In vitro Assessment of Total Bioactive Contents, Antioxidant, Anti-Alzheimer and Antidiabetic Activities of Leaves Extracts and Fractions of *Aloe vera*

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ABSTRACT

The present work was conducted to evaluate the quantitative analysis of the leaves of Aloe vera and to evaluate their potential antioxidant, anti-Alzheimer and antidiabetic properties in vitro. The acetone extract, methanolic extract and its four fractions were subjected to quantitative determination of polyphenol, flavonoid, flavonol, condensed tannin and hydrolysable tannin contents. Then, the antioxidant properties of all extracts and fractions were evaluated by using DPPH free radical scavenging, ABTS cation radical decolorization, Cupric Reducing Antioxidant Capacity and Metal Chelating Activity assays. Anti-Alzheimer activity was tested against acetylcholinesterase and butyrylcholinesterase enzymes using the Ellman method. The antidiabetic activity was evaluated by using Alpha-Glucosidase Inhibition Assay. The acetone extract showed the highest amount of total phenolic content (TPC), total flavonoid content (TFC), flavonol content (FLC) and total condensed tannins content (TCTC) compared to others extracts and fractions. The water fraction exhibited the low content of TFC, TPC and FLC. The content of total hydrolysable tannins (THTC) varied from 0.94 ± 0.01 to 1.22 ± 0.02 µg TAE/mg extract. The methanolic extract exhibited highest antioxidant activity in all tests (IC_{50} value: 24.21±0.30 µg/mL in DPPH assay, IC_{50} value : 30.75±1.67 µg/mL in ABTS assay, IC_{50} value: 140.99±2.95 µg/mL in metal chelating activity, and

IC_{50} value: 17.50±0.47 µg/mL in CUPRAC assay). Furthermore, the n-butanol fraction indicated the highest BChE inhibitory activity (IC_{50} value: 79.61±2.41 µg/ml) and the good α-glucosidase inhibitory activity (IC_{50} value: 40.75±0.06 µg/ml). These results showed that Aloe vera leaves, can be used in food and pharmaceutical industries as natural antioxidants, as well as moderate anti-Alzheimer and antidiabetic agents.

Keywords: *Aloe vera*, Antidiabetic, Anti-Alzheimer, Antioxidant, Extract, Phenolic

INTRODUCTION

The use of traditional medicine is as old as human, civilization and in many regions of the world is still the primary source of health care. Ayurvedic medicine in India, for example, is still commonly practiced, with approximately 85% of Indians using crude plant preparations for the treatment of various ailments and diseases (Kamboj, 2000). Even in Western civilizations, plants play an important role in medicine. At least 25% of pharmaceuticals prescribed worldwide are directly obtained from plants with many more drugs being semi-synthetic derivatives of natural plant precursors (Hostettmann and Hamburger, 1993; Walsh, 2003). Approximately 119 pure chemical substances extracted from higher plants are used in medicine throughout the world (Hoareau and Dasilva, 1999). Examples of medicinally important plant-derived compounds include the anticholinergic drug atropine derived from plants of the family *Solanaceae* (*Atropa belladonna*, *Datura stramonium* and *Mandragora officinarum*), the analgesics morphine and codeine (from *Papaver somniferum*), the anti-malarial drug quinine and its derivatives (from *Cinchona* spp.), the anticancer drug taxol (derived from *Taxus brevifolia*) (Gilani and Rahman, 2005).

Plants have the capacity to synthesize a large variety of secondary metabolites that are used to perform important biological functions. Since ancient times, many plants have been used for the treatment of many diseases related to the toxic effects of oxidants. Oxidative stress is responsible for several diseases, such as atherosclerosis, arthritis, cardiovascular disorders, Alzheimer's disease and canser (Halliwell, 1999). Alzheimer's disease is the severe form of dementia, and the acetylcholinesterase (AChE) inhibitor drugs are used to treat Alzheimer's disease. Most of these drugs cause liver and bradycardia, intestine toxicities and stomach (Dökmeçi, 2000). The synthetic antioxidants can induce many side effects, for these reasons, the improvement and handling of safe anticholinesterases and antioxidants from nature are desired. As one of the most important secondary metabolites, phenolic compounds are widely investigated in many medicinal plants. The beneficial effects of phenolic compounds in human life is attributed to their antioxidant activity that mainly due to their redox