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Review Article

From Roots To Remedies: A Review Of Commiphora Opobalsamum- Plant Features, Phytochemistry, Pharmacological Insights And Safety

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ABSTRACT

In the last years, consumers are paying much more attention to natural medicines and principles, mainly due to the general sense that natural compounds are safe. On the other hand, there is a growing demand by industry for plants used in traditional medicine that could be incorporated in foods, nutraceuticals, cosmetics, or even pharmaceuticals. Commiphora opobalsamum (L.) Engl. belongs to the Burseraceae family and has been recognized since ancient times for its ethnopharmacological values. This plant contains different phytocompounds, such as quercetin, syringic acid, canophyllal, friedelin, and oleanonic acid that have demonstrated various pharmacological activities. Pharmacological experiments have demonstrated that different extracts and pure compounds from this species exhibit a broad range of biological properties, including antiulcer, hepatoprotective, antihypertensive, antidiabetic, analgesic & anti-inflammatory, vasodilator, anticancer, antiseptic, anticoagulatant, antibacterial, antiviral, antioxidant, etc. A few toxicological studies have reported some concerns. This review addresses all those issues and focuses on the pharmacological activities reported for Commiphora opobalsamum. Therefore, an updated, critical, and extensive overview on the current knowledge of Commiphora opobalsamum botanical

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description, phytochemical composition, pharmacological activities & toxicity profile is provided here in order to explore its therapeutic potential and future challenges to be utilized for the formulation of new products that will contribute to human well-being.

INTRODUCTION

According to historical experience and folk remedies, plants have been utilized as medicine for thousands of years, and their ability to heal both moderate and chronic illnesses continues to get significant interest. Globally, there has been a recent surge in interest in plant study, and a substantial amount of data has been gathered to demonstrate the huge potential of plants with medicinal properties that are employed in many traditional medical systems.1 One plant that is frequently used in folk medicine to treat wounds, pain, inflammatory conditions, etc. is Commiphora opobalsamum (CO). CO is a part of the large, widely consumed Burseraceae family of plants. It is known for its distinctive and noteworthy aroma, it is also referred to in Arab culture as "Al-Besham," "balsam," "Al-Balessan," and "balsam of Mecca." In essence, carbon monoxide is a shrub that is typically found in significant quantities in hilly regions of Makkah, Madina, Saudi Arabia, and Al-Quds, Palestine, holy sites. As a result of their belief in the fallacy that "all those products with natural sources are safe," Arabs use CO frequently".2 Commiphora opobalsamum is used to treat urinary tract illnesses. In modest quantities, balsams stimulate mucous tissues and have diuretic properties; in excessive doses, they can be nauseating and purgative. The fruit itself is used as an emmenagogue and expectorant in Unani medicine, as well as for neurological ailments. Additionally, the wood is a component of medications treating epilepsy and other neurological conditions. Because of the oil's anti-inflammatory and rejuvenating qualities, it is applied externally.3

Al-Howiriny et al. (2005) state that the ancient herb this plant Commiphora opobalsamum, also referred to as Gafal in Sudan, is used in Arabian folk medicine to cure a variety of ailments, such as sore throats, coughs, laryngitis, chronic bronchitis, and inflammations brought on by rheumatism and arthritis. It is extensively dispersed over the states of Darfur and Kordofan in western Sudan. The plant yields soft, light-weight, aromatic wood which is utilized natively to build tools (hammers), furniture (stools), and kitchen items (pots and cups).4 With about 150 plant species, the genus Commiphora (Burseraceae) is found throughout tropical and subtropical climates, with a concentration in northeastern Africa, southern Arabia, and India (Langenheim, 2003; Vollesen, 1989). Commiphora species are small trees or shrubs with reddish-brown resinous exudates, pale grey bark, and spinescent branches. Humanity has gradually come to appreciate the medical benefits of the resin's exudates of the family Commiphora, which are widely employed in perfume, incense, as well as embalming ointment (Langenheim, 2003). They are used in traditional medicine to treat gastrointestinal disorders, obesity, arthritis, fractures, wounds, pain, and parasite infections (Al-Harbi et al., 1997; Zhang, 2009; Abdul-Ghani et al., 2009). Many secondary metabolites, such as lignans, sugars, flavonoids, terpenoids, and steroids, have been found in this genus (Hanus et al., 2005 ˇ). Antiproliferative, anti-inflammatory, antimicrobial, hepatoprotective and cardiovascular properties of the purified metabolites and the crude extracts have been investigated (El Ashry et al., 2003; Shen and Lou, 2008; Deng, 2007).5

History:

Variously contracted from Balsam, balm, baulm, or bawm may come from the Hebrew words smin, 'chief of oils,' or bâsâm, 'balm,' and besem, 'a fragrant smell.' Dioscorides uses apobalsamum to refer to 'the fluid coming from the balsam-tree.'Pliny claims the tree was originally delivered to Rome by the Vespasian generals, whereas

Josephus says the Queen of Sheba brought it to Judea as a gift for Solomon. There, it was grown for its juice and gained its well-known moniker, especially on Mount Gilead. It was then dubbed Opobalsamum, its dried fruit Carpobalsamum, and its dry twigs Xylobalsamum. Many other species have adopted the latter due to its scarcity and the enchantment of its moniker. Twelveth-century Damascan physician Abd-Allatif observed that the tree had two barks: an inner, thick, green bark and an outer, reddish-slim bark with a strong, fragrant scent. The incisions on the bark aid in the juice's spontaneous exudation, which occurs in resinous drips during the summer heat. The amount gathered increases with air humidity. After the oil has been separated, it is then made in secret and brought to the ruler's stores, where it is kept under strict security. Approximately one-tenth of the juice is extracted as oil. It's likely that leaves and wood are boiled in water to produce a lower-quality oil. Small fragments of wood are present; numerous varieties are known to be commercially viable, although the wood quickly loses its scent.

The fruit has a pleasant, fragrant taste and is small, pea-sized, and reddish-gray in color. Its use has been completely ceased within Europe and America since it is so rarely obtained in a pure state. 6

PLANT PROFILE:

Fig no. 1 Commiphora opobalsamum (L.) Engl.

Kingdom:	Plantae
Phylum:	Angiosperms
Class	Eudicots
Order:	Sapindales
Family:	Burseraceae
Genus:	Commiphora
Species	C. opobalsamum
Synonyms:	Commiphora gileadensis, Balsamodendron opobalsamum
Vernaculars:	Balsa'n, Murr makki; Hin.: Balsa'n, Roghan-e-balsan; San.: Guggulu; Ara.: Akulla-balsan, Balsam, Balsa'n, Habb-el-balsana; Eng.: Arabian balsam tree, Balm of Giliad, Balm of Mecca, Mecca myrrh; Fin.: Arabialainen mirhami, Mekanmirhapuu, Mekka-palsami; Fre.: Baumier de la Mecque; Ger.: Mekkamyrrhenstrauch; Ita.: Balsamo della Mecca; Per.: Balasãn; Tur.: Balsam Makkah

BOTONICAL DESCRIPTION:

Table no.1- Plant Characteristics:5,6,7,8,9

Height:	3-5 m / 9.8-16.4 ft / 118-196 in / 300-500 cm
Width and Spread:	1-1.5 m / 3.3-4.9 ft / 100-150 cm / 1-1.5 m
Plant Type:	Balsam tree
Habit/Form	Shrub or small tree
Leaf Type:	Deciduous, pinnate along with 3-9 leaflets
Leaf Arrangement:	Alternate
Leaf Shape:	Ovate to elliptic
Leaf Margin:	Entire
Leaf Color:	Green
Fragrance:	Yes; Sweet, woody, and spicy fragrance
Stem Description:	Smooth, peeling bark, branching, often with thorny projections
Stem Is Aromatic:	Yes
Texture:	Smooth, peeling
Leaf Feel:	Smooth, glossy
Leaf Length:	5-10 cm
Leaf Description:	Alternate, pinnate, 10-20 cm long, with 3-9 leaflets, each leaflet 2-5 cm long.
Hairs Present:	Yes

Table no.2- Flower and Fruit Information5,6,7,8,9

Fruit Type:	Non-edible berry

Fruit Description:	Small, reddish to yellowish, drupe-like, berry-like fruit.
Flower Color:	White to yellowish
Flower Shape:	Radially symmetrical
Flower Inflorescence:	Axillary clusters
Flowering Season:	May to July
Bloom Duration:	6-8 week

Table no.3- Tolerance and Hardiness5,6,7,8,9

Drought Tolerance:	Moderate
Frost Tolerance:	Not frost-tolerant
Heat Tolerance:	Not well-documented; prefers warm, dry climates; likely intolerant to prolonged high temperatures.
Wind Tolerance:	Moderate
Shade Tolerance:	Moderate shade tolerance
Salt Tolerance:	Moderate
Soil Compaction Tolerance:	Low
USDA Plant Hardiness Zones:	10-12
Photoperiod Sensitivity:	Not well-documented

Table no.4- Health and Safety5,6,7,8,9

Edibility:	No
Edible Parts:	Resin (used as a spice or flavouring)
Toxicity:	No
Poison Parts of Plant:	No parts poisonous
Toxic to Humans:	No
Toxic to Cats:	No known toxicity to cats.
Toxic to Dogs:	No known toxicity to dogs.
Causes Contact Dermatitis:	Yes.
Air Purification Qualities:	No established air purification qualities.
Medicinal Properties:	Anti-inflammatory, analgesic, antimicrobial, antifungal, antiviral, anticancer, antioxidant, antidiabetic, hepatoprotective, immunomodulatory
Thorniness or Spikiness:	Yes

Table No. 5- Wildlife and Landscape5,6,7,8,9

Pollinator Attraction:	Commiphora opobalsamum attracts bees and other insects for pollination.
Wildlife Value:	Commiphora opobalsamum provides habitat and food for various insects and birds through its flowers, leaves, and fruit.
Problematic Insects:	Scale insects, mealybugs
Allelopathic Properties:	No
Habitat Enhancement:	Commiphora opobalsamum, also known as Balm of Gilead, may enhance its habitat by providing resin that has antimicrobial properties, potentially reducing plant pathogens in the surrounding area.
Erosion Control Potential:	Limited; not commonly used for erosion control.
Landscape Location	Dry, rocky hillsides and valleys in the southern Arabian Peninsula and northeastern Africa.
Landscape Theme:	Desert Garden; Biblical Garden; Xeriscape; Medicinal Plant Garden; Aromatic Garden
Design Feature:	Yes, Commiphora opobalsamum, known for its aromatic resin, is used in landscape design for its aesthetic appeal and fragrance.
Ethnobotanical Significance:	Used in traditional medicine for wound healing, anti-inflammatory properties, and as an aromatic in religious rituals
Neutralization ability	Low naturalization ability outside native range
Campanion planting suitability	Not well-documented; research needed

TRADITIONAL MEDICINAL USES:

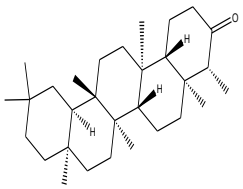
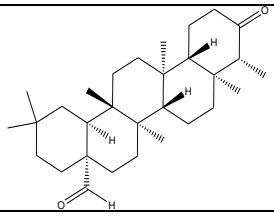
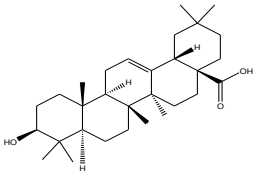
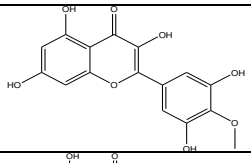
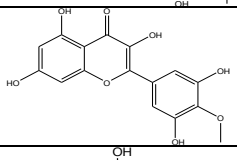
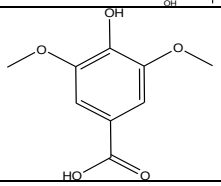
Commiphora opobalsamum was traditionally used for sore throats, oral mucosa and gingival irritations. It is also used in dyspepsia, colic, joint pain, promoting urine output, expelling renal caliculi, liver and stomach diseases.5

PHYTOCHEMISTRY AND BIOACTIVE COMPOUNDS:

The study of C. opobalsamum's phytochemical makeup and biological activities was warranted in an effort to correlate the findings with the plant's traditional use, given the variety of biological activities associated with this species and the lack of comprehensive chemical-based reports on C. opobalsamum. This paper reports the first-ever determination and analysis of six compounds from C. opobalsamum. The substances that have been identified are quercetin (6), syringic acid (4), canophyllal (2), friedelin (1), and oleanonic acid (3).7 T. Shen et al. / Journal of Ethnopharmacology 142 (2012) 319–330 324 The discovery of sesquiterpenoid lactones, designated as germacranolide (1), eudesmanolides (2 and 3). According to Shen et al. (2007), 2008a, 2009; Xu et al. (2011)a,b, the main phytochemical advancement of this genus in recent years has been cadinanolide (6 and 7) extracted from the resins of C. opobalsamum and C. myrrha, elemanolide (4), and guaianolide [5]. Recently, it was shown that C. opobalsamum and C. myrrha contain ten cycloartane triterpenoids (11–20) with a unique substitution at the C–2 position (Shen et al., 2007, 2008b; Su et al., 2009). The recent study by (Shen et al., 2007, 2008b; Su et al., 2009). shows that C. opobalsamum and C. myrrha contain ten cycloartane triterpenoids (11–20) that have a unique substitution at the C–2 position. A range of triterpenoids (11–19) of the cycloartane type were isolated from C. opobalsamum and tested for their ability to inhibit prostate tumors in PC3 & Du145 cells (Shen et al., 2007, 2008b). LNCaP cells' ability to produce androgen receptors (AR) was inhibited by cycloartan-24-ene-1a,2a,3b-triol (11). The compound Octade cane-1,2S,3S,4R-tetrol 1-O-a-L-rhamnopyranoside exhibited inhibitory impact on PC3 and LNCaP cells, with IC50 values of 22.1 and 23.6 mM (Shen et al., 2007).5 The resinous exudates from Commiphora opobalsamum contained six recognized sesquiterpenoids (5–10) as well as an acycloartane-type triterpenoid (1), the aliphatic alcohol glycoside (2), a eudesmane-type sesquiterpenoid (3), as well as a guaiane-type sesquiterpenoid (4). A thorough examination of their 1D & 2D nuclear magnetic resonance spectroscopic results as well as chemical techniques were used to determine their structures. The extracted compounds 1-3 and 5-8 were examined in experiments using PC 3 and LNCaP human prostate cancer cells. Among them, 1 and 2 had an IC50 value which ranged from 5.7 to 23.6 lM and had moderate antiproliferative actions upon human prostate cancer (PC) cell lines. They were also able to block the transcription of androgenic receptors (AR) in LNCaP cells.10

This study involved fractionating an acetone extract derived from the stem wood of Commiphora opobalsamum (L.) Engl. (Burseraceae) and isolated four known flavonoids (6-(3,3-Dimethylallyl)-2,3-dihydroka empferol 1, aromadendrin 3, kaempferol 2, and quercetin 4). The two novel prenylated flavonoids, 6-(3,3-Dimethylallyl)-2,3-dihydrokaempferol-3-b-O-glucoside 5, and 6-(3,3-Dimethylallyl) naringe nin-7-O-b-glucoside 6, were also discovered. All of these substances, with the exception of quercetin, have never been documented from this plant before. By using spectroscopic analysis and comparing the results with published data for recognized substances, their structures were clarified.11 From the resinous exudates of Commiphora opobalsamum, three new triterpenoids of the cycloartane type (1-3) and seven new sesquiterpenoids (7-9) have been

identified. Their structures were clarified after a thorough spectroscopic examination. The structures of 1, 3, and 7 were verified using a single-crystal X-ray diffraction method. The single-crystal X-ray diffraction study and the CD exciton chirality approach were successful in determining absolute configuration of 1 and 10, respectively. Additionally, compounds 11 and 15 had the greatest potential for cytotoxicity against HeLa (IC50 = 15.4 lM) & HepG2 (IC50 = 8.7 lM) cancer cell lines, respectively, based on in vitro cytotoxicity evaluation test

Sr no	Name of Phytoconstituent	IUPAC Name	Chemical Formula	Molecular weight (g/mol)	Structure	Ref
1	Fridelin	(4R,4aS,6aS,6aS,6bR,8aR,12aR,14aS,14bS)-4,4a,6a,6b,8a,11,11,14a-octamethyl-2,4,5,6,6a,7,8,9,10,12,12a,13,14,14b-tetradecahydro-1H-picen-3-one	$C_{30}H_{50}O$	426.7 g/mol		7
2	Canophyllal	(4aS,6aR,6bS,8aS,9R,12aS,12bS,14aS,14bS)-2,2,6a,8a,9,12b,14a-heptamethyl-10-oxoicosahydropicene-4a(2H)-carbaldehyde	$C_{30}H_{48}O_2$	440.7 g/mol		7
3	Oleanolic acid	(4aS,6aS,6bR,8aR,10S,12aR,12bR,14bS)-10-Hydroxy-2,2,6a,6b,9,9,12a-heptamethyl-1,3,4,5,6,6a,6b,7,8,8a,9,10,11,12,12a,12b,13,14b-octadecahydropicene-4a(2H)-carboxylic acid	$C_{30}H_{48}O_3$	456.7 g/mol		7
4	Mearnsetin	2-(3,5-dihydroxy-4-methoxyphenyl)-3,5,7-trihydroxychromen-4-one	$C_{16}H_{12}O_8$	332.26 g/mol		7
5	Quercetin	2-(3,4-Dihydroxyphenyl)-3,5,7-trihydroxy-4*H*-1-benzopyran-4-one	$C_{15}H_{10}O_7$	302.23 g/mol		7
6	Synergic acid	4-hydroxy-3,5-dimethoxybenzoic acid	$C_9H_{10}O_5$	198.17 g/mol		7

PHARMACOLOGICAL PROPERTIES:

Commiphora opobalsamum (L). an ancient herb Engl., family Burseraceae, is also known locally as Balessan or Ood-e-Balsan. It is used in Arabian folk medicine to treat a variety of ailments, such as sore throats, coughs, laryngitis, chronic bronchitis, and inflammations brought on by rheumatism and arthritis. The tincture has been useful in the

treatment of rheumatic aches, scurvy, kidney, stomach, and chest ailments. They provide an effective external application when combined with oil for bruising, swellings, wounds, and rheumatic aches. Additionally, it is a diuretic and is used to eliminate kidney stones in traditional Arabian medicine (Personal communication, 2002). Nevertheless, no scientific investigation has been conducted to support the assertions made by traditional healers. Consequently, the current investigation was started to assess this plant's potential in laboratory animals for anti-inflammatory, analgesic, antipyretic, and diuretic effects.13

1. Antiulcer activity:

An ethanol extract of Commiphora opobalsamum (L.) Engl. (Burseraceae) 'Balessan' was evaluated for its ability to prevent ulcers against various acute gastric ulcer models in rats that were caused by pyloric ligation (Shay), 80% ethanol, 0.2M NaOH, and 25% NaCl, as well as hypothermic restraint stress. In all of the aforementioned ulcer models, oral administration of Balessan at doses of 250 and 500 mg/kg (intraperitoneally in the Shay rat model) demonstrated dose-dependent protective benefits against ulcer development. Additionally, the extract provided defense against the lowering of nonprotein sulfhydryl (NP-SH) concentration and the depletion of stomach wall mucus caused by ethanol. Treatment with ethanol also resulted in histological lesions on the stomach wall. The pretreatment with Balessan extract supported both the offensive and defensive aspects, resulting in total protection of the stomach mucosa. Additionally, Balessan extract displayed a wide margin of safety without any apparent adverse effects in rat.14

2. Hepatoprotective activity:

The ethanolic extract of Commiphora opobalsamum ("Balessan") was found to have hepatoprotective properties when it was used to induce hepatotoxicity in rats using a 1:1 ratio of carbon tetrachloride to liquid paraffin. It has been demonstrated that this extract significantly lowers blood transaminase levels (serum glutamate pyruvate transaminase and serum glutamate oxaloacetate transaminase), alkaline phosphatase, and bilirubin. Mice exposed to a pretreatment of Balessan extract did not experience the prolonged barbiturate sleep duration associated with liver damage caused by carbon tetrachloride. Alternatively, the Balessan extract restored the low-level nonprotein sulfhydryl concentration that CO1/induced in the liver. The information provided implies that C. opobalsamum may have hepatoprotective and antioxidant properties.15 According to Aljadaani B. et al., Commiphora gileadensis can treat and prevent diethylnitrosamine (DEN)-induced liver damage in albino rats. By lowering the level of liver enzymes and enhancing hepatic histopathology, C. gileadensis exhibits strong hepatoprotective benefits. It has strong anti-platelet properties as well. Based on the results, C. gileadensis may be worth investigating further into hepatic health and platelet-related disorders due to its unique hepatoprotective and impressive anti-platelet properties.16

3. Antihypertensive activity:

Aqueous extracts from Commiphora opobalsamum tree branches were studied for their potential cardiovascular effects. Intravenous treatment of 4 mg/kg of the aqueous extract resulted in a 20% reduction in systemic arterial blood pressure (PB0.01) and a 14% decrease in the heart rate of anesthetized rats (PB0.05). Both the bradycardiac and hypotensive effects happened right away and were dosage related. The pretreatment using atropine sulfate (1±4 mg:kg) decreased the hypotensive action of C. opobalsamum. Based on these findings, it appears that C. opobalsamum's hypotensive action arises from muscarinic cholinergic receptor activation.17

4. Antidiabetic activity:

According to Farid M., the butanol fraction from the stem bark of C. opobalsamum has strong anti-diabetic properties that are on par with Glibenclamide. It proved to be effective in bringing insulin, glucose, and α-amylase levels back to normal. The anti-inflammatory and antioxidant qualities of the extract point to a potential role in averting diabetic complications. Coming out as a potentially safe natural alternative to manufactured pharmaceuticals, C. opobalsamum shows great promise in the drug-discovery field. In order to determine the active ingredients and clarify the mode of action, more research is advised.18

5. Analgesic and anti-inflammatory activity:

This study compares the analgesic & anti-inflammatory properties of Commiphora opobalsamum to those of diclofenac in rodents. C. opobalsamum has notable anti-inflammatory effects on par with non-steroidal anti-inflammatory medications and powerful analgesic qualities that outperform diclofenac in a number of assays. The synergistic potentiation of analgesic and anti-inflammatory properties is demonstrated when C. opobalsamum and diclofenac are taken at decreased levels together. According to the results, C. opobalsamum is a viable option for additional study, and it is important to comprehend both its mechanism as well as its safety profile.19

6. Ameliorative effect on liver and kidney injury:

The study looks into how Ginkgo biloba & Commiphora opobalsamum can prevent albino rats from CCl4-induced liver and kidney damage. When CCl4 was administered, there were toxic signs such as increased liver enzymes & kidney failure. When G. biloba was administered, these levels were much lower than when C. opobalsamum was administered or the positive control group. Additionally, G. biloba raised the levels of total protein and albumin. The results indicate that CCl4 causes toxicity to the liver and kidneys, and in experimental models, G. biloba and C. opobalsamum significantly improve liver fibrosis & kidney damage.20

7. Vasodilator activity:

Traditional Chinese medicine uses Commiphora opobalsamum to treat traumatic injuries, primarily by relaxing blood vessels. In this work, two diterpenes—dehydroabietic acid (DA) & sandaracopimaric acid (SA)—were extracted from it by the use of separated rat's pulmonary arterial rings in a method guided by bioassay. Using spectroscopic techniques, the structures of both of these compounds have been determined (IR, 1H- & 13C-NMR, HR-ESI-MS). In a concentration-dependent way, both DA and SA decreased the contraction of pulmonary arteries caused by phenylephrine, with a significant contribution from the endothelium to the vasodilatory impact of DA. NG-Nitro-L-arginine methyl ester (L-NAME, the eNOS inhibitor) reduced the impact of DA. In the meantime, DA caused endothelial cells to produce more nitric oxide (NO) and raised the amount of eNOS and Akt phosphorylation. This effect could be reversed by the PI3K inhibitor LY294002, suggesting that the endothelium PI3K/Akt pathway is responsible for the mechanism behind DA-induced pulmonary artery relaxation. In Molecules 2014, 19 8504 Commiphora opobalsamum, this work demonstrated the presence of vasorelaxant chemicals and confirmed the association between the PI3K/Akt-eNOS pathway and DA-induced pulmonary artery vasodilation.21

8. Anticancer activity:

The study looks on the effects of habitat variation on the chemical compositions of Commiphora gileadensis (also known as Commiphora opobalsamum), a native medicinal plant that is found majorly in Saudi Arabia. Samples from the Breiman and Khulais regions were examined using GC-MS. Furthermore, C. gileadensis's antigenotoxic potential was investigated using a

range of experiments on mice given varying dosages of the plant's extract along with CCL4. Significant chemical variances between regions are shown by the results. C. gileadensis has the potential to function as an agent of defense against genotoxicity, as demonstrated by in vivo trials that show it to be effective in reducing CCL4-induced damage, especially when administered at high doses. The results highlight how location affects plant composition and point to C. gileadensis as a viable option for defense against genotoxicity brought on by CCL4.22 In this study, the anti-cancerous properties of Commiphora gileadensis Or Commiphora opobalsamum, the biblical balm of Gilead, were examined against tumor cell lines. A significant constituent of essential oils isolated from Gilead balm is β-caryophyllene, also known as trans-(1R,9S)-8-methylene-4,11,11-trimethylbicyclo [7.2.0] undec-4-ene, according to the results of ethanol-based extracts and essential oils. Caryophyllene, which has anti-inflammatory, local anesthetic, and antifungal qualities, is present in many food and beverage products, spice mixes, citrus tastes, soaps, detergents, creams, & lotions. Additionally, it has strong cytotoxic effects on a variety of cell lines. In the present study, we discovered that the stem extracts and essential oil of Commiphora gileadensis exhibit an antiproliferative proapoptotic action against tumor cells and β-caryophyllene significantly induced apoptosis in tumor cell lines, accompanied by caspase-3 catalytic activity and a DNA ladder. In conclusion, we demonstrated that the C. gileadensis stems contains potent apoptosis inducer which selectively targets tumor cell lines rather than healthy cells.23

9. Wound healing activity:

When Commiphora gileadensis stems are compared in fresh and dried conditions, essential oils within the two samples show comparable components that lose oil content as they dry. Each sample has the same level of antibacterial potency. Rat's ability to heal wounds is evaluated between EO and chloroform extract (CE), which is derived from fresh stems and is recognized for its antibacterial properties. As evidenced by the rapid wound contraction, shortened epithelialization period, and favourable histological alterations, the CE greatly accelerates wound healing. The results point to CE cream's possible use in wound care by suggesting that it speeds up the healing process.24

10. Anticogulant activity:

According to the current investigation, PT, a PTT, & bleeding time were all prolonged more by C. gileadensis sap, a methanol & acetone extracts than by heparin and aspirin. This suggests that methanol, acetone, and sap from C. gileadensis may have antithrombotic properties and could be applied as an antithrombotic treatment to individuals who have prosthetic heart valves. It is advised that more research be done to determine how C. gileadensis avoids intravascular thrombosis.25

11. Antibacterial activity:

This study used microbiological testing, wound contraction rate, and histological alterations to describe the antibacterial activity & healing of cutaneous wounds ability of the CG extracts. Mass spectrometry combined with liquid chromatography (LC–MS) was used to characterize the methanolic extract. Then, 60 males Balb/c mice were given an excision wound measuring six millimeters (mm). The mice were divided into two classes, with three groups of ten mice each in each class. I was allocated to the control group within the non-infected wound class, and they were given regular saline. Group II was administered gentamicin, while Group III was given CG-methanolic extract. Group IV from the Staphylococcus aureus-infected class was given normal saline, whereas groups V and VI received treatments with gentamicin & CG-methanolic extract, respectively. Colony-forming units (CFUs) were used to measure the level of wound

contraction in each group as well as the extent of colonization of infected wounds. Finally, the presence of collagen fibers and granulation tissue, the degree of re-epithelization, and the histopathologic semi-quantitative assessment of wound healing were assessed. The methanolic extract's composition analysis revealed that ceramide made up 69% of the total and was followed in amount by hexosylceramide (18%) and phosphatidylethanolamine (7%). Furthermore, in both Staphylococcus aureus-infected and non-infected wounds, there was a statistically significant difference ($p < 0.01$) in the proportion of wound contraction between the CG-treated and control groups. In the CG-treated group, the infected wounds had less colonization than in the control group ($p < 0.01$). The CG-treated group demonstrated statistically significant differences ($p < 0.01$) in inflammatory cell infiltration, collagen fibers, re-epithelization, and granulation tissue development in both non-infected and infected wounds. The antibacterial and anti-inflammatory qualities of the CG extract promote wound healing.26

TOXICITY PROFILE:

Commiphora opobalsamum's (CO) sub-acute toxicity was investigated by Khan L. et al. using histological examination of key organs. 24 male Wister rats, aged between 10 and 12 weeks, were utilized. Studies on the oral toxicity of repeated doses were conducted on four groups of rats, with six rats per group. For fourteen days, three groups of rats received oral CO at graded doses of 250, 500, & 1,000 mg/kg/day once daily compared to normal control. At the conclusion of the investigation, the relative weights of the major organs and their histological alterations were determined.27 Mai A. Alim et al. studied the acute and long-term toxicity profile of rats exposed to CO (Commiphora opobalsamum). Acute oral CO fatal dose in rats was shown to be safe and more than the tested amount, which was 2000 mg/kg. Moreover, no toxicity signs were seen with a single oral dose. Additionally, the complete blood count (CBC) of CO rats treated with graded dosage after 14 days of therapy showed a negligible decrease in comparison to the control group ($p>0.05$) due to the sub-acute toxicological impact on hematological analysis. The biochemical measures also included measurements of glucose, urea, and creatinine; using the same methods, the lipid profile & thyroid function markers showed only marginal variations. Even after a 14-day oral administration, the results of this present exploratory investigation clearly show the CO extract has minimal oral toxicity in rats, with a dose of 1000 mg/kg/day showing no visible harmful effects. Even after 14 days of CO treatment, the thorough sub-acute toxicological influence of CO extracts upon hematological as well as coagulation parameters along with biochemical parameters, including evaluations of urea, creatinine, glucose, lipid profile as well as function of the thyroid markers fairly revealed no substantial harmful outcome.28

CONCLUSION:

Herbal medicine has a long history of usage in traditional medicine. Both ancient people and our predecessors relied primarily on plants to heal from illnesses. However, it is discouraging to see the current trend away from artificial and toward natural methods of prevention against illness. Because there is a global health alert being signalled by ongoing reports about antibiotic resistance and synthetic medication adverse effects worldwide. Everyone finds it concerning that diabetes, cancer, obesity, hypertension, and neurological disorders are becoming more commonplace globally. Extensive studies are conducted to identify the causes and treatments of them. It is therefore necessary to look for a better substitute for synthetic drugs as soon as possible. Medicinal plants could be a useful tool in the fight against. This review has presented a

comprehensive view about the phytochemistry composition and pharmacology activities of Commiphora opobalsamum (L.) Engl. This plant has been broadly used as a traditional medicine and was used for sore throats, oral mucosa and gingival irritations. It is also used in dyspepsia, colic, joint pain, promoting urine output, expelling renal caliculi, liver and stomach diseases. It contains significant amount of antioxidant, secondary metabolites, and other important ingredients, these may be helpful to fight against several diseases including ulcer, liver disorders, hypertension, analgesia & inflammation, diabetes, cancer, and neurodegenerative diseases, etc.

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