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# Evaluation of Antioxidant Activity in Spineless Varieties of *Solanum melongena* L. Fruits

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## Abstract

*Solanum melongena* L. spineless variety is a Solanaceae of the genus *Solanum* whose fruit is used in the composition of several cultural dishes in West Cameroon and has many medicinal properties. The objective of this study was to evaluate the antioxidant power of this endemic eggplant for better valorization. We performed a characterization of the extracts according to Mane (2012), then antioxidant tests (carotenoids, polyphenols, DPPH test and ABTS) according to the methods described by: Sass *et al.* (2005), Chérifa (2014), Kim *et al.* (2002) and Bellili and Khenouce (2013). Phytochemical screening of aqueous fruit extracts of *Solanum melongena* L. spineless variety revealed the presence of alkaloids, tannins, saponins, flavonoids, triterpenes and sterols, anthocyanins and cardiotonic glycosides. For 100 g of *Solanum melongena* L. fruit, spineless variety, we have 21.03 ± 0.008 mg as total carotenoid content and 448 ± 0.002 mgEAG/100 g total polyphenol content for the aqueous extract. In addition, we noted that the presence of free radical anti-free radical compounds inhibits DPPH and ABTS radicals at the 50% equivalent concentrations respectively: (0.69 ± 0.002 mg/mL and 0.74 ± 0.002 mg/mL). The consumption of *Solanum melongena* L. spineless variety is said to be beneficial in the prevention and treatment of diseases related to oxidative stress.

***Key words:*** *Solanum melongena L., Chemical screening, Antioxidant activity*



## 1. Introduction

The Cameroonian flora, ranked 4th in Africa according to its biodiversity, is full of many plants that are used

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for both their culinary and therapeutic properties. They can help populations in the fight against undernourishment, the prevention and treatment of several human pathologies (Programme des Nations Unies pour l'Environnement: Février, 1997). Eggplant, a plant belonging to the Solanaceae family and the genus *Solanum*, is a fruit-vegetable that is used in the composition of several dishes and is of economic importance in Mediterranean and Asian countries. Found in America as well as in Africa, eggplants can be grown in a wide variety of climates (temperate, dry tropical or humid). It contains many cultivars that are distinguished by the color, size and shape of the fruit (Alla *et al.*, 2018). In Cameroon, *Solanum melongena* L. fruits species are used in several dishes. When ripe, the pulp of the fruit is fibrous; It has a fine texture and a bitter taste (Grubben and Denton, 2004). In terms of agri-food, eggplants are used in the preparation of soups (Charbel, 2007). They are used as spices in preparations such as yellow sauce and gooey sauce, which originated in the West and North-West regions of Cameroon (Tchiégang and Mbougueng, 2005). *Solanum melongena* L. is said to have medicinal properties conferred on its metabolites, hence the interest in evaluating its antioxidant potential in view of the extent of diseases related to oxidative stress. The present work aims to carry out a qualitative characterization of extracts and assays of the compounds of interest of *Solanum melongena* L. fruits spineless variety in order to valorize this plant,

## 2. Material and methods

- *Type of study:* We conducted an experimental study.
- *Study setting:* The study took place in the following structures and places:
  - Biochemistry Laboratory of the Faculty of Sciences of the University of Douala,
  - Animal Production and Nutrition Research Laboratory, and Laboratory of the Research Unit of Soil Analysis and Environmental Chemistry (ANLRSE) of the Faculty of Agronomy and Agricultural Sciences (FAAS) of the University of Dschang.
- Duration of the study: The study took place over 8 months, from August 25, 2021 to April 25, 2022.

### *2.1. Study material*

The plant material used consisted of *Solanum melongena* L. fruits, spineless variety identified at the National Herbarium of Yaoundé (Identification by comparison with the botanical collection of Swarbrick N°-2264, registered at the National Herbarium under N°-34757/HNC). These organs were harvested in August 2021 in Bagam in the Bamboutos Division in West Cameroon.

### *2.2. Methods*

- **Fruit harvesting and spraying:** The fruits of *Solanum melongena* L. spineless variety harvested in Bagam (West Cameroon) in August 2021 were stripped of their husks and dried in an oven at 45 °C for 4 days. The dehydrated fruit was pulverized using an electronic shredder.
- **Extraction:** We have chosen to use as an extraction method, the aqueous infusion which allows a solid material to be put in contact with a hot solvent in order to extract the different constituents of the drug. After bringing the water to a boil, two grams (powder) of *Solanum melongena* L. spineless variety was gently introduced into 50 mL of water and kept in contact for 30 min to 01 h in an Erlenmeyer flask. Then, filtration and drying in the oven followed.

#### *2.2.1. Qualitative characterization of Solanum melongena L. extracts of the spineless variety*

The presence of chemical groups was identified by colorimetric reactions (Mane, 2012).

- **Alkaloids:** Dragendorff's test described by Azzi (2012);
- **Tannins:** Stiasny's test described by Bentabet (2015);
- **Flavonoids:** Shinoda's test described by Azzi (2012);
- **Saponins:** Foam test described by Bentabet (2015);
- **Cardiac glycosides:** Keller Killiani test described by Yam (2009);

- Sterols and tri terpenes: Liebermann Buchard test described by Yam (2009);
- Anthocyanins: Test described by Mane (2012).

*2.2.2. Evaluation of antioxidant potential*

The following analyses were carried out:

- Dosage of total carotenoids: Method of Sass-Kiss *et al.* (2005).
- Determination of total phenols: Folin-Ciocalteux method (Wood *et al.*, 2002; Nabila and Nassima, 2013).
- Free radical testing with DPPH: method by Bentabet *et al.* (2014) and Bentabet *et al.* (2014).
- 2,2-azino-bis-3-ethylbenzothiazoline-6-sulfonic acid (ABTS) free radical acid test: Method described by Bellili and Khenouce (2013).

## 3. Data analysis

The analyses were carried out in 3 tests and the results recorded on Microsoft Excel 2016 are presented as a mean ± standard deviations. The results were subjected to the analysis of variances (ANOVA) and the T TEST was used for the comparison of the means, at the probability level of $p < 0.05$ using the GRAPHPAD PRISM version 7.0 software.

## 4. Results

### *4.1. Qualitative characterization of fruit extracts of Solanum melongena L. smooth variety*

Table 1 presents the chemical groups revealed by the aqueous extract of *Solanum melongena* L. spineless variety. Phytochemical screening of fruit extracts of *Solanum melongena* L. Spineless variety reveals the presence of Alkaloids, Tannins, Flavonoids, Saponins, Cardiotonic Glycosides, Triterpenes and Sterols, and Anthocyanins.

**Table 1: Phytochemical screening of *Solanum melongena* L. extracts of the spineless variety**

| Test | Aqueous extract |
|---|---|
| Alcaloïds | + |
| Tannins | + |
| Flavonoids | + |
| Saponins | + |
| Cardiac glycosides | + |
| Stérols/triterpenes | + |
| Anthocyanes | + |

**Note:** Presence +

### *4.2. Antioxidant potential*

*4.2.1. Total carotenoid content*

Table 2 shows the carotenoid content contained in 100 g of *Solanum melongena* L. powder the spineless variety. The reported values are mean ± standard deviations calculated from three separate analyses. For a given nutrient content, the averages with different lowercase letters within a line are significantly different ($p < 0.05$).

*4.2.2. Total polyphenol content*

From Table 3, we can see that *Solanum melongena* L. powder contains polyphenols. The reported values are

| **Table 2: Total carotenoid content of fruits of *Solanum melongena* L. spineless variety** |
|---|
| Total carotenoid content of fruits of *Solanum melongena* L.spineless variety |
| 21.03 ± 0.008[a] |

| **Table 3: Total polyphenol content fruits of *Solanum melongena* L. powder the spineless variety** | |
|---|---|
| Total polyphenol content (µgEAG/100 g of *Solanum melongena* L. powder the spineless variety | |
| Aqueous extract | 448 ± 0.002[b] |

mean ± standard deviations calculated from three separate analyses. For a given nutrient content, the averages with different lowercase letters within a line are significantly different ($p < 0.05$).

*4.2.3. Anti-free radical activity by the DPPH assay*

Table 4 Anti-free radical activity (DPPH assay) of *Solanum melongena* L. powder the spineless variety. The reported values are mean ± standard deviations calculated from three separate analyses. For each given sample, the means with different lowercase letters within a line are significantly different ($p < 0.05$). The aqueous extract of *Solanum melongena* L., spineless variety, inhibited the ABTS radical ($EC_{50}$ 0.74 mg/mL), indicating that it has anti-free radical activity.

| **Table 4: Presents the EC50 reflecting the inhibition of 50% of the DPPH radical** | |
|---|---|
| Anti-free radical activity $EC_{50}$ (mg/mL) | |
| Aqueous extract | 0.69 ± 0.002[b] |

## 5. Discussion

The phytochemical screening of the fruits of *Solanum melongena* L. spineless variety revealed in different proportions the presence of Alkaloids, Tannins, Flavonoids, Saponins, Cardiotonic Glycosides, Triterpenes and sterols, and Anthocyanins: Most of these molecules in synergy would be responsible for the antioxidant activities of the fruits. Similar results were obtained by Mandal (2010) and Boubekri (2014). The results obtained in our analysis corroborate those presented by Aubert *et al.* (1989) on *Solanum melongena* L. The same is true of the work of Mourchidath (2016) who confirmed the presence of flavonoids, saponosides, alkaloids, cardiotonic glycosides and tannins on *Solanum aethiopicum* L. a plant of the Solanaceae family very closely related to *Solanum melongena* L. The presence of these groups attests to the possibility of their antioxidant and/or anti-free radical activities of the eggplants consumed.

The results of our study indicate the presence of carotenoids in the fruit sample of *Solanum melongena* L. spineless variety. This carotenoid content obtained was higher than that found in the studies by Holland *et al.* (1991) and Maiani *et al.* (2009).

In 100 g of *Solanum melongena* L. fruit spineless variety, the aqueous extract showed a high content of total polyphenols (448 µgEAG), which indicates that the extract of *Solanum melongena* L., spineless variety, has antioxidant properties due on the one hand to the polyphenols present. In addition, our study revealed that fruit extracts of *Solanum melongena* L. spineless variety are endowed with anti-free radical properties following the inhibition of DPPH and ABTS radicals as shown by the work of Boubekri (2014).

## 6. Conclusion

The qualitative characterization of fruit extracts of *Solanum melongena* L. spineless variety revealed the presence of phytochemical groups (Alkaloids, Tannins, Flavonoids, Saponins, Cardiotonic Glycosides, Triterpenes and sterols, and Anthocyanins). Fruits have compounds with antioxidant properties such as polyphenols and carotenoids that have superoxide radical scavenging activity. The consumption of *Solanum melongena* L. spineless variety would be beneficial in the prevention of diseases related to oxidative stress.

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