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Investigations on Bioactive Compounds and In Vitro Biological Potent of *Corchorus olitorius*. L from Algerian Cultivar †

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Abstract: The evaluation of phytopharmaceutical, antioxidant and antimicrobial activities still a useful and interesting task, especially for unknown and less used medicinal plants in traditional herbal medicine. These plants represent new sources of active compounds. *Corchorus olitorius* Linn (Tiliaceae) is an important cultivated edible plant in many Arab countries such as Egypt or Sudan, and extreme east of Algeria, it is used for the preparation of a very popular hot soup (called Molokhia). In West Algeria, this plant is reported to be used, for the first time, for medicinal purposes. In the present study, polyphenols potential and in vitro biological activities of cultivated *Corchorus olitorius*. L leaves and seeds from the Grand Constantinois region (North-east Algeria) are investigated and some preliminary results exhibit an interesting DPPH free radical scavenging potential and antibacterial and antifungal activities for studied plant proportional to richness in secondary metabolites.

Keywords: Edible plants; bioactive compounds; antioxidant activity; antimicrobial activity; soil toxicity phytoremediation

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1. Introduction

Corchorus olitorius L. (Tossa jute) is a widely cultivated fibrous species with important physiological characteristics including quick growth and great biomass [1–3], a deep rooting system, and tolerance to metal stress which is an interesting phytoremediation potential Although several excellent investigations have been done on jute in metal-contaminated soil [4–10], in addition to fiber -reinforced composites area [3,8,11].

Corchorus olitorius L. is cultivated throughout tropical Asia and Africa and is one of the traditional plants that have the potential to be used for medicinal purpose. Their leaves are also consumed for their nutritive and medicinal values [12]. Several studies reported that Tossa jute had antiviral, antibacterial and antioxidant activities [13–15], due to its high amounts of vitamin E, β-carotene, ascorbic acid, α-tocopherol, glutathione, phenol compounds and polysaccharides [16–19], which had interesting functional proprieties and enhanced the appearance, texture and flavor of yogurt [20], and also evaluate the its phytoremediation potential on heavy metals toxicity above the normal threshold constitutes a threat to humanity and biodiversity by cleaning polluted sites through the use of plants.

In the present work *Corchorus olitorius* was considered because it is a popular nutritious leafy vegetable crop, it is consumed virtually in the whole continent of Africa, Japan and China… and in view of the global economic recession, cheaper options are considered for the treatment of industrial wastewater. Therefore, this plant could also serves as a more sustainable means of waste water treatment and remediation.

2. Experiments

2.1. Plant Materials

Corchorus olitorius L. was harvested during the 2017' summer, in the Grand Constantinois region.

All used chemicals are of analytical quality, and strains ATCC referenced.

2.2. Extraction

After the plant leaves and seeds are harvested, perfectly cleaned and dried in dark place, it is grounded into powder using a mortar and a pestle, then extracted for 2 h with Sohxlet apparatus and ethanol as extraction solvent.

Each percolate is filtered using a Whatman paper N°4, and evaporated at 40 °C under reduced pressure, maintained with a vacuum pump, to give the crud ethanol extracts conserved aseptically in the freezer for future uses in the quantitative analysis.

Yields are calculated according to the following formula:

$$\text{Yield \%} = (\text{Crude extract mass/powder mass}) \times 100$$

2.3. Total Polyphenols Content

0.2 mL of each sample was firstly mixed with 1 mL of diluted Folin–Ciocalteu reagent (5/10 H_2O) by vortexing. After that, 0.75 mL of Na_2CO_3 (7.5%) are added. Then, the reaction mixtures are further incubated for 2 h at room temperature in the dark, and finally, the absorbed optical density is recorded at the wavelength of 765 nm [21,22].

2.4. Total Flavonoid Content

0.4 mL of diluted sample with 1 mL ethanol is separately mixed with 1 mL of 2% aluminum chloride methanol solution. After incubation at room temperature for 15 min, the absorbance of the reaction mixture is measured at 430 nm with spectrophotometer [23].

2.5. The Antioxidant Activity Analysis

The DPPH scavenging activity was evaluated according to Blois method [24]. 160 µL of DPPH methanol solution (6 mg/100 mL) were added to 40 µL of extracts, the mixture was then incubated for 30 min in the dark at room temperature. The absorbance was measured at 517 nm. A blank of 40 µL of methanol with 5 mL of DPPH solution was used as negative control. α-tocophérol, BHT and BHA were used as positive controls.

2.6. The Antimicrobial Activity Analysis

The antimicrobial susceptibility and resistance tests of our extracts were carried out according to the Agar disk-diffusion testing developed in 1940 [25].

Discs (Whatman No. 1, 6 mm diameter) are impregnated with each extract and then applied to the surface of the agar plates which have been seeded by spreading the microbial suspension. The seeding is carried out in such a way to ensure a homogeneous distribution of the bacteria. The petri dishes are incubated during 24 h at the appropriate temperature 37 °C in the laboratory oven, and the resulting inhibition zone diameter was measured in millimeters using a ruler.

Antimicrobial activity is determined in terms of the diameter of the inhibition zone produced around the discs.

2.7. Statistical Analysis

Sampling and analyses were performed in triplicate, and the data are presented as mean ± standard deviation (S.D.). Statistical analysis was performed using Microsoft Office Excel 2008 ($p < 0.05$).

3. Results and Discussion

3.1. Total Phenol and Flavonoid Compound Content Results

The total phenol content shows total polyphenols content of (20.2 ± 0.01) and (6.375 ± 0.00) μg EGA/mg DE for leaves and seeds extracts respectively.

For total flavonoids content, (14.05 ± 0.00) μg QE/mg is reported for leaves extract.

3.2. Evaluation of Biological Activities

3.2.1. Antioxidant Activity

The antioxidant capacity of *Corchorus olitorius L. leaves ethanol* extract was determined using DPPH free radical scavenging test potency (IC50 = 86.4 ± 0.01 μg/mL, EC50 = 0.017 ± 0.5 μg/μg DPPH, APR = 58 ± 0.08%) which is close to referential used standard ascorbic acid (IC50 = 110 ± 0.00 μg/mL, EC50 = 0.022 ±0.04 μg/μg DPPH, APR = 45.45 ± 0.8%) which is in agreement with obtained total phenols content.

IC50% is defined as antioxidant concentration required to reduce 50% of initial free radicals concentration, and to better evaluate it two factors were calculated

- EC50 which take in consideration DPPH concentration in the reaction medium [effective concentration at 50%, EC50 = (IC50/μg of DPPH/mL)].
- Antiradical power factor (APR) which is inversely proportional to EC50

3.2.2. Antimicrobial Activity Results

- **Antibacterial test**

The diameters results of the growth inhibition zones exhibit an important antibacterial potential, at low concentrations, thus we noticed:

- 20 mm of inhibition zone for *Bacillus subtilis* treated with 100 μg/mL of leave extract,
- 22 mm of inhibition zone for *Staphylococcus* aureus treated with 50 μg/mL of leave extract,
- 16 mm of inhibition zone for *Escherichia coli* treated with for 25 μg/mL of leave extract.

Gentamicin (10 μg/disc) and Nalidixic (30 μg/disc) were used as positive control.

- **Antifungal activity test**

Antifungal activity against *Trichoderma harzianum Rifai* reveal that there is no inhibiting potential against studied strain which is resistant to plant leave extract even at high dose.

4. Conclusions

In the present work an edible cultivated plant *Corchorus olitorius.* Linn leaves and seeds methanol percolate was investigated through its in vitro antioxidant and antimicrobial activities assessment. Qualitative and quantitative analysis methods were used: Sohxlet extraction, thin layer chromatography (TLC) and UV spectroscopy. The antioxidant effect of studied plant was evaluated by the reaction between DPPH free radical scavenging, the antimicrobial effect was evaluated by disk diffusion method for one bacteria Gram (-): *Escherichia coli*: ATCC25922, and two bacteria Gram (+) *Staphylococcus aureus*: ATCC 25923, *Bacillus subtilis* ATCC 6633 and on a fungus: *Rhizopus oryzae*: M491890.1). This functional food may, therefore, be considered as natural preservatives against food-borne pathogens that may be useful in foods and for protecting human health.

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