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## Mako (*Solanum nigrum* Linn): Therapeutic Uses and Scientific Studies in Unani Perspective - A Review



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### ABSTRACT

Unani System of Medicine is a treasure of herbal source, which are used medicinally and *Mako* (*Solanum nigrum* Linn) is one of them. It belongs to the family Solanaceae and found throughout the country in dry parts, quite common in cultivated lands, road sides and gardens. It is one of the most prescribed drugs by Unani physicians for the treatment of various ailments like liver diseases, rheumatic and gouty joints and various skin disorders. Phytochemical analysis of the plant showed the presence of alkaloids, flavonoids, terpenoids, saponins, steroids and phenols. Various pharmacological studies on the plant have been done like analgesic, antimicrobial, hepatoprotective activities, etc. Through this paper, an effort has been made to collect information about the medicinal properties of Mako mentioned in Unani classical literature as well as those which have been validated in the light of recent scientific studies.



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## INTRODUCTION

*Mako* (*Solanum nigrum* Linn) is an erect, branched, smooth or nearly smooth herb, reached up to one meter or less height. It usually grows as a weed in moist habitats in different types of soils. It has two varieties, one is bearing black colour fruit, and other one has reddish fruit. The genus name *Solanum* is taken from *Latin* word “*Solar*” means “*to sooth*” which indicates towards its soothing property [1] and the specific name “*nigrum*” means “*black*” due to the colour of its fruit. The Arabic name *Inab-us-Salab* comes from two words ‘*Inab*’ means grapes and ‘*Salab*’ means fox, as fox like it very much, hence named so [2]. Its repined fruit resembles to the fruit of *Asrawl* (*Raulwolfia serpentina* (L) Benth. Ex Kurz) and *Halyun* (*Asparagus officinalis* Linn) [3]. However, *Mako* (*Solanum nigrum* Linn) contains small and minute seeds similar to *Khashkhash* (*Papaver somniferum* Linn), whereas *Halyun* (*Asparagus officinalis*) contains one seed and *Asrawl* (*Raulwolfia serpentina* Linn) contains 3 seeds [2]. It is one of the most used herbs in Indian Traditional System of Medicines like Ayurveda, Siddha and Unani. In Unani Medicine, its leaves, dry flowers and whole plant is used to treat various ailments, such as jaundice, hepatitis, pain, rheumatism, gout, fever etc. single as well as in various compound formulations. [4] Various chemical compounds have been identified, which are responsible for diverse activities of the plant, such as alkaloids, flavonoids, tannins, saponins, glycosides, proteins, carbohydrates, coumarins and phytosterols.

## MATERIALS AND METHODS

Various authentic both printed and electronic publications are taken into account for the review of *Solanum nigrum* L. regarding pharmacognostical characteristics, therapeutic uses in Unani Medicine, phytochemical constituents, pharmacological studies, etc. All relevant articles up to 2020 were referred including 15 Unani books, 5 English books on Herbals, 2 review papers, 26 research papers and 1 from website. Genuine materials published in PubMed, Science Direct Google Scholar, and Research gate were referred to assemble all the latest data. Appropriate Unani Terminologies were taken from Standard Unani Medical Terminology Published by Central Council for Research in Unani Medicine in collaboration with the World Health Organization. The Images of various parts of *Solanum nigrum* L were collected by self in Srinagar, Kashmir, India.

**Distribution:** The plant is found throughout India, in dry parts, up to an elevation of 2,100 m. [5].

**Botanical Description:** *Solanum nigrum* Linn is an erect, branched, smooth or nearly smooth herb, up to 1 meter or less in height. Stems are green and 3-angled. The leaves are 5 to 8 centimeters long, pointed at both ends, ovate-deltoid, entire or sinuate-toothed, base are oblique. Flowers are in extra-axillary, sub-umbellate, 3 to 8 flowered chymes. Sepals are 5 connate, copular, 1.5-3.0 mm long. Petals are 5, connate into rotate corolla tube, white or sometimes purple tinged, 4-8 mm across. Stamens are 5, filament short free, carpels are 2, connate, ovary 2-celled, sometimes 3 or 4-celled due to elongation of placenta, style 1, simple, minute, hairy, stigma obscurely 2-lobed. Fruits are berry, 3-5 mm across, red or dark purple or black. Seeds are broadly elliptic to reniform, 1.5-2.0 mm across, pitted. Flowering: Almost throughout the year; Fruiting: Almost throughout the years [6].

### Scientific Classification [7]

Kingdom:	Plantae
Subkingdom:	Tracheobionta
Super division:	Spermatophyta
Division:	Magnoliophyta
Class:	Magnoliopsida
Subclass:	Asteridae
Order:	Solanales
Genus:	<i>Solanum</i>
Species:	<i>Solanum nigrum</i> Linn
Synonym:	<i>S. rubrum</i> Mill





**Figure No.** a) and b) showing plant of *Solanum nigrum* Linn. with flowers and unripe fruit; c) ripe fruits d) dried fruits

#### **DESCRIPTION IN UNANI LITERATURE:**

In Unani System of Medicine various types of Mako (*Solanum nigrum* Linn) like *Jangli*, *Bustani* and *Pahadi* are mentioned. The branches of *Bustani* variety are about one and a half meter, and its leaves are broad and blackish in colour. Its flowers are small and white in colour. Its fruits are round like that of small pea and seeds small in size. Fresh fruits are of green colour whereas dried fruits are of red colour. Dried fruits contain small seeds like *Khashkhash* [8,9]. Dried leaves are best to use before one year and fruits is best before two years, after that they deteriorate. [2]

#### **MUTARADIFAT (VERNACULAR NAMES):**

Arabic: Inab-us-Salab, Qana, Barnof, Balban, InabuzZaiab, HabulLahu, Ghaliya [10]

Assamese: Pichkati [11]

Bengali: Gudakamai, Kakamachi, Mako [11]

Chinese:	Long K'oui, Lung K'uei [11]
English:	Black Nightshade, Garden Nightshade, Hound's Berry Berry[5,11]
Hindi:	Kakmachi[5], Makoya [10], Gachmach, Kali Makoy
Gujarati:	Piludi[11]
Kannada:	Ganikesopu
Kashmiri:	Kambae
Malayalam:	Manatakkali
Marathi:	Ghati, Kamoni, Kakmachi[11]
Persian:	AngoorRobah, AngurShifa, Robah Trak, Sak-i-Angoor, Angoor-i-Shighal [10]
Sanskrit:	Dhvankshamachi[11]
Punjabi:	Mako, Peelak, Mamoli
Sindhi:	Kanperun[11]
Tamil:	Manittakkali[5,11]
Telugu:	Gajuchettu[11]
Unani:	Tarlidun [10]
Urdu:	Makoya[11]



**AJZA-I-MUSTA'MALA (PARTS USED):**

Leaves, Berries, Arq Mako SabzMurawwaq [2, 8, 12].

**MIZAJ (TEMPERAMENT):**

The temperament is hot and dry in 2<sup>nd</sup> degree [2]. But according to Galen, it is cold and dry in 2<sup>nd</sup> degree.

**AF'ALWA KHAWAS (ACTION AND USES):**

It has *Muhallil-i-Awaram* (anti-inflammatory), *Dafi' Hummā* (antipyretic/febrifuge), *Radi'-i-Mawad* (divergent), *Dafi' Ruṭūbat-i-Rahim* (uterine fluids expellant), *Musakkin Harārat*, *Qābid* (astringent), *Mani' Nazla* (anticatarrh) [2, 8, 12,], *Mujaffif* (siccative), *Dāfi' Sudā'* (pain killer for headache) [10, 12,13], *Mani' Hamal* (abortifacient) [12, 13], *Mubarrid* (refrigerant) [10], *Mudirr-i-Bawl* (diuretic) [10, 12, 13,14,15, ,16]. *Kāsir-i-Riyāh* (carminative) [12], *Mujaffif* (desiccant) [15,13], *Mulattif* (demulcent) [12, 15], *Mulayyin* (laxative) [12,17, 10, 15], *Munaffith* (expectorant) [17], *Munawwim* (hypnotic) [12,17,14, 10,13], *Musaffi-i-Dam* (blood purifier) [12], *Mushil*(purgative), *Musakkin-i-Alam* (analgesic/anodyne), *Musakkin-i-Atash* (thirst quencher), *Mani' Sailan-i-Hayd* (anti emmenagogue).

*Waram-i-Ahsha* (Inflammation of viscera), *Waram-i-Mi'da* (Gastritis), *Waram-i-Jigar* (Hepatitis), *Waram-i-Lisan* (glossitis) [10,12,13,16], *Hummā* (fever) [12], *Sudā'* (headache), *Waj' al-Mafasil* (arthritis), *Waj' al-Chashm* (ophthalmia), *Waj' al-Uzn* (otalgia), *Waj'-i-Dandān* (toothache) [12, 17, 8,14,10], *Zahīr* (dysentery), *Is'hāl* (diarrhea) [12,8,4,10,15, 13], *Amrād-i-Chashm*, *Amrād-i-Uzn*, *Amrād-i-Anaf* (Eye, Ear, Nose diseases) [12, 8; 10; 13], *Amrād-i-Jild* (Skin diseases) [8,10]. According to Dioscorides, its *Shiyaf* helps to treat cataract [10].

**TARKEEB-I-ISTE'MAL (METHOD OF APPLICATION):**

**a) Amrād-i-RāswaA'sāb (diseases of brain and nerves):** It *Dimād* (paste) is used to treat meningitis. Its inhalation to treat rhinitis. The bark of root with alcohol 4.25 g has hypnotic effects. [8] Its enema is beneficial in of melancholia and also clear the intestine from putrified matter [8].

**b) Amrād-i-Chasm (eye diseases):** Leaves extract is used to treat lacrimal fistula and eyes pain and also act as eye tonic. [8] According to Dioscorides, its *Shiyaf* helps to treat cataract [10].

**c) Amrād-i-Anaf, Uzunwa Halaq (diseases of nose, ear and throat)**

**Butlan-i-Shum (anosmia):** Marzanjosh (*Origanum marjorum*), InabusSalabKhushk (*Solanum nigrum*), Shih Armani, Gul-i-Babuna (*Matricaria chamomilla*) and Sirka (vinegar)



each in equal quantity is taken with water and after boiling the vaporization and inhalation is done for the treatment of anosmia [18].

**Waram-i-Anaful Uzun (mumps):** Paste made with Jadwar 20g in *Arq Mako Sabz* (fresh leaves extract) is applied locally on mumps [18] Vaporization of the decoction prepared with Banafsha 10g, Mako Khushk 10g, Gul-i-Khitmi 10g, Post Khashkhash 10g, and Gul-i-Babuna 10g is done to cure mumps and doing *TakmīdHārRatab* (hot fomentation) by the same decoction with the help of cloth piece soaked in it is also useful for the same diseases [18]Its decoction is used as gargle singly or along with pulp of *Cassia fistula* Linn in the treatment of glossitis and diphtheria.[4].It's gargle is used to treat pharyngitis and toothache. [8]Lukewarm *Ab-i-Barg-i-Murawwaq* is poured in the diseases of ear and it is *Musakkin-i-Alam* (analgesic/anodyne) in acute earache [4].

**d) *Ilīhab* (Inflammatory conditions):**

**Waram-i-Rukhsār (swelling on cheek):** Paste made with Mako Khushk 10 gm, MaghzAmaltas 10g in warm Juice of Mako leaves is beneficial to apply on cheek [18].

**Khanāzīr (scrofula):** A vaporization and *TakmīdHārRatab* from the decoction of Inab-us-Thalab 20g, Branjasif, and Marzanjosh each 10g is useful to cure Khanāzīr (scrofula) [18].

**Warm-i-Mi'da (gastritis):** *Ab-i-Mako SabzMurawwaq* 20ml, mixed with *Ab-i-KasniSabzMurawwaq* 20 ml and *SharbatBazoori* 20 ml is used for *Waram-i- Mi'da*. DryMako (*Solanum nigrum* Linn) is used in the form of *Dimād* (medicated paste) and Sharbat (syrup) in the treatment of internal abdominal organ inflammation, such as hepatitis, gastritis. In initial stage, its *Dimād* (medicated paste) has *Rādi' Mawad* (repellant) and then *Muhallil-e-Awarām* (anti-inflammatory) effects. It is used in *Qurūh* (spreading ulcer) and *SartānMutaqarrih* (cancer). *Ab-i-Barg-i-Mako Murawwaq* is also given for the same purpose [4]. Its *Dimād* (medicated paste) is used to treat gastritis and all internal abdominal organ. Mako (*Solanum nigrum* Linn) with 135.4 g sugar is beneficial in internal organ inflammation, and purgative of bile, and also useful for dysentery and inflamed anal canal [8].

**e) *Amrād-i-Niswān* (Gynecological diseases):** Its *Firzaja* (vaginal pessary) is used in the treatment of leucorrhea and excess uterine secretions. [8]

**MAZARRAT (ADVERSE EFFECT AND TOXICITY):** Causing headache, harmful to bladder [8]

**Musleh (Corrective):** Anisun (*Pimpinella anisum* Linn), Asal (honey) [4].

**Badal (substitute/alternate):** Kaknaj (*Physalis alkakengi*), Branjasif (*Achillea mellifolium* Linn) [2].

**Miqdar Khurak (Dosage):** 9-12g, 5-7g [2].

**Murakkabat (Compound formulations):** ArqMako, Ab-i-BargMako SabzMurawwaq, Dīmād-i-Kabid, Dīmād-i-Muhallil, Dīmād-i-Niswān, ArqBranjasif, Arq Maul Lahm Mako Kasni Wala, Qurs Istisqa, Roghan Sama'at Kusha Jadeed, Tihali, Iksirul Atfal, Qairuti Mako Wali (see **Table 01** for detail)

**Table No. 01:** Showing compound formulations in which *Mako* is one of the ingredients with their dosage and indication.

S.No	Compound formulation	Parts	Dose and Method of use	Indication
1.	ArqMako [19]	Leaves	120 ml	Inflammation of liver, stomach, intestine, spleen, uterus
2.	Ab-i-Barg MakoMurawwaq[19]	Leaves	48-60 ml twice daily	Sanguineous hepatitis
3.	ArqBranjasif [22]	Mako Khusk (dry fruit)	125 ml	Inflammation of abdominal organs
4.	ArqBranjasif Maul Lahm Kasni Mako Wala [18]	Mako Khusk (dry fruit) and Ab-i-Mako (juice of the leaves)	50 -100ml	Liver tonic, stomachic
5.	Arq Maul Lahm Mako Kasni Wala [22]	Leaves	125 ml	Inflammation of liver, spleen, stomach, uterus
6.	Dīmād-i-Kabid [19]	Mako Khusk (dry fruit)	Locally as required	Hepatitis
7.	Dīmād-i-Muhallil [20]	Leaves	Locally as required	Osteoarthritis



8.	<i>Dimād-i-Niswān</i> [21]	Mako Khusk (dry fruit)	Locally as required	Uterine tonic used in metritis and uterine pain
9.	<i>Dimād-i-Kabid</i> [19]	Mako Khusk (dry fruit)	Locally as required	Hepatitis
10.	<i>IksirulAtfal</i> [22]	Mako Khusk (dry fruit)	6 months: 500 mg; adults: 3g	Stomachic, dyspepsia
11.	<i>Murawwaqain</i> [18]	Ab-i-Mako SabzMurawwaq	80 ml with SharbatBuzoori 40 ml	Liver disorder like hepatitis, fever, Istisqa
12.	<i>Qurs-i-Istisqa</i> [23]	Ab-i-Mako	5 to 10 gm	Hepatoprotective, diuretic; used in hepatitis
13.	<i>RoghanSama'atKushaJadeed</i> [21]	Mako Khusk (dry fruit)	2 drops in ear 2 to 3 times a day	Analgesic and anti-inflammatory used in otitis, deafness and otalgia
14.	<i>Tihali</i> [21]	Mako Khusk (dry fruit)	10 ml BD; for children 5 ml BD	Hepatosplenomegaly

### SCIENTIFIC STUDIES:

**Major chemical constituents:** The berries contain steroidal alkaloid glycosides, solasonine,  $\alpha$ - and  $\beta$ -solanigrine,  $\alpha$ - and  $\beta$ -solamargine; steroidal sapogenins, diosgenin and tigogenin; solasodine and solasodine. Solamargine and solasonine are present also in leaves. The total alkaloid content of fruits and leaves are 0.101 and 0.431% respectively. [5] Different parts with their respective chemical constituents are illustrated in Table 2.

**Table No. 2:** Different parts of *Mako* (*Solanum nigrum* Linn), with their chemical constituents.

S.N	Parts of the plant	Chemical constituents
1	Leaves	Solasonine; solamagine [6].
2	Berries	Steroidal-alkaloidal-glucoside solasodine; tigogenine; diosgenine; solassodine and solasodine as aglycone. The percentage of solasodine in stems, leaves and berries are 0.02, 0.03 and 0.7 respectively [6].
3	Immature berries	Five steroidal glycosides SN-O, SN-1, SN-2, SN-3, SN-4. [6].
4	Stem and root	UttrosideAand B; Solamagine; solasonine [6].

Others phytochemicals are (+)-pinoresinol(I), (+)-syringaresinol (II), (+)-syringaresinol (II), (+)-medioresinol (III), scopoletin (IV), tetracosanoic acid (V),  $\beta$ -sitosterol (VI) solamagine and solasonine [24].

#### Pharmacological studies:

**Anti-diabetic activity:** Hypoglycemic activity of the aqueous and hydro-alcoholic extracts of different parts of *Solanum nigrum*, like leaves, fruits and stems was done in Sprague Dawley rats. The results of the study indicated that aqueous extracts of leave and fruits possessed significant hypoglycemic effect in dose dependent manner, followed by hydroalcoholic extracts. But the extract of stem has no profound effects [25]. Ali *et al.* (2010) studied the effect of crude ethanolic extract of *Solanum nigrum* Linn on blood sugar of albino rats after daily oral administration of 250mg/kg body weight for five and seven days, respectively. It was observed that chronic administration lead to significant decrease in blood sugar as compared to control [26].

**Immuno-stimulant activity:** The immunostimulant potential of ethanol and methanol extract of *Solanum nigrum* L. was studied by Hanifa (2011) for preventing fish diseases. On the basis of results, it is found that ethanol and methanol extract treated group has less mortality rate as compared to chloroform toluene and water extract treated group [27].

#### Antimicrobial studies:

Methanol and water extracts of *Solanum nigrum* Linn leaves were investigated for in vitro anti-bacterial activity. A significant result was observed for its methanolic extract [28].

Kavishankar *et al.*, (2011) studied for the antibacterial activity of methanol and water extracts of *Solanum nigrum* Linn leaves. The methanol and water extracts of the drug were tested against *Escherichia coli*, *Staphylococcus aureus*, *Enterobacter aerogenes* and *Pseudomonas aeruginosa*. On the basis of the results obtained, it was concluded that methanol could be used for extracting antimicrobial compounds from leaves [28]. An *in vitro* antibacterial activity and phytochemical analysis study was performed on six solvent extracts of leaf, seed and roots of *Solanum nigrum* Linn. It showed that organic solvent extracts of seeds of *Solanum nigrum* Linn possessed significant antibacterial activity against *Pseudomonas*, *Proteous vulgaris* and *Klebsiella*, as compared to leaf and root solvent extracts. [29].

**Anti-HCV study:** Javed *et al.*, (2011) studied that at non-toxic level, methanol and chloroform extracts of *Solanum nigrum* Linn (SN) seeds exhibits 37% and more than 50% inhibition of HCV, respectively. The study also showed that chloroform extract of *Solanum nigrum* Linn extracts decreased the expression or function of HCV NS3 protease in a dose dependent manner without altering GAPDH. It has been also concluded that SN contains potential antiviral agents against HCV. It was also suggested that in the management of HCV, interferon combined with SN extracts would result better prognosis [30].

**Antimycotic activity:** Petroleum ether and 98% methanolic young leaf extracts of *Solanum nigrum* were evaluated against dermatophytic fungi namely, *Candida albicans*, *Trichophyton tonsurans*, *Trichophyton rubrum*, *Trichophyton mentagrophytes*, *Microsporum gypseum*, and bacteria like, *Bacillus subtilis*, *Psudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli*. The maximum activity was observed in interpolar methanolic extract when compared to low polar petroleum ether extract. The minimum inhibitory concentration, minimum fungicidal concentration and minimum bactericidal concentration were determined against all the test strains [31].

#### **Anticonvulsant and anti-seizure studies:**

Son and Yen (2014) has studied the ethanolic extract of *Solanum nigrum* Linn berries on PTZ-induced seizure in mice model. In the result it was found that the extract significantly delayed the latency of convulsion ( $p < 0.05$ ) at the dose of 300 mg/kg p.o. The extract also reduced the frequency of convulsion and provided up to 100 % protection (300 mg/kg p.o) against death. [32] Noel *et al.*, (2008) evaluated the anti-seizure activity of aqueous extract of the leaves of *Solanum nigrum* L. in chicks and rats (electrically induced seizure), and mice and

rats (pentylene tetrazole induced and picrotoxin induced seizures) for seizures. The results indicated significant ( $P < 0.05$ ) dose dependent protection [33].

**Antiulcer study:** A study reported that methanolic extract of *Solanum nigrum* L. berries possessed anti-ulcerogenic activity in aspirin-induced gastric ulcers on rats and also the antioxidant activity by a free radical scavenging mechanism [34].

**Hepatoprotective study:** A comparative study between methanolic and aqueous extract of *Solanum nigrum* Linn demonstrates marked hepatoprotective activity with methanolic extracts in rats (hepatotoxicity induced with  $\text{CCl}_4$  0.2 ml/kg injection for 10 days) [35].

**Antioxidant studies:** A study by Jainu & Devi (2004) showed the marked ( $p < 0.001$ ) antioxidant activity of methanolic extract of *Solanum nigrum* L. berries assessed by the cardiac tissue biochemical antioxidant profile [36]. Agata Campisi, *et al.* (2019) evaluated that SN1 and SN2 extracts of *Solanum nigrum* L. leaves decrease the glutamate uptake and inhibits glutamate excitotoxicity and produce antioxidant property [37].

**Cardio-protective study:** Bhatia *et al.*, (2011) evaluated the cardio-protective effect of methanolic extract of *Solanum nigrum* L. berries by global *in vitro* on chemiarc perfusion injury and tissue biochemical antioxidant profile, respectively. The doses of 2.5 and 5.0 mg/kg for 6 days per week for 30 days were given to rats. The results demonstrate significant ( $p < 0.001$ ) cardio protective activity [38].

#### **Anti-inflammatory and Analgesic studies:**

Kaushik *et al.*, (2009) evaluated the analgesic, anti-inflammatory and antimicrobial activities of ethanolic extracts of *Solanum nigrum* Linn berries by using Carrageenan-induced edema in rat paw and analgesic by Eddy's hot plate and acetic acid induced writhing, respectively. The study was carried out using doses of 100, 250 & 500 mg/kg orally. The results demonstrated marked ( $P < 0.01$ ) analgesic and anti-inflammatory activities at 500mg/kg as compared to standard drug diclofenac sodium (50mg/kg) [39]. Ravi *et al.*, (2009) concluded that ethanolic extract of *Solanum nigrum* Linn produced significant anti-inflammatory ( $P < 0.01$ ) and anticonvulsant ( $P < 0.05$ ) effect in dose dependent manner due to flavonoid [40]. Another study done by Arunachalam *et al.* (2009) on the methanolic extract of whole plants of *Solanum nigrum* Linn for anti-inflammatory activity on the experimental animal models showed extract decreased edema (induced in hind paw) at 375 mg/kg body weight [41].

**Nutritional study:** Akubugwo *et al.*, (2007) found protein content of the leaves and seed of *Solanum nigrum* Linn Var *virginicum* as 24.90% and 17.63%, respectively. And also found cyanide levels more in the leaves as compared to the seeds [42].

**Anthelmintic study:** A Study on ethanol and water extracts of leaves of *Solanum nigrum* Linn respectively showed significant anthelmintic activity as compared to the standard drug. And also demonstrated petroleum ether and chloroform extracts of *Solanum nigrum* Linn leaves has less anthelmintic activity as compared with the standard drug [43].

**Anti-cancerous studies:**

Li *et al.*, (2008) study showed that *Solanum nigrum* Linn aqueous extracts of seeds (SNL-AE) could inhibit U14 cervical carcinoma growth. It also concluded that SNL-AE increased the number and ratio of CD4+ T lymphocyte subsets and CD4+/CD8+ T lymphocyte, respectively and also reduce the number of CD8+ T lymphocyte subsets of tumor bearing mice and PCNA positive cells. It was due to modulating immune response and arrest of tumour cell cycle in G0/G1 phase [44].

A study done by Gabrani *et al.*, (2012) demonstrated antiproliferative activity of organic solvent and aqueous extracts *Solanum nigrum* Linn berries on leukemic cell lines for Jurkat and HL- 60 (Human promyelocytic leukemia cells). The results indicated increased extract concentrations cause increase in cytotoxicity [45]. A Study indicated that methanolic extracts of *Solanum nigrum* Linn leaves and stems have anticancer activity on prostate cancer, cervical cancer and have non-toxic effect on 3T3 and CC-1[46]. A study by Shen et al (2014) showed that alpha solanine (*Solanum nigrum* Linn) has therapeutic potential to suppress prostate cancerous cell [47]. Yang et al (2010) showed that tetradecanoylphosphor-13-acetate mediated migration and invasion of HepG2 cells were also found to be attenuated by polyphenol-rich extracts of *Solanum nigrum* Linn [48].

**Angiogenesis study:** A study by Yang et al (2016) demonstrated that polyphenolic and aqueous extract of *Solanum nigrum* Linn suppresses angiogenesis, as evident from reduced expression of CD31 in nude mice bearing tumor xenograft [49].

**CONCLUSION:**

Mako (*Solanum nigrum* L.) in one of the most useful drugs in Unani System of Medicine for the treatment of inflammatory conditions of internal organs like, stomach, liver, spleen and

also for rheumatic and gouty joints and various skin disorders. Various studies like anti-inflammatory, analgesic, hepatoprotective activities have been done, which proved the efficacy of drug as mentioned by Unani physicians. The presence of alkaloids, flavonoids, terpenoids, saponins, steroids and phenols make it more useful. So more and more studies are required to explore its miraculous benefits on various diseases.

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