem extract (Figure S1). To assess the free-radical scavenging capacity of the plant extracts, DPPH and ORAC assays were used. (Roy et al. 2010) All extracts (0.1–500 µg/mL) showed concentration-dependent DPPH scavenging effects (Figure S2). Among these, *U. comperei* stem and *A. muricata* root extracts showed the highest radical scavenger activities with EC_{50} values of 12.9 and 18.8 µg/mL, respectively, being 2–25.7-fold more potent than the other tested extracts (Table 1). Moreover, the extracts showed significant scavenging activities also using ORAC assay (Figure S3). The TEAC values were from 6874 ± 661 µmol trolox/g, with *X. africana* leaf extract, to 11481 ± 302 µmol trolox/g, with *A. muricata* root extract which showed the highest activity (Table 1). In general, a great antioxidant activity may be attributed to high level of phenolic compounds. This seems particularly true in the case of the stem extract of *U. comperei* that has a TPC of 46.9 ± 4.9 GAE mg/g and exerted the highest DPPH scavenging activity, with an EC_{50} of 12.9 µg/mL. Indeed, findings from previous studies suggest that phenolic content could be used as an indicator of antioxidant capacity (Piluzza & Bullitta 2011; Büyüktuncel et al. 2014). Otherwise, the TFC level seems not to be related to the radical scavenging activity. The beneficial properties of the extracts were further explored as potential inhibitors of human pathogenic yeasts, particularly *Candida* spp. (*C. albicans, C. glabrata, C. krusei, C. holmii, C. parapsilosis, C. lusitaniae, C. tropicalis*) and *Cryptococcus neoformans* that are responsible for the greatest number of opportunistic infections worldwide (Hogan and Wheeler 2014). In the present research, several extracts showed moderate antifungal activities against various *Candida* species and *C. neoformans* (Tables S3). In particular, the *U. comperei* stem and *A. muricata* extracts showed moderate antifungal activities, mostly with MIC values ranging from 1.9 to 7.5 mg/mL. Conversely, the extracts of *M. tenuifolia* (leaf and stem), *U. muricata* (leaf, stem) and *X. africana* (root) did not show appreciable antifungal activity (MIC ≥ 15 mg/mL). In agreement with present data, Pai et al. (2016) already showed the anti-*Candida* activity of *A. muricata* leaf extract.

3. Conclusion

The plants *A. muricata*, *M. tenuifolia*, *U. comperei*, *U. muricata* and *X. africana* show different antioxidant and antifungal activities, also in relation to the type of plant tissue. Among these, the stem extract of *U. comperei* and the root extract of *A. muricata* exhibit the highest radical scavenging activity and the former displays also moderate antifungal activity. Among the plants studied, the *U. comperei* stem extract shows the highest antiradical and antifungal activities, supporting its healing use and suggesting the usefulness of further investigations to characterise its active compounds.

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