



A REVIEW ARTICLE OF HERBAL DRUG FOR KIDNEY STONE

¹Snehal Jagtap, ²Priyanka Gawade ³Poonam Mantri, ⁴Dr.Rajesh Oswal

^{1,2}Research student, ³Assistant Professor, ⁴Principal

^{1,2,3,4}Genba Sopanrao Moze Colleague Of Pharmacy, Wagholi, Pune, India.

ABSTRACT:-

Kidney stones are among the oldest and most widespread urinary tract ailments, impacting people all over the globe with a high recurrence rate. The mechanism of kidney stone formation includes events such as urine supersaturation, aggregation, retention, nucleation, and growth of crystals in the cells of the renal tubular epithelium. Kidney stones may cause extreme pain and blockage of urine flow. They are usually treated with synthetic drugs and extracorporeal shock wave lithotripsy (ESWL) as well as a variety of medications that may cause several adverse effects. The remaining stone fragments and the risk of infection following ESWL are severe problems in the treatment of kidney stones. Recently, despite the emergence of synthetic drugs, medicinal plants have been recognized and utilized in many nations due to their safety profile, efficiency, cultural acceptance, and fewer side effects than synthetic drugs. Medicinal plants are used in different cultures as a reliable source of natural remedies. The aim of this review is to provide comprehensive information about traditionally used antiurolithiatic plants as well as their scientifically proven pharmacological activities, their primary chemical ingredients, and potential mechanisms of action, such as analgesic, astringent, demulcent, diuretic activity, antioxidant activity, inhibition of the inflammatory process, nucleation inhibition, crystallization inhibition, inhibition of crystal aggregation, reducing hyperoxaluria, reducing stone size, and reducing urine supersaturation .

Keywords – Supersaturation, extracorporeal shock wave lithotripsy, antiurolithiatic, hyperoxaluria etc.

INTRODUCTION-

The kidneys are two bean-shaped organs, each about the size of a fist. They are located just below the rib cage, one on each side of your spine. Healthy kidneys filter about a half cup of blood every minute, removing wastes and extra water to make urine. The urine flows from the kidneys to the bladder through two thin tubes of muscle called ureters, one on each side of your bladder. Your bladder stores urine. Your kidneys, ureters, and bladder are part of your urinary tract.^[1]

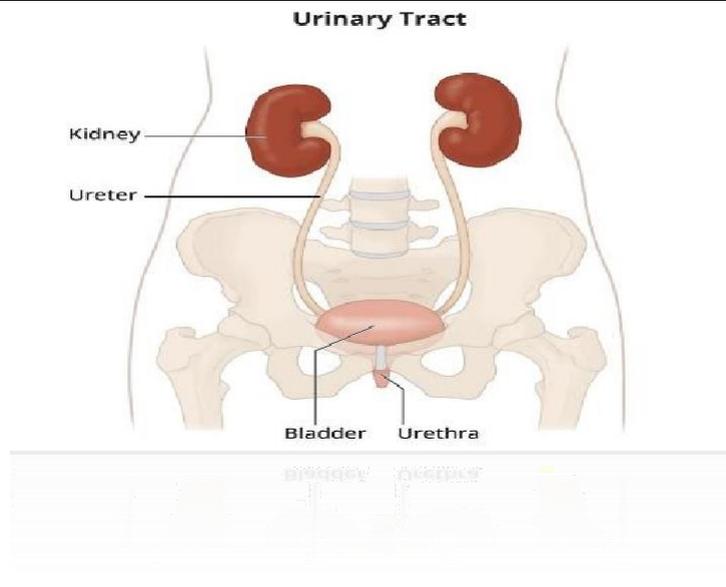


Figure 1: Diagram of urinary system

Kidney stone –

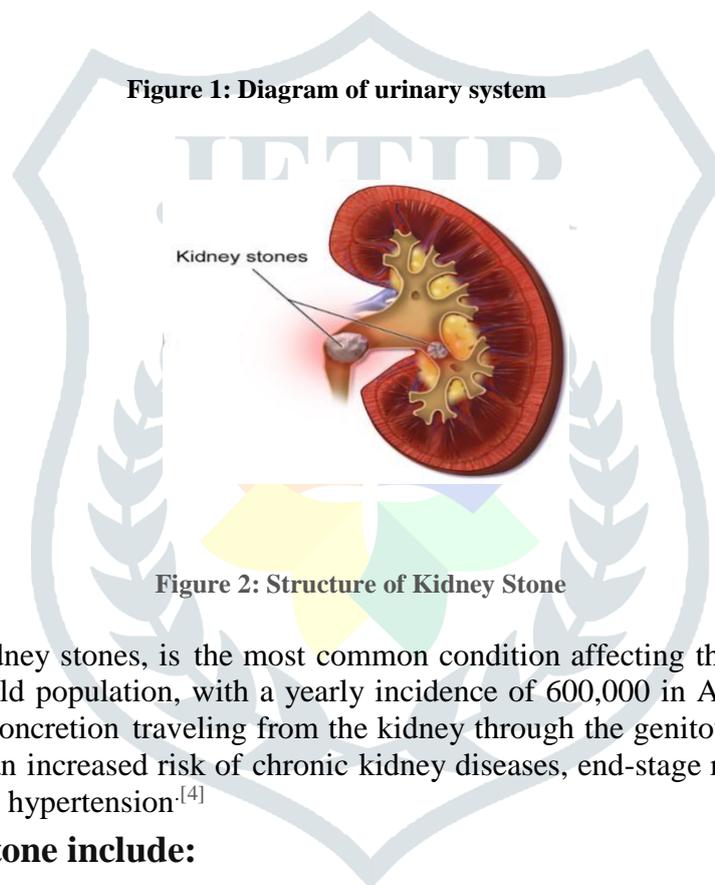


Figure 2: Structure of Kidney Stone

Nephrolithiasis, or kidney stones, is the most common condition affecting the urinary system, affecting about 12% of the world population, with a yearly incidence of 600,000 in America. It is the result of a crystal or crystalline concretion traveling from the kidney through the genitourinary system^{[2][3]} Kidney stones correlate with an increased risk of chronic kidney diseases, end-stage renal failure, cardiovascular diseases, diabetes, and hypertension^[4]

Types of kidney stone include:



Types of Kidney Stone



Calcium Stone



Uric Acid Stone



Struvite Stone



Cysteine Stone

Figure :3 types of kidney stone ^[5]

Classification and characteristics of kidney disease

Type	Incidence	Crystal shape	X-ray findings	Urinary risk factors	Clinical risk factors
Calcium oxalate (may include calcium phosphate [$< 50\%$])	80%	Envelope	Radiopaque, spherical (staghorns rare)	↑ Urine calcium, oxalate, uric acid; ↓ urine volume, citrate	Men in 30s and 40s
Calcium phosphate ($\geq 50\%$)	$< 5\%$	Amorphous	Radiopaque, spherical	↑ Urine calcium, urine pH	Primary hyperparathyroidism, distal RTA, alkali treatment
Uric acid	10%	Diamond, rhomboid	Radiolucent, staghorns possible	↑ Urine uric acid; ↓ urine pH, urine volume	Gout, diabetes mellitus, chronic diarrheal disease
Struvite	10%	Coffin-lid	Radiopaque, staghorns common	↑ Urine pH: urease-positive UTI	Neurogenic bladder, other anatomic abnormality
Cystine	$< 1\%$	Hexagonal	Faintly radiopaque, staghorns common	Inherited disorder	—

RTA, renal tubular acidosis; UTI, urinary tract infection.

Table-1 Classification and characteristics of kidney stone ^[6]

1. Calcium stones:

Most kidney stones are calcium stones, usually in the form of calcium oxalate. Oxalate is a substance made daily by your liver or absorbed from your diet. Certain fruits and vegetables, as well as nuts and chocolate, have high oxalate content.

Dietary factors, high doses of vitamin D, intestinal bypass surgery and several metabolic disorders can increase the concentration of calcium or oxalate in urine.

Calcium stones may also occur in the form of calcium phosphate. This type of stone is more common in metabolic conditions, such as renal tubular acidosis. It may also be associated with certain medications used to treat migraines or seizures, such as topiramate (Topamax, Trokendi XR, Qudexy XR).

2. Struvite stones:

Struvite stones form in response to a urinary tract infection. These stones can grow quickly and become quite large, sometimes with few symptoms or little warning.

3. Uric acid stones:

Uric acid stones can form in people who lose too much fluid because of chronic diarrhea or malabsorption, those who eat a high-protein diet, and those with diabetes or metabolic syndrome. Certain genetic factors also may increase your risk of uric acid stones.

4. Cystine stones:

These stones form in people with a hereditary disorder called cystinuria that causes the kidneys to excrete too much of a specific amino acid ^[7].

Technique to detect kidney stone-

	Sensitivity(%)	Specificity(%)	advantages	limitation
	19	97	A.accessible	Poor visualization of ureteral stone
Plain radiography	45-59	71-77	Accessible	Stones in middle section of ureter, phleboliths, radiolucent calcification
Intravenous pyelography	64-87	92-94	A. Accessible B. Provide information on anatomy and of functioning both kidneys	A . Variable –quality imaging B .requires bowel preparation and use of contrast media
Noncontrast helical CT	95-100	94-96	A. Most sensitive and specific radiologic test B. Indirect signs of degree of obstruction C. Provides information on nongenitourinary conditions	A. less accessible and relatively expensive B. no direct measure of renal function

Table 2: technique to detect kidney stone

SYMPTOMS

- Severe [colicky](#) pain.
- Inability to urinate (when a stone blocks the urinary tract).
- Nausea/vomiting.
- Cloudy, foul-smelling urine, fever, chills or weakness which might be a sign of a serious infection. Blood in the urine ^[8].

RISK FACTOR-

- A family or personal history of kidney stone.
- Being aged 40 years or older, although they can sometimes affect children.
- Sex, as they are more common in males and females
- Pregnancy
- Diabetes
- Obesity
- Diet
- Recent surgery on the digestive system ^[9]

TREATMENT OF THE KIDNEY STONE-

Treatment for kidney stones varies, depending on the type of stone and the cause.

1. Small stones with minimal symptoms-

Most small kidney stones won't require invasive treatment. You may be able to pass a small stone by:

a) **Drinking water.**

Drinking as much as 2 to 3 quarts (1.8 to 3.6 liters) a day will keep your urine dilute and may prevent stones from forming. Unless your doctor tells you otherwise, drink enough fluid — ideally mostly water — to produce clear or nearly clear urine.

b) **Pain relieve :**

Passing small stone can cause some discomfort. To relieve mild pain, your doctor may recommend pain relievers such as ibuprofen (Advil, Motrin IB, others) or naproxen sodium (Aleve).

c) **Medical therapy.**

Your doctor may give you a medication to help pass your kidney stone. This type of medication, known as an alpha blocker, relaxes the muscles in your ureter, helping you pass the kidney stone more quickly and with less pain. Examples of alpha blockers include tamsulosin (Flomax) and the drug combination dutasteride and tamsulosin (Jalyn).

2. Large stones and those that cause symptoms-

a. **Parathyroid glands** Open pop-up dialog box-

Kidney stones that are too large to pass on their own or cause bleeding, kidney damage or ongoing urinary tract infections may require more-extensive treatment. Procedures may include:

Using sound waves to break up stones. For certain kidney stones — depending on size and location — your doctor may recommend a procedure called extracorporeal shock wave lithotripsy (ESWL).

ESWL uses sound waves to create strong vibrations (shock waves) that break the stones into tiny pieces that can be passed in your urine. The procedure lasts about 45 to 60 minutes and can cause moderate pain, so you may be under sedation or light anesthesia to make you comfortable.

ESWL can cause blood in the urine, bruising on the back or abdomen, bleeding around the kidney and other adjacent organs, and discomfort as the stone fragments pass through the urinary tract.

Surgery to remove very large stones in the kidney. A procedure called percutaneous nephrolithotomy (neph-row-lih-THOT-uh-me) involves surgically removing a kidney stone using small telescopes and instruments inserted through a small incision in your back.

You will receive general anesthesia during the surgery and be in the hospital for one to two days while you recover. Your doctor may recommend this surgery if ESWL is unsuccessful

b. Using a scope to remove stones.

To remove a smaller stone in your ureter or kidney, your doctor may pass a thin lighted tube (ureteroscope) equipped with a camera through your urethra and bladder to your ureter.

Once the stone is located, special tools can snare the stone or break it into pieces that will pass in your urine. Your doctor may then place a small tube (stent) in the ureter to relieve swelling and promote healing. You may need general or local anesthesia during this procedure.

c. Parathyroid gland surgery.

Some calcium phosphate stones are caused by overactive parathyroid glands, which are located on the four corners of your thyroid gland, just below your Adam's apple. When these glands produce too much parathyroid hormone (hyperparathyroidism), your calcium levels can become too high and kidney stones may form as a result. Hyperparathyroidism sometimes occurs when a small, benign tumor forms in one of your parathyroid glands or you develop another condition that leads these glands to produce more parathyroid hormone. Removing the growth from the gland stops the formation of kidney stones. Or your doctor may recommend treatment of the condition that's causing your part^[10]

HERBAL DRUGS FOR THE TREATMENT-

Sr.No	plants	family	uses
1.	Cynodon dactylon	gramineae	Astringent, diuretic, laxative and antidiabetic
2.	Abutilon indicum	malvaceae	Hypoglycemic, antibacterial, analgesic, anti-inflammatory, hepatoprotective and antioxidant
3.	Terminalia arjuna	comretaceae	Hyperlipidemia, cardiovascular disorder, hypocholesterolemic and cardioprotective
4.	Herniaria hirsuta	caryophyllaceae	Diuretic, lithotriptic
5	Aerva lanata	amaranthaceae	Hypoglycemic, diuretic, hepatoprotective and nephroprotective

Table:3 herbal drugs for the treatment

1. Cynodon dactylon (Gramineae).



Figure 4: Cynodon Dactylon ^[11]

The whole plant is used. Common name is Couch grass. Its chemical constituents are aromatic ingredient, arundoin, furfuryl alcohol, ionone, phytol, sitosterol, glucoside, stigmasterol acetate, phytone, xanthophylls, carotene, glycosides, saponins, tannins, flavonoids, carotenoids, chlorophyll, quercetin, kaempferol, lutein, myricetin, catechin, rutin, zeaxanthin and y violaxanthin. Its pharmacological activities are astringent, diuretic, laxative, and antidiabetic.^[12]

Chemical constituent-

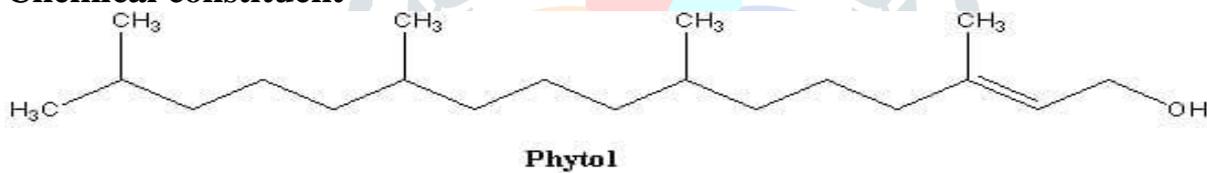


Figure 5: Phytol ^[13]

Marketed Formulation-



Figure 6: Arugampul Powder [14]

2 .Abutilon indicum (Malvaceae).



Figure:7 Abutilon indicum [15]

Parts used are leaves, root, flower, seed, and bark. Common name is Indian mallow. Its chemical constituents are cineole, geraniol, and tocopherol oil. It is used in diabetes mellitus, liver disorders, and degenerative diseases. Its pharmacological activities are hypoglycemic, antibacterial, analgesic, anti-inflammatory, hepatoprotective, and antioxidant. Prachi et al.^[16] reported the use of this plant in kidney stone

Chemical constituent

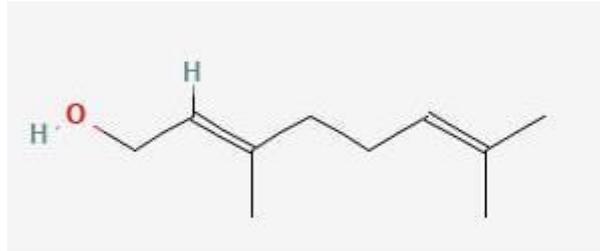


Figure:8 Geraniol [17]

Marketed Formulation



figure: 9 kanghi fresh leaves [18]

3 Terminalia arjuna (Combretaceae).



Figure:10 Terminalia arjuna

Parts used are leaves. Common name is Arjun. Its chemical constituents are arjunetin, friedelin, beta sitosterol, arjunic acid, and ellagic acid. It is used in hyperlipidemia and cardiovascular disorders. Its pharmacological activities are hypo-cholesterolemic and cardioprotective. Bark of Terminalia arjuna was investigated for its inhibitory effect on calcium oxalate and calcium phosphate crystal formation. Fraction of solvent and crude extract of this plant was used for inhibitory activity. This study was done in vitro. This study indicated that bark of Terminalia arjuna has potential to inhibit calcium oxalate and calcium phosphate crystal formation. Most effective fraction of Terminalia arjuna was butanol.^[19]

Chemical constituent

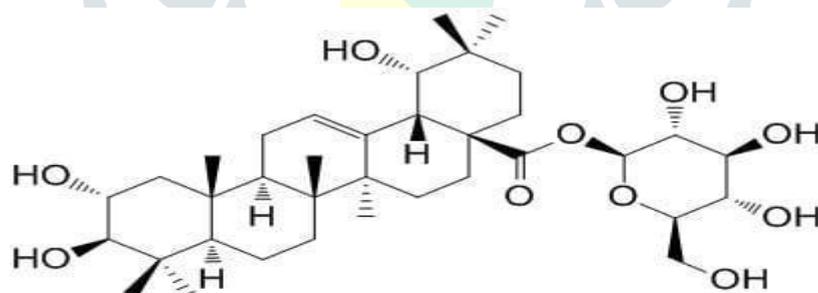


Figure:11 Arjunetin^[20]

Marketed Formulation



Figure:12 arjun ^[21]

5. *Herniaria hirsuta* (Caryophyllaceae).



Figure:13 *Herniaria hirsute* ^[22]

Parts used are aerial parts. Common name is Hairy Rupture Wort. Its chemical constituents are monodesmosidic saponins, tannins, herniarin, alkaloids, essential oil, coumarin, herniarin acid, quercetin, and rutin. It is used in kidney stones. It is antiurolithiatic. Its pharmacological activities are diuretic and lithotriptic. Atmani et al.^[23] reported the efficacy of this plant in kidney stone.

Chemical constituent

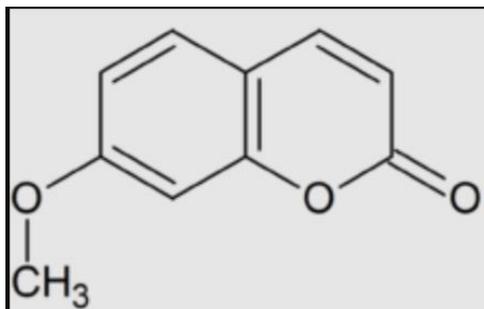


Figure:14 Herniarin ^[24]

5. *Aerva lanata* (Amaranthaceae).



Figure:15 *Aerva Lanata* ^[25]

The whole plant and leaves are used. Common name is Gorakha ganja. Its chemical constituents are tannic acid, benzoic acid, lapels, persinol, quercetin, ervoside and aervine. It is used in diabetes mellitus, urinary tract infections, kidney stones, and cancer. Its pharmacological activities are hypoglycemic, diuretic, hepatoprotective and nephroprotective. Soundararajan et al ^[26] reported the efficacy of this plant on calcium oxalate urolithiasis in rats

Chemical constituent

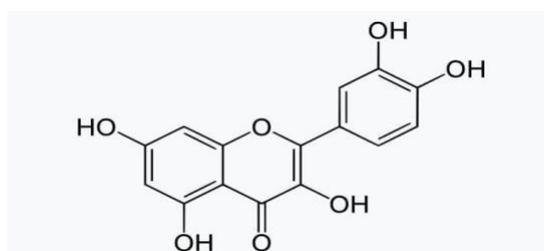


Figure:16 Quercetin ^[27]

Marketed Formulation

PMW

MOUNTAIN KNOT GRASS Powder

Cellular stones
Renal pelvic stones
Upper ureteral stones

Acts on Stones in Kidney

Arthritis

Helps in prevention of Arthritis

fssai
Lic No:10119006000214

Ingredients :
Mountain Knot Grass

Weight :
Mfg. Dt :
Exp. Dt :
M.R.P Rs. :
Best before 24 months from Mfg.

Marketed by :
PADMAVATHI DISTRIBUTORS
Gollapudi 521 225, Vijayawada (A.P)
Customer Care : +91 9966724364
www.pmwkart.com e-mail : tavva.jagadish@gmail.com

Figure :17 mountain knot grass powder ^[28]

REFERENCE-

1. Definition & Facts for Kidney Stones | NIDDK (nih.gov)
2. upto the system a) Atelign T , Petros B : kidney stone Disease : An Update on current Concepts [PMC free article] [PubMed] Altu Orol . 2018 2018 3068365 .
b) Lopez M. Hoppe B History epidemiobay & regimas diversities urolithiasis . Pediatr Nephrol 0010Ion ; 25 (1) : 49-59 come free article] [PubMed]
4. Sigurjonsdottir Vk , Runolfsdottir HL, Indridason OS . Palsson R. Edvardsson Vo , Impact of nephrolithiasis on kidney function . BMC Nephro.1 2015 . Aug 28 : 16 : 149
[PMC free article] [Pubmed] .
5. <https://protect-eu.mimecast.com/s/ZBIYCnO0oIpv9LDINW3T2?domain=caresathome.com>
6. <https://protect-eu.mimecast.com/s/PkvNCmymnCLzyYII0oAtm?domain=consultant360.com>
7. <https://www.mayoclinic.org/diseases-conditions> | kidney stones / symptoms - causes / syc -20355755
8. <https://my-clevelandclinic.org/health/diseases/15604-kidney-stones> .
9. <https://www.medicalnews-today.com/articles/154193>
10. <https://www.Clinical-advisor.com/home-features/a-comprehensive-look-at-kidney-stones> | 217
11. <https://protect-eu.mimecast.com/s/5oz2Coyo0CpE2GYI6TmXN?domain=inaturalist.org>

12. Jarald E, Joshi S and Jain D (2008) Antidiabetic activity of aqueous extract and non polysaccharide fraction of *Cynodon dactylon* Pers. Indian Journal of Experimental Biology 46(9): 660–667.
13. <https://protect-eu.mimecast.com/s/nUSMCwrzATZKIQxIR5VP3?domain=innovareacademics.in>
14. <https://protect-eu.mimecast.com/s/RFHyC17lmuqxRKEFGLjs1?domain=images.app.goo.gl>
15. <https://protect-eu.mimecast.com/s/bt6ACp2pqIEm4LoIJ7cvr?domain=greenmolbd.gov.bd>
16. Prachi Chauhan N, Kumar D, et al. (2009) Medicinal plants of Muzaffarnagar district used in treatment of Urinary tract and Kidney stones. Indian Journal of Traditional Knowledge 8(2): 191–195.
17. <https://protect-eu.mimecast.com/s/SiZ7Cx1ABSqkE0vF7ET1-?domain=pubchem.ncbi.nlm.nih.gov>
18. <https://protect-eu.mimecast.com/s/osDiCyXBDFmZOWoTn8tmr?domain=newmgnaturals.com/>
19. Chaudhary A, Singla S and Tandon C (2010) In vitro evaluation of *Terminalia arjuna* on calcium phosphate and calcium oxalate crystallization. Indian Journal of Pharmaceutical Sciences 72(3): 340.
20. <https://protect-eu.mimecast.com/s/ArgECzXDEFN6WBqt1Ww42?domain=chemfaces.com>
21. <https://protect-eu.mimecast.com/s/STp-CA1z2SJ4poOSk8C5M?domain=indiamart.com>
22. https://protect-eu.mimecast.com/s/fA3SCr9rvT3EQjZcGW_7F?domain=gobotany.nativeplanttrust.org/
23. Atmani F, Slimani Y, Mimouni M, et al. (2003) Prophylaxis of calcium oxalate stones by *Herniaria hirsuta* on experimentally induced nephrolithiasis in rats. BJU International 92(1): 137–140.
24. <https://protect-eu.mimecast.com/s/fDKNCB6A2sJjWmKSMOTwk?domain=en.wikipedia.org>
25. <https://protect-eu.mimecast.com/s/Zb5ZCvZyzc0xwg8i8JRXs?domain=commons.m.wikimedia.org>
26. Soundararajan P, Mahesh R, Ramesh T, et al. (2006) Effect of *Aerva lanata* on calcium oxalate urolithiasis in rats. Indian Journal of Experimental Biology 44(12): 981–986.
27. https://protect-eu.mimecast.com/s/_ksICD8D2srqYmAuxzY_r?domain=en.wikipedia.org
28. <https://protect-eu.mimecast.com/s/49KUCExE2coLAGxIDG7PU?domain=images.app.goo.gl>