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AN IN-DEPTH ANALYSIS OF THE PHARMACOGNOSTICAL AND PHYTO-PHARMACOLOGICAL ASPECTS OF *Averrhoa carambola* Linn

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ABSTRACT

Since ancient times, natural plants have been a key source of pharmaceuticals. The therapeutic elements found in plants are crucial in the management of a wide range of illnesses. They provided a plentiful supply of the active phytochemical components needed to produce a range of biological activities. One of the valuable therapeutic plants belonging to the Oxalidaceae family is the star fruit, scientifically known as *Averrhoa carambola.* The phytochemical elements such as tannins, alkaloids, glycosides, phenols, terpenoids, saponins, carambolasides, emodols and coumarin with additional compounds discovered in abundance in the plant's parts through extraction and isolation that are primarily responsible for producing a range of biological activities like antioxidant, antimicrobial, anti-tumor, hypotensive properties and so on. The herb is commonly used in traditional medicine to treat a range of illnesses such as bleeding hemorrhoids, malaria, indigestion etc. Therefore, the primary goal of this review is to highlight the customary uses, phytochemistry, pharmacology of the plant Averrhoa carambola. Further investigation is required to explore the plant's medicinal capabilities specifically at the cellular and molecular levels creating new methods for extractions. Conducting pharmacological screening and running clinical trials are crucial in order to maximize the therapeutic benefits of *Averrhoa carambola*. A detailed examination of the medicinal properties of *Averrhoa carambola* sets the stage for future studies that could result in the creation of innovative treatments for different illnesses.

Keywords: *Averrhoa carambola, P*hytochemistry, Pharmacology, Phytochemical elements

INTRODUCTION:

The Averrhoa carambola L. fruit, also called star fruit or carambola, belongs to the Oxalidaceae family **[1]**. comes from various nations including India, Malaysia, China, Indonesia, Taiwan, the Philippines, Australia, and Florida. The complete fruit is not only edible but also juicy. Fruits are named based on their star-shaped slice, and they are picked when they are either light green, dark green, or yellow. There are two varieties of star fruits that are grown: The little one, a light green color, is extremely tart due to its high oxalic acid content. while the larger one is sweet, less acidic, and milder in taste. Ayurvedic medicine recommends utilizing fruit juice to assist with digestion, lower fever, and as a natural eye drop for enhancing vision. In 'Yunani' medicine, mature fruits are believed to decrease thirst and aid in preventing diarrhea and vomiting in cases of food poisoning. Fully grown fruits are utilized in traditional Indian methods to halt the bleeding of blood. Fruit juice is popular in Vietnam and acts as a remedy for the eyes and helps to lower elevated blood pressure. There are certain nations where drinking juice is regarded as a good way to combat the overconsumption of alcohol. In Brazil, fruit juice is a popular beverage choice as it is suggested for its effect of increasing urination and also for managing eczema. carambola Fruit is utilized in making fruit salads, jams, making clear juices, and manufacturing jellies. Star fruits are often cooked with seafood or meat in Malaysia. Moreover, residents also enjoy salads that involve mixing carambola fruits mixed with sugar, apples and cloves and letting them simmer together. However, in most agricultural areas, fruits are consumed uncooked with salt and chili seasoning. It consists of abundant amounts of vit A and C, along with high levels of calcium, folate, potassium, and oxalic acid. carambola fruits have a minimal sugar content and also include phenolic substances like epicatechin and proanthocyanidin. Star fruits also contain elevated amounts of oxalic acid, ranging from 0.08 to 0.73 g per 100 grams. The incidence of reported harmful effects from eating star fruit has been increasing **[2]**. Negative responses from ingesting star fruit primarily led to harm in the kidneys and nerves **[3]**. It can be utilized for washing dishes as it helps remove rust **[4]**.

Plant Description:

Carambola trees produce abundant fruit and are perfect for home gardens. It grows gradually, has a small trunk, is dense with numerous branches, features a broad, circular canopy, and can reach a height of 6-10 meters. The leaves that shed annually are sensitive to make physical contact, spiral in arrangement, interchange, and 15-20 centimetres in length and containing 5-11 leaflets that are almost directly across from each other, shaped like ovals or oblong

ovals, pointed at the tip with a smooth edge, slanted base, and short stem. They measure 3-9 cm and have a velvety, green upper side and a fuzzy, whitish underside. The leaflets react to light by closing together at night or when the tree is disturbed. Clusters of fragrant flowers, approximately 6 mm wide, with red stems and purple streaks, can be found in leaf axils on new or on mature branches without foliage. These flowers bloom multiple times a year. The fruits are elongated or oval in shape, measuring 6–15 centimetre long and 9-centimetre breath, with five angles, occasionally four or six. When fully ripened, they have a bright orange-yellow skin, a thin waxy surface, and a juicy, crunchy, see-through yellow flesh. Cross-sectional slices have a star-like appearance. The fruit, classified as a berry, can have a varying aroma of oxalic acid and a flavour that varies from extremely tart to slightly sweet. Generally, types of "sweet" typically have less than 4% sugar content. There could be as many as a dozen flat, thin, brown seeds measuring 6-12 mm in length, or none at all. Once seeds are taken out of the fruit, their ability to grow diminishes rapidly. Seeds 8-10 display an arillate composition and are a yellow to light brown hue, with a compressed form. Studies have been carried out on the development of ovules and seeds, as well as on the modifications in mineral content of flower clusters and the development of starfruit **[5]**.

A. *Carambola* leaf & blossom

***A. Carambola* fruit**

Table 1: Taxonomic Classification [6]:

Kingdom	***Plantae***
Subkingdom	***Tracheobionta***
Superdivision	***Spermatophyta***
Division	***Magnoliophyta***
Class	***Magnoliopsida***
Subclass	***Rosidae***
Order	***Geraniales***
Family	***Oxalidaceae***
Genus	***Averrhoa* Adans**
Species	***Averrhoa carambola* L.**

Table 2: Vernacular Names [7]:

Sanskrit	**Karmaranga**
English	**Starfruit, Chinese gooseberry**
Tamil	**Thambaratham/Tamarattai**
Assamese	**Kordoi/ rohdoi**
Bengali	**Kamranga**
Gujarati	**Kamrakh**
Marathi	**Karambal**
Telugu	**Ambanamkaya**
Hindi	**Kamrakh, Karmal**
Malayalam	**Caturappuli**
Sinhala	**Kamaranga**
Filipino	**Balimbing, saranate**
Indonesian	**Belimbing**
Malay	**Belimbing**

Traditional uses:

The *carambola* has been used in ancient medicine for various health issues for centuries, containing roots, leaves, stems, fruits, flowers, and seeds in nations like India, China, Malaysia, as well as Brazil. In India, the juice and mature fruits are abundantly used for scurvy, appetite, astringent, Production of spit, high body temperature, swollen veins around the rectum, dryness in the mouth, and for Laxative. In Brazil, ripe fruit is used for urinary problems, hypertension, and diabetes. Sri Lanka recognizes hypoglycemic benefits for diabetes. In Malay traditional medicine, crushed shoots or leaves are used for headaches, chickenpox, and ringworm, with a mix of fruits and leaves to treat vomiting, fevers, mouth ulcers, and chest pain **[8]**. Ripe fruits in Chinese medicine are utilized to treat various conditions such as sickness from food, swollen spleen, yellowing of skin, upset stomach, infections in throat, swelling,

tooth pain, skin irritations, and sudden brain attacks. It is also used in women for milk production and menstruation stimulation and increases sexual desire in both males and females. Star fruit leaves are used to help with diabetes, reduce vomiting, treat coughs, prevent hangovers, and manage headaches. Ground seeds are used for managing colic pain and asthma in southeast Asia **[9]**.

Review Report of *carambola* Extraction Methods:

Kumar D *et al*. reported that the leaves are washed with water and dried under shade. Dried leaves were transformed into rough powder using a grinder. Around 100 grams of coarse powder was placed into a 1000 mL Soxhlet apparatus and then extracted with petroleum ether to remove the fat from the sample. Following this, the identical sample was once more obtained using pure alcohol. Following the extraction process, any extra solvent was eliminated from the extract through steam distillation. The concentrated solution was evaporated on a water bath at 40°Celsius, and the extraction yield was determined **[10]**.

Jannah MH *et al*. stated that the *carambola* leaves are washed dried crushed into powder and stored in a container prior to starting the extraction process the powder in a glass bottle was treated with pure ethanol and then filtered 20 days later the Soxhlet apparatus was employed for additional extraction from the remaining marc the raw extract was divided using n-hexane and chloroform for fractionation the procedure included shaking and separating layers the filtered materials were evaporated to produce a sticky concentrate which was then stored in a labelled container to preserve it the process of fractionating *carambola* EAC was thoroughly described and executed successfully **[11]**.

Marina IKA *et al*. isolated and separated compounds from *carambola* leaves by washing, air-drying for 5 days, and grinding in an electric blender. The dried leaves were powdered using a milling machine. After 24 hours, the powder was macerated with 70% ethanol. The solvent was eliminated and the essence was dehydrated using a rotary vacuum evaporator at approximately 50°C. The ethanol extract was separated into n-hexane, ethyl acetate, and water. The rotary vacuum evaporator processed the fraction again at 40°C, 100 rpm. The ethyl acetate portion was then used in the experiments **[12]**.

Raj Kumar Singh B *et al*. obtained the dried fruit powder through a series of solvent extractions using multiple liquids used for dissolving other substances such as Pet. ether, methanol, and ethanol in order of increasing polarity. The liquid was removed by decreasing the pressure to produce a partially solid substance, which was then dried under vacuum to result in solid

remnants. The desiccated extracts were kept in a sealed container until they were needed **[13]**.

Oliveira DA *et al*. outlined the technique of aqueous extraction. The aqueous extract is made by blending 80 grams of *carambola* fruit with 800 milliliters of water in an industrial blender and afterwards filter it using an organza cloth. The ethanol extract was obtained through percolation, followed by evaporation of the solvent in a rotary evaporator at 40°C. Both aqueous and ethanol extracts were frozen, lyophilized, weighed, and stored at 4°C. Enzymes from Lachesis muta, Crotalus durissus terrificus, and Bothrops, venoms are utilized to induce different activities **[14]**.

Mardhiyah S *et al*. explained the process of obtaining a *carambola* leaf extract by macerating it with 70% ethanol as the solvent. Briefly, the *carambola* leaf powder was added to a container and combined using 70% ethanol in a ratio of 1 gram of powder to the solvent of 10ml. The powder was mixed in liquid for 6 hours before being left undisturbed for 18 hours. Then, the macerate was separated through precipitation and filtration, then evaporated using a rotary vacuum evaporator and water bath at 50 °C until a crude extract was obtained **[15]**.

Rahma RK *et al*. reported that they obtained *carambola* leaves powder by using multilevel maceration with n-hexane, ethyl acetate, and 70% ethanol in a 1:10 ratio (sample: solvent). The soaking period took one day for one round, involving stirring for the first 6 hours and then leaving it undisturbed for the next 18 hours. This procedure was done 4 times. Next, the extract was dehydrated by employing either a rotary vacuum evaporator for a period of 4 days or a water bath at 60°Celcius for 7-8 days in order to produce a dense and powerful extract **[16]**.

Aladaileh SH *et al*. observed that *carambola* leaves are extensively washed, then dried in the oven at 45 °C. crushed using a grinder, the substance was crushed into a smooth powder. The powder is extracted with methanol through maceration by using a ratio of 1 part to 6 parts by volume for a continuous 9-day period. Additional solvent was introduced every 72 hours. The methanolic extract was strained with cotton plug and Whatman filter paper No. 1. Afterwards, it was dehydrated in a vacuum at 45 °C. The dehydrated concentrate was freeze-dried and kept in the fridge until needed **[17]**.

Ndukwe GI *et al*. detailed the extraction process using hydro distillation and a Clevenger apparatus to recover volatile organic compounds from diced fruits and leaves. The materials were heated at 60°C for about 1 hour and 30 minutes in a round bottom flask with a Clevenger apparatus. The resulting extracts were collected in

sealed glass vials and kept under 4°C up to the point of examination **[18]**.

Weerasekara NK *et al*. stated that they extracted the hexane fraction from fresh unripe mature fruit juice of a *carambola* by solvent-solvent partitioning followed by concentration at 40°C with a rotary evaporator **[19]**.

Hasan MR *et al*. stated that the fruit of the *carambola* plant is washed with water to eliminate dirt, then chopped into small pieces and allowed to dry in the air for a couple of days before undergoing further dehydration in a hot-air oven (Size 1, Gallenkamp) at 50°Celcius. The dried fruits were then crushed into coarse powder using a strong grinding mill. The methanol (500 ml) was used to extract the crushed fruits with a Soxhlet apparatus at a high temperature of 65°C. The extraction process was finished once the fruit parts were free from any remaining components, by continuous removal of transparent fluid in the Soxhlet device. The filtrates gathered were dried at a temperature of 40±2°C to form a sticky concentrate of the original extract. The sample was placed in an appropriate vessel, labeled accurately, and placed in a cool, dry place for future usage **[20]**.

Khanam Z *et al*. stated that the fruits underwent thorough washing, were hand-peeled, and subsequently chopped into tiny pieces (100 g). The combination samples were put into 200 ml of ethanol in a bath of water at a temperature of 40 °C. Aluminum foil was utilized to shield the conical flask from direct sunlight while the extraction was taking place. After 24 hours, the fruit extract was strained with a Whatman filter paper. The liquid left was dried at 40° Celsius with a rotary evaporator under reduced pressure. The unprocessed extract was collected and kept in a dark glass container at a temperature of -4°C for additional examination. The exact identical approach was employed to make the aqueous extract of the fruit **[21]**.

Biswa ND *et al*. stated that they washed the gathered fruits, chopped them into small pieces and then dried them under the sun for approximately one week the rough powder was separated using a solvent blend containing equal parts of Pet. ether, methanol and ethyl acetate **[22]**.

Pharmacognostical studies:

Wahab S *et al*. analyzed the macroscopic and microscopic traits of *carambola* leaf. At a large scale, the plant's compound leaves are arranged in a pinnate pattern and consist of soft ovate to ovate lanceolate leaflets. The sleek surface features a pointed tip, even edge, and angled base. When viewed under the microscope, the leaves show a striped cuticle covering a single layer of epidermis, as well as elongated epidermal cells forming trichomes. Cells of xylem and phloem, collenchyma tissue, Trichomes, and bundles

of vascular tissue can be found in the leaves as well. Physiochemical characteristics like the rate of impurities from other sources, ash content, moisture loss, swelling ability, and extractable substances were assessed. Carbs, terpenes, sugars, flavonoids, and phenols were detected during the phytochemical analysis. The outcomes can offer direction for future research and applications, aiding in differentiation of *carambola* from similar species **[23]**.

Thomas S *et al*. observed the physical traits of the *carambola* fruit, which are big, oblong, longitudinally 5-angled with a green, firm skin that becomes translucent golden yellow when ready to eat, having a star-shaped cross-section, and a flavor that ranges from sour to slightly sweet, containing 2-3 brown seeds. At a tiny scale, the fruit's cross-section displays a star pattern, with different sections in the pericarp like the outer exocarp composed of rectangular cells with trichomes, and the endocarp containing densely packed parenchymatous cells in young fruit and empty spaces in mature fruit. Analysis of the powdered fruit's physical and chemical properties indicates values for ash and extractives. The fluorescence of the fruit of Averrhoa *carambola* has been documented as well **[24]**.

Phytochemistry Extraction Method of Compound Isolated:

Patel D *et al*. conducted a phytochemical study on the *carambola* plant, analyzing its leaves using Methanol and Hexane solvents. Alkaloids, Phenols, Saponins, Terpenoids, and Flavonoids were identified in the screening process **[25]**.

Islam S *et al*. found various secondary metabolites like phenolic acids, xanthones, terpenoids and flavonoids in ethanolic extract of carambola bark utilizing paper spray ionization (PSI) coupled with high-resolution mass spectrometry **[26]**.

Aye TK *et al*. examined the phytochemical analysis of a *carambola* a variety of compounds were found in the fruits including alkaloids can be found in amino acids, carbs, reducing sugars, glycosides, phenolic compounds, tannins, flavonoids, saponins and starch **[27]**.

Sona Rajashree B *et al*. carried out preliminary screening of *carambola* that outlined the presence of flavonoids, tannins, alkaloids, terpenoids, phenols, glycosides, saponins, emodols, and coumarins **[28]**.

Preliminary Phytochemical Study Showed Compounds:

Sari Y *et al*. identified epicatechin gallate (ECG) and other phytochemicals in extracts of fresh and dried Ripened star-fruits (RSF), such as 2,3-Butanediol, (R*,R*)]-, Glycerin, 4H-Pyran-4-one,5-hydroxy-2-(hydroxymethyl)-, D-Glucose,6-O-à-D-galactopyranosyl-, sucrose, 5-Hydroxymethylfurfural, n-Hexadecanoic

acid Cyclooctasiloxane, hexadecamethyl-, and 4H-Pyran-4-one,2,3-dihydro-3,5-dihydroxy-6-methyl-. Methanol was added to the samples to lower the concentration to 100 ppm before being analyzed with LC-MS and GC-MS methods. GC-MS utilized a ZB-5MS column, while LC-MS used a C18 reverse-phase column with formic acid and acetonitrile as the mobile phase. The NIST library was utilized for the purpose of recognizing chemical compounds. ECG levels were measured utilizing UV-visible spectrophotometry. Regression analysis was used to assess ECG concentrations at 277 nm. These methods accurately identified and quantified ECG elements in the specimens, providing crucial data for assessment **[29]**.

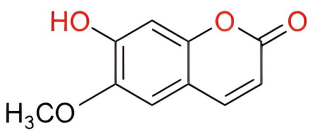
Yang Y *et al*. isolated Ten previously uncharacterized dihydrochalcone C-glycosides, including carambolasides R_1–R_3, T_1–T_3, S_1& S_2 as well as 3-hydroxycarambolaside T_1 and 3-hydroxycarambolaside P, were obtained together with carambolasides P&I from the foliage using solvent fractionation column chromatography liquid chromatography. Their structures were identified through spectroscopic and chemical techniques. High-performance liquid chromatography (HPLC) analysis and that indicates the carambolasides P, I, T_1&T_2 were the most abundant **[30]**.

Jia X *et al*. identified thirteen flavonoids from the 95% aqueous extract of *carambola* fruit, through solvent fractionation, column and liquid chromatography. (+)-Epicatechin, aromadendrin 3-O-β-d-glucoside, helicioside A, taxifolin 3′-O-β-d-glucoside, galangin 3-O-rutinoside, and isorhamnetin 3-O-rutinoside were newly identified in this species. The compound structures were identified by spectroscopic and chemical techniques. pinobanksin 3-O-β-d-glucoside, 8-Carboxymethyl- (+)-epicatechin methyl ester and carambolasides M-Q were new substances, with no prior identification. Moreover, newly found substances are also identified in this species **[1]**.

Jia X *et al*. discovered that they could separate eleven non-flavonoid phenolic compounds from sweet fresh star fruit by fractionating and separating its 95% ethanol extract through different chromatographic methods. Examination of spectroscopic data helped in determining their structures. Two additional alkylphenol diglucosides, carambolasides K and L, were incorporated alongside four phenylpropanoids: (+)-isolariciresinol 9-O-β-d-glucoside, (+)-lyoniresinol 9-O-β-d-glucoside, (−)-lyoniresinol 9-O-β-d-glucoside, and 1-O-feruloyl-β-d-glucose. Furthermore, three benzoic acids were discovered: protocatechuic acid, 1-O-vanilloyl-β-d-glucose, and tecomin, as well as a basic

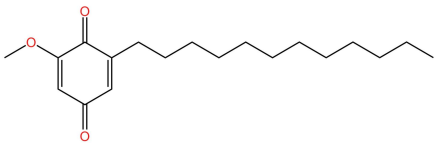
phenol, koaburaside, and a naphthoquinone, (+)-cryptosporin. Every single one of them was initially recorded from the star fruit **[31]**.

Wijayabandara MD *et al*. stated that they extracted *carambola* fruits using n-hexane and CH2Cl2, then purified the extracts with silica gel chromatography using hexane and EtOAc mixtures. A substance called JW-AC-3 was obtained through preparative TLC. UV, IR, MS, and NMR spectroscopy techniques were employed to establish its structure, with the use of Hetero Multiple Bond Connectivities (HMBC), Homonuclear Shift-Corrilation Spectroscopy (COSY), Nuclear Overhauser Spectroscopy (NOESY), Distortionless Enhancement Polarization Transfer (DEPT) and Heteronuclear Multiple-Quantum Coherence (HMQC) experiments. JW-AC-3 was recognized as scopoletin by comparing it to existing data. This is the initial detection of scopoletin in *carambola* **[32]**.



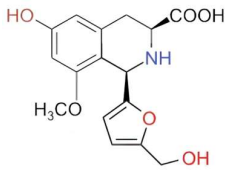
Scopoletin

Gao Y *et al*. stated that 2-dodecyl-6-methoxycyclohexa-25-diene-14-dione, a cyclohexanedione, is present in the roots of starfruit **[33]**.

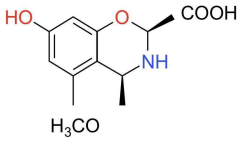


2-dodecyl-6-methoxycyclohexa-25-diene-14-dione

Yang D *et al*. identified two new alkaloids derived from tetrahydroisoquinoline, specifically (1R*,3S*)-1-(5-hydroxymethylfuran-2-yl)-3-carboxy-6-hydroxy-8-methoxyl-1,2,3,4-tetrahydroisoquinoline and (1S*,3S*)-1-methyl-3-carboxy-6-hydroxy-8-methyoxyl-1,2,3,4-tetrahydroisoquinoline, along with 4-Hydroxy-3-methoxybenzoic acid, hydroxycinnamic acid, 8,9,10-trihydroxythymol, and 2-alpha,3-beta,23-trihydroxy-olean-12-en-28-oic-acid from star fruit. Spectroscopic methods are used to determine their structures **[34]**.



(1R*,3S*)-1-(5-hydroxymethylfuran-2-yl)-3-carboxy-6-hydroxy-8-methoxyl-1,2,3,4-tetrahydroisoquinoline



(1S*,3S*)-1-methyl-3-carboxy-6-hydroxy-8-methyoxyl-1,2,3,4-tetrahydroisoquinoline.

Pharmacological activity:

Anti-hyperlipidemic & antioxidant activity:

Abduh MS *et al*. examined the antioxidant and anti-hyperlipidemic effects on various

fractions of methanolic extract from *carambola* leaves. Different tests were carried out to evaluate antioxidant activity and inhibitory effects on pancreatic lipase and HMG-CoA reductase. Rats were given various fractions of the extract after being induced with acute hyperlipidemia, and their lipid levels, antioxidant levels, and gene expressions were examined. The EA fraction showed the most potent antioxidant and anti-hyperlipidemic properties, lowering cholesterol levels and increasing antioxidant enzymes. It also decreased the expression of damaging genes and enzymes associated with lipid metabolism. In general, the methanolic extract and its various fractions demonstrated strong antioxidant effects in both laboratory and living organisms. The EA fraction was shown to be the most efficient in protecting against dyslipidemia and enhancing antioxidant levels in hyperlipidemic rats **[35]**.

Anti-tumor: Singh R *et al*. studied how *carambola* fruit could potentially prevent liver cancer in mice induced by diethylnitrosamine (DENA) and carbon tetrachloride (CCl4). Swiss albino mice received oral *carambola* extract for five days prior to being exposed to carcinogens. The findings indicated a notable decrease in tumor occurrence, tumor output, and tumor load in mice given *carambola* extract in comparison to the control group. This indicates that *carambola* may act as a preventive agent against liver cancer in mice by guarding against changes caused by carcinogens **[36]**.

Anti hyperglycemic activity:

Xu X *et al*. examined the impact of EACR obtained from *carambola* roots on diabetic mice induced by STZ. Mice were treated with STZ to trigger diabetes and later administered EACR or metformin for a period of three weeks. EACR led to a significant decrease in blood glucose, TC, TGs, and FFAs, with a simultaneous increase in insulin levels. It also decreased apoptosis regulators and triggered proteins, safeguarding pancreatic β cells against apoptosis. The research shows that EACR can lower blood sugar levels by controlling certain factors related to cell death and decreasing cell death in the pancreas. These findings suggest that EACR has the potential to be used as a treatment for diabetes **[37]**.

Analgesic activity:

Das BN *et al*. performed a study to evaluate the pain-relieving properties of *carambola* fruit extract in Swiss-Albino mice. A pair of experiments were carried out: one using acetic acid-induced writhing method to test peripheral action, and the other using radiant heat tail-flick test to assess central action. Twenty-four mice were separated into four categories and administered varied treatments. Findings demonstrated a marked decrease in writhing when given 200 and

400 mg/kg doses, along with a prolongation in tail flicking duration at oral doses of 200 and 400 mg/kg. The research revealed the possible pain-relieving effect of *carambola* fruit extract in mice **[38]**.

Anti-tumor activity:

Li X *et al*. investigated the transformation of dihydro-epi-deoxyarteannuin b using suspension-cultured cells of *carambola* the introduction of the substrate led to the discovery of two sesquiterpenes 7-hydroxy-dihydro-epideoxyarteannuin b and 3-hydroxy-dihydro-epideoxyarteannuin b this novel biocatalytic system unveiled these compounds for the first time showcasing the cells ability to selectively hydroxylate sesquiterpene molecules the anticancer effects of both compounds were tested on k562 and Hela cells with 7-hydroxyl (compound 2) showing higher activity than 3-hydroxyl product (compound 3) **[39]**.

Anthelmintic activity:

Shah NA *et al* conducted a test on pheretima posthuma as a test worm for anthelmintic activity with slight alterations different doses ranging from 10 to 100 mg/ml of the medication were examined in the bioassay which included assessing the time it took for the worms to become paralyzed p and die d albendazole was utilized as a benchmark 10-100 mg/ml with distilled water serving as the control the foliage of starfruit showed notable anthelmintic effects in a dose-dependent manner achieving the quickest paralysis p and death d with a concentration of 100 mg/ml the effectiveness of the water extract was similar to the standard drug at 100 mg/ml concentration the plant extract caused immobility in 10 minutes and mortality in 16 minutes while albendazole produced comparable results in 10 and 21 minutes potentially leading to death **[40]**.

Hypotensive activity:

Soncini R *et al*. examined the effects of low blood pressure on *carambola* extract on rat aorta in isolation. In live animals, it decreased average blood pressure in rats. In a laboratory setting, it reduced reaction to phenylephrine without altering sensitivity, blocked contractions induced by CaCl(2), and slowed down response curves, indicating suppression of extracellular Ca (2+) entry. Analysis by HPLC verified the chromatogram of its unique fingerprint. Findings indicate that EAC causes low blood pressure by blocking Ca (2+) channels, which supports long-standing medicinal beliefs **[41]**.

Antiulcer activity:

Goncalves ST *et al*. studied the ulcer-preventing properties of *carambola* leaf extract (ACE) in rats. ACE exhibited substantial anti-ulcer properties in the acidified ethanol-induced ulcer model at doses of 800 and 1200 mg/kg, yet it failed to show effectiveness in the indomethacin or acute stress ulcer models. Findings show

limited effectiveness in preventing ulcers with different ways of working **[42]**.

Depressant action:

Muir CK *et al*. examined whether star fruit had a depressant compound with pharmacological activity by testing male albino mice. It was found that star fruit did not have an anesthetic or pain-relieving effect, but it did lengthen the amount of time mice slept after being given barbiturates and reduced their activity levels. This indicates the existence of substances that depress similar to tranquilizers in star fruit. Additional studies are currently being carried out to pinpoint the exact component accountable for these impacts. In conclusion, the research highlights the possible use of star fruit as a pharmacological substance that has sedative effects on the central nervous system **[43]**.

CONCLUSIONS:

Information on *carambola* was collected from public sources and review papers, uncovering its diverse range of phytochemical components. Different sections of the plant display medicinal qualities such as sedative properties, anti-cancer abilities, reducing high lipid levels, fighting oxidation, relieving pain, lowering high blood sugar levels, expelling parasites, treating ulcers, managing diabetes and diabetic kidney disease, alleviating arthritis pain, breaking down kidney stones, easing coughs, curing hangovers, alleviating chronic headaches, reducing fevers, expelling worms, and treating diseases like malaria, chickenpox, and ringworm, among other effects. The analysis offers information on the pharmacognostic traits, historical applications, and documented pharmacological effects of *carambola*. The plant is extremely interesting as it has oxalic acid, caramboxin which makes it great for removing rust and cleaning kitchen tools. Further research is needed to fully understand the therapeutic potential of this plant, especially at a cellular and molecular level. Our evaluation has brought attention to the lack of research done on this plant. In the future, the medicinal advantages of this plant may prove to be very beneficial.

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CONFLICTS OF INTEREST: I affirm that I have no conflicts of interest to revel.

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