Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
Impact Factor (RJIF): 6.35
www.phytojournal.com
JPP 2026; 15(1): 138-144
Received: 23-11-2025
Accepted: 27-12-2025

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A review on role of Arjuna bark herbal chocolate in the prevention and management of cardiovascular diseases

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DOI: https://www.doi.org/10.22271/phyto.2026.v15.i1b.15713

Abstract
The review is about creating Arjuna bark chocolate, a special food product that uses the healing properties of Arjuna bark, which comes from the Terminalia arjuna plant.
Ashwagandha, also called Withania somnifera, is another plant with health benefits like reducing stress, fighting inflammation, and helping the nervous system. Guggul, which is also known as Commiphora mukul or Commiphora wightii, is a powerful plant resin used in Ayurvedic medicine. According to the ancient Ayurvedic text Caraka Samhita, guggul is considered a cure for many diseases. Arjuna bark is known to help with heart health, lower cholesterol, and improve blood flow. The study looks at how to mix Arjuna bark extract with cocoa, sugar, and other healthy ingredients to make a nutritious chocolate. People enjoy chocolate more than most foods, but they usually avoid medicines. The goal of this project was to make medicated chocolate that includes medicinal ingredients to help prevent various illnesses.

Keywords: Herbal chocolate, arjuna bark, ashwagandha and guggul, cardiovascular diseases, cardiac risk factor, health management

Introduction

Cardiovascular diseases

Cardiovascular diseases is a general term that includes all kinds of illnesses that affect the blood circulation system, like the heart and blood vessels, which pump and carry blood through the body [1]. Cardiovascular disease refers to a group of illnesses that impact your heart and blood vessels.
These conditions can affect either one part or multiple parts of your heart and/or blood vessels. A person with the disease might feel symptoms, like pain or discomfort, or they might [2] not feel anything at all.

Symptoms of heart issues

- Chest pain.
- Shortness of breath.
- Exhaustion.
- Fatigue
- Dizziness
- Fainting

Cardiovascular diseases are classified into [3]

- Rare afflictions of the systemic (Class 1)
- Pulmonary circulation (Class 2)
- Rare cardiomyopathies (Class 3)
- Rare congenital cardiovascular disorders (Class 4)
- Rare cardiac arrhythmias (Class 5)
- Cardiac tumors and cardiovascular affections related to cancer (Class 6)
- Cardiovascular sickness in pregnancy (Class 7)
- Types of rare cardiovascular illness (Class 8)

What are cardiovascular disease risk factors? [4]

This study aimed to look at various risk factors that are common in people under 45 years old who have coronary heart disease.

- High cholesterol.
- Tobacco use.
- Overuse of alcohol.
- Family history of heart disease.
- Lack of physical activity.
- Misuse of prescription or recreational drugs.
- Overuse of alcohol.
- Diet high in sodium, sugar and fat.
- Overuse of alcohol.
- Preeclampsia or toxemia
- High blood pressure
- Type 2 dibeties

What is Herbal chocolate [5]

Herbal chocolate is a type of food that also has health benefits. It mixes medicinal herbs and natural ingredients t o offer positive effects on health [6].

Pharmacological and health benefits of herbal chocolate[7]

1. Antioxidants
1. Antibacterial agent
2. Immunomodulators
3. Anti-inflammatory

A) Active ingredient and herbal drugs which used in this chocolate

1. Arjuna bark
2. Ashwagandha
3. Guggul

Table 1: Risk factors among included study population (in percentages) [8]

Risk factor vs authors	High BP %	High blood sugar %	Obesity %	Dyslipide mia %	Family history %
Sayeed *et al*. 2010 [19]	7.1%	7.2%	Below 25 : 19.4% Above 25: 8.7%	-	Significant association
Nadeem *et al*. 2013 [20]	37%	18%	Increased BMI 63.3%	33%	43%
GUPTA *et al*.2012 [21]	31.6%	15.7%	Increased BMI Above 25: 42%	High level cholesterol 25% Low HDL 34.5%	-
Roman *et al*. 2019 [22]	65%	Urban: 5% Rural: 2%	Overweight: 36% Female>male	High LDL 65% Low HDL 79%	53%

1. Arjuna Bark [9]

- **Cardioprotective Activity:** Improves coronary circulation, improve reduces blood pressure improve cholesterol.
- **Botanical name:** Terminalia arjuna
- **Synonyms:** Terminalia Glabra, Pentaptera Arjuna
- **Common name:** Arjuna tree, arjun
- **Family:** Combretaceae
- **Order:** Myrtales
- **Kingdom:** Plantae Genus: terminalia
- **Division:** Magnoliopsida
- **Active phyto-chemicals:** Triterpenoids, flavonoids, glycosides, tannins, saponin
- **Part used for research:** Bark, leaves, Fruits
- **General uses:** Anti-inflammatory, antioxidant

Fig 1: Arjuna plant [10]

Fig 2: Arjuna bark powder [11]

Cardioprotective activity

Reduces blood pressure

Improve cholesterol.

Improve lipid profile

- **Botanical name:** withania somnifera
- **Synonyms:** Indian ginseng, winter cherry
- **Common name:** Ashwagandha, Punir
- **Family:** Solanaceae
- **Order:** solanales
- **Kingdom:** Plantae Genus: withania
- **Division:** Magnoliophyta
- **Active phyto-chemicals:** Withanolides, alkaloids, saponin, flavonoids, steroidal lactones Part used for research: Bark, leaves, Fruits, roots.
- **General uses:** Improve immunity, anti-inflammatory, antoxidant, improve stamina and strenth

Fig 3: Ashwagandha plant [12]

Fig 4: Ashwagandha powder [13]

Guggul
Cardioprotective Activity:
Improve coronary circulation
Improve reduces blood pressure
Improve cholesterol.

Botanical Name: Commiphora wightii

Synonyms: Comiphoramukul, Balasampdendron mukul

Common Name: guggul, Indian bdellium

Family: Burseraceae

Order: Sapindales

Kingdom: Plantae Genus: commiphora

Division: Magnoliophyta

Active phytoconstituents: Guggulipid,steroids, flavonoids.

Part used for research: Leaves, Fruits, oleoresin, bark to-chemicals: Guggulsterones, myrrhanol A and B.

General uses: Used in cardiovascular and joint pain, management of hyperlipidemia, treatment of obesity.

Fig 5: Guggul plant [14]

Fig 6: Guggul powder [3]

b) Other ingredient which used in this chocolate [15]
1. **Cocoa powder:** Flavors enhancer
2. **Cocoa butter:** Provide smooth texture
3. **Honey:** Emulsifiers
4. **Vanilla:** Flavoring agent
5. **Milk powder:** Creamy texture and taste
6. **Sugar:** sweetener
7. **Water:** solvent

Drug profile
Terminalia arjuna
Terminalia Arjuna is a plant used in Ayurveda that has significant healing properties [11]. Terminalia arjuna, a plant known scientifically as (Roxb.) Wight & Arn,is widely used in traditional medicine to help treat heart and blood vessel problems.In recent times, both experimental and clinical studies have said that the dried bark powder of Terminalia Arjuna has helpful effects in ischemic heart disease. However, the exact way that the bark of Terminalia Arjuna protects the heart in ischemic heart disease, based on what we know about how the disease works, is not well understood [16]. These days, people are more focused on their health and like to choose foods thatare good for their bodies [17] and make them feel better [18].
Because people are asking for more from their food, many new kinds of functional foods have been created. These foods not only provide good nutrition but also offer special health benefits. Milk-based drinks are especially good at carrying these new healthy ingredients because they taste great and are very nutritious [19]. Chakradatta,the famous old doctor, suggested giving it as a drink made from the bark mixed with milk or as a ghrita, which is a special mixture made with ghee or butter [20]. The bark has been used to make a decoction for washing ulcers, and the ashes from the bark have been used to treat snakebites and scorpion stings.

Habitat

The Arjuna tree grows to a height of about 60 to 80 feet. It is commonly found near rivers, streams, and dry water areas in the Indo-sub-Himalayan regions, including parts of Uttar Pradesh, southern Bihar, Chota Nagpur, Burma, Madhya Pradesh, Delhi, and the Deccan region. It can also be seen in the forests of Sri Lanka and Mauritius [21].

Phytochemistry [22]

- **Stem bark**

1) **Triterpenoids:** Arjuna, Arjunic acid, Arjungen
2) **Ursane triterpenoids:** 2a, 3b-dihydroyurs-12, 18-oic acid 28-O-b-D-glucopyranosyl ester, 2a, 3b, 23-trihydroxyurs-12, 18-dien-28-oic acid 28-O-b-glucopyranosyl ester, Qudranoside, VIII Kajiichigoside F.
3) **Glycosides:** Arjunetin, Arjunoside I, II, Arjunolone, Arjunolitin Tripathi, Arjunaphthanoloside, Arjunglucoside, Arjunasides, Olean-3b, 22b-diol-12-en-28-b-D- glucopyranoside-oic acid, Terminarjunoside I and II
4) **Flavonoids and Phenolics:** Arjunone, Luteolin, Baicalein, Oligomeric proanthocyanins, Pelargonidin, Quercetin
5) **Tannins:** Pyrocatechols, Punicallin, Castalagin, Casuariin, Casuarinin.

Roots: Glycosides: Arjunetosie (3-O-b-D-glucopyranosyl-2a, 3b, 19a-trihydroxyolean-12- en-28-oic acid).

- **Fruits 1):** Triterpenoids and flavonoids: Arjunic acid, Arjunone, Arachidic stearate, Cerasidin, Ellagic acid, Fridelin, Gallic acid, Hentriacontan

Leaves and Seeds

1) **Flavonoids and Glycosides:** Luteolin, 14,16-dianhydrogitoxigenin 3-b-D-xylopyranosyl -(1 > 2)-O-b-D- galactopyranoside

Graphical Abstract of Terminalia Arjuna

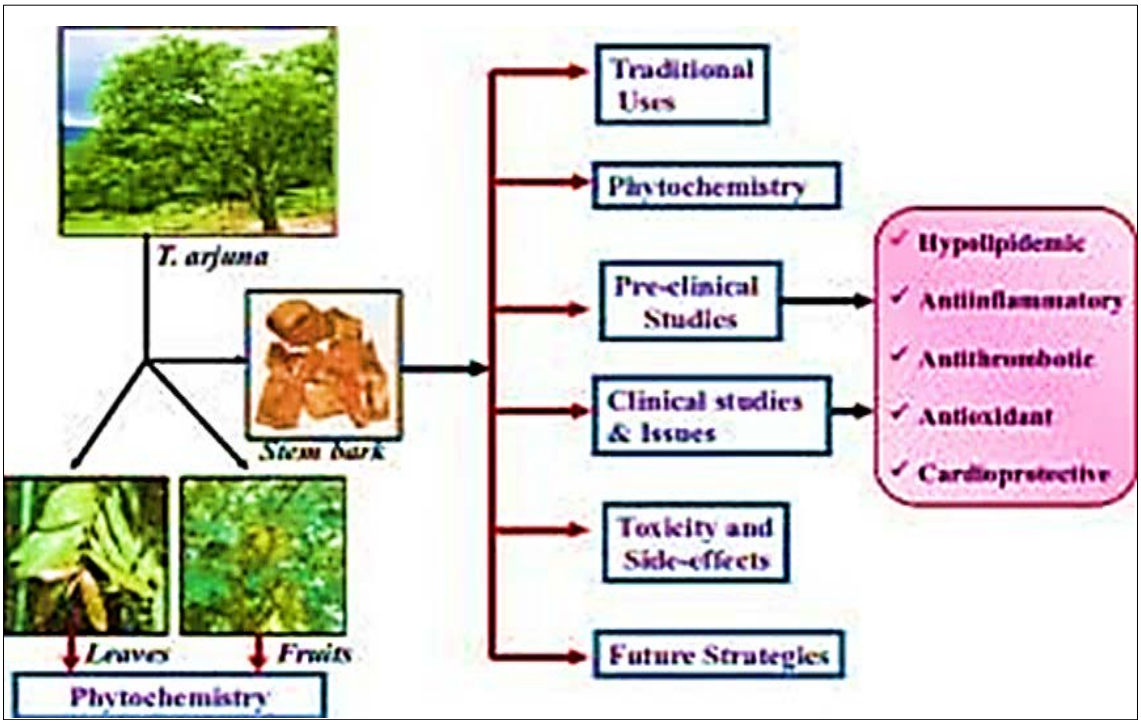

Fig 7: graphical abstract [23]

- **Withania Somnifera**

Ashwagandha, which is also called Withania somnifera, has been well-known for a long time. Many research studies have found that the extract from this plant, because it contains a lot of active compounds [24], can help reduce inflammation, protect the brain, balance the immune system, protect the liver, support heart health, help control diabetes, help the body handle stress, and even fight off some types of bacteria and infections.[25] Withania somnifera has alkaloids, steroidal lactones, and glycosides [6].

- **Test drugs**

Withania somnifera was used as a standardized aqueous root extract, and Teminalia arjuna was used as an aqueous bark extract. Both extracts were obtained from the Central Council for Research in Ayurveda and Siddha (CCRAS) in Delhi, India. The extracts were placed into 500mg gelatin capsules. These capsules were stored in airtight containers at room temperature, which was kept below 30°C throughout the study. Both drugs were given in a dose of one capsule per day, taken orally for a period of eight weeks. To ensure that participants followed the study protocol,the researcher personally gave the medication to each subject during the eight week period. All the variables mentioned were measured both before and after the eight- week treatment period. The measurements were taken in the Isotonic and VO2 max labs, as well as the KMS lab, which are part of the Department of Sports Medicine and Physiotherapy at Guru Nanak Dev University in Amritsar [26].

Graphical abstract of Withania Somnifera

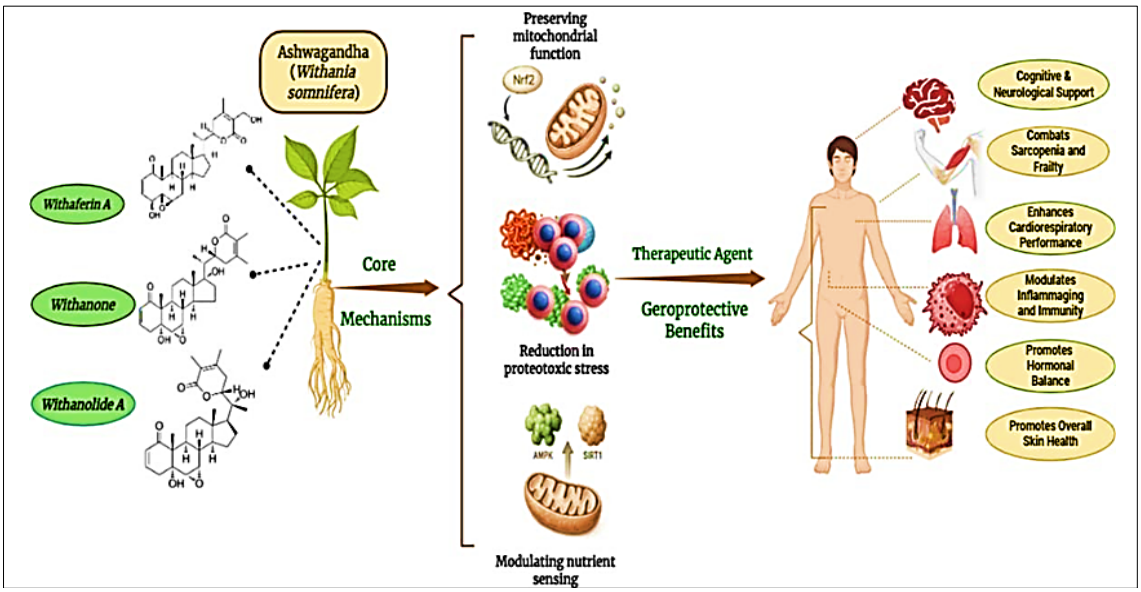

Fig 7: Graphical abstract [11]

Commiphora Wightii

Commiphora wightii, also known as guggul, is a valuable plant resin that has been used in Ayurvedic medicine for a long time.In fact, the ancient Ayurvedic text called Caraka Samhita refers to guggul as a "cure for all diseases." Guggul should be smooth, soft, and sticky, with a pleasant smell, a bitter taste, and a yellowish color.

It should dissolve in water and must not be contaminated. The resin from the guggul tree, which is also called Commifora mukul, has been used in Ayurvedic medicine for more than 2,000 years. This tree has sharp thorns and not many leaves, and it grows naturally in western India [27]. In 1966, scientists studied the resin's ability to lower lipids in the body. Then, in 1986, the Indian government approved guggul oleoresin for sale as a medicine to help reduce cholesterol levels [12].

The Ayurvedic properties of guggul are

Guna (qualities): light (laghu), penetrating (tikshna), unctuous (snigdha), viscid (pichchil), subtle (sukshma), spreading (sara).

Rasa (taste): bitter (tikta), pungent (katu), sweet (Madhur), astringent (kasaya) Vipaka (post- digestive effect): pungent (katu).

Virya (energy): heating (ushna)

Prabhava (special action): tridoshic (tridoshahara) Dosha: VPK-, can aggravate pitta in excess Dhatu (tissue): all tissues

Srotas (channel): raktavaha, mahavaha, majjavaha, pranavaha, shukravaha, and artavavaha

Graphical abstract of Commiphora wightii [28-29]

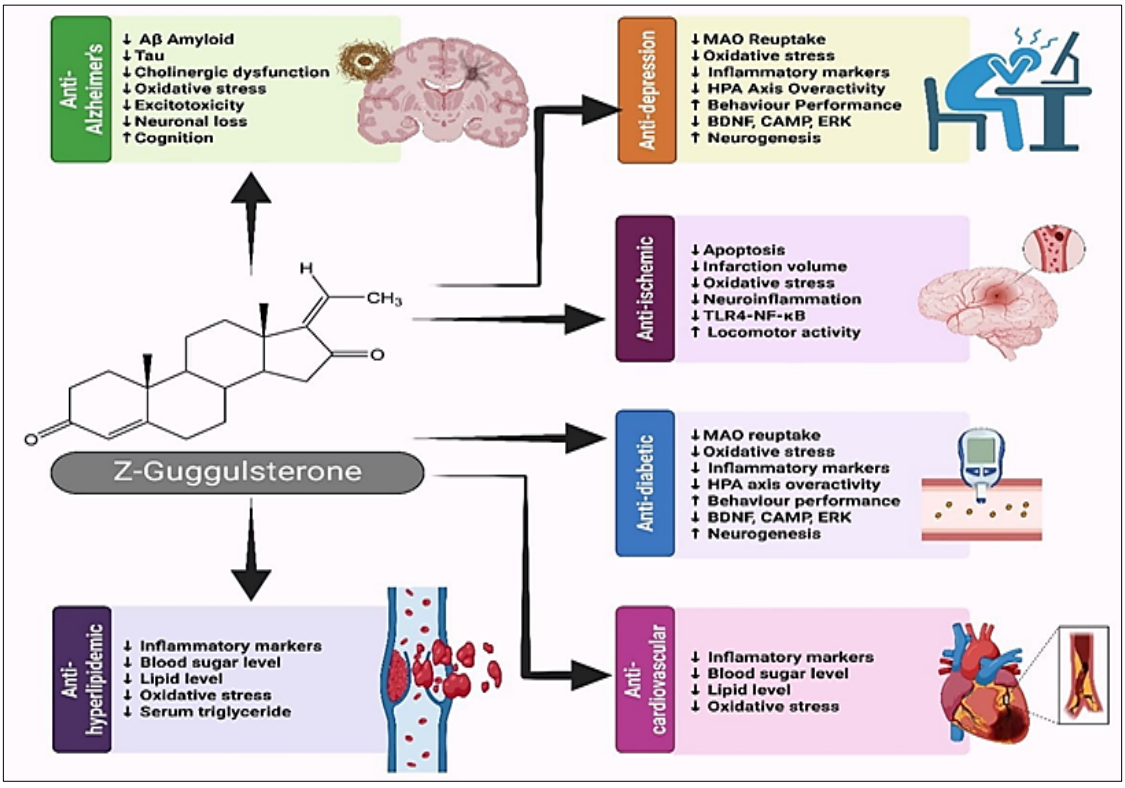

Fig 9: Graphical abstract

Aim and Objective

Aim: To create and form herbal chocolate with multiple uses for heart diseases

Objective

1. To reduse High BP, Cholesterol.
2. To treat various heart diseases.
3. Decrease heart attack rate.
4. To reduce stress.

Management of Cardivascular Disease [30]

Table 2: Cardiovascular conditions along with their causes, symptoms and management [13]

Cardiovascular conditions	Causes	Symptoms	Management
1. Coronary Artery Disease (CAD)	Atherosclerosis (plaque buildup in coronary arteries)	Chest pain (angina), shortness of breath, fatigue	Lifestyle changes, medications (statins, beta blockers), angioplasty, coronary artery bypass grafting (CABG)
2. Peripheral Arterial Disease (PAD)	Atherosclerosis affecting arteries in the limbs, typically the legs	Leg pain while walking (claudication), numbness, weakness	Lifestyle changes, medications (antiplatelets, statins), revascularization procedures (angioplasty, bypass surgery)
3. Cerebrovascular Diseases (Stroke)	Ischemic stroke: blockage of blood vessels in the brain; hemorrhagic stroke: rupture of blood vessels in the brain	Sudden weakness or numbness, confusion, difficulty speaking, vision problems, severe headache	Thrombolytic therapy (ischemic stroke), surgical interventions (hemorrhagic stroke), rehabilitation and lifestyle modifications
4. Myocardial Infarction (MI)	Blockage of blood flow to the heart muscle due to a blood clot	Severe chest pain, shortness of breath, sweating, nausea, light-headedness	Immediate revascularization (angioplasty, CABG), thrombolytics,

In this study, we have described how to make gold nanoparticles using an extract from T. Arjuna leaves and checked their properties. We also looked at how well these nanoparticles work in two areas: helping with cell division and supporting pollen germination. Our tests show at the gold nanoparticles were very effective in both cases. Additionally, we found that they did not harm the cells or pollen grains in any harmful way [14]. It's important for doctors to focus on non- HDL-C/apoA-I and MHR in their everyday work. Finding these markers early can help in better identifying and predictin g the outcome for patients with coronary artery disease [3].

Discussion and Conclusion

The study found that having a family history of CHD, being over 45 old, having high blood sugar levels, and a higher ACR were the years old, having high blood sugar levels, and a higher ACR were the main factors that could predict the risk of CHD. Low-income individuals faced the most dangerous cardiovascular disease risks because they had less access to good treatments, lower levels of education, and worse financial conditions. Based on the evidence found in the literature, Terminalia arjuna, Commiphora wightii, and Withania somnifera can be seen as heart- protective medicines with a lot of potential for treating conditions like CVD and CHD.

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