Chapter 9
The Chemical Constituents, Anti-Inflammatory, Anti-Oxidant, and Ethnomedicinal Properties of Aloe barbadensis

Dickson Adom
Kwame Nkrumah University of Science and Technology, Ghana

Paul Appiah Sekyere
Kwame Nkrumah University of Science and Technology, Ghana

Mohan Kumar Krishnappa
Tamil Nadu Agricultural University, India

ABSTRACT

Aloe vera is a perennial, drought-resisting, succulent plant belonging to the Asphodelaceae family that has a long history of having many tremendous medicinal and anti-inflammatory as well as anti-bacterial properties. This chapter highlights the great potentials of the aloe vera species. Desk study and document analysis guided the systematic and extensive review of both published and unpublished resources on the Aloe vera Species. The chapter contends that horticulturists and plant scientists in the field of agriculture and medicine must pay attention to the Aloe vera as a medicinal plant that possesses the most powerful antibacterial and anti-inflammatory properties, which protects the body against constipation through enhancing the body metabolism, skin, and worm infestations.

INTRODUCTION

Aloe vera is a spiky cactus-like xerophytes clump forming perennial, drought-resisting, succulent plant with thick fibrous root (Ahlawat & Khatkar, 2011) belonging to the Asphodelaceae family. Specifically, the Aloe species is a member of the tree Lily family together with onion, garlic and turnip (Pandey
& Singh, 2016). In terms of physiology and phenology, Aloe vera belongs to a large class of plants known as “xeroids” characterized for its ability to close its stomata completely to avoid loss of water. This adaptation allows the Aloe vera plants to survive long and extreme drought periods (Akinyeye & Odiyi, 2007). The Aloe vera plant has been mentioned throughout history and has been ranked as one of the leading and all-purpose plants in the world (Bai, Deva, Madan, & Sharma, 2013). Ahlawat and Khatkar (2011) contend that the popularity of Aloe vera is initiated by naturopaths, yag gurus, alternative medicine promoters and holistic healers. The name, Aloe, is derived from the Arabic “alloeh” or Hebrew “halal” meaning bitter shiny substance. Aloe vera is a species of Aloe that is particularly popular for its medicinal properties and as such is often referred to as the miracle plant (Shende & Telrandhe, 2017). In Ayurveda, Aloe is referred to as ‘Kumari’ meaning ‘young girl’ because it is believed among the Indians as giving users of products from them, youthful vigor, energy and vitality. Greek scientists regarded Aloe vera as the universal panacea and the Egyptians call Aloe the plant of immortality” (Itrat & Zarnigar, 2013). It has a vast traditional role in indigenous system of medicine like homoeopathy (Baby & Justin, 2010). Aloe vera (Aloe barbadensis Miller) is a perennial plant of the Xanthorrhoeaceae family (USDA, 2012). It has been designated its own family, known as Aloeaceae (Eshun & He, 2004). This plant grows well in dry conditions which pretty much get sunlight (Kumar & Yadav, 2014). Aloe vera species cannot thrive in frost or freezing temperatures but only in warm tropical areas (Pandey & Singh, 2016). Aloe vera species can be found in Mexico, Pacific Rim countries, Central America, South America, The Caribbean, Australia, India and Africa.

According to the world checklist of selected plant species, the genus Aloe contains over 550 species (Royal Botanic Garden Kew, 2013). Aloe barbadensis, Aloe arborescens, and Aloe chinensis are the most popular. Aloe barbadensis Miller is considered the most biologically active species (Bozzi, Perrin, Austin, & Arcevera, 2007). However, only two species, Aloe barbadensis Miller and Aloe aborescens Miller are grown commercially (Sanjit & Tushar, 2018).

The leaves of the Aloe plant grow from the base in the rosette pattern. Mature plants can grow as tall as 2 and a half inches to 4 feet with the average being around 28 to 36 inches in length. Each plant usually has at least 12 leaves that, when fully matured, weighs up to three pounds (Pandey & Singh, 2016). Each leaf is composed of three layers: An inner clear gel that contains 99% water and rest is made of glucomannans, amino acids, lipids, sterols and vitamins. This Aloe vera gel is transparent and colorless, slippery mucilage that is produced by the thin-walled tubular cells in the thin-walled tubular cells in the inner central part (parenchyma) of the Aloe vera leaf ((Chatterjee, Chakraborty & Nandy, 2013). The middle layer contains the latex which is the bitter yellow sap and contains anthraquinones and glycosides. The outer thick layer of about 15 to 20 cells called rind has protective function and synthesizes carbohydrates and proteins (Nandal & Bhardwaj, 2012). The Aloe plant is said to be disease free though occasionally, black spots may occur in the upper surface because of fungal infection or soft rotting (Pardeshi & Tapar, 2016). In terms of phytochemistry, the dry matter basis of Aloe gel consists of lipid-4%, phenolic compounds-1%, proteins-7%, minerals-16%, polysaccharides-55%, and sugar-17% (Ahlawat & Khatkar, 2011). Acemannan is the major carbohydrate fraction in the gel and it is made up of water soluble long chain mannose polymer which demonstrates antineoplastic and antiviral effects (Bai et al., 2013).

The best time to cultivate Aloe vera in the year is from March to June and it grows well in coarse sandy loam soils with pH ranging from 7.0 to 8.5 (Maiti & Chandra, 2002). Aloe vera grows best in sunshine conditions with little amount of water for its establishment, growth and reproduction. The plant is highly adapted to areas with mean annual rainfall in the range 700 mm to 3000 mm. The plant thrives