BIOACTIVE COMPOUNDS IN JAMUN (*SYZYGIUM CUMINI* L.) ENSURING NUTRITIONAL SECURITY

Abstract

The jambolan fruit is well-known for the high concentration of bioactive phenolic compounds that it contains. These compounds show potential for improving the health of humans. The jambolan plant includes a range of phenolic compounds in addition to tannins. These phenolic compounds include phenolic acids, flavonoids (primarily anthocyanins, flavonols, flavanols, and flavanonols), and flavonol glycosides. Tannins are also present in the jambolan plant. Although a significant portion of the plant's resources are used in forestry and fruit propagation, the jambolan fruit has attracted a lot of attention due to the benefits that it is said to have, including those that are neuropsychopharmacological, nephroprotective, and anti-diarrheal. Anthocyanins, most notably delphinidin, petunidin, and malvidin, are present in significant numbers in the skin of the fruit, particularly in their glycosylated forms. This is notable since these anthocyanins give the fruit its distinctive color. On the other hand, the fruit pulp is mostly composed of phenolic acids such as gallic acid and ellagic acid, in addition to tannins. In addition, the leaves, skin, and pulp of the jambolan fruit include other chemicals, such as flavonoids such as quercetin and myricetin. These substances can be found in the jambolan fruit. These phenolic compounds have been linked to a wide variety of health advantages, including but not limited to anti-inflammation, anti-allergy, management of blood sugar, cancer prevention, cardiovascular health, support for radiation therapy, reduction of bacterial infections, and improvement in the efficacy of chemotherapy.

Keywords: bioactive phenolic compounds, neuropsychopharmacological, nephroprotective

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I. INTRODUCTION

The pharmacological, nutritional, and physiological benefits of jamun (Syzygium cumini) are being discussed, along with an investigation of the numerous bioactive components that may be found in this fruit. Notably, jambosine, an alkaloid, and jambolin, a glycoside also known as antimellin, are both present in jambolan seeds.

The jambolan fruit has seen a recent spike in popularity as a result of its high anti-oxidant content as well as its potential to contribute to the nutritional well-being of consumers. Jambolan has a number of bioactive chemicals that have been related to a variety of health benefits. The focus of this research is on the effects that climate change will have on global ecosystems, with a particular emphasis on the role that phytochemicals will play (despite the fact that phytochemicals do not in and of themselves supply either calories or nutrients to food). Phenolic compounds, which are a type of chemicals that are generated from plants, have particularly aroused the interest of the scientific community due to the antioxidant capabilities that they possess. Tannins and other secondary plant metabolites have historically been considered to be antinutrients due to the negative properties that they possess. The idea that phenolic chemicals have no bearing on human health has been thoroughly debunked by epidemiological research to a large extent. As a direct result of this, food technology and fields that are closely related to it have moved their focus toward defining and quantifying phenolic chemicals found in food. Within the family of Myrtaceae, the jambolan tree (Syzygium cumini Skeels), sometimes referred to as black plum, Indian blackberry, jamun, and jambul, has been recognized as a significant source of phenolic chemicals. Other names for this tree include jamun and jambol. Due to the fact that its fruits can be consumed, it was first brought to some areas in Africa; yet, its natural habitat is in India as well as other parts of South and Southeast Asia. In addition, jambolan can be located in a number of countries, such as Bangladesh, Pakistan, Nepal, Sri Lanka, Indonesia, Malaysia, and Burma, as well as the United places, namely in places such as Florida. The plant has a long history of use in both traditional Indian medicine and cuisine. Different components of the plant, such as fruits, seeds, leaves, and even the bark, have been used at various times. Phytochemicals are found in a wide variety of plant species and are thought to have the ability to exert bioactive effects.

Because of its stomachic, diuretic, anti-diabetic, and anti-diarrheal characteristics, jambolan has been utilized extensively in complementary and alternative medicine for a significant amount of time. Although there is widespread agreement that this herb may provide some health benefits, there is a dearth of reliable research to back these claims. Jambolan was found in a wide variety of processed goods, such as wine, juice, frozen yogurt, and muffins, according to research conducted by Singh et al. (2015) and Tavares et al. (2016). These researchers found jambolan in the products. The jambolan fruit includes a variety of interesting substances, including as phenolic acids, flavonoids, and tannins, which are recognized for their capacity to inhibit the production of potentially dangerous free radicals. Lestario et al. (2017) found that the presence of anthocyanins in jambolan fruit increases the fruit's capacity to act as an antioxidant. This is an important finding. Because of their water-solubility and contribution to the fruit's brilliant color, anthocyanins including delphinidin, petunidin, and malvidin are highly prized for use in the food industry as colorants, flavor enhancers, and preservatives.

Ellagic acid, gallic acid, quercetin, myricetin, kaempferol, condensed tannins, and hydrolyzable tannins are among the many secondary chemicals that may be found in jambolan fruit. Other secondary chemicals include ellagic acid and myricetin. According to Afify et al. (2011), the bioactive compounds in the plant are what give it its pharmacological significance. These compounds offer multiple therapeutic applications, such as antioxidant, antibacterial, chemopreventive, anti-inflammatory, anti-allergic, anti-hyperglycemic, anti-cancer, and cardioprotective properties. Radioprotective properties can also be found in the plant.

The phenolic compounds found in jambolan include phenolic acids, flavonoids, and tannins. These substances are separated into distinct categories according to the phenolic hydroxyl groups and structural components that connect benzene rings. Phenolic acids are a class of chemicals that include, but are not limited to, caffeic acid, coumaric acid, gallic acid, ellagic acid, and many others. Flavonoids, on the other hand, have a distinct structural arrangement known as C6-C3-C6. This configuration consists of two aromatic rings joined by a heterocyclic ring. These include anthocyanins, flavonols, flavanols, flavones, flavanones, and isoflavones. Flavones and flavanones are also included. Tannins have molecular weights that are normally between 500 and 3000 and have a flavor that is either bitter or astringent. Tannins are soluble in water. Anthocyanins, which are a type of flavonoid, are of special interest to the food business due to the fact that they may have applications in coloring, enhancing flavor, and maintaining freshness. The Folin-Ciocalteu reagent or mass spectrometry are two common methods that are utilized in the process of determining the total phenolic content. Utilizing polar solvents in binary solvent systems is a frequent practice when doing high-performance liquid chromatography (HPLC), which is often done with reversed phase C18 columns. For the successful extraction of phenolic components, fresh samples are required before moving on to following preservation techniques such as freeze-drying. The method of phenolic chemical extraction can have a significant impact on the amount of the chemical that is extracted.

According to Veigas et al. (2007) and Aqil et al. (2012), extracts of jambolan pulp and seeds have the potential to yield a substantial amount of phenolic chemicals. The procedures, on the other hand, might be very strenuous and time-consuming. It should be noted that the phenolic content of jambolan fruit peel has been the subject of research; nevertheless, this area of study is still not as well developed as that of pomegranate juice. The processing of jambolan juice can have an effect on the concentration of anthocyanins and other beneficial components, with temperature playing a key influence in the degradation of anthocyanins. Other components of jambolan juice can also be affected. The phenolic compounds found in jambolan display an unusual pattern of distribution; different plant portions contain varying quantities of these bioactive components, and this pattern is consistent throughout the plant.

II. CONCLUSION

The jambolan plant contains flavonoids, which are a type of naturally occurring chemicals, in virtually every section of the plant. A wide variety of flavonols and flavanonols may be found in the extracts of jambolan fruit, which include both the pulp and the peel. To cite just a few examples, myricetin 3-O-pentoside, myricetin 3-O-hexoside, and myricetin all fall within this category.

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