

Therapeutic Potential Drug of Dry Leaves of *Eugenia Jambolana* against Hypertension

Maheen Sara ^aNurmeen Khokhar ^bAmman Khokhar ^c

Abstract: Diet plays a significant role on human health. A good diet is directly proportionally to good health. The fruits contain bioactive components and photochemical that has potential effects. So this study was designed to check the effects of *Eugenia jambolana* leaves powder on hypertension in rats. Twenty rats were divided into three groups including the control group and *Eugenia jambolana* leaves powder was provided for 30 days at a concentration of 2.0, 3.0, and 4.0 g/kg/day. After a specific period physical and biochemical assessments (lipid profile, HDL, LDL and total cholesterol, triglycerides and electrolyte imbalance) were performed. Among all groups G3 showed a significant result as systolic blood pressure decreased to 110 from 150 (mmHg). Diastolic blood pressure reduced to 60 from 95 (mmHg). LDL reduced to 96 from 140.0 (mg/dl) and cholesterol reduced 177 from 246 (mg/dl). Among all groups, G3 expressed a significant result than the control group and other groups.

Key Words: Hypertension, *Eugenia Jambolana* Leaves Powder, Drug, Lipid Profile, and Electrolyte Imbalance

Introduction

Hypertension affects 67 million US adults and other 85 million have pre-hypertension (Sun et al., 2021). According to World Health Organization (WHO) hypertension is increasing & causes many risk factors like kidney disease, obesity, diabetes and heart disease. The occurrence of hypertension increases with age. Hypertension is the most common disease present worldwide. It also leads to cardiovascular diseases. Fruits and plants are nature's wonderful gift to human kind as these have life prolonging and health protecting components. The self-management and change in dietary habits (usage of different herbs/plants) can reduce the complications of hypertension. *Eugenia jambolana* also very beneficial for other diseases like diabetics, gastro problem etc. The antioxidant present in *Eugenia jambolana* leaves powder may help to control hypertension (Campbell et al., 2022).

Fruits and vegetables play a vital role in the human diet. They play a significant role to promote human health. The fruits contain bioactive components and photochemical that has potential effects. The fruits are essential for the proper physiology functioning of the human body. *Eugenia jambolana* commonly known are Java plum, Black plum, Indian blackberry, Jambool. They belong to the *Myrtaceae* family. *Eugenia jambolana* leaves contain many bioactive compounds like polyphenols, carotenoids, myricetin, flavonoids, oxalic acid, hotrienol and gallic acid. Flavonoids play an important role to decrease hypertension probably by improving of arterial tone by maintaining the extracellular Ca flow. The *Eugenia jambolana* plant contains acetyl ellagic, quercetin, oleanolic, isoqueritin, myricetin, and triterpenoids. *Eugenia jambolana* fruit is rich in glucoside, ellagic acid, anthocyanins, isoquercetin, ascorbic acid, myricetin and kaempfero, coumaric acid (Rizvi et al., 2022).

According to diet experts, *Eugenia jambolana*

^a Lecturer, Government College Women's University Faisalabad, Punjab, Pakistan.

Email: maheensara77@gmail.com (Corresponding Author)

^b Post RN BSc Nursing.

^c Bachelor in Botany.

fruit is rich in vitamins, carbohydrates, and minerals and *Eugenia jambolana* crust consist of fructose and glucose as main sugars causal syrupiness of the crust as well some significant minerals such as calcium, iron, sodium, zinc, and potassium. The leaves of *Eugenia jambolana* have been traditionally used in Ayurvedic medicine for their anti-hypertensive properties. Some studies have shown that the leaves of *Eugenia jambolana* can help reduce blood pressure in hypertensive individuals. However, more research is needed to confirm these findings and to determine the efficacy and safety of using *Eugenia jambolana* for hypertension. It's also important to note that natural remedies should not be used as a substitute for conventional medical treatment, and that one should always consult a doctor before starting any new treatment, including the use of natural remedies. There is some evidence to suggest that the dry leaves of *Eugenia jambolana*, also known as the Indian blackberry or jamun, may have properties that can help regulate blood pressure levels and potentially benefit people with hypertension. However, more research is needed to determine the exact mechanisms by which jamun may affect hypertension and establish its safety and efficacy as a treatment. It is always best to consult with a qualified healthcare professional before using any new supplement or natural remedy for a medical condition (Mohite et al., 2020).

In traditional medicine, the leaves of *Eugenia jambolana* have been used to treat a range of ailments, including hypertension. Some studies have shown that extracts of the leaves have antioxidant and anti-inflammatory effects, which may help to reduce oxidative stress and lower blood pressure levels. Additionally, compounds found in jamun leaves, such as anthocyanins and ellagitannins, have been shown to have vasodilatory effects, which can help to widen blood vessels and improve blood flow, further contributing to the reduction of blood pressure. It is important to note that while these findings are promising, more research is needed to fully understand the effects of jamun leaves on hypertension and to establish the most effective dosage and method of administration. Additionally, natural remedies are not a substitute for conventional medical treatments and it is always best to work with a healthcare professional to manage high blood pressure (Deshmukh & Patel, 2021).

Eugenia jambolana is remarkable fruit use to cure hypertension. Hypertension is the condition in which blood flows higher than the normal rate. Control of hypertension was defined as systolic blood pressure <140mmHg and diastolic blood pressure < 90mmHg.

Hypertension occurs due to many reasons like obesity, a sedentary lifestyle, dietary habits, smoking and alcohol intake (Marbaniang et al., 2021). The National Health Survey of Pakistan (NHSP) showed that hypertension effects on the adolescents 18% and adult's 33% (Mohib-UR-Rehman et al., 2022). More than one-fourth of the world's adult population suffers from arterial hypertension and 51% of heart diseases. Studies have shown that a reduction of 5mmHg in systolic blood pressure (SBP) is associated with a 7% reduction in cardiovascular mortality (Alpsoy, 2020).

Objectives

- To determine the antioxidant potential of *Eugenia jambolana* leaves
- To evaluate the effect of *Eugenia jambolana* leaves on hypertensive rats

Materials and Methods

Eugenia jambolana leaves were obtained from the research garden of the Horticulture Department, University of Agriculture Faisalabad. Leaves were fed and sun-dried and then were grinded to get uniform powder. *Eugenia jambolana* dry leaves powder was analyzed for ash, moisture, fat, crude fiber and protein contents by the following method (Abu-Sree et al., 2021).

Bio Efficacy Trials

The efficacy trial was conducted in the animal house Department of NIFSAT, University of Agriculture, Faisalabad. Twenty rats were divided into 4 groups (5 rats per group). Animals were given a high fat diet to induced hypertension for 30 days. After that *Eugenia jambolana* leaves powder were given to rats (as given in table 1) along with a normal diet for 30 days. The blood was collected at 0, 7, 14, 21 and 28 days and the following parameters cholesterol, high density lipoprotein, lower-density lipoprotein and electrolyte balance were analyzed. Feed intake and drink intake values were also measured on weekly basis.

Table 1. Treatment Plan

Group	<i>Eugenia jambolana</i> Dry Leaves powder(g/kg s BW)
G ₀	Normal control rats
G ₁	2.0
G ₂	3.0
G ₃	4.0

Physical Assessment

Weight of rats was done before and after therapy at regular interval.

Blood Pressure

Hypertension & ECG of the rats were measured by the instrument named power lab (Kpemissi et al., 2022). This instrument comprised of five wires. One wire attached with a computer for the visual display of data and remaining four with the rats for measurement respective data. Firstly rats were anesthetized with urethane (1200mg/kg). Then it was placed on the non-electric table in a front posture (abdomen upward). After this required data regarding blood pressure and ECG was obtained and this whole procedure comprised of 10-20 minutes with a complete monitor.

Biochemical Analysis of Rat Blood Pressure

Blood was obtained from a lateral vein and analyzed for the following parameters. A blood test called a lipid profile is used to measure cholesterol levels, including total cholesterol, LDL cholesterol, and HDL cholesterol. An electrolyte panel or electrolyte test is used to measure the levels of various electrolytes.

High and Low-density Lipoproteins

High-density lipoproteins (HDL) and low-density lipoproteins (LDL) are types of lipoproteins that transport cholesterol in the blood. HDL is often referred to as "good" cholesterol because it helps remove excess cholesterol from the bloodstream. LDL is often referred to as "bad" cholesterol because high levels are associated with an increased risk of heart disease.

Electrolyte Balance

Electrolyte balance refers to the balance of electrolytes (such as sodium, potassium, and calcium) in the body. Electrolytes are minerals that carry a charge and are essential for the proper functioning of many bodily processes, including muscle and nerve function, hydration, and pH balance. An imbalance of electrolytes can lead to various health problems, including dehydration, muscle cramps, and irregular

heartbeats.

Data Analysis

Data was analyzed statistically using statistix.8.1 (FL32317, USA) to check the significance of results by the standard method.

Results

Systolic Blood Pressure

The statistical result regarding systolic blood pressure are influenced by the treatments mentioned in Table 4. It was recorded that during disease induction the systolic blood pressure of rats was increased. During the experiment when *Eugenia jambolana* leave powder was given to rats the systolic blood pressure decreased significantly with increasing the amount of fed leaves. Furthermore, the systolic blood pressure also decreased with the passage of time with continuous leave feeding up to 28 days significantly. The systolic blood pressure of rats in groups G₀, G₁, G₂ and G₃ was 148, 150, 149, and 151 (mmHg) before induction. Then after one month different trends in systolic blood pressure of treatments were observed, 2.0 g/kg *Eugenia jambolana* leaves powder given to G₁ decrease systolic blood pressure from 140 to 130 (mmHg). Similarly, 3.0 g/kg *Eugenia jambolana* leaves powder given in G₂ the systolic blood pressure decreased from 135 to 120 (mmHg). Four g/kg (*Eugenia jambolana* leaves powder) in G₃ showed decreased in systolic blood pressure to 120 mmHg and finally reached to 110 mmHg respectively.

Eugenia jambolana leaves contain flavonoids which help to main systolic blood pressure. The study was correlated with Tcheutchoua et al. (2022) who observed that if *Eugenia jambolana* leaves powder was fed to rats in doses of 15, 10, and 20 mg/kg reduced systolic blood pressure up to 2 %.

The current result was matched with the scientific research of Prabhakar (2022). They have illustrated that oral use of 40 mg *Eugenia jambolana* seeds powder to hypertensive rats for 22 days can reduced systolic blood pressure (5%). They examined that systolic blood pressure in group G₀ had 140(mmHg) as compared to G₁ 135.0(mmHg), G₂ 120(mmHg) and G₃ 110(mmHg).

Table 1. Effect of *Eugenia jambolana* Dry Leaves Powder on Systolic Blood Pressure (mm Hg)

Treatment	Systolic Blood Pressure (mm Hg) Before and After the Interval	
	0 day	28 day
G ₀	150±5.10 ^a	148± 7.68 ^b c
G ₁	140±4.20 ^b	130± 7.90 ^d
G ₂	135±5.40 ^c	120± 4.80 ^a
G ₃	120±6.00 ^d	110± 5.50 ^d

±standard Deviation

Mean value with different letter/letters are significantly different at $p < 0.01$

G₀. Control group

G₁. 2.0g/kg/day *Eugenia jambolana* leaves powder dose

G₂. 3.0g/kg/day *Eugenia jambolana* leaves powder dose

G₃. 4.0g/kg/day *Eugenia jambolana* leaves powder dose

Diastolic Blood Pressure

The statistical result regarding diastolic blood pressure are influenced by the treatments are mentioned in Table 4. It was recorded that during disease induction the diastolic blood pressure of rats was increased. During the experiment when *Eugenia*

jambolana leave powder was given to rats the diastolic blood pressure decreased significantly with increasing the amount of fed leaves. Furthermore, the diastolic blood pressure also decreased with the passage of time with continuous leave feeding up to 28 days significantly. The diastolic blood pressure of rats in groups G₀, G₁, G₂, and G₃ was 95, 94, 96 and 95 (mmHg) before induction. Then after one-month different trends in diastolic blood pressure of treatments were observed, 2.0 g/kg *Eugenia jambolana* leaves powder given to G₁ decrease diastolic blood pressure from 90 to 80 (mmHg). Similarly, 3.0 g/kg *Eugenia jambolana* leaves powder given in G₂ the diastolic blood pressure was decreased from 85 to 75 (mmHg). Four g/kg (*Eugenia jambolana* leaves powder) in G₃ showed decrease in diastolic blood pressure to 80 (mmHg) and finally reached to 60 (mmHg) respectively.

Table 3. Effect of *Eugenia jambolana* Dry Leaves Powder on Diastolic Blood Pressure (mm Hg)

Treatment	Diastolic Blood Pressure (mm Hg) Before and After the Interval	
	0 day	28 day
G ₀	95±3.23 ^a	92±49.1 ₃ b
G ₁	90±2.70 ^b	80±42.4 ₅ c
G ₂	85±3.40 ^c	75±3.00 ^a
G ₃	80±4.00 ^{bc}	60±3.50 ^b c

The statistical result regarding body weight are influenced by the. It was recorded that during disease induction the body weight of rats was increased. During the experiment when *Eugenia jambolana* leave powder was given to rats the body weight decreased significantly with increasing the amount of fed leaves. Furthermore, the body weight also decreased with the passage of time with continuous leave feeding up to 28 days significantly. The body weight of rats in groups G₀, G₁, G₂, and G₃ was 295, 294, 294 and 295g before induction. Then after one month different trends in body weight of treatments were observed, 2.0 g/kg *Eugenia jambolana* leaves powder given to G₁ decrease body weight from 288g in 0 days. Then 287.63 (g) at 7 day which further decreased to 284.0 (g) at 14 days and after 21 days body weight decreased to 243.0 (g) and finally

reached to 282.0 (g). Similarly, 3.0 g/kg *Eugenia jambolana* leaves powder given in G₂ the body weight was decreased from 285.0 (g) at 0 day to 284.93 (g) at 7 day which further decreased body weight 283.3 (g) at 14 day to 281.0 (g) at 21 days and finally reached to 280 (g). Four g/kg *Eugenia jambolana* leaves powder in G₃ showed decreased body weight of 280 (g) at 0 day to 279.71 (g) at 7 day which further decreased body weight 278.37 (g) at 14 day to 277.0 (g) at 21 days and finally, 28 day body weight decreased to 276.0 (g). *Eugenia jambolana* leaves contain flavonoids which help to main body weight.

The statistical result regarding water intake are influenced by the treatments are mentioned in Table 4.12. It was recorded that during disease induction the water intake of rats was increased. During the

experiment when *Eugenia jambolana* leave powder was given to rats the water intake was non-significantly with increasing the amount of fed leaves. Furthermore, the water intake increased with the passage of time with continuous leave feeding up to 28 days significantly. The water intake of rats in groups G0, G1, G2 and G3 was 198, 199, 197, and 195 (ml/d) before inductions. Then after one month water intake at 0 day of G0 were 196, G1 434, G2 441, and G3 421 (ml/d). At 7 day G0 was 180, G1 330, G2 325, and G3 460 (ml/d). At 14 day G0 was 160, G1 270, G2 265, and G3 360 and at 28 day G0 was 185 G1 350 G2 375 and G3 360 (ml/d). The study was correlated with those who observed that if *Eugenia jambolana* leaves powder was fed to rats in doses of 15, 10 and 20 mg/kg increase water intake up to 15 %.

Conclusion

It is concluded that among all groups G3 showed a significant impact as systolic blood pressure decreased to 110 from 150 (mmHg) and diastolic blood pressure reduced to 60 from 95 (mmHg). In the case of LDL, the level was reduced to 96 from 140.0 (mmHg), and cholesterol reduced to 177 from 246 (mg/dl). Thus utilization of jamun and its bioactive components such as, proanthocyanidin, flavonoids,

tannins, phenolic, and carotenoids can be effective in reducing the burden of hypertension and hypertension related disorders. Overall, the use of dry leaves of *Eugenia jambolana* as a remedy for hypertension is a promising area of research. While some preliminary studies have shown that jamun leaves may have benefits for regulating blood pressure levels, more research is needed to fully understand the effects and establish their safety and efficacy as a treatment. As with any natural remedy, it is important to consult with a qualified healthcare professional before using jamun leaves or any other new supplement to manage a medical condition, including hypertension.

Recommendations

- As *Eugenia jambolana* is efficient fruit, its effectiveness could be measured for countering disease other than hypertension.
- Except for leaves other parts of the *Eugenia jambolana* are very significant for multiple purposes, which could be researched.
- *Eugenia jambolana* is an effective fruit. its daily use in diet could be analyzed for good health.
- *Eugenia jambolana* could be used in different type of food products as similar to pineapple.

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