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ANTIUROLITHIATIC PLANTS OF ACANTHACEAE, AMARANTHACEAE, AMARYLLIDACEAE, ANACARDIACEAE, APOCYNACEAE, ARECACEAE, ASPARAGACEAE, ASPLENIACEAE, CAESALPINIACEAE, CAPPARIDACEAE, CARYOPHYLLACEAE, CHENOPODIACEAE, CUCURBITACEAE, CUPRESSACEAE, ERICACEAE, EQUISETACEAE AND EUPHORBIACEAE

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ABSTRACT

Urolithiasis is a common worldwide problem with high recurrence. This review covers Euphorbiaceae twenty (20), Cucurbitaceae eighteen (18), Acanthaceae and Amaranthaceae fifteen (15), Cupressaceae twelve (12), Caryophyllaceae eleven (11), Anacardiaceae ten (10), Amaryllidaceae, Apocynaceae and Asparagaceae nine (09), Ericaceae and Equisetaceae eight (08), Arecaceae and Caesalpiniaceae seven (07), Chenopodiaceae six (06), Aspleniaceae, Capparidaceae and Crassulaceae five (05) plants used globally in different countries. Hopefully, this review will not only be useful for the general public but also attract the scientific world for antiurolithiatic drug discovery.

KEYWORDS: Urolithiasis, antiurolithiatic, natural products, drug development.

INTRODUCTION

Urolithiasis is a common worldwide problem with high recurrence. Medicinal plants have been used globally in different countries and cultures for its prophylactic management and treatment. Current attempt is one of the parts of the study entitled "Searching globally (orally) used antiurolithiatic plants belonging to different plant families". The plants of the family Asteraceae[1], Apiaceae[2], Fabaceae[3] and Lamiaceae[4] have already been discussed

in a similar way. The presented review article covered Acanthaceae, Amaranthaceae, Amaryllidaceae, Anacardiaceae, Apocynaceae, Arecaceae, Asparagaceae, Aspleniaceae, Caesalpiniaceae, Capparidaceae, Caryophyllaceae, Chenopodiaceae, Cucurbitaceae, Cupressaceae, Ericaceae, Equisetaceae and Euphorbiaceae families in this regard.

Acanthaceae

This review covers the fifteen (15) medicinal plants of the family Acanthaceae used in 7 different countries such as Bangladesh, India, Java, Malaysia, Thailand, Trinidad and Yemen. Their historical antiurolithiatic background shared in well known book of Dioscorides. Among the plant parts leaves were noted the most common (41.17%) followed by whole plant (29.41%), roots (23.52%) and aerial parts stem (5.88%). In terms of preparation, the decoction was observed most commonly (62.5%), followed by infusion (37.5%).

Amaranthaceae

Fifteen (15) medicinal plants used in Algeria, Bangladesh, India, Iran, Nigeria, Pakistan and Trinidad have been shared. Among the plant parts roots were noted the most common (29.41%) followed by whole plant and leaves (23.52% each), aerial parts, stem, seeds and flowers (5.88% each). In terms of preparation, infusion was observed most commonly (42.10%), followed by decoction (36.84%), juices (15.78%), and extracts (5.26%).

Amaryllidaceae

It covers the nine (09) medicinal plants of the family Amaryllidaceae used in 5 different countries such as India, Iran, Kyrgyzstan, Palestine and Uzbekistan. Their historical antiurolithiatic background shared in well known book of Dioscorides. Among the plant parts bulbs and leaves were noted the most common (37.5%) followed by seeds and rhizome (12.5% each). In terms of preparation, infusion was observed the most common (83.3%), followed by decoction (16.66%).

Anacardiaceae

Ten (10) medicinal plants used in India, Iran, Lebanon, Morocco and Turkey have been shared. Their historical antiurolithiatic background shared in well known book of Dioscorides (03 plants). Among the plant parts fruits were noted the most common (42.85%) followed by leaves (28.57%) and whole plant and stem (14.28% each). In terms of preparation, the decoction was observed most commonly (80%), followed by infusion (20%).

Apocynaceae

It covers the nine (09) medicinal plants of the family Apocynaceae used in India and Pakistan. Among the plant parts roots were noted the most common (37.5%) followed by leaves (25%), seeds, and stem and whole plant (12.5% each). In terms of preparation, the decoction was observed most commonly (87.5%), followed by an extract (12.5%).

Arecaceae

It covers the seven (07) medicinal plants of the family Arecaceae used in 3 different countries such as Algeria, India and Indonesia. Their historical antiurolithiatic background shared in well known book of Dioscorides. Among the plant parts fruits, leaves and roots and rhizome were noted the most common (25% each) followed by flowering bud and seeds (12.5% each). In terms of preparation, the decoction was observed most commonly (66.66%), followed by infusion (33.33%).

Asparagaceae

It covers the nine (09) plants of family Asparagaceae used in 7 different countries such as Canada, Cyprus, Germany, India, Iran, Israel and Serbia. Their historical antiurolithiatc background shared in well known book of Dioscorides. Among the plant parts roots were noted the most common (50%) followed by bulbs, fruits, leaves, stem (12.5% each). In terms of preparation, decoction and infusions were equally observed most common (42.85% each), followed by extracts (14.28%).

Aspleniaceae

Five (05) medicinal plants of family Aspleniaceae used in 3 different countries such as Iran, Spain and Turkey have been shared. Their historical antiurolithiatc background shared in well known books of Dioscorides (04 plants) and Ibn Sina (01 plant). Among the plant parts leaves were noted the most common (60%) followed by whole plant (40%). In terms of preparation, the decoction was observed most commonly (80%), followed by infusion (20%).

Caesalpiniaceae

It covers the seven (07) medicinal plants of family Caesalpiniaceae used in Brazil, India, Mauritius and Nepal. Among the plant parts leaves were noted the most common (35.71%) followed by a bark (25%), fruits, flowers, stem (12.5%). In terms of preparation, the decoction was observed most commonly (60%), followed by juices and infusions (20% of each).

Capparidaceae

It covers the five (05) medicinal plants used in Algeria, Canada, India, Lebanon and Saudi Arabia. Their historical antiurolithiatc background shared in well known books of Dioscorides, Al Razi and Pliny the Elder (01 plant from each). Among the plant parts stem were noted the most common (57.41%) followed by leaves, flowers and roots (14.28% each). In terms of preparation, only decoction was observed.

Caryophyllaceae

It covers the eleven (11) medicinal plants used in 10 different countries such as Algeria, Canada, India, Iran, Jordan, Morocco, Palestine, Romania, Spain and Turkey. Their historical antiurolithiatc background shared in well known book of Dioscorides and Ibn Sina (01 plant from each). The whole plant and aerial parts leaves were noted the most common (28.57% each) followed by leaves (21.42%), roots (14.28%) and flowers (7.14%). In terms of preparation, the decoction was observed the most common (88.88%), followed by infusion (11.11%).

Chenopodiaceae

It covers the six (06) medicinal plants of the family Chenopodiaceae used in Algeria, India, Iran, Italy, Pakistan and Tunisia. Among the plant parts leaves were noted the most common (57.14%) followed by whole plant (28.57%) and flowers (14.28%). In terms of preparation, infusion was observed most commonly (66.66%), followed by decoction (33.33%).

Crassulaceae

Five (05) plants of the family Crassulaceae used in 6 different countries such as Bangladesh, Brazil, India, Iraq, Pakistan and Trinidad have been shared. Their historical antiurolithiatc background shared in well known book of Dioscorides. Among the plant parts leaves were noted the most common (80%) followed by whole plant (20%). In terms of preparation, the juices were observed most commonly (75%), followed by decoction (25%).

Cucurbitaceae

It covers the eighteen (18) medicinal plants of the family Cucurbitaceae used in 7 different countries such as India, Iran, Jordan, Pakistan, Palestine, Romania and Turkey has been shared. Their historical antiurolithiatc background shared in well known books of Dioscorides (03 plants), Al-Razi (02 plants), Ibn Sina (04 plants), and Al Antaki and Pliny the Elder (01 plant from each). Among the plant parts seeds were noted the most common

(40%) followed by fruits (25%), whole plant (20%), leaves, stem and roots (5% each). In terms of preparation, infusion was observed most commonly (50%), followed by decoction (30%) and juices (20%).

Cupressaceae

It covers the twelve (12) medicinal plants of the family Cupressaceae used in 6 different countries such as Algeria, Bosnia, Herzegovina, India, Pakistan, Turkey, Uzbekistan and Kyrgyzstan. Their historical antiurolithiatc background shared in well known books of Dioscorides (02 plants), Pliny the Elder (02 plants) and Ibn Sina (01 plant). Among the plant parts fruits were noted the most common (50%) followed by leaves and roots (20% each) and seeds (10%). In terms of preparation, infusion was observed most commonly (55.55%), followed by decoction (44.44%).

Ericaceae

It covers the eight (08) plants used in Algeria, America, Bosnia, Herzegovina, India, Rome, Serbia, Spain and Turkey. Among the plant parts leaves were noted the most common (50%) followed by aerial parts (30%), fruits and flowers (10% each). In terms of preparation, the decoction was observed most commonly (85.71%), followed by infusion (14.28%).

Equisetaceae

It covers the eight (08) medicinal plants used in Bosnia, Herzegovina, Canada, India, Iran, Mt. Pelion area of Greece, Pakistan, Peru, Spain and Turkey. Their historical antiurolithiatc background shared in well known book of Dioscorides. The whole plant was noted the most common (60%) followed by aerial parts (40%). In terms of preparation, infusion was observed most commonly (45.45%), followed by decoction (36.36%) and juices (18.18%).

Euphorbiaceae

This review covers the twenty (20) used in India, Italy, Morocco, Pakistan, Trinidad, Tunisia and Vietnam. Among the plant parts leaves were noted the most common (29.16%) followed by roots (25%), stem (20.83%), whole plant (16.66%), latex and seeds (4.16% each). In terms of preparation, the decoction was observed the most common (66.66%), followed by infusion (22.22%) and juices and extracts (5.55%).

ABBREVIATIONS USED

h.= hour.

OD= once daily.

QID = four times a day.

tbsp.= table spoon.

TID= three times a day.

tsp.= tea spoon.

days= days required to dissolve / expel kidney stones.

before breakfast= every morning in empty stomach.

Whewellite: Calcium oxalate monohydrate.

MSUM: Mono sodium urate monohydrate.

Struvite: magnesium ammonium phosphatee.

Table – 1: Antiurolithiatic plants of different families.

Antiurolithiatic plants	Explaination
Acanthaceae (15)	
Acanthus ilicifolius L.	Whole plant --- Thailand[5].
Acanthus mollis L.	Dioscorides (De Materia Medica):Whole plant is diuretic[6].
Anisotes trisulcus (Forssk.) Nees.	Leaves infusion – Yemen[7].
	Pharmacological activities: Anti-inflammatory and antioxidant properties[8].
Barleria prionitis L.	Roots decoction --- India[7].
	Pharmacological activities: Diuretic[8].
Dipteracanthus repens (L.) Hassk.	Leaves infusion--- Malaysia[7].
Ecbolium viride (Forsk.) Alst.	Leaves / roots decoction--- India[7].
	Pharmacological activities: Leaves and roots are analgesic, antioxidant and diuretic[8].
Gymnocarpus decandrum Forssk.	Aerial parts --- India[7].
Hygrophila auriculata (Schum.) Heine.	Plant ash / roots decoction--- India[7].
	India: Mix 10 g dried root powder with 500 ml of cow milk. 250 ml BD till stone expulsion[9] OR 5 g of plant ash is given with 100ml of cow milk for 30 days[10]. Boil 3-6 g of dried roots in one L of water; keep cover for 30 mins then filter. 250 ml in the morning OD till stone expulsion[11].
	Pharmacological activities: Roots possess analgesic, antioxidant, and diuretic properties[8].
Hygrophila schulli (Buch.-Ham.) Almeida.	Roots decoction--- India[7]; whole plant decoction --- India[12].
	India: 50-100 ml of root decoction OD till stone expulsion[9].
Hygrophila spinosa T. Anderson.	Whole plant --- Bangladesh[5].
	Pharmacological activities: Whole plant is analgesic, anti-inflammatory, antioxidant, diuretic, demulcent[5,13] and lithotriptic[14].
Lepidagathis prostrata Dalzell.	Whole plant --- India[15].

	Pharmacological activities: Whole plant possesses antioxidant and lithotriptic properties[15].
	Antiurolithiatic spectrum (reported): Whole plant against Whewellite[15].
Pararuellia napifera (Zoll.) Bremek. & Nann.-Bremek.	Leaves infusion --- Java[16].
Strobilanthes crispa Blume.	
Thunbergia alata Thnal.	Leaves decoction--- India[7]; flowers infusion --- Trinidad[17].
	Pharmacological activities: Leaves are lithotriptic[14].
Tubiflora acaulis (L. f.) Kuntze.	Leaves --- India[18].
	Pharmacological activities: Leaves are litholytic[18].
Amaranthaceae (15)	
Achyranthes aspera L.	Whole plant infusion --- India[9], Pakistan[19]; roots decoction/infusin --- Bangladesh, India, Pakistan[7].
	India: Mix 1tsp. of plant powder with water. 250 ml OD till stone expulsion[9].
	Pharmacological activities: Roots possess analgesic, anti-inflammatory, antioxidant, diuretic, litholytic[8] and lithotriptic[20] properties.
	Antiurolithiatic spectrum (reported): Leaves and roots against whewellite[20]; roots against brushite[21].
Aerva javanica (Burm, f.) Juss. ex Shult.	Plant decoction / infusion --- India, Pakistan[7] ; stem decoction --- Algeria[22].
	India: Mix 15 g of whole plant paste with 1L water. 250ml OD for 15 days[9].
	Pharmacological activities: Whole plant possess antioxidant, demulcent, diuretic[8] and lithotriptic[23] properties.
	Antiurolithiatic spectrum (reported): Roots against whewellite[23].
Aerva lanata (Linn.) Juss. ex Schult.	Whole plant decoction / leaves juice --- India[7, 11]; whole plant--- Nigeria[24].
	India: 50-100 ml of plant decoction OD[11]. 20 – 30ml of leaves juice OD[25].
	Pharmacological activities: Whole plant have antioxidant, diuretic, litholytic[8] and lithotriptic[26] properties.
	Antiurolithiatic spectrum (reported): Whole plant against whewellite[26]; flowers and roots against whewellite; roots and shoots against brushite; roots against MSUM and struvite**[21]**.
Alternanthera brasiliana (L.) Kuntze.	Leaves juice --- India[27].
	Pharmacological activities: Leaves possess antioxidant, anti-inflammatory, diuretic and litholytic properties[8].
Amaranthus blitum L.	Leaves infusion --- India[7].
Amaranthus blitoides S. Watson.	Aerial parts --- Iran[28].
Amaranthus caudatus L.	Leaves infusion --- India[7].
	Pharmacological activities: Leaves possess antioxidant, diuretic and litholytic properties[8].
Amaranthus spinosus L.	Roots decoction --- India[7].
	India: Mix 3 g of whole plant ash with water. 250 ml BD for 30 days[9]; roots decoction OD for 2 – 3 weeks[12].

Amaranthus viridis L.	Roots decoction / infusion --- India, Pakistan[7].
	Pharmacological activities: Antioxidant and litholytic[8].
Beta vulgaris L.	Rhizome juice --- India[7].
	India: 500 ml of rhizome juice in empty stomach daily early in the morning for 7 days[9].
	Pharmacological activities: Anti-inflammatory and antioxidant properties[8].
	Antiurolithiatic spectrum (reported): Leaves and rhizome against whewellite[21].
Digera muricata (L.) Mart**.**	Leaves extract OD till cure --- India[29].
	Pharmacological activities: Litholytic[18].
	Antiurolithiatic spectrum (reported): Leaves against whewellite[18].
Celosia argentea L.	Roots infusion --- India[7]. Seed powder, 3 – 6 g orally taken --- India[11].
	India: Boil 1 tsp. dried roots in one L of water, keep cover for 30 mins then filter. 250ml in the morning OD till stone expulsion. OR boil 1tbsp. seed powder with 300 ml of water until it reduces to 75 ml. 35 ml BD for 7-10 days[9].
	Pharmacological activities: Roots possess anti-inflammatory, antioxidant[8] and lithotriptic[14] properties.
Gomphrena celosioides Mart.	Whole plant infusion --- India[7].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant[8] and lithotriptic[30].
	Antiurolithiatic spectrum (reported): Roots against whewellite[31].
Gomphrena globosa L.	Flowers decoction / infusion --- Trinidad[17].
Nothosaerva brachiata (L.) Wight.	Roots decoction ---India[32].
	Pharmacological activities: Diuretic, litholytic, lithotriptic[8].
	Antiurolithiatic spectrum (reported): Roots against whewellite[32].
Amaryllidaceae (09)	
Allium akaka S.G.Gmel. ex Schult. & Schult.f.	Leaves --- Iran[28].
Allium ampeloprasum L.	
Allium cepa L.	Dioscorides (De Materia Medica): Bulb is diuretic[6].
	Bulb infusion --- India[7].
	India: 10-15 ml onion bulb extract along with sugar candy TID till stone expulsion[9].
	Pharmacological activities: Anti-inflammatory, astringent, diuretic, lithotriptic[8].
Allium odorum L.	Leaves infusion --- India[7].
	India: Boil 250 g of leaves in one L of water. 250 ml leaves decoction OD till stone expulsion[9].
	Pharmacological activities: Antioxidant, lithotriptic[8].
Allium porrum L.	Dioscorides (De Materia Medica): Whole plant is diuretic[6].
Allium sativum L.	Dioscorides (De Materia Medica): Bulb is diuretic[6].
	Bulb infusion --- Palestine[7].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant[8], diuretic[33].
Crinum asiaticum L.	Bulb --- India[14].

	Pharmacological activities: Lithotriptic[14].
Curculigo orchioides Gaertn.	Rhizome decoction / infusion --- India[7, 34].
	India: 2-3 tsp. of rhizome decoction with 1 tsp. of honey in empty stomach for 21-30 days[34].
	Pharmacological activities: Antioxidant[35], lithotriptic[14].
	Antiurolithiatic spectrum (reported): Roots against whewellite[14].
Ungernia victoris Vved.	Seeds infusion --- Uzbekistan , Kyrgyzstan[7].
Anacardiaceae (10)	
Anacardium occidentale L.	Leaves --- India[9].
	India: Mix paste of tender leaves and cumin seed in 250 ml coconut water. 250 ml water BD till stone expulsion[9].
Cotinus coggygria Scop.	Leaves decoction --- Turkey[36]; shoots decoction --- Turkey [37].
Mangifera indica L.	Fruit eaten --- Iran[38].
Pistacia lentiscus L.	Dioscorides (De Materia Medica): Aerial parts are diuretic[6].
	Plant infusion --- Morocco[7].
	Antiurolithiatic spectrum (reported): Bark against struvite[21].
Pistacia palaestina Boiss.	Dioscorides (De Materia Medica): Leaves are litholytic[6].
Pistacia terebinthus L.	Dioscorides (De Materia Medica): Aerial parts are diuretic[6].
	Shoots decoction --- Turkey[37]; leaves infusion --- Lebanon[39].
Rhus succedanea L.	Fruit decoction --- India[7].
	Pharmacological activities: Antioxidant[8], lithotriptic[14].
Rhus tripartita (Ucria) Grande.	Antiurolithiatic spectrum (reported): Bark against struvite[21].
Semecarpus anacardium L.f.	Antiurolithiatic spectrum (reported): Seeds against whewellite[21].
Spondias axillaris L.	Fruit decoction --- India[7].
Apocynaceae (09)	
Asclepias syriaca L.	Root decoction --- India[7].
Carissa opaca Stapf. ex. Haines.	Leaves decoction --- Pakistan[7].
Ceropegia bulbosa Roxb.	Tuber decoction--- India[27].
	Pharmacological activities: Antioxidant, litholytic[8].
	Antiurolithiatic spectrum (reported): Roots against whewellite[21].
Hemidesmus indicus (L.) R. Br. ex Schult.	Leaves / root decoction --- India[7].
	Pharmacological activities: Anti-inflammatory[8], lithotriptic[14].
	Antiurolithiatic spectrum (reported): Roots against whewellite[40].
Holarrhena antidysenterica (Roth.) DC.	Root bark decoction --- India[7].
	Pharmacological activities: ACE inhibitor, analgesic, anti-inflammatory, astringent and litholytic[8].
	Antiurolithiatic spectrum (reported): Seeds against whewellite[41].
Holarrhena pubescens (Buch.Ham). Wall. ex. G. Don.	Stem / seeds decoction --- India[7].
	India: 1tsp. bark powder BD till stone expulsion. OR 1tsp. seed powder before breakfast till stone expulsion[9].
Ichnocarpus frutescens (L.) W.T. Aiton.	Roots decoction --- India[42].
	India: Root powder along with milk BD till stone expulsion[43].
	Pharmacological activities: Litholytic[8].
	Antiurolithiatic spectrum (reported): Roots against whewellite[42].
Pergularia daemia (Forssk.) Chiov.	Whole plant extract --- India[11].
	Pharmacological activities: Litholytic[44], lithotriptic[14].
	Antiurolithiatic spectrum (reported): Whole plant against

	whewellite[44].
Vallaris solanacea (Roth) Kuntze.	India: 3–6 g of root powder mixed with sugar solution in water is taken[11].
Arecaceae (07)	
Areca catechu L.	Nut powder --- India[9].
	India: 1.5 g of nut powder along with 250 ml of water. 250 ml BD for 7 days[9].
Borassus flabellifer L.	Leaves / roots decoction / buds infusion --- India[7, 9].
	India: 250 ml roots / leaves decoction BD till stone expulsion. OR Eat jelly like kernel of fruit OD till stone expulsion[9].
	Pharmacological activities: Diuretic[8].
	Antiurolithiatic spectrum (reported): Fruits against brushite and whewellite[21].
Calamus rotang L.	Rhizome powder / decoction --- India[7]; stem and leaves --- India[45].
	India: 100 ml rhizome decoction or 5-10 g rhizome powder in one L of water. 250 ml TID till stone expulsion[11].
	Pharmacological activities: Anti-inflammatory[46].
Chamaerops humilis L.	Leaves --- Algeria[47].
	Pharmacological activities: Lithotriptic[21].
	Antiurolithiatic spectrum (reported): Bark against whewellite[21].
Cocos nucifera L.	Fruit water --- India[7]; fruit --- Indonesia[48]
	India: 30 ml of flower extract mix with 50 ml of goat milk and sugar. 80 ml OD till stone expulsion[9]; Indonesia: Fruit baked and its water mixed with brown sugar or honey taken orally[48].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant[8], litholytic[49].
	Antiurolithiatic spectrum (reported): Fruits against brushite, whewellite and struvite[21].
Phoenix dactylifera L.	Dioscorides (De Materia Medica): Fruits are diuretic[6].
	Antiurolithiatic spectrum (reported): Fruits against whewellite[50].
Serenoa repens (W.Bartram) Small.	Fruit raw eaten ---India[51].
	Pharmacological activities: Anti-inflammatory, antioxidant, antispasmodic, diuretic, PLA_2-inhibitor[8].
Asparagaceae (09)	
Asparagus officinalis L.	Roots decoction / infusion --- Germany, India[7, 9].
	India: 3-5 g of root powder in one L of water. 250 ml TID till stone expulsion[9].
	Pharmacological activities: Antioxidant, diuretic[8].
Asparagus racemosus Willd.	Roots decoction / extract --- Canada, India, Iran[7,9,11].
	Canada: 1 tsp. dried, powdered root, 8 oz. water, decoct 10 mins, steep 40 mins. 250ml BD till stone expulsion[9]. India: mix 1 tsp. of dried rhizome with 500 ml of cow milk. 250 ml BD till stone expulsion[9].
	Pharmacological activities: Anti-inflammatory, antioxidant, astringent, diuretic, litholytic[8], lithotriptic[14].
	Antiurolithiatic spectrum (reported): Roots against whewellite[21].
Drimia indica (Roxb.) Jessop.	Bulb infusion --- India[7].
	Pharmacological activities: Diuretic[8].

Polygonatum multiflorum (L.) All.	Roots --- India[14].
	Pharmacological activities: Lithotriptic[14].
Ruscus aculeatus L.	Dioscorides (De Materia Medica): Fruits / leaves are diuretic, litholytic and used against strangury[6].
	Leaves / stem decoction --- Israel[52]; rhizome --- Serbia[53]; infusion of crushed tender stems and leaves --- Cyprus[54].
	Serbia: 100 g of chopped rhizome boiled in 1 L of water, and left for 2 – 3 h and filter. 1 tsp. TID before meals[53].
	Pharmacological activities: Leaves: Antioxidant, litholytic[8].
	Antiurolithiatic spectrum: Leaves against whewellite[55].
Ruscus racemosus L.	Dioscorides (De Materia Medica): Roots/rhizomes are diuretic[6].
Ruscus hypoglossum L.	Fruit raw eaten --- India[7].
Scilla bifolia L.	Dioscorides (De Materia Medica): Diuretic[6].
Urginea maritima (L.) Baker.	Dioscorides (De Materia Medica): Diuretic[6].
Aspleniaceae (05)	
Asplenium ceterach L.	Leaves decoction --- Turkey[7].
	Pharmacological activities: Antioxidant[8].
Asplenium hemionitis L.	Leaves infusion --- Spain[56].
	Pharmacological activities: Diuretic, litholytic[8].
Asplenium scolopendrium L. or *Scolopendrium vulgare* Sm.	Ibn Sina (Al Qanoon Fit Tibb): Leaves are litholytic[6].
	Leaves decoction --- Iran[7].
	Pharmacological activities: Antioxidant[8].
Ceterach aureum Buch.	Whole plant infusion / roots decoction --- Spain[56].
	Pharmacological activities: Diuretic, litholytic[8].
Ceterach officinarum Willd.	Dioscorides (De Materia Medica): Whole plant is litholytic and strangury[6].
	Whole plant decoction--- Turkey[57].
Caesalpiniaceae (07)	
Bauhinia acuminata L.	Bark / leaves --- India[14].
	Pharmacological activities: Lithotriptic[14].
Bauhinia forficata Link.	Leaves decoction --- Brazil[7].
	Latin America: Boil 250 g of leaves in one L of water. 250 ml TID till stone expulsion[9].
Bauhinia purpurea L.	Bark infusion --- Nepal[7].
Cassia auriculata L.	Leaves juice --- India[7].
	Pharmacological activities: Antioxidant[8].
Cassia fistula L.	Fruit juice --- India, Mauritius[7]; stem bark decoction --- India[11].
	India: 0.25 - 0.5 tsp. fruit powder in 100 ml water. 50 ml BD for 90 - 120 days[9]. OR 50 - 100 ml of stem bark decoction OD[11].
	Pharmacological activities: Antioxidant, litholytic[8].
Cassia occidentalis L.	Flowers decoction --- India[7].
Hardwickia binata Roxb.	Balsam --- India[58].
	Pharmacological activities: Diuretic[8].
Capparidaceae (05)	
Capparis sicula Duhamel.	Bark / roots decoction --- Lebanon[39].
Capparis spinosa L.	Dioscorides (De Materia Medica): Whole plant is diuretic[6]; Pliny the Elder (Naturalis Historis): Whole plant is diuretic[6]; Al Razi / Rhazes (Al-Hawi fi al-Tibb): Whole plant is litholytic[6]
	Leaves and floral buds decoction --- Algeria[59] , Saudi Arabia[60].

	Pharmacological activities: Antioxidant, anti-inflammatory, diuretic[61].
Crateva adansonii DC. subsp. *odora* Buch. Ham.	Bark decoction --- India[7].
	India: Bark decoction before breakfast till stone expulsion[9].
	Pharmacological activities: Analgesic, antioxidant[8].
	Antiurolithiatic spectrum (reported): Bark against whewellite[62].
Crataeva magna (Lour.) D.C.	Stem bark decoction --- India[7].
	India: Bark decoction 15 – 30 ml BD for 7 days[9, 25]; fruit juice OD to disintegrate stones[12].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, demulcent, diuretic, lithotriptic[8].
	Antiurolithiatic spectrum (reported): Bark[63], leaves[64] and roots[65] against whewellite.
Crataeva nurvala Buch.-Ham.	Stem bark decoction --- Canada, India[7, 9].
	Canada: 2 tsp. dried bark, 12 oz. water, boil for 15 mins, keep cover for 30 mins then filter. 8 oz. BD till stone expulsion[9]. India: Boil 20-30 g of stem bark in one L of water. 250ml BD till stone expulsion[9].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, demulcent, diuretic, lithotriptic[8], litholytic[66].
	Antiurolithiatic spectrum (reported): Bark against whewellite[67]
Caryophyllaceae (11)	
Arenaria serpyllifolia L.	Whole plant decoction --- Algeria[68].
Gymnocarpos decandrus Forssk.	Aerial parts decoction --- Morocco[7].
Gypsophila struthium L.	Ibn Sina (Al Qanoon Fit Tibb): Roots are litholytic[6].
	Roots decoction --- Iran[7].
Herniaria glabra L.	Aerial parts ---- Romania[69].
	Pharmacological activities: Lithotriptic[8].
Herniaria hirsuta L.	Whole plant decoction --- Canada[9].
	Canada: 1 tsp. dried herb in 8 oz. water, boil for 5-10mins. 250 ml BD till stone expulsion[9].
	Pharmacological activities: Lithotriptic[14].
	Antiurolithiatic spectrum (reported): Whole plant against whewellite[21].
Honiara cinera DC.	Whole plant decoction / infusion --- Spain[70].
Paronychia arabica L.	Aerial part decoction --- Algeria[59].
Paronychia argentea Lam.	Whole plant decoction --- Palestine[71], Turkey[57]; aerial parts decoction / infusion --- Algeria, Jordan[72, 73]; leaves / flowers decoction --- India, Palestine[7, 11].
	Palestine: Boil about 100g of dried plant in 100ml water. 30ml of decoction TID before each meal[71].
	Pharmacological activities: Antioxidant, litholytic[8].
Saponaria mesogitana Boiss.	Leaves / roots decoction --- Palestine[7].
	Pharmacological activities: Litholytic[8].
Saponaria officinalis L.	Dioscorides (De Materia Medica): Roots are diuretic and litholytic[6].
Spergularia rubra (L.) J.Presl & C. Presl.	Leave infusion--- India[74].
	Pharmacological activities: Diuretic, lithotriptic[8].
Chenopodiaceae (06)	

Atriplex halimus L.	Leaves infusion --- Algeria[22].
	Antiurolithiatic spectrum (reported): Leaves against whewellite[21].
Chenopodium album L.	Plant infusion --- India[75], Pakistan[7].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, antispasmodic[8].
	Antiurolithiatic spectrum: Fruits and seeds against brushite and whewellite[21].
Haloxylon stocksii Boiss. Benth. & Hook.	Plant decoction --- Pakistan[7].
Noaea mucronata (Forssk.) Asch. & Schweinf.	Flowers / leaves --- Iran[28].
Salsola kali L.	Leaves infusion --- Italy and Tunisia[76].
	Pharmacological activities: Diuretic[76].
Suaeda fruticosa L. Forsk.	Leaves decoction / infusion --- Pakistan[7, 19].
	Pharmacological activities: Diuretic[19].
Crassulaceae (05)	
Bryophyllum calycinum Salisb.	Leaves juice --- India[7].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, diuretic, litholytic[8].
Bryophyllum pinnatum (Lam.) Oken.	Leaves juice --- India [7].
	India: 2tsp. leaves juice BD till stone expulsion[9].
	Pharmacological activities: Analgesic, anti-inflammatory, litholytic[8] lithotriptic[20].
	Antiurolithiatic spectrum (reported): Leaves against whewellite[21].
Kalanchoe brasiliensis Cambess.	Leaves --- Brazil[77].
Kalanchoe pinnata (Lam.) Pers.	Leaves juice --- Bangladesh[78], India, Pakistan, Trinidad[7, 17, 79].
	Bangladesh: 250 ml leaves juice BD for 7 days[78].
	Pharmacological activities: Analgesic, anti-inflammatory, diuretic, litholytic[8], lithotriptic[14].
	Antiurolithiatic spectrum (reported): Leaves against whewellite[21].
Nasturtium officinale R.Br.	Whole herb decoction --- Iraq[80].
Umbilicus rupestris (Salisb.) Dandy.	Dioscorides (De Materia Medica): Litholytic[6].
Cucurbitaceae (18)	
Benincasa hispida (Thunb.) Cogn.	Fruit juice --- India, Pakistan[7].
	India: 2-3 tbsp. fruit juice BD till stone expulsion[9].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, astringent, diuretic[8] lithotriptic[14].
	Antiurolithiatic spectrum (reported): Seeds against Brushite and whewellite[81].
Bryonia alba L. / *Bryonia dioica* Jacq.	Dioscorides (De Materia Medica): Whole plant is diuretic[6]. Ibn Sina (Al Qanoon Fit Tibb): Stem is litholytic and expels stones[6].
	Stem infusion --- Iran[7].
Citrullus colocynthis (L.) Schrad.	Whole plant extract --- Pakistan[7]; seeds infusion --- Palestine[71].
	Palestine: Steep 40 g of the grounded seeds in 100 ml water for 12 h. 25 ml from this infusion taken TID[71].

	Pharmacological activities: Anti-inflammatory, antioxidant[8].
	Antiurolithiatic spectrum (reported): Fruits against brushite; bark and fruits against struvite[21].
Citrullus lanatus L.	Dioscorides (De Materia Medica): Seeds are diuretic[6]
	Seeds infusion --- Pakistan[7].
	Pharmacological activities: analgesic, anti-inflammatory, antioxidant[8].
	Antiurolithiatic spectrum (reported): Fruits against Brushite and Whewellite[21].
Citrullus vulgaris Schrad.	Ibn Sina (Al Qanoon Fit Tibb): Fruit juice is diuretic and litholytic[82].
	Fruits / seeds infusion --- Jordan, Pakistan[7].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, diuretic[8].
Coccinia grandis (L.) Voigt.	Roots decoction --- India[7].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant[8].
	Antiurolithiatic spectrum (reported): Leaves against whewellite[83].
Coccinia indica Wight & Arn.	Whole plant --- India[7].
	Pharmacological activities: Litholytic[8].
	Antiurolithiatic spectrum (reported): Fruits against whewellite[84].
Cucumis melo L.	Dioscorides (De Materia Medica): Seeds are diuretic[6]; Pliny the Elder (Naturalis Historis): Seeds are diuretic[6]; Al Razi / Rhazes (Al-Hawi fi al-Tibb): Seeds are diuretic[6]; Ibn Sina (Al Qanoon Fit Tibb): Seeds are diuretic and expel stones[6].
	Seeds / fruit juice --- India, Iran, Pakistan[7].
	India: 1 tbsp. fresh fruit juice BD till stone expulsion. OR Mix 5-10 g fruit peel paste with 250 ml of coconut water. 250 ml OD for 15 days[9] OR seeds powder with milk to dissolve stones[12].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, diuretic[8]seeds possess litholytic properties[12].
	Antiurolithiatic spectrum (reported): Fruits[85], fruit skin[86] against Whewellite.
Cucumis sativus L.	Al Razi / Rhazes (Al-Hawi fi al-Tibb): Fruits are diuretic[6] Ibn Sina (Al Qanoon Fit Tibb): Fruits are diuretic and litholytic[82].
	Seeds / fruit decoction --- India, Pakistan, Palestine[7]. Leaves / roots decoction --- Fiji[7].
	Pharmacological activities: Litholytic[8], lithotriptic[14].
Cucurbita maxima Duchesne.	Seeds --- Romania[87].
	Pharmacological activities: Antioxidant, diuretic, lithotriptic [8].
Cucurbita moschata Duchesne.	Daoud al-Antaki (Tadhkirat Uli l-al-Bab wa l-Jami li-L-'Ajab al-'Ujab): Seeds are useful in renal stone[82].
Lagenaria abyssinica (Hook. f.) C. Jeffrey.	Seed powder --- India[88].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, diuretic[8].
Lagenaria siceraria (Molina) Standl.	Fruit infusion --- India[7].

	India: Fresh fruits after peeling off the rind and removing seeds are cut into thin slices. Slices are sun dried and preserved in the form of garlands at home for winter season. In winter, boil for 20 mins, cover for 60 mins then filter. 4 oz. TID till stone expulsion (in winter). OR 1tsp. seed powder with 50 ml sheep milk. 50 ml OD for 7 days[9].
	Pharmacological activities: Diuretic, litholytic[8], lithotriptic[14].
	Antiurolithiatic spectrum (reported): Fruits against whewellite [89].
Melothria perpusilla (Blume) Cogn.	Whole plant --- India[14].
	Pharmacological activities: Lithotriptic[14].
Momordica charantia L.	Fruits and leaves --- India[90] Paste of the fruit rind mixed with honey eaten --- Turkey[37].
	Pharmacological activities: lithotriptic[91].
	Antiurolithiatic spectrum (reported): Fruits and leaves against whewellite[21,91].
Momordica cochinchinensis (Lour.) Spreng.	Seed decoction or fruit / seeds infusion --- India[7, 9].
	India: Boil 1 tsp. seed powder in one L of water. 100 ml OD for 7 days[9].
	Pharmacological activities: Antioxidant[8].
Momordica dioica Roxb. ex Willd.	Fruit --- India[7].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant[8], lithotriptic[14].
Mukia maderaspatana (L.) M. Roem.	Whole plant infusion --- India[7].
	India: 10-20ml of plant extract OD till stone expulsion[9].
	Pharmacological activities: Anti-inflammatory, antioxidant, diuretic[8].
Cupressaceae (12)	
Cupressus sempervirens L.	Dioscorides (De Materia Medica): Cone / leaves are diuretic [6]; Pliny the Elder (Naturalis Historis): Cone / leaves are diuretic[6].
Juniperus chinensis L.	Fruit infusion --- Bosnia , Herzegovina[7].
	Pharmacological activities: Antioxidant[8].
Juniperus communis L.	Dioscorides (De Materia Medica): Fruits are diuretic[6]; Pliny the Elder (Naturalis Historis): Fruits are diuretic[6].
	Fruit infusion --- Bosnia , Herzegovina[7], Pakistan[92].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, diuretic[8].
Juniperus drupacea Labill.	Ibn Sina (Al Qanoon Fit Tibb): Fruits are diuretic and litholytic[82].
Juniperus excelsa M. Bieb.	Fruit infusion --- Bosnia, Herzegovina[7] Pakistan[92]; seeds decoction --- Turkey[93].
	Pharmacological activities: Fruits: antioxidant, diuretic[8]; seeds: diuretic[93].
Juniperus oxycedrus L. subsp. *Oxycedrus.*	Cone infusion--- Turkey[94]; volatile oil (1 drop or 0.05 ml)--- Turkey[95].
	Pharmacological activities: Anti-inflammatory, antioxidant[8].
Juniperus phoenicea L.	Leaves infusion --- Algeria[22].
Juniperus polycarpos K.Koch.	Root decoction --- India[7].
	Pharmacological activities: Anti-inflammatory, diuretic[8].

Juniperus pseudosabina Fisch.	Fruit decoction --- Uzbekistan , Kyrgyzstan[7].
Juniperus sabina L.	Roots decoction --- Uzbekistan , Kyrgyzstan[7].
Juniperus seravschanica Kom.	
Tetraclinis articulata (Vahl) Mast.	Leaves --- Algeria[96].
	Pharmacological activities: Lithotriptic[96].
	Antiurolithiatic spectrum (reported): Leaves against whewellite[21].
Ericaceae (08)	
Arbutus andrachne L.	Flowers infusion --- Turkey[37].
	Pharmacological activities: Diuretic[37].
Arctostaphylos pungens Kunth.	Leaves decoction --- India[7].
	Pharmacological activities: Antioxidant[8].
Arctostaphylos uva ursi (L.) Spreng.	Leaves decoction --- Rome[97].
	Pharmacological activities: Anti-inflammatory, antioxidant, astringent, diuretic, litholytic[8] lithotriptic[98].
	Antiurolithiatic spectrum (reported): Whole plant against whewellite[98].
Erica arborea L.	Leaves --- Algeria[96]; flowers --- Algeria[99].
	Pharmacological activities: Lithotriptic[96].
	Antiurolithiatic spectrum (reported): Leaves against whewellite[21].
Erica multiflora L.	Leaves --- Algeria[96].
	Pharmacological activities: Lithotriptic[96].
	Antiurolithiatic spectrum (reported): Leaves against whewellite[21].
Chimaphila maculata (L.) Pursh.	Leaves decoction --- America[7].
	Appalachia: Mix 2 tsp. of dried leaves with 250 ml of boiling water, keep cover for 10 mins then filter. Take 250 ml TID for 7 days[9].
	Pharmacological activities: Diuretic[8].
Chimaphila umbellata (L.) Barton.	Aerial parts decoction --- America[7].
	Pharmacological activities: Antioxidant, diuretic[8].
Loiseleuria procumbens (L.) Loisel.	Aerial part decoction --- Spain[100].
Vaccinium vitis-idaea L.	Aerial parts decoction --- Bosnia , Herzegovina[7]; fruits --- Serbia[53].
	Pharmacological activities: Antioxidant[8].
Equisetaceae (08)	
Equisetum arvense L.	Aerial parts juice --- Bosnia , Herzegovina, Pakistan, Turkey[7]; aerial parts decoction --- Iran[28], Mt. Pelion area of Greece, Turkey[37, 101]; whole plant decoction --- Canada[9].
	Canada: 1 tsp. dried herb in 8 oz. water, boil for 15 mins, keep cover for 60 mins then filter. 4 oz. TID till stone expulsion[9].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, diuretic, litholytic[8].
	Antiurolithiatic spectrum (reported): Whole plant against whewellite[102].
Equisetum bogotense HBK.	Plant infusion --- Peru[7].
	Pharmacological activities: Diuretic[8].
Equisetum debile Roxb.	Plant juice --- India[7].

	India: Whole plant soaked overnight and filtered water drink early in morning[75].
	Pharmacological activities: Antioxidant[8], lithotriptic[14].
Equisetum giganteum L.	Aerial parts decoction --- Turkey[37].
Equisetum hyemale L.	Whole plant--- Turkey[103].
Equisetum palustre L.	Whole plant infusion ---Turkey[57].
Equisetum ramosissimum Desf.	Aerial parts decoction / infusion --- Spain, Turkey[7, 70].
	Turkey: 250 g of aerial parts in one L of water boil for 10-15 mins, keep cover for 30 mins then filter. 250 ml before breakfast for 7- 8 days[9].
	Pharmacological activities: Diuretic[8].
Equisetum sylvaticum L.	Dioscorides (De Materia Medica): Whole plant is diuretic[6].
Equisetum telmateia Ehrh.	Whole plant decoction --- Spain[70]; aerial parts decoction --- Turkey [36]; aerial parts infusion --- Bosnia , Herzegovina[7].
	Turkey: 125 ml aerial parts decoction TID for 15 days[36].
Lavandula stoechas L.	Flowery plant infusion --- Spain[70].
Euphorbiaceae (20)	
Acalypha indica L.	Leaves / flower --- Pakistan[7].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, diuretic[8].
	Antiurolithiatic spectrum (reported): Whole plant against whewellite[104].
Baliospermum solanifolium (Burm.) Suresh.	Root powder 1 – 3 g orally taken with water --- India[11].
Bischofia trifoliata (Roxb.) Hook.	Leaves --- Vietnam[105].
Bridelia montana (Roxb.) Willd.	Bark --- India[14].
	Pharmacological activities: Lithotriptic[14].
Bridelia retusa (L.) A.Juss.	Antiurolithiatic spectrum (reported): Whole plant against whewellite[106].
Croton tiglium L.	Daoud al-Antaki (Tadhkirat Uli l-al-Bab wa l-Jami li-L-'Ajab al-'Ujab): Seeds are useful in renal stone[82].
Emblica officinalis Gaertn.	Fruit pulp / infusion / juice --- India[7, 9].
	India: 4 tsp. of fruit juice extracted with 250 ml lime water. 250 ml BD for 7 days[9].
	Pharmacological activities: Lithotriptic[14].
Euphorbia antiquorum L.	Leaves and roots --- India[107].
Euphorbia hirta L.	Plant decoction / extract --- India[7,9]; leaves infusion --- Trinidad[17].
	India: Mix 100 ml whole plant extract with 200 ml goat milk. 200 ml OD for 30 days[9].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant, diuretic[8].
Euphorbia macroclada Boiss.	Whole plant decoction --- Turkey[95].
Euphorbia neriifolia L.	Whole plant decoction --- Pakistan[7]
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant[8].
Euphorbia oerstediana (Klotzsch & Garcke) Boiss.	Leaves / seeds / stem decoction --- Trinidad[17]
Euphorbia prostrata L.	Whole plant decoction --- Pakistan[7]; leaves infusion ---

	Pakistan[19].
	Pharmacological activities: Whole plant: anti-inflammatory, antioxidant[8].
Euphorbia retusa Forssk.	Latex decoction --- Morocco[7].
Euphorbia serpens Kunth.	Plant decoction --- Pakistan[7].
Homonoia riparia Lour.	Root decoction --- India[7].
	India: Fresh juice of root BD till stones expulsion[12].
	Pharmacological activities: Antioxidant[108], diuretic, lithotriptic[8].
Macaranga peltata Roxb. Muell.-Arg.	Bark decoction --- India[7].
Mallotus philippensis (Lam.) Muell. Arg.	
	Pharmacological activities: Lithotriptic[14].
Mercurialis annua L.	Leaves decoction / infusion ---- Italy, Tunisia[76].
	Pharmacological activities: Diuretic[76].
Ricinus communis L.	Roots decoction --- India[7].
	Pharmacological activities: Analgesic, anti-inflammatory, antioxidant[8].
Sapium sebiferum (Linn.) Roxb.	Leaves infusion --- Pakistan[7].
	Pharmacological activities: Diuretic[8].

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