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*Proceeding Paper*

# Antioxidant and Anti-Inflammatory Activities of Ethanol Extract from *Daucus crinitus Desf* †

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**Abstract:** Oxidative stress, a key factor in triggering inflammation, plays a central role in the development of various aging-related diseases, including cancer, Parkinson's, and Alzheimer's. In this context, plant phenolics represent a major group of bioactive compounds that act as primary antioxidants, effectively scavenging free radicals and mitigating oxidative damage, thereby helping to counteract these pathological processes. The objective of this work was to examine the phytochemicals present in the ethanol extract of the aerial parts of *Daucus crinitus Desf*. and to evaluate their anti-inflammatory and antioxidant activities. Phytochemical screening of the ethanol extract revealed the presence of various chemical groups, including tannins, flavonoids, phenolic acids, and coumarins. The biological activity assessment demonstrated that the ethanol extract exhibited promising antioxidant and anti-inflammatory properties. *Daucus crinitus* may be a valuable source of bioactive molecules with potential antioxidant and anti-inflammatory benefits.

**Keywords:** *Daucus*; extract; anti-oxidant; anti-inflammatory

## 1. Introduction

In recent years, there has been increasing interest in medicinal plants as an alternative to synthetic drugs, particularly in addressing oxidative stress [1]. Although synthetic antioxidants have been commonly used in pharmaceuticals, agro-food, and cosmetics to mitigate oxidative stress-related mechanisms, their long-term use is suspected of having carcinogenic, teratogenic, and mutagenic effects [2]. In contrast, many natural products have been reported to contain significant levels of antioxidants beyond vitamin C, vitamin E, and carotenoids [3], which can delay, intercept, or prevent oxidative reactions catalyzed by free radicals [4]. This antioxidant activity is mainly attributed to phenolic compounds, such as flavonoids [5], phenolic acids, and phenolic diterpenes. Free radicals, reactive oxygen species (ROS), and reactive nitrogen species (RNS) are associated with various pathologies, including inflammation, metabolic disorders, and cellular aging [6].

Plants from the Apiaceae family are commonly utilized for food, flavoring, fragrance, and medicinal purposes, and have been used as household remedies since antiquity. Recently, many experimental and biological studies have been conducted to validate the ethnomedicinal claims associated with these plants [7].

*Daucus* is a genus in the Apiaceae family, consisting of about 600 species that are widely distributed across the world [8]. In Algeria, species of the *Daucus* genus are commonly found in dry, uncultivated areas. Among these, *D. crinitus Desf*. syn. and D. meifolius Brot. are widespread along the western Algerian coast, from Tlemcen to Mascara. *D. crinitus* is notable for its numerous subspecies that colonize sandy and Cliffside habitats [9].

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The aim of the study was to examine the phytochemical composition of *Daucus crinitus* and assess the antioxidant and anti-inflammatory activities of its ethanol extract.

## 2. Results and Discussion

In recent years, a global trend has emerged towards the use of natural phytochemicals found in fruits and vegetables [10]. Some plant extracts and phytochemicals are recognized for their antioxidant properties, which could play a significant role in medical applications [11]. Table 1 presents the compounds identified in the ethanol extract of *Daucus crinitus*, including tannins, flavonoids, phenolic acids, and coumarins.

**Table 1.** Phytochemical prospections of ethanol extract of *Daucus crinitus*.

| Chemical Family | Flavonoids | Alkaloids | Tannins | Phenolic | Coumarins |
|---|---|---|---|---|---|
| Ethanol extract | + | − | + | + | + |

All repeated tests have revealed the same result. −: absence, +: presence.

### *2.1. DPPH Free Radical Scavenging Assay*

The antioxidant activity was assessed using the DPPH free radical scavenging method, with BHT serving as a positive control. The half-maximal inhibitory concentration (IC50), which represents the concentration required for 50% inhibition of DPPH in the test solution, was determined. The ethanol extract exhibited superior antioxidant activity compared to BHT, with an IC50 of 0.56 mg/mL, whereas BHT had an IC50 of 0.63 mg/mL (Figure 1).

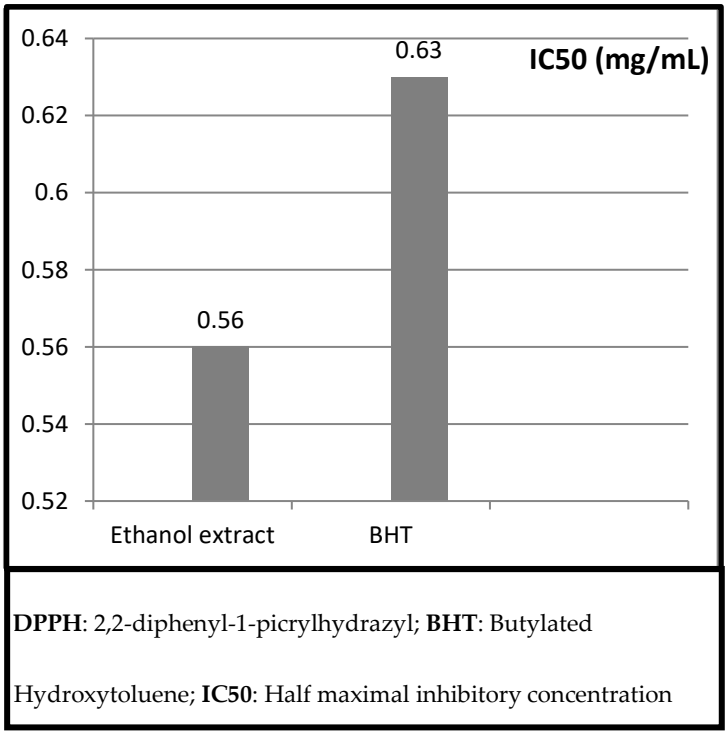


**Figure 1.** IC50 of ethanol extract and BHT by the DPPH• test.

### *2.2. Ferric Reducing Antioxidant Power Assay*

The FRAP assay is a widely used method that evaluates antioxidant capacity by utilizing antioxidants as reductants in a redox-linked colorimetric reaction, wherein $Fe^{3+}$ is reduced to $Fe^{2+}$. Figure 2 shows the reducing power of the ethanol extract. The ethanol extract exhibited a notable reductive effect that increased with concentration, demonstrating greater reducing power compared to the synthetic antioxidant BHT.

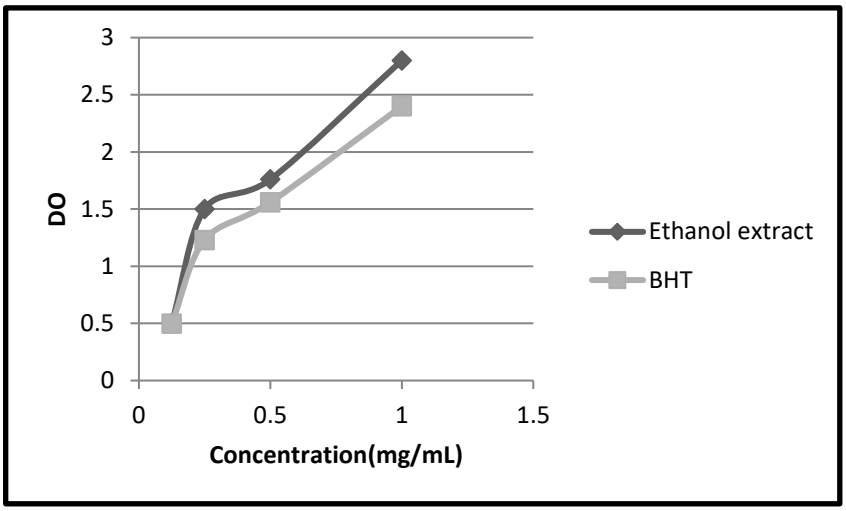


**Figure 2.** Ferric-Reducing Antioxidant Power Assay of ethanol extract and BHT (butylated hydroxytoluene).

*2.3. Anti-Inflammatory Activity*

The anti-inflammatory potential of the ethanol extract was assessed using the albumin denaturation method, which measures the extract's ability to prevent protein denaturation. The extract demonstrated an anti-inflammatory activity comparable to that of diclofenac (IC50 = 0.51 mg/mL), with an IC50 value of 0.69 mg/mL (Figure 3).

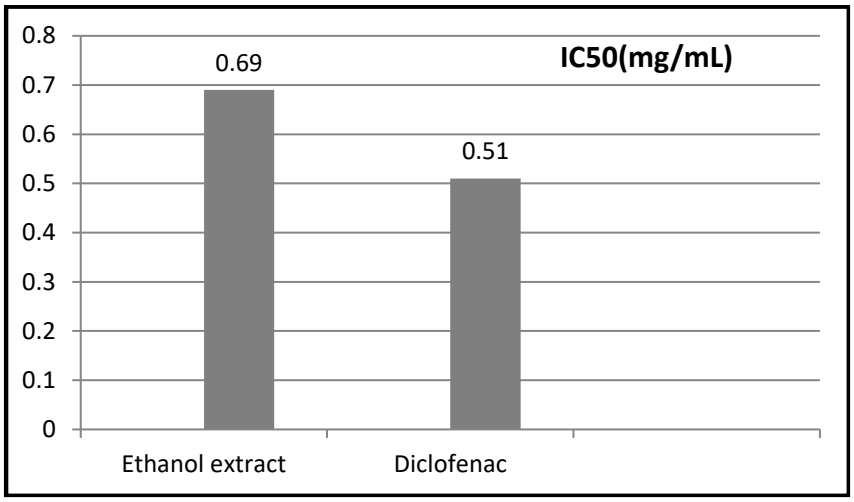


**Figure 3.** IC50 (Half maximal inhibitory concentration) values determined through egg albumin test.

## 3. Materials and Methods

*3.1. Plant Material and Extract Preparation*

The aerial parts from *D. crinitus* was harvested in April 2023, in tlemcen, Algeria.

The aerial parts of *D. crinitus* (20 g) were macerated in ethanol at room temperature for 5 days. The macerate was then filtered under vacuum, yielding an extract with a 2% yield.

*3.2. DPPH Free Radical Scavenging Assay*

The free radical-scavenging activity was measured using the DPPH test, as described in the literature [12]. A series of dilutions with varying concentrations (0.125 to 2 mg/mL) was prepared. Subsequently, 1000 µL of each concentration was mixed with 1000 µL of

0.004% DPPH solution. After a 30-min incubation period at room temperature, the absorbance was measured at 517 nm using a spectrophotometer. BHT was used as the standard, the percentage inhibition of DPPH free radicals (I %) was calculated as follows:

$$(\%\ \mathrm{I}) = \frac{Ac-At}{\mathrm{Ac}} \times 100$$

where: Ac is the absorbance of the control; At is the absorbance of the test.

*3.3. Ferric Reducing Antioxidant Power Assay*

The ferric reducing antioxidant power (FRAP) was assessed as described earlier [13]. Different concentrations of the extract dissolved in ethanol were mixed with 2.5 mL of phosphate buffer (pH = 6.6) and 2.5 mL of potassium ferricyanide. The mixture was then incubated at 50 °C for 20 min. After incubation, 1.25 mL of 10% trichloroacetic acid was added. The mixture was shaken vigorously and then mixed with 2.5 mL of distilled water and 0.5 mL of 0.1% ferric chloride. After a further 30 min of incubation, the absorbance was measured at 700 nm. BHT was used as the reference standard.

*3.4. Anti-Inflammatory Activity*

The anti-inflammatory activity in vitro was assessed using the protein denaturation method, with diclofenac as the reference. The reaction mixture consisted of 2 mL of different dilutions of the ethanol extract or control (distilled water) and 2.8 mL of phosphate-buffered saline (PBS, pH 6.4) mixed with 0.2 mL of egg albumin. The mixture was incubated at 37 °C for 15 min. Protein denaturation was then induced by heating the mixture in a water bath at 70 °C for 5 min. After cooling, the absorbance was measured at 660 nm. The percentage inhibition of denaturation was calculated using the following formula:

$$\%\ \text{inhibition} = [\mathrm{At/Ac} - 1] \times 100$$

where: Ac = absorbance at 660 nm of control; At = absorbance at 660 nm of samples.

## 4. Conclusions

This study validates the in vitro antioxidant and anti-inflammatory potential of the ethanol extract of *Daucus crinitus*, demonstrating activity levels comparable to those of standard reference compounds such as BHT and diclofenac. Given these promising results, the extract may be considered a potential natural source for developing additives in the food and pharmaceutical industries, offering an alternative to synthetic compounds for enhancing health benefits and mitigating oxidative stress and inflammation.

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**Conflicts of Interest:**

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