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Glutathione Peroxidase Activity in Crude Extract and Fractions of Solanum nigrum Berries

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Abstract

Crude aqueous extracts and fractions of *Solanum nigrum* berries were prepared using standard methods from berries harvested in both metropolitan and rural areas of Enugu, Nigeria. The extracts exhibited significant glutathione peroxidase activity, an important antioxidant enzyme. This antioxidant activity suggests the potential of *Solanum nigrum* berries as a valuable resource for developing local remedies for infections in these communities. These findings highlight the therapeutic potential of this plant, particularly in regions where traditional treatments are commonly used.

Keywords: Solanum nigrum; Glutathione peroxidase; Oxidative stress; Aghara; Black night shade

Introduction

The plant, *Solanum nigrum*, otherwise known as Black night shade or Aghara in Igbo language, is short-lived perennial shrub found in many farm lands, wooded area as well as disturbed habitats. It is a cosmopolitan wild plant with global distribution [1, 2]. This plant is widely recognized for its nutritional and medicinal properties.

Studies have shown that *Solanum nigrum* berries contain significant amounts of essential nutrients, including iron, calcium, vitamins B1, B2, B6, C, and carotenoids [2, 3]. The ripe fruits are utilized in culinary preparations such as pies and jams [4]. Despite these known uses, there is limited data on

its potential antioxidant activity, particularly in relation to glutathione peroxidase (GPx), an enzyme essential for protecting cells from oxidative stress.

GPx is a family of selenium-containing enzymes that catalyze the reduction of hydrogen peroxide and lipid peroxides into water and their corresponding alcohols, respectively [5]. This activity plays an important role in maintaining cellular redox homeostasis and preventing oxidative damage [6]. Given the medicinal reputation of *Solanum nigrum*, the objective of this study was to evaluate its GPx activity as a measure of its antioxidant potential.

Materials and Methods

Sample Preparation

Fresh *Solanum nigrum* berries were harvested metropolitan and rural arears of Enugu. It was identify by the Department of Botany, University of Nigeria, Nsukka. The freshly harvested plant was cleaned, and dried at room temperature. The dried berries were pulverized, and the powder was soaked in distilled water at a 1:10 (w/v) ratio for 48 hours at room temperature with occasional stirring. The mixture was filtered, and the filtrate was concentrated using a rotary evaporator. The resulting extract was stored at 4°C for subsequent analysis. Aqueous extraction and fractionnization were conducted the Project Development Institute (PRODA), Enugu, Nigeria, and the Southeast zonal laboratory of National Agency for food and drug Administration and control (NAFDAC), Agulu, Anambra State, resppectively, Nigeria following standard extraction procedures [2].

Determination of GPx Activity

GPx activity was determined using the method described by Rotruck et al [5]. In this assay, the reduction of hydrogen peroxide by GPx oxidizes reduced glutathione (GSH). The decrease in GSH levels was monitored spectrophotometrically at 412 nm using Ellman's reagent. The assay mixture contained 50 mM phosphate buffer (pH 7.0), 1 mM EDTA, 1 mM sodium azide, 0.2 mM NADPH, 1 unit of glutathione reductase, 2 mM GSH, and varying concentrations of the *Solanum nigrum* extract. The reaction was initiated by adding 0.5 mM hydrogen peroxide. GPx activity was expressed as μmol of GSH consumed per minute per milligram of protein.

Statistical Analysis

All experiment were performed in triplicate. Data were analyzed using Student's t-test, and results were expressed as mean ± standard error (SE). Statistical significance was set at $p < 0.05$.

Result

Antioxidant Activity

The GPx activity levels of the aqueous extract of *Solanum nigrum* and the control are summarized in Table 1.

Parameter	*Control (μmol/min)*	*Test (μmol/min)*	*P-value*
GPx Activity	0.88 ± 0.03	0.93 ± 0.01	<0.05

Table 1: GPx Activity of Solanum nigrum Extract Compared to Control.

The GPx activity of the *Solanum nigrum* extract was significantly higher than the control ($p < 0.05$), suggesting enhanced antioxidant potential.

Discussion

The findings of this study demonstrate that *Solanum nigrum* possesses significant GPx activity, which aligns with its traditional use as a medicinal plant. GPx is an important antioxidant enzyme that neutralizes hydrogen peroxide and lipid peroxides, thereby protecting cells from oxidative stress-induced damage [2, 5].

The observed increase in GPx activity may be attributed to the phytochemical composition of *Solanum nigrum*, which includes polyphenols, flavonoids, and other antioxidant compounds. These compounds likely contribute to the scavenging of reactive oxygen species and the activation of antioxidant defense systems.

This study corroborates previous reports highlighting the nutritional and medicinal value of *Solanum nigrum* [2, 3]. However, the exact mechanism by which the plant enhances GPx activity requires further investigation. Studies focusing on isolating and characterizing specific bioactive compounds responsible for this activity are warranted.

Conclusion

The aqueous extract of *Solanum nigrum* exhibits significant GPx activity, indicating its potential as a natural antioxidant. These findings provide a scientific basis for the traditional use of *Solanum nigrum* in managing oxidative stress-related conditions. Future research should focus on detailed phytochemical analysis and in vivo studies to fully elucidate its therapeutic potential.

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