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Evaluation of the *in vitro* antioxidant activities of *Xylopia aethiopica* methanolic extract

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Dedication

To God and above all, Praise be to God for completing this success and this memory. I dedicate my graduation to:

My father is my support and my pride. Here I am today, offering him the fruit of his labor. Perhaps I can return with it a little of what he paid for me.

My mother, my life and happiness., who inspired me and continues to guide me, who supported me without limits and gave me without return. I dedicate to you my graduation and my success.

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ملخص

يعتبر نبات (Xae) *Xylopia aethiopica* (الإسم الشعبي قرني) كنبات طبي وهو ينتمي إلى عائلة Annonaceae . يستخدم هذا النبات في الطب الشعبي الإفريقي لعلاج الروماتيزم والتهاب الشعب الهوائية والربو وآلام المعدة بالإضافة إلى مجموعة واسعة من الأمراض. تهدف هذه الدراسة إلى تقييم النشاطية المضادة للأكسدة لمستخلص ميثانولي لثمار Xae، تم الحصول على هذا الأخير باستعمال زجاجية Soxhlet وكان مردود الاستخلاص بمعدل 38.5%. تم تحديد المحتوى الفينولي الكلي باستخدام كاشف Folin-Ciocalteu (49.52 ± 2.68 مكروغرام مكافئ حمض الغاليك/مغ من المستخلص الجاف) ، بينما تم تحديد محتوى الفلافونويدات الكلي باستخدام طريقة ثلاثي كلوريد الألومنيوم (1.93 ± 0.06 مغ مكافئ Quercitin/غ من المستخلص الجاف). تم تقييم النشاطية المضادة للأكسدة باستخدام طريقة إزاحة DPPH والقدرة على استخلاب الحديد والقدرة الإرجاعية بالإضافة إلى اختبار حمض لينولييك / β-carotene. بالنسبة إلى اختبار إزاحة جذورDPPH، أظهر المستخلص نشاطية تقدر بـ IC_{50} = 0.14 ± 0.002 مغ/مل، هذه القيمة أقل من تلك المسجلة مع BHT.كما تميز المستخلص بنشاطية استخلابية بقيمة IC_{50} = 1.33 ± 0.03 مغ/مل وهي أضعف من تلك المسجلة مع EDTA. في اختبار القدرة الإرجاعية، أظهر المستخلص نشاطية بقيمة EC_{50} = 0.07 ± 0.01 مغ/مل وهي مقاربة للقدرة الإرجاعية للحمض أسكوربيك (EC_{50} = 0.05 ±0.001 مغ/مل). أخيرا، أظهر مستخلص Xae، في اختبار β-carotène-الحمض لينولييك، نشاطية تثبيطية منخفضة بقيمة 47 % وهو بالتالي أقل فعالية مقارنة بـ BHT (98 %). من خلال هذه النتائج، يعتبر *Xylopia aethiopica* مصدرًا فقيرًا لكل من عديدات الفينول والفلافونويدات وعموما له أنشطة مضادة للأكسدة منخفضة.

الكلمات الدالة: *Xylopia aethiopica*، عديدات الفينول، الفلافونويدات، الاجهاد التأكسدي، نشاط مضاد للأكسدة.

Abstract

Xylopia aethiopica (Xae) (the popular name is Guirani) is a medicinal plant that belongs to Annonaceae family, it is used in African folk medicine to treat rheumatism, bronchitis, asthma, stomach-aches along with a wide range of disorders. The aim of this study was to evaluate the antioxidant activity of Xae fruit's methanolic extract that was obtained by Soxhlet extraction with a yield of 38.5 %. The total phenolic contents were determined using Folin-Ciocalteu reagent (49.52 ± 2.68 µg GAE/mg ext). While, total flavonoid contents were determined using aluminum trichloride reagent (1.93 ± 0.06 mg QE/g ext). The antioxidant activity was evaluated using DPPH radical scavenging, ferrous iron chelating and ferric reducing antioxidant abilities as well as β-carotene bleaching assay. In DPPH radical scavenging test, the extract exhibited an IC_{50} of 0.14 ± 0.002 mg/ml, which is lower than that of BHT standard. Also, a low ability of ferrous chelating (1.33 ± 0.03 mg/ml) was observed compared to EDTA that have an IC_{50} of 0.006 mg/ml). Extract had a low ability to reduce ferric ion (EC_{50} = 0.07 ± 0.01 mg/ml) compared to ascorbic acid (EC_{50} = 0.05 ± 0.001 mg/ml). Xae extract showed a lower inhibitory activity of β-carotene oxidation with a value of 47.79 %, less effective than BHT (98.16 %). Based on these results, *Xylopia aethiopica* is a poor source for polyphenols and flavonoids and possesses, generally, low antioxidant activities.

Key words: *Xylopia aethiopica*, polyphenols, flavonoids, oxidative stress, antioxidant activity**.**

Résumé

Xylopia aethiopica (Xae) (le nom vernaculaire est Guirani) est une plante médicinale qui appartient à la famille des Annonaceae, elle est utilisée en médecine traditionnelle pour traiter les rhumatismes, bronchite, asthme, des troubles gastriques ainsi qu'un large éventail de troubles. Le but de cette étude est d'évaluer l'activité antioxydante de l'extrait méthanolique du fruit de Xae obtenu par extraction Soxhlet avec un rendement de 38.5 %. Les teneurs en polyphénols totaux ont été déterminées à l'aide du réactif Folin-Ciocalteu (49.52 ± 2.68 µg GAE/mg ext). Alors que les teneurs en flavonoïdes ont été déterminées à l'aide du réactif de chlorure d'aluminium (1.93 ± 0.06 mg QE/g ext). L'activité antioxydante a été évaluée en utilisant le test de piégeage des radicaux DPPH, la chélation du fer ferreux et le pouvoir antioxydant réducteur ferrique ainsi que le test de blanchiment du β-carotène. Dans le test de piégeage des radicaux DPPH, l'extrait a présenté une IC_{50} de 0.14 ± 0.002 mg/ml, qui est inférieure à celle du standard BHT. De plus, une faible capacité de chélation du ferreux (1.33 ± 0.03 mg/ml) a été observée par rapport à l'EDTA. L'extrait avait une faible capacité à réduire l'ion ferrique (EC_{50} = 0.07 ± 0.01 mg/ml) par rapport à l'acide ascorbique (EC_{50} = 0.05 ± 0.001 mg/ml). L'extrait de Xae a montré une activité inhibitrice plus faible de l'oxydation du bêta-carotène avec une valeur de 47.79 %, moins efficace que le BHT (98.16 %). D'après ces résultats, *Xylopia aethiopica* est une pauvre source de polyphénols et de flavonoïdes et possède, généralement, de faibles activités antioxydantes.

Mots clés: *Xylopia aethiopica*, polyphénols, flavonoïdes, stress oxydatif, activité antioxydante.

Abbreviations list

ABTS: 2,2’-azinobis(3-ethylbenzthiazoline)-6-sulfonic acid

AOS: Activated oxygen species

BHT: 2,6-di-tert-butyl-4-methyl phenol

BHT: Butylated hydroxytoluene

DPPH: 2,2'-diphenyl-1-picrylhydrazyl

EC50: Effective concentration

EDTA: Ethylenediamine tetra acetic acid

GAE: Gallic acid equivalent

GPx: Glutathione peroxidases

GSH: Reduced glutathione

GSSG: Glutathione disulfide

IC50: Inhibitory concentration

NDGA: Nordihydroguaretic acid

QE: Quercetin equivalent

RNS: Reactive nitrogen species

ROS: Reactive oxygen species

SOD: Superoxide dismutase

TFC: Total flavonoid content

TPC: Total phenol content

Xae: *Xylopia aethiopica*

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Xylopia aethiopica (Xae) est une plante médicinale qui appartient à la famille des Annonaceae, elle est utilisée en médecine traditionnelle pour traiter les rhumatismes, bronchite, asthme, maux de ventre ainsi qu'un large éventail de troubles. Le but de cette étude est d'évaluer l'activité antioxydante de l'extrait méthanolique du fruit de Xae obtenu par extraction Soxhlet avec un rendement de 38.5 %. Les teneurs en polyphénols totaux ont été déterminées à l'aide du réactif Folin-Ciocalteu (49.52 ± 2.68 µg GAE/mg ext). Alors que les teneurs en flavonoïdes ont été déterminées à l'aide du réactif de chlorure d'aluminium (1.93 ± 0.06 mg QE/g ext). L'activité antioxydante a été évaluée en utilisant le test de piégeage des radicaux DPPH, la chélation du fer ferreux et le pouvoir antioxydant réducteur ferrique ainsi que le test de blanchiment du β-carotène. Dans le test de piégeage des radicaux DPPH, l'extrait a présenté une IC_{50} de 0.14 ± 0.002 mg/ml, qui est inférieure à celle du standard BHT. De plus, une faible capacité de chélation du ferreux (1,33 ± 0.03 mg/ml) a été observée par rapport à l'EDTA. L'extrait avait une faible capacité à réduire l'ion ferrique (EC_{50} = 0.07 ± 0.01 mg/ml) par rapport à l'acide ascorbique (EC_{50} = 0.05 ± 0.001 mg/ml). L'extrait de Xae a montré une activité inhibitrice plus faible de l'oxydation du bêta-carotène avec une valeur de 47.79 %, moins efficace que le BHT (98.16 %). D'après ces résultats, *Xylopia aethiopica* est une pauvre source de polyphénols et de flavonoïdes et possède, généralement, de faibles activités antioxydantes.

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