

## REVIEW ARTICLE

# Synthesis and Antioxidant Properties of Organoselenium Compounds

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**Abstract: Background:** The chemistry of organoselenium reagents provides an asset for organic synthesis. The versatility of these reagents as electrophiles and nucleophiles makes them one of the key components of organic synthesis. Various synthetic transformations such as oxyselenenylations, selenocyclization and selenoxide elimination have been successfully achieved using organoselenium reagents under mild reaction conditions. The presence of selenocysteine in a few mammalian enzymes was the key information for selenium chemists to explore the biochemistry of selenium compounds. Glutathione peroxidase (GPx), a mammalian selenoenzyme, is well known for maintaining redox equilibrium by detoxifying reactive oxygen species.

**Objective:** The aim is to critically analyze the recent development and prospects of synthesis and antioxidant properties of organoselenium compounds.

**Methods:** In this review, we summarised research and review papers from the PubMed and Scopus databases. The primary themes were linked to the synthesis of organoselenium compounds and their capacity to maintain cellular redox equilibrium when exposed to oxidative stress.

**Results:** The study reveals that diselenide compounds synthesised by various methods showed a better antioxidant activity profile compared to selenides. In a few cases, the activity was found better than the standard compound ebselen. Moreover, the synthesis and antioxidant activity of Selenium-based nanoparticles have been also included.

**Conclusion:** In the past two decades, various biological properties of organoselenium compounds have been extensively studied, including the antioxidant properties. This review article will give insight into the synthesis of different types of recently synthesised organoselenium compounds. The review would be helpful to the researchers working in the field of medicinal chemistry in directing the synthesis of new organoselenium compounds as antioxidants.

**Keywords:** Organoselenium, antioxidant activity, GPx mimics, diselenides, selenides, enzymes.

## 1. INTRODUCTION

The history of organoselenium reagents is quite old and the first organoselenium compound was discovered

in 1836. The progress of selenium chemistry was quite slow despite this early discovery in this area. In the mid-1970s, organoselenium chemists received particular attention due to the discovery of selenoxide elimination [1, 2]. Organoselenium reagents have been successfully employed to achieve various synthetic transformations using either stoichiometric or catalytic amounts under mild reaction conditions [3, 4]. In the past two decades, organoselenium compounds have received significant attention in the field of medicinal

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