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ANTIHYPERTENSIVE AND ANTIDIABETIC POTENTIAL OF SYZYGIUM CUMINI: A COMPREHENSIVE REVIEW

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Abstract

The medicinal plant *Syzygium cumini* (Jamun) is well known for its potential to treat diabetes mellitus and hypertension. Current research on its phytochemical makeup, pharmacological actions, and the processes behind its antihypertensive and antidiabetic properties is compiled in this review. Its antioxidant, anti-inflammatory, insulin-sensitizing, and vasodilatory qualities are attributed to bioactive substances such as flavonoids, anthocyanins, ellagic acid, and jamboline. *S. cumini* may enhance glycemic control, lower oxidative stress, and improve cardiovascular health, according to a few experimental and clinical trials. Even if the results are encouraging, further carefully planned clinical trials are needed to ascertain its effectiveness, safety, ideal dosage, and long-term therapeutic uses.

Keywords: *Syzygium cumini;* Hypertension; Diabetes mellitus; Antihypertensive activity; Antidiabetic activity; Phytochemicals; Antioxidants; Herbal medicine; Cardiovascular health

Introduction

In anesthetized Wistar rats, intravenous infusion of HESC (0.01–4.0 mg/kg) had a dose-dependent hypotensive effect that was somewhat mitigated by atropine sulfate pretreatment. (Balak et al.,2015) HESC treatment decreased the maximum effect (Emax) of noradrenaline (NE)-induced contraction by 40% in endothelium-denuded superior

mesenteric artery rings. (Benyamen et al.,2024).This study showed that *Syzygium cumini* lowers heart rate and blood pressure in SHR, and that this antihypertensive action is probably caused by the suppression of extracellular calcium influx and arterial tone.(Ribeiro et al.,2014) There are few studies that support the use of *S. cumini* as an antihypertensive medication, despite its biological potential as a pharmacological tool.(Chagas et al.,2015) In the present investigation, SHR rats were employed; they serve as a useful experimental model for exploring the mechanisms involved in the etiology of arterial hypertension, given that these animals demonstrate enhanced vascular reactivity accompanied by hyper-responsiveness to vasoconstrictor agonists. Given that HESC significantly reduced blood pressure in SHR rats receiving long-term treatment, *S. cumini* may be a viable option for antihypertensive therapy. (Mattera et al.,2017)Vasoconstrictor drugs function by modulating intracellular calcium concentrations.(Michea et al.,2005) Inositol trisphosphate is then created as a result of this activation, which raises intracellular calcium levels.(Berridge et al.,2009)As a result, the main factor controlling tension in VSM is calcium. Ca2+ influx from the extracellular area through voltage-dependent and/or receptor-activated calcium channels is necessary for the maintenance of contraction. By opening voltage-dependent calcium channels, contractile substances like KCl cause a notable rise in intracellular calcium. Therefore, the involvement of calcium in mechanisms that lower vascular tone has often been studied using VSM contractions elicited by depolarizing solutions (high K+ concentration and ostensibly Ca2+-free).(Tarjus et al.,2015)This result suggests that the HESC has elements that disrupt VSM responsiveness, most likely by adjusting intracellular calcium levels through voltage-dependent calcium channels. (Satin et al.,2008)When we used the hydroalcoholic extract of *S. cumini* on isolated aortic rings from normotensive rats with intact endothelium, our lab previously found comparable results regarding the suppression of calcium-induced contractile responses.

Syzygium cumini

Syzygium cumini (Myrtaceae) is a widely distributed medicinal plant that has long been employed in phytotherapy due to its known antihyperglycemic, hypolipidemic, anti-inflammatory, cardioprotective, and antioxidant qualities against cardiometabolic illnesses. These characteristics have been linked to the presence of bioactive substances

in different plant sections, including phenols, flavonoids, and tannins, however little is known about how they work. By connecting previously discovered phytochemicals to their explained mechanisms of action, this succinct review highlights the cardiometabolic characteristics of *S. cumini*. According to the collected data, some chemicals act on several metabolic pathways, making them suitable therapeutic tools. Additionally, the lack of clinical trials pertaining to the usage of *S. cumini* makes it a viable topic of interest for the pharmaceutical sector as well as the scholarly community. Many risk factors, such as insulin resistance, dyslipidemia, hypertension, and obesity, are linked to cardiometabolic syndrome. The World Health Organization estimates that being overweight or obese causes 2.8 million deaths worldwide each year. By 2030, 439 million adults are expected to have diabetes, and 30% of deaths in both industrialized and developing nations are attributed to cardiovascular illnesses. Cardiometabolic syndrome diseases are chronic and degenerative, necessitating long-term, expensive therapies for the patient and healthcare services, as well as potentially hazardous side effects from polytherapeutic regimens. In this regard, plant-based medicines have become a major source of bioactive compounds and have shown promise as therapeutic instruments for the use of multi-target approaches particularly because they have a lot more intrinsic structural variation than synthetic compounds. The genus *Syzygium*, which has 1,100 species, is one of the most well-known members of this family. Among these, *Syzygium cumini* (L.) Skeels (syn.: *Eugenia jambolana*, *Syzygium jambolanum*)—a species used to treat a number of illnesses, particularly diabetes—deserves special consideration. *S. cumini* was first employed in Western medicine when research on its antidiabetic properties was reported in the mid-1800s (Helmstadter, 2008). The fruits are used to cure splenic illnesses and pharyngitis; the bark is used as an astringent, anthelmintic, and carminative; the leaves are used to treat skin conditions, gastrointestinal issues, constipation, leukorrhea, and diabetes. The seeds are also used as a diuretic and astringent, and they are particularly useful in the treatment of diabetes. The known biological actions of *S. cumini* have been extended by pharmacological research to include antihyperglycemic, anti-inflammatory, antibacterial, cardioprotective, and antioxidant properties. Over the past ten years, important reviews of the literature on the pharmacological characteristics,

phytochemicals, and nutritional value of *S. cumini* have also been published. Regardless of soil conditions or nutrient levels, this tree, which yields non-climacteric fruit, is grown in a variety of geographic locations. Taiwan began cultivating *Syzygium samarangense* in the seventeenth century. It is grown in humid areas of India, including West Bengal, Andhra Pradesh, Assam, Bihar, Goa, Karnataka, Kerala, and Maharashtra. There are over 1,100 species in the genus *Syzygium*. Similar fruits from other species, like *Syzygium aqueum*, *Syzygium jambos*, and *Syzygium malaccense* (commonly known as water apple, rose apple, and Malay apple, respectively), are grown in tropical regions all over the world and have comparable commercial value to this plant. The Malay apple is renowned for its eye-catching appearance, while the oval-shaped rose apple, which is endemic to eastern India, smells like roses.

Because of its abundance of different chemicals, this plant has been shown to have antidiabetic, anticancer, antioxidant, antibacterial, antifungal, and antidiarrheal qualities.(Veigas et al.,2007)

Hypertension

High blood pressure can be caused by consuming dairy products, particularly cow's milk meant for calves. This happens because thick, viscous blood, which impedes smooth flow through microscopic capillaries, is frequently the cause of hypertension. Dairy products have been related to blood thickening, a factor that exacerbates this illness. Stress is a major contributing factor to the development of hypertension, and the pressures of contemporary life can have an impact on our health. Both of these effects have the potential to increase blood pressure and foster hypertensive disorders. Walking or mild exercise for at least two hours each day is advised by experts. Of them, two hours a day of Tai Chi practice is regarded as one of the best forms of exercise for general health.

Concerning results were also reported in another article the same month that was published in the *British Medical Journal*. Researchers discovered that, in comparison to other drug classes, angiotensin-converting enzyme (ACE) inhibitors, a kind of blood pressure medication taken daily by millions of individuals worldwide, are linked to an elevated risk of lung cancer. The study indicated that people treated with ACE inhibitors were 14% more likely to acquire lung cancer. The risk increased with the length of time

the medication was used: people who used it for five years were 22% more likely to acquire lung cancer, and people who took it for ten years were 31% more likely to do so. Researchers think that these medications contribute to the buildup of molecules called bradykinins in the lungs, which eventually results in cancer. Due to the widespread prescription of ACE inhibitors, the overall number of individuals at risk of getting lung cancer may be substantial, even though the risk for each individual patient is moderate, the researchers stated. I talked about how high blood pressure is frequently brought on by blood that is too thick and viscous to pass smoothly through the body's microscopic capillaries at one of my Monday night Qi Gong classes in West Hartford. The heart must pump more forcefully to maintain adequate circulation, which raises blood pressure. But healthy blood should flow more readily and not be so viscous. In Western medicine, high blood pressure is diagnosed as an illness and treated with medications that cause artery walls to relax, thereby artificially lowering blood pressure. Due to the thick, viscous blood's inability to reach every cell that requires it, this results in circulation issues and subsequent difficulties. However, that is not my belief; it is theirs. I think it's important to drink more Pu-erh tea, Huang Jing tea, or herbal infusions; eat more live nutrients and chia seeds (13g daily); dramatically cut back on animal products; cook with *Chi* every day; and simply enjoy life. After making these lifestyle adjustments, blood pressure returns to normal within 24 hours—or even less than 10 days—because the blood is more hydrated and circulates more freely. When she returned to the Qigong class on Monday, July 26, she told me: "I drank the 'King's' Pu-erh tea as instructed the day after the previous Monday's Qigong class, and in less than 24 hours, my blood pressure dropped." I stopped taking my medicine for high blood pressure that same day. I've been drinking "King's" Pu-erh tea every day for the past week, and it has kept my blood pressure steady." Most cases of hypertension are chronic, however acute occurrences can occur. The chronic type is more prevalent in middle-aged and older persons; it develops gradually and initially shows no symptoms. Additionally, when symptoms do appear, they usually differ from person to person. The acute variety, on the other hand, is more prevalent in youth; it has a speedy onset and progression and can result in a number of consequences, including cardiac, renal, and cerebrovascular issues. Paroxysmal hypertension brought on by malignancies in the urinary system is a

less frequent type of acute hypertension. When the patient urinates, their blood pressure can rise dramatically, up to 250/120 mmHg, and they frequently experience paroxysmal vertigo. About ten minutes after urinating, the symptoms gradually go away. In these situations, the patient needs to be referred right away to a urologist for a diagnosis; giving blood pressure medicine would simply make the condition worse and put the patient's health at even greater risk.(Gradman et al.,2010)

Diabetes Mellitus

Prenatal screening tests are used to determine gestational diabetes instead of symptoms. Diabetes mellitus, or just diabetes, is a collection of prevalent endocrine disorders marked by consistently elevated blood sugar levels. Diabetes is a condition that tends to get worse over time and is brought on by either the pancreas producing less insulin or the body's cells not reacting to the hormone's effects. The "three Ps"—polydipsia (excessive thirst), polyuria (excessive urine), and polyphagia (excessive hunger)—as well as weight loss and blurred eyesight are typical symptoms. Numerous health issues, such as cardiovascular illnesses and issues with the eyes, kidneys, and nerves, might result from the disease if treatment is not received. While type 2 diabetes can be controlled with antidiabetic drugs (such as metformin and semaglutide or tirzepatide) and lifestyle changes, type 1 diabetes is often treated with insulin replacement therapy (insulin injections). A kind of diabetes that occasionally appears during pregnancy, gestational diabetes often goes away soon after giving birth. In type 1 diabetes, the body's immune system targets the pancreatic beta cells, or β-cells, which stops the body from producing insulin.

This condition usually manifests early in life or is present from birth. When the body develops resistance to insulin, glucose stays in the bloodstream rather than being absorbed by the cells, leading to type 2 diabetes. Other specific causes of diabetes include genetic disorders (monogenic diabetes syndromes, such as adult-onset diabetes and neonatal diabetes), pancreatic diseases (such as pancreatitis), or the use of specific drugs and chemicals . From 200 million in 1990 to 828 million in 2024, the number of people with diabetes diagnosed globally has skyrocketed in recent decades. Over half of people with diabetes are unaware that they have the disease, which results in about two million deaths annually. Over 95% of cases are type 2 diabetes, which affects one in

seven persons. By 2045, these numbers have already exceeded earlier estimates of 783 million individuals. The disease is currently the ninth most common cause of mortality in low- and middle-income nations, where its prevalence is rising most sharply. The rates for males and women are comparable. An estimated $760 billion is spent on diabetes-related medical care worldwide each year.(Guillausseau et al.,2008)

Antihypertensive Activity

Metabolic disorders and dyslipidemia frequently coexist with hypertension, a prevalent disease linked to cardiovascular mortality risk. UPF (20 μg/mL) activated eNOS and Akt phosphorylation to increase nitric oxide generation in HUVECs cultured with L-NAME, an eNOS inhibitor. Additionally, UPF therapy decreased the rise in IL-1β and TNF-α in aortic tissue associated with iNOS expression Collectively, our data imply that UPF offers advantages over standard medications for preventing hypertension and that these biological activities justify the use of functional foods in novel therapeutic techniques for treating the condition. A major source of morbidity, hypertension is linked to over 7.5 million fatalities each year (Singh, Shankar, and Singh, 2017). It is among the most important cardiovascular disease (CVD) risk factors. Despite the widespread use of antihypertensive medications worldwide, their high cost and role in the emergence of secondary illnesses need the development of alternative, side-effect-free treatments. Plant-based medications or extracts having antihypertensive properties have garnered a lot of attention in recent decades (Getiye, Tolessa, and Engidawork, 2016). In an animal model, Vasant assessed the antihypertensive effect of aqueous *Colocasia* leaf extracts. The release of relaxing substances generated from the endothelium or the inhibition of phosphodiesterase or angiotensin-converting enzymes are two possible explanations for the antihypertensive action of *taro* leaves. Sakano et al. (2005) used recombinant human lanosterol synthase (hOSC) to assess the impact of ethanolic extracts from a variety of vegetables, including *C. esculenta*. At a dosage of 300 μg/ml, *taro* showed the greatest inhibition (55%) among the vegetables examined. Similarly, food science research has looked for novel molecules that can function as strong inhibitors and have hypotensive effects. Compounds that can decrease ACE activity have been found in kombucha and kombucha-based products. They also made kombucha. from other sources, finding that drinks with elderberry or stinging nettle had greater inhibitory

effects, while drinks with mountain savory, mint, wild thyme, or quince had less. Mexican bay leaves, however they found that the fermentation procedure lowered this capacity, which was higher in the unfermented infusions. Milk proteins are known to include relevant bioactive sequences that could be released as active inhibitory peptides. There was only slight calcium channel blocking action in compounds with phenylalkyl side chains, and there was no effect when heterocycles were substituted for the phenyl ring. Calcium channel blocking action was enhanced by adding a second phenyl group to the alkyl side chain. Strong antihypertensive action was produced when the phenyl rings were hydrogenated. Substitutions at the naphthol moiety's 6 and 7 positions had the strongest antihypertensive effect; in this case, the compound's calcium channel blocking effectiveness was on par with verapamil. Antihypertensive action was completely lost when one of the phenyl rings was swapped out for an isopropyl group. A number of naphthalen-2-ol-indolin-2-one-thiocarbamide derivatives were synthesized by Manikandan *et al., who also documented their anti-angiotensin-converting enzyme (ACE) activity. The most active compounds for the activities under investigation were those substituted on the indole core with carboxylic acids, carboxamides (including those with -CHO groups), tertiary carboxamides, and alkyl halides (having a halogen and a leaving group connected to an sp3 carbon).(Escudero et al.,2012)

Antidiabetic Activity

Persistent hyperglycemia is a hallmark of diabetes mellitus, a diverse set of conditions with many causes. It impacts every organ in the body, making the search for a single treatment plan more difficult and requiring a multimodal approach. Global economic growth may be in danger in the near future due to the enormous financial expenditures associated with the increasing healthcare burden caused by diabetes-related problems. This emphasizes the urgent need for new and better choices because the current healthcare systems are ill-prepared to meet the growing worldwide effect of diabetes. Finding individual characteristics that can improve glycemic control is the main problem in the treatment of diabetes. Because they produce a wide range of physiologically active chemicals with antidiabetic characteristics, plants have long been employed as diabetes treatments around the world. By highlighting the antidiabetic qualities (based on particular modes of action) of more than 300 different phytoconstituents, this review

seeks to describe the existing armory of plant-derived antidiabetic medicines, covering both discovery and development phases. These substances, which come from about 100 different plant species and represent a variety of chemical classes, influence metabolic processes like gluconeogenesis, glycolysis, the Krebs cycle, glycogen synthesis and degradation, cholesterol synthesis, and carbohydrate metabolism. Presenting a wide range of antidiabetic phytoconstituents with demonstrated pharmacological efficacy is the aim, with a focus on creative, affordable treatments that may be of great interest to other low- and middle-income nations across the globe. The most prevalent endocrine condition caused by a malfunction in insulin production, insulin resistance, or both is diabetes mellitus (DM). After cancer and myocardial infarction, it is the third most common cause of illness and death. Around 415 million people globally had diabetes in 2015, with 78 million of those cases occurring in Southeast Asia (SEA). One of the global DM pandemic's epicenters is India, where 69.1 million cases were reported in 2015. Characterized by persistent hyperglycemia, DM is a complex set of illnesses with multiple etiologies affecting various organs, making it difficult to follow a single line of treatment. A multimodal strategy that is customized and tailored to each individual is necessary for the therapy protocol. DM is typically divided into two groups: type 1 and type 2. Type 2 diabetes (DM2) is marked by a progressive decrease in insulin secretion by these cells and a relative decrease in target tissue sensitivity to the hormone's action, whereas type 1 diabetes (DM1) is characterized by the destruction of pancreatic beta cells, which prevents the production of the hormone insulin. In addition to making the patient more vulnerable to infections, DM2 has additional pathological effects such nephropathy, neuropathy, and cardiovascular diseases. Global economic growth may be seriously hampered in the near future by the tremendous financial burden associated with the increasing medical burden of diabetes-related problems. This illustrates the critical need for new and improved solutions because the current healthcare system has historically been unprepared to handle the expanding worldwide effect of diabetes. Finding unique elements that can result in better glycemic control is the main problem in the field of diabetes treatment. Treatments for diabetes include dietary adjustments, regular exercise, lifestyle modifications, weight control, and complementary or alternative therapies like phytotherapy, in addition to traditional drugs (oral and

injectable).5, 6 Because of their effectiveness, low cost, and few side effects, herbal remedies are frequently prescribed as a preferred therapeutic alternative. Studies based on crude mixtures or extracts are becoming less relevant in modern science; instead, the focus has shifted—for the better—to the discovery and use of specific compounds for their therapeutic properties. Since diabetes is a complex disease that affects almost every organ, it is necessary to increase research and development in order to harness plant resources to obtain superior therapeutic molecules.(Sabu et al.,2002)

Phytochemicals

PAccording to Ramakrishna and Ravishankar (2011), phytochemicals are a vast class of non-nutritive substances that plants manufacture as a defensive strategy against stressors like temperature, sunshine, and pathogenic agents. Many of these chemicals have bioactive characteristics in animals after eating, in addition to preserving the plant that produces them. Notably, because of their well-known anti-obesity qualities, phytochemicals exhibit considerable potential as a weight-loss method. For example, by influencing important proteins and enzymes including hormone-sensitive lipase, acetyl-CoA carboxylase, carnitine acyltransferase, and PGC1α, polyphenols have been shown to promote lipolysis and cause fatty acid oxidation. The majority of these phytochemicals have anti-inflammatory and antioxidant qualities in addition to their impacts on body weight. These supplementary advantages can strengthen phytochemicals' anti-obesity effects because lower inflammation lowers the risk of metabolic disorders. Apart from well-known medicinal examples (such paclitaxel and salicylic acid), the preventative function of phytochemicals is the main focus of current interest and attention. The mechanism of each phytochemical's bioactivity is determined by its unique structure. For instance, polyphenols are a class of phytochemicals made up of many phenolic units (Meulenberg, 2009). As a result, they are promoted and well-known as antioxidants. Nonetheless, some of them are classified as endocrine-disrupting substances because they have structural similarities to steroid hormones, which allows them to modify hormonal signaling. Phytochemicals are chemical substances derived from plants that have biological function and are created by either primary or secondary metabolism. They serve a key role in plant development and act as defense agents against infections, predators, or rivals. Stilbenes, lignans, flavonoids, and phenolic acids are examples of

phytochemicals that fall under several categories, such as polyphenols and carotenoids. More sophisticated research entails the isolation of certain compounds and the identification of the exact compound in charge of the biological activity that has been observed. Since ancient times, phytochemicals have been utilized as poisons and in traditional medicine, despite the fact that their precise cellular effects and processes were unknown. Plants were employed by early people to make poisoned arrows; Agrippina, the wife of Emperor Claudius, is reported to have killed her husband with a plant. The English yew is very widely recognized for being harmful to humans and animals; in fact, paclitaxel, a substance with anticancer effects, was discovered from this species in 1971. These substances are linked to important health advantages, such as anti-inflammatory, antioxidant, and anticancer qualities, and they also give these meals their distinctive color, flavor, and perfume. Numerous types of phytochemicals, including as polyphenols, alkaloids, carotenoids, and flavonoids, have been identified. This section looks at various phytochemical subgroups, their structures, and how they might affect biological signaling pathways. The presence of many phenolic rings and hydroxyl groups, which define their chemical structure and unique effects, makes polyphenols one of the most prevalent kinds of phytochemicals. TThese characteristics result from polyphenols' capacity to suppress inflammatory enzyme activity, alter cell signaling pathways, and neutralize free radicals. (Jang et al.,2007)

Antioxidants

Methods based on the inhibition of autoxidation are most suited for antioxidants that promote reaction termination and for chain-breaking antioxidants, whereas preventative antioxidants require distinct, particular investigations. In order to achieve this, a number of chemical test techniques are critically reviewed and the most popular *in vitro* techniques for assessing the antioxidant potential of food and pharmaceutical components are investigated. Additionally, for both pure compounds and crude plant extracts, their benefits, drawbacks, restrictions, and utility are examined. Reactive oxygen species (ROS) are created naturally and continually as byproducts of aerobic cellular metabolism, despite the fact that molecular oxygen is generally stable. According to this view, between 1% and 2% of the total O2 used or ingested during metabolism is transformed into ROS. Molecular oxygen has two unpaired electrons with parallel spins

in distinct antibonding orbitals in this ground state, which restricts direct electron pairing and thus its reactivity. As a result, paired electrons from an electron donor can be taken up by molecular oxygen. Furthermore, the metabolism of biological systems depends heavily on redox reactions, which are activities that involve the transfer of electrons from one molecule to another.

In living things, oxygen is intricately linked to a number of redox and enzymatic activities. However, if the electron flow becomes uncoupled and free radicals are produced, problems may occur.(García-Alonso eta l.,2004)

Herbal Medicine

The foundation of complementary and alternative medicine is herbal medicine (HM), which has become increasingly popular worldwide in recent years and is progressively being included into traditional healthcare systems. In both industrialized and developing nations, the usage of HM transcends racial, socioeconomic class, and gender divides. Driven by the growing popularity of HM, its market share—spanning both local and worldwide markets—is developing quickly, with annual sales currently nearing US$62 billion. Its low cost and widespread acceptance—resulting from its reputation as a natural substance thought to have low toxicity—as well as its effectiveness against some complicated disorders and its adaptability in terms of accessibility, preparation, and use are important factors driving this increase in demand and use. HM goods may have negative effects in addition to their many advantages. The activity of HM's secondary metabolites has been connected to both its pharmacological effects and most of its adverse consequences. These goods have been misused and misinterpreted, despite the fact that they are frequently used correctly. The advantages of HM as a healthcare resource are largely dependent on sufficient knowledge and experience; on the other hand, misuse and misinterpretation have been linked to a lack of knowledge about these products, especially with regard to their advantages and potential disadvantages, among primary healthcare professionals (physicians, pharmacists, and nurses) and the general public. This book serves as a comprehensive resource to appropriately educate scientists, medical experts, and laypeople on a variety of topics related to herbal therapy. In fact, certain herbal products have been connected to major side effects like cancer development and neurological, renal, and cardiovascular toxicity. Another area that

needs attention is adulteration and the concurrent use of herbal medications with conventional pharmaceuticals, which emphasizes the necessity for stringent regulation as well as efficient communication and control systems. Herbal medicines (HMs), which are mostly used for disease prevention and treatment, include herbs, plant materials, herbal preparations, and finished goods that contain plant parts, other plant materials, or mixtures of these as active ingredients. In many rural communities in Asia and Africa today, HMs continue to play a major role in primary healthcare. Additionally, they are an essential component of many societies' cultures across the globe. Folks have long used a variety of herbs and herbal remedies, which are thought to offer a number of health advantages. Research has demonstrated that complex chemical compounds found in HMs are responsible for pharmacological activities, which translate into the products' potential toxicity or health advantages. HMs have been used to treat a wide range of illnesses, from mild to severe, as well as for preventative purposes—to preserve health. These days, HMs are made and employed in a variety of ways, which affects the results of their activities. The way these medications are administered, the patient, the culture, the sort of illness being treated, and even philosophical beliefs all have a significant impact on the dosage form. HMs are primarily made from fresh or dried herbs in homes and traditional medicine clinics—commonly as infusions, decoctions, poultices, or powders—for application to open wounds or integration into traditional beverages, pastries, and the like. Conventional commercial products, on the other hand, typically come in a variety of forms, including pills, capsules, tablets, powders or granules, lotions, and ointments. It is anticipated that formulating HMs into certain dosage forms will enable accurate dosing and enhance the product's look, which will promote use and, ultimately, treatment adherence.(Moreira et al.,2014)

Cardiovascular Health

Sinus rhythm refers to the heart's regular, rhythmic heartbeat. The heart's pacemaker cells, which are found in a region known as the sinoatrial node (shown in the picture below), produce this beat. The flow of electrolytes (sodium, potassium, and calcium ions) into and out of pacemaker cells generates electrical impulses. The right and left atria contract simultaneously as a result of a fast electrical signal that travels from the sinoatrial node to them throughout each cardiac cycle. The signal then moves on to the

atrioventricular node, which is also seen here. From there, it reaches the left and right ventricles, which likewise contract simultaneously a split second following the atrial contraction. Two paired cardiovascular centers in the medulla oblongata, a portion of the brainstem, are the source of these nerves. Sympathetic nerves raise heart rate, whilst parasympathetic nerves lower it. Without parasympathetic stimulation, the pacemaker cells would produce a resting heart rate of almost 100 beats per minute instead of the typical 72 beats per minute. The body's receptors provide information to the cardiovascular centers, which then use sympathetic nerves to raise heart rate when necessary. For instance, sensors found in tendons, joints, and muscles sense increased physical activity.

These receptors cause the sympathetic nerves to raise heart rate by sending nerve signals to the cardiovascular centers. This increases the amount of blood that reaches the muscles. A collection of illnesses that impact the circulatory system are known as cardiovascular diseases. About one-third of all deaths each year are caused by cardiovascular illnesses, which are the leading cause of death worldwide. Cardiovascular disease often appears ten years earlier in males than in women, with the majority of instances occurring in those over 60. Due to stigma, a lack of awareness among medical personnel, and insensitivity to the unique needs of this group, these young people receive lower-quality healthcare. LGBT youth frequently find it challenging to tell healthcare professionals about their sexual orientation, and some of these experts are ill-equipped to handle the issues raised by members of this community. Other factors that raise the risk of cardiovascular disease can be addressed, but age and sex are uncontrollable. These conditions can be prevented or their progression slowed by quitting smoking, keeping a healthy weight, eating a balanced diet, taking the required medicine to control cholesterol and diabetes, and engaging in regular exercise. It is important to remember that high blood cholesterol is definitely a risk factor for cardiovascular disease. On the other hand, high blood cholesterol levels do not seem to be directly correlated with high dietary cholesterol intake. In the end, the causes of cardiovascular illnesses are complex. There are two types of arterial hypertension: primary and secondary. (Bassareo et al.,2023)Primary hypertension, which is brought on by a mix of lifestyle and hereditary factors, accounts for at least 90% of cases. There are

many genes that have been found to have minor effects on blood pressure. Along with the previously listed risk factors for cardiovascular disease, excessive salt and alcohol consumption are lifestyle variables that raise the risk of hypertension. The remaining 10% of cases are secondary hypertension, which is brought on by endocrine disorders such Cushing's disease or chronic renal disease. Reducing the risk of all forms of cardiovascular disease, including stroke, requires treating hypertension. These and other issues brought on by chronic hypertension are depicted in the following image. Sometimes lowering blood pressure to normal levels only requires changing one's lifestyle, such as cutting back on salt and switching to a healthier diet like the DASH diet, which is covered in the special section below. But medication is also necessary in many situations.(DeFina et al.,2015)

Conclusion

Because of its rich phytochemical profile, antioxidant activity, and capacity to enhance glucose metabolism and vascular function, *Syzygium cumini* exhibits considerable antihypertensive and antidiabetic potential. Its therapeutic potential is currently supported by evidence; however, extensive clinical research is necessary to validate its effectiveness, provide standardized formulations, ascertain the ideal dosage, and guarantee long-term safety.

References

Balak TC. The effects of propofol, sodium pentobarbital, and ketamine hydrochloride on in vitro mouse embryonic development. Old Dominion University; 2015.

Bassareo PP, Calcaterra G, Sabatino J, Oreto L, Ciliberti P, Perrone M, Martino F, D'Alto M, Chessa M, Salvo GD, Guccione P. Primary and secondary paediatric hypertension. Journal of Cardiovascular Medicine. 2023 Apr 1;24(Supplement 1):e77-85.

Benyamen, J., 2024. *The potential for repurposing α2-adrenoceptor agonists and noradrenaline uptake1 inhibitors in the management of septic shock* (Doctoral dissertation, University of Nottingham (United Kingdom)).

Berridge MJ. Inositol trisphosphate and calcium signalling mechanisms. Biochimica et Biophysica Acta (BBA)-Molecular Cell Research. 2009 Jun 1;1793(6):933-40.

Chagas VT, França LM, Malik S, Paes AM. Syzygium cumini (L.) skeels: a prominent source of bioactive molecules against cardiometabolic diseases. Frontiers in pharmacology. 2015 Nov 3;6:164849.

DeFina LF, Haskell WL, Willis BL, Barlow CE, Finley CE, Levine BD, Cooper KH. Physical activity versus cardiorespiratory fitness: two (partly) distinct components of cardiovascular health?. Progress in cardiovascular diseases. 2015 Jan 1;57(4):324-9.

Escudero E, Toldra F, Sentandreu MA, Nishimura H, Arihara K. Antihypertensive activity of peptides identified in the in vitro gastrointestinal digest of pork meat. Meat Science. 2012 Jul 1;91(3):382-4.

Garcıá-Alonso M, de Pascual-Teresa S, Santos-Buelga C, Rivas-Gonzalo JC. Evaluation of the antioxidant properties of fruits. Food chemistry. 2004 Jan 1;84(1):13-8.

Gradman AH, Basile JN, Carter BL, Bakris GL, American Society of Hypertension Writing Group. Combination therapy in hypertension. Journal of the American Society of Hypertension. 2010 Mar 1;4(2):90-8.

Guillausseau PJ, Meas T, Virally M, Laloi-Michelin M, Médeau V, Kevorkian JP. Abnormalities in insulin secretion in type 2 diabetes mellitus. Diabetes & metabolism. 2008 Feb 1;34:S43-8.

Jang HD, Chang KS, Huang YS, Hsu CL, Lee SH, Su MS. Principal phenolic phytochemicals and antioxidant activities of three Chinese medicinal plants. Food chemistry. 2007 Jan 1;103(3):749-56.

Mattera R, Benvenuto M, Giganti MG, Tresoldi I, Pluchinotta FR, Bergante S, Tettamanti G, Masuelli L, Manzari V, Modesti A, Bei R. Effects of polyphenols on oxidative stress-mediated injury in cardiomyocytes. Nutrients. 2017 May 20;9(5):523.

Michea L, Delpiano AM, Hitschfeld C, Lobos L, Lavandero S, Marusic ET. Eplerenone blocks nongenomic effects of aldosterone on the Na+/H+ exchanger, intracellular Ca2+ levels, and vasoconstriction in mesenteric resistance vessels. Endocrinology. 2005 Mar 1;146(3):973-80.

Moreira DD, Teixeira SS, Monteiro MH, De-Oliveira AC, Paumgartten FJ. Traditional use and safety of herbal medicines. Revista Brasileira de Farmacognosia. 2014 Mar 1;24(2):248-57.

Ribeiro RM, Pinheiro Neto VF, Ribeiro KS, Vieira DA, Abreu IC, Silva SD, Cartágenes MD, Freire SM, Borges AC, Borges MO. Antihypertensive effect of Syzygium cumini in spontaneously hypertensive rats. Evidence-Based Complementary and Alternative Medicine. 2014;2014(1):605452.

Sabu MC, Smitha K. Anti-diabetic activity of green tea polyphenols and their role in reducing oxidative stress in experimental diabetes. Journal of ethnopharmacology. 2002 Nov 1;83(1-2):109-16.

Satin J, Itzhaki I, Rapoport S, Schroder EA, Izu L, Arbel G, Beyar R, Balke CW, Schiller J, Gepstein L. Calcium handling in human embryonic stem cell-derived cardiomyocytes. Stem cells. 2008 Aug 1;26(8):1961-72.

Tarjus A, Belozertseva E, Louis H, El Moghrabi S, Labat C, Lacolley P, Jaisser F, Galmiche G. Role of smooth muscle cell mineralocorticoid receptor in vascular tone. Pflügers Archiv-European Journal of Physiology. 2015 Aug;467(8):1643-50.

Veigas JM, Narayan MS, Laxman PM, Neelwarne B. Chemical nature, stability and bioefficacies of anthocyanins from fruit peel of Syzygium cumini Skeels. Food Chemistry. 2007 Jan 1;105(2):619-27.