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Zeera siyah (*Carum carvi* Linn.): A culinary spice and an important drug of unani medicine

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Abstract

Traditional medicine is the source of primary health care due to its cultural acceptability and better compatibility with the human body and lesser side effects. Zeera siyah (*Carum carvi*) a famous culinary spice is an important medicinal plant in the Unani system of medicine (USM) due to its multiple therapeutic properties. In USM, the pharmacological actions of Zeera siyah are *Hazim* (Digestive), *Muqawwi-e-Meda* (Stomachic), *Kasir-i-Riyah* (Carminative), *Qabiz* (Astringent), *Mukhrij-i-Didan-i-Shikam'* (Vermifuge), *Muqawwi-i-Jigar* (Hepatotonic) etc. *Carum carvi* is reported for its Diuretic Activity, Hepatoprotective Activity, Antioxidant Activity, Antihyperlipidemic Activity, Anticancer activity etc. This study explores the pharmacological, phytochemical and therapeutic properties of *Carum carvi* Lin. A number of pharmacological activities mentioned in Unani medicine are validated and many activities need further exploration owing to immense therapeutic scope in this drug.

Keywords: zeera siyah, *Carum carvi*, unani, medicine, phytochemical, pharmacological activity

1. Introduction

Zeera siyah (*Carum carvi*) is an important medicinal plant in the Unani System of Medicine (USM) due to its multiple therapeutic properties. *Zeera Siyah* comprises of dried ripe fruits of *Carum carvi* Linn. of Umbelliferae family. Drug yielding plant is a biennial herb, 30-90 cm high, cultivated as a cold season crop in plains of India and as summer crop in hilly areas of Kashmir, Kumaon, Garhwal and Chamba^[1]. Caraway (*Caraway* Fruit) consists of the dried, ripe fruits of *Carum carvi* (Umbelliferae), a biennial herb about 1 m high. It occurs both wild and cultivated in central and northern Europe (Netherlands, Denmark, Germany, Russia, Finland, Poland, Hungary and Britain) and in Egypt, Morocco, Australia and China^[2].

2. Methodology: The review has been compiled using references from major databases like classical text; indexed journals and authentic websites have been reviewed and analyzed.

3. Historical Background: A kind of caraway called Sushava and Krishna-jiraka or "black cumin" appears to have been known to the Hindus before the introduction into India of European caraway seeds. Royle is the first European writer to note *Zeera Siyah* as a kind of caraway imported from Kunawar, and he named them *Carum nigrum* because they are much darker than ordinary caraways. Stewart reduces Royle's *C. nigrum* to *C. carui* and in this view he appears to be supported by Mr. C. B. Clarke in the *Flora of British India*. The same variety of caraway is known in Persia as *Zereh-i-siyah*, and as it is principally cultivated in the neighborhood of *Kirman*, is also called *Zireh-i-Kirmani*. The European caraway is first mentioned by the Arabians under the name of *Carawiya*. Ibn Sina, Edrisi and Ibn Baitar all treat of it as distinct from cumin. A caraway bath is recommended for painful swellings of the womb, and a poultice for painful and protruding piles^[3].

4. Scientific / Taxonomical classification:^[4]

Kingdom:	Plantae
Subkingdom:	Tracheobionta
Superdivision:	Spermatophyta
Division:	Mangoliophyta
Class:	Magnoliopsida
Sub Class:	Rosidae
Order:	Apiales
Family:	Apiaceae/Umbelliferae
Genus:	<i>Carum</i> L
Species:	<i>Carum carvi</i> L

Botanical Name: *Carum carvi* L.^[5]
 Synonym: *Carum velenovskyi* R

5. Vernacular names

Arabic: Kamoon, Carawya, Karoya, ^[1, 6-9] Assamese: Krisnjeera, Kalajira, Kalira, ^[1] Ayurvedic: Krishna jiraka,^[10] Bengali: Shia jira, Kalajira, Jira, ^[1, 6, 9] Bombay: Vilayatizirah, Catalan: Cumi de prat, Cheban: Gunyun, Danish: Kornmen, Dutch: Karwij, ^[9] English: Caraway, Black carway, Common caraway, ^[1, 9-10] French: Anis des Vosges, Carobin, *Carvi*, Cumin armennien, Cumin de montagne, German: Feldkummel, Fischkummel, Gemeiner Kummel, Kaem, Kalm, Karbei, Kiem, Kim, Koehm, Koem, Makenn, Makinisch, Mattenkammi, Mattenkummel, Wegkummellich, Gujrati: Shahjirum, Shajiru, ^[9] Hindi Kali jira, *Zeera*, Shijajira, Zira, ^[1, 8-9] Italian: Caro, *Carvi*, Comino, Comino dei prati, ^[9] Kannada: Kari jeerige,^[11] Kashmiri: Gunyun, ^[1, 9] Ladak: Umbu, ^[9] Malayalam: Karinjeerakam,^[11] Marathi: Shahajire ^[1, 9] Oriya: Kalajira, Punjabi: Zira *siyah*,^[11] Morocco: Karuya, North Western Provinces: Zira, Norway: Karve, ^[1] Persian: Kumoon, Karoya, *Zeera*, Jirah rumi, ^[1, 8-9] Portugese: Alcaravia, Alcarovia, Alchirivia, Chirivia, Roumanian: Chimion de camp, Chimien, Secarica, ^[9] Russian: Timon, ^[9] Siddha/Tamil: Shimai-shembu,^[10] Sindhi: Jeru, ^[6] Spanish: Alcaravea, *Carvi*, Cominos de prado, Swedish: Kummin, ^[9] Sanskrit: Sushavi, Bahugandha, Bhedanika, Bhedini, Hridya, Jarana, Nila, Tamil: Karamjiragam, Shimayi-Shombu, Kekkuvirai, Telugu: Nalla jeerakarra, Shimaisapu, Urdu: Zira *Siyah*, Kala *Zeera*, Shahjira ^[1, 9].

6. Habit and Habitat: Drug is obtained from both wild and cultivated in Northern and Central European countries, mostly in Holland ^[11]. Caraway is found in Europe, Siberia, the Caucasus, the Near East, the Himalayas, Mongolia and Morocco. Found wild in North America after being introduced ^[12]. It is Native to Europe and West Asia ^[10]. It has also being used and cultivated in several regions from Northern Europe to the Mediterranean regions, Russia, Iran, Indonesia, North America, Siberia, Egypt, Australia, China and Turkey. It occurs in India to a limited extent in the temperate regions of the western Himalayas, Jammu and Kashmir and in Chakrata hills of Uttar Pradesh ^[13].

7. Botanical description

7.1 Flower and Fruit: The main trunk and the side branches each terminate in a compound flowering umbel of 8 to 16 umbel rays. The epicalyx and calyx are almost non-existent. The florets are white or reddish and very small. The fruit is a schizocarp that is oblong, glabrous and elliptoid. It consists of 2 mericarps that are 3 to 6 mm long, sickle-shaped, brownish with 5 lighter, angular main ribs (caraway seeds). (Figure 1)

7.2 Leaves, Stem and Root: *Carum carvi* are usually a biennial, 30 to 100 cm high plant with a fleshy, fusiform tap root. The stem is erect, angular, grooved, filled with latex, glabrous and branched from the ground up. The rosette leaves and the cauline leaves are glabrous and in part tri-pinnate. The lower pinna is typically crossed ^[12].

7.3 Microscopic: Transverse section of fruit show pericarp with outer epidermis of polygonal tabular cells with a thick outer wall and striated cuticle; trichomes, absent; vittae four dorsal, intercostal and two commissural extending the length of each mericarp, with and epithelium of brown cells and volatile oil in the cavity; mesocarp parenchymatous without

reticulate thickening; costae five in each mericarp with vascular strand consisting of an inner group of small vessels and fibres and arched, outer group of pitted sclerenchyma with a small group of phloem on each lateral surface; on the outer margin of each vascular strand a small schizogenous canal extending into both stylopod and pedicel; inner epidermis of thin-walled, subrectangular cells, elongated tangentially, each about 8-12 μ wide and 40-100 μ long, arranged parallel with one another; endosperm of thick-walled, cellulosic parenchyma, containing much fixed oil and numerous small aleurone grains up to 10 μ in diameter, each containing one or sometimes two micro-rosette crystals of calcium oxalate; carpophore, when present, passing at the apex to a raphe in rach mericarp, and with a small strand of sclerenchyma, the sclereids of which continue into the styleopod ^[1].



Fig 1: Zeera siyah (*Carum carvi*)

8. Description in Unani: *Zeera* is of four types *Farsi*, *Nabti*, *Kirman* and *Shami*. *Kirman* is black in colour and *Farsi* is in brown colour. All four types are cultivated and wild variety. *Zeera Farsi* is more powerful action than *Zeera Shami* ^[14]. Seeds of *Zeera siyah* are looking same as *Badiyan* seeds but the size is smaller than *Badiyan*. *Zeera siyah* is mentioned as better than *Zeera Safaid* in some action and it is used more ^[6]. *Zeera Siyah* is thin and pleasant odour. Fresh *Zeera Siyah* is mentioned better. *Zeera Siyah* of a city name *Paras* which is located in the border of *Kirman* is famous and all over the Iran is exported from there, that's why *Zeera Siyah* is famous as a *Zeera Kirmani*. In the *Ghiyas-ul-lugat* writer written that *Kirman* goat meat are delicious and this is due to may be the goats are grazing in the farm of *Zeera Siyah* ^[7].

8.1 Part used: Fruit ^[1] Seed ^[6, 8, 14]

8.2 Mizaj (Temperament): *Har* (Hot) ² *Yabis* (Dry) ³ ^[7, 8, 14]
Har (Hot) ³ *Yabis* (Dry) ³ ^[7] *Har* (Hot) *Yabis* (Dry) ^[15]

9. Pharmacological action (Afa'al) in Unani Medicine: *Hazim* (Digestive), ^[1] *Muqawwi-e-Meda* (Stomachic), ^[1, 14] *Kasir-i-Riyah* (Carminative), ^[14] *Qabiz* (Astringent), ^[6, 7, 8, 14] *Mukhrij-i-Didan-i-Shikam'* (Vermifuge), *Muqawwi-i-Jigar* (Hepatotonic), *Muharrrik* (Stimulant), *Mudirr-i-Hayd* (Emmenagogue), *Muharrrik* (Stimulant), *Du'f al-Basar* (Asthenopia), *Qatil-i-Didan-i-Am'a'* (Antihelminthic) ^[7] *Jali* (Detergent), *Mujaffif* (Desiccant), *Mudirr-i-Bawl* (Diuretic), *Fuwaq* (Hiccough), ^[6] *Taqti'*,

Taskhin (Calefaction), *Taltif* (Refining/Attenuation), *Mudirr-I-Bawl Wa Mudirr-I-Hayd* (Diuretic And Emmenagogue), *Muqawwi-i-A'da' Ra'isa* (Tonic for vital organs),⁸*Muwallid-i-Laban* (Galactopoietic)^[15]

10. Istemal (Uses in USM):*Zof-e-Meda* (Weakness of stomach), *Nafkh-e-Shikam*, *Su-e-Hazm* (Dyspepsia),^[1] *Sabal* (Vascular Keratitis / Pannus), *Waja' al-Asnan* (Odontalgia/Toothache), *Khafaqan* (Palpitation), *Ramad* (Conjunctivitis), *Muwallid-i-Mani* (Spermatogenic), *Taqtir al-Bawl* (Dribbling of urine), *Dard-e-Shikam* (Pain in abdomen), *Muwallid-i-Mani* (Spermatogenic),^[7] *Ikhraj-i-Balgham* (Expulsion of phlegm), *Nakhuna* (Pterygium), *Idrar-i-Bawl* (Diuresis), *Mushtahi* (Appetizer), *Ru'af* (Epistaxis), *Munaffith-i-Balgham* (Expectorant),^[6] *Bawasir* (Piles), *Zukam* (Coryza)^[15]

10.1 Miqdare Khuraq (Dose): 7 gm,^[7] 3 to 5 g,^[1,6] 3-4 gm^[8].

10.2 Muzir (Adverse effect): To Lungs, Overdose uses can cause weakness,^[6, 7, 8] *Muhazzil* (Drug which cause body slim)^[6].

10.3 Musleh (Corrective): *Kateera* (*Cochlospermum religiosum* (Linn.) alston.)^[6-8] *Sirka* (Vinegar)^[7, 8].

10.4 Badal (Substitute): *Tukhm-e-Gandana* (*Allium ascalonicum* Linn.)^[8] *Karoya*, *Zeera Safaid* (*Carum carvi*), *Kalonji* (*Nigella sativa* Linn)^[7].

11. Shelf life: 7 years^[7-8]

12. Murakkabat (Compound formulation): Jawarish Kamooni, Majoon-e-Kalkatanaj, Majoon-e-Jograj, Gugal, Habb-e-Pachlona, Habb-e-Jund, Sufoof-e-Muqliyasa, Sufoof-e-Habb-ur-Rumman, Sufoof-e-Moya^[1], Sufoof-e-Hazim, Jawarish Mastagi Murrakab, Sufoof-e-Muddire Haiz,^[6] Habb-e-Ashkhaar, Habb-e-Qatil-e-Deedan, Qurs-e-Sumaq Mushtahi, Majoon-e-Niqras, Majoon-e-Pethapak, Majoon-e-Yahya Bin Khalid, Jawarish-e-Kamooni Kabir,^[5] Qurs pudina, Jawarish Pudina Wilayti, Majun Jograj Gugal, Majun Muqawwi Meda, Arq *Zeera*, Iksier-ul-Atfal^[16].

13. Uses as per ethano-botanical and other Literature: Anemia, anorexia, cardiopathy, cholecystosis, cough, dermatosis, dysmenorrhea, dyspepsia, gastrosis, hemorrhoid, nausea, neurosis, scabies, stomatosis, bronchosis, cancer, candida, cardiopathy, cholecystosis, colic, cough, cramp, dyspepsia, enterosis, hepatosis, lumbago, myalgia, mycosis, nervousness, pharyngosis, pleurosis, rheumatism, scabies, stomachache, stomas, uterosis, worm, antiinflammatory, antibacterial, antihistaminic, antispasmodic, carminative, choleric, collyrium, digestive, diuretic, expectorant, fungicide, stimulant, vermifuge,^[17] Aromatic stimulant, Carminative, Flavouring agent, used as a spice^[11].

14. Chemical constituents: Fruit contains volatile oil flavonoids, polysaccharides, fixed oil; calcium oxalate etc^[10].

14.1 Essential oil / Volatile oil: Caraway Seeds / fruit contains 3-7% v/m of essential oil, consisting basically of d-carvone (50-65%), and (+)-limonene (up to 45%), with less than 1.5% of carveol and dihydrocarveol. It also contains 10-18% of fixed oil, of which the main components are

petroselinic (30-43%), linoleic (34-37%), oleic (15-25%) and palmitic (4-5%) acids^[18].

Chief phytochemicals of *C. carvi* essential oil were 37.98% (R)-carvone, 26.55% D-limonene, 5.21% [-pinene, 5.01% cis-carveol and 4.67% ^-myrcene. The essential oil of *C. carvi* was also characterized by high contents of oxygenated monoterpenes (62.1 7%), monoterpenes (36.08%) and sesquiterpenes (0.41%), saturated and unsaturated fatty acids, ketones, aldehydes and esters. ten new monoterpenoid triols, five new monoterpenoid glucosides and four identified monoterpenoids^[13]. α -pinene, camphene, β -pinene, myrcene, 3-carene, limonene, γ -terpinene, p-cymene, cadinene, myristicin, carveol acetate, 4-terpineol and perillyl alcohol^[19] p-Cymene and cuminaldehyde was identified;^[20] germacrene-D and β -elemene was a major constituents in seed oil of Israeli plant; oil content of seeds increased rapidly with maturity of plant^[21].

14.2 Lipids: lipids (10.5%) isolated from seeds contained hydrocarbons (0.2), triacylglycerols (66.0), waxes (0.1), free fatty acids (5.1), free alcohols (tr.), sterols (0.4) and chlorophyll (0.1%); petroselinic acid in both free and esterified forms also present in seeds.^[20] Roots contained glyceryl esters of saturated and unsaturated fatty acids, phytofluene, β -sitosterol, umbelliferone and scopoletin^[19].

14.3 Flavonoids: Fruit contains traces of flavonoids such as quercetin, kaempferol and their glycosides^[18]. Roots of *Carum carvi* have also been found to contain flavonoids quercetin-3-glucuronides, Iso-quercitrin, Quercetin 3-o-caffeylglucoside and kaempferol-3-glucoside^[22].

14.4 Vitamins: Total ascorbic acid 21.0 mg, thiamine 0.3606 mg, riboflavin 0.379 mg, niacin 3.606 mg, vitamin B6 0.360 mg, folate 10 μ g, vitamin A (RAE) 18 μ g, vitamin A (IU) 363IU, vitamin E 2.50 mg^[18].

15. Reported Pharmacological activity

15.1 Antidiabetic activity: Haidari F *et al* displayed the effect of oral administration of *Carum carvi* on weight, serum glucose, and lipid profile in streptozotocin-induced diabetic rats. Results showed that oral caraway administration caused a significant reduction in the blood glucose level of treated rats and a mitigation of their loss of body weight. Caraway has both antihyperglycemic and hypolipidemic activity in diabetic rats^[23].

15.2 Antiulcerogenic Activity: Alhaider AA *et al* studied effect of *Carum carvi* on experimentally induced gastric mucosal damage in wistar albino rats. Result indicates ant gastric ulcer and antisecretory activity of *Carum carvi* and confirms its traditional use against gastric disorders. Report suggests a strong correlation of flavonoids and terpenes in the ant gastric ulcer activity of *Carum carvi*. Exact mechanism of action of the gastroprotective activity of *Carum carvi* is not known. However it might be due to flavonoid related suppression of cytochrome P450 1A1 (CYP1A1)^[24].

15.3 Antimicrobial activity: Begum J *et al* studied antimicrobial activity of essential oil from seeds and its composition against ten pathogenic bacteria and six phytopathogenic fungi. The essential oil, at 2 μ l/disk, demonstrated promising inhibitory activity against all test bacteria. The minimum inhibitory concentration (MIC, 100-300 ppm) and minimum bactericidal concentration (MBC,

200-400 ppm) values of essential oil were determined [25].

15.4 Antibacterial activity: Iacobellis NS *et al* showed antibacterial activity of *Cuminum cyminum* L. and *Carum carvi* L. essential oils. Result indicate that activity was primarily high against the genera *Clavibacter*, *Ralstonia*, *Rhodococcus*, *Erwinia*, *Curtobacterium*, and *Agrobacterium* which are responsible for universal plant or cultivated mushroom disease. In general, bacteria belonging to the genus *Pseudomonas* were found with lower activity. Findings suggest the possible use of the essential oils for bacterial disease control [26].

15.5 Analgesic Activity: Swathi V *et al* done in-vivo Screening of Analgesic and Antiulcer Activity on Seeds. Analgesic activity was evaluated in rat's models by proper guidelines of CPCSEA. Antiulcer activity was evaluated by aspirin induced ulcer models. Effect of concurrent administration of ethanolic and aqueous extracts of seeds extract *Carum carvi* at a dose of 100 and 200 mg/kg b.w. respectively was given by oral route. Results of the hydro-alcoholic extract at a dose of 100 mg showed analgesic activity and antiulcer activity at a dose of 200 mg compared to a standard drug [27].

15.6 Diuretic Activity: Lahlou S *et al* studied diuretic activity of the aqueous extracts of *Carum carvi* and *Tanacetum vulgare* in normal rats. Result indicates that both drug water extracts have good diuretic action supporting their ethno-pharmacological application. From the pattern of excretion of sodium, water and potassium, it can be deduced that these extracts contain at least two forms of active principals, one having a furosemide-like activity and the other having a thiazide-like activity.

15.7 Hepatoprotective Activity: The in vitro antioxidant activity was evaluated as a free radical scavenging capacity (RSC), measured as scavenging activity of the essential oils on 2,2-diphenyl-1-picrylhydrazyl (DPPH) and OH radicals and effects on lipid peroxidation (LP) in two systems of induction. Some liver biochemical parameters were determined in animals pre-treated with essential oils and later intoxicated with CCl₄ to assess *in vivo* hepatoprotective effect. Tested essential oils were able to reduce the stable DPPH in a dose-dependent manner and to neutralize H₂O₂, reaching 50% neutralization with IC₅₀ values of <2.5 µL/mL for Carvi aetheroleum and 4.05 µL/mL for Coriandri aetheroleum. Caraway essential oil strongly inhibited LP in both systems of induction, whereas coriander essential oil exhibited prooxidant activity [29].

15.8 Antioxidant Activity: Antioxidant activity of essential oil from *Carum Carvi* L was evaluated by three different in vitro antioxidant assays (DPPH· and ABTS+ scavenging and reducing power assays). Butylhydroxyanisole was used as reference standard, evaluation revealed significant effects, with IC₅₀ values of 46.51 ± 1.61 µg/mL, 5.34 ± 0.07 µg/mL and 7.64 ± 0.22 µg/mL, respectively, as compared to those of the reference standard, butylhydroxyanisole i.e. 6.09 ± 0.27 µg/mL, 1.49 ± 0.00 µg/mL and 3.39 ± 0.07 µg/mL, respectively [30].

15.9 Antihyperlipidemic Activity: Study was to assess the effect of aqueous extract of *Carum carvi* seeds in diet induced hyperlipidemia in rats. 2% cholesterol diet were given to rats

for six weeks and rats showed high lipid levels were included in the study. Then all rats were divided into, normal control group (A), hyperlipidemia positive control group (B), and the remaining two groups (C and D) served as experimental groups. Group C hyperlipidemic experimental rats received aqueous dried extract of *Carum carvi* seeds at 60 mg/kg of body weight for eight weeks on daily basis. On the other hand group D rats received simvastatin at 1.0 mg/kg body weight for eight weeks. Blood samples were collected after eight weeks. The hyperlipidemic positive control group rats showed variable increase in serum triglycerides, LDL and total cholesterol levels. Serum HDL levels decreased in hyperlipidemic positive control groups. *Carum carvi* and simvastatin significantly decreased the levels of these parameters in rats. On comparison *Carum carvi* reduced lipid levels more, effectively than the simvastatin. *Carum carvi* constituents, especially flavonoids and carvone have strong anti-oxidant activity which might be involved in hypolipidemia [31].

15.10 Anticancer activity: Study exploring the potential anticancer activity of CVN (Carvone), if any, in cultured primary rat neuron and N2a NB cells. Results indicated that CVN (only at 25 mg/L) treatment led to an increase in the total antioxidant capacity levels in cultured primary rat neuron cells compared with control cells. Also, CVN (at concentrations higher than 100 mg/L) treatment led to an increase in the total oxidative stress levels in both cell types. The mean values of the total scores of cells showing DNA damage (for comet assay) were not found to be significantly different from the control values in both cells ($p > 0.05$). On the other hand, after 24 h treatment with CVN, 3-(4,5-dimethylthiazol-2-yl)-2,5 diphenyltetrazolium bromide assay showed that CVN application significantly reduced the cell viability rates in both cell types at concentrations higher than 100 mg/L. Summarizing, our data suggest that CVN represents little potential for promising anticancer agent to improve brain tumors therapy [32].

16. Results and Discussions

Carum carvi is uses as Digestive, Stomachic, Carminative, Astringent, Vermifuge, Hepatonic, Stimulant etc. This drug has better acceptability and compatibility with the physical body and also has lesser adverse effects. Detailed review suggests that, based upon the capable pharmacological activity of the drug its indication has been detailed in the classical texts of USM. Reported Pharmacological activity on *Zeera siyah* are Antidiabetic activity, Antiulcerogenic Activity, Antimicrobial activity, Analgesic Activity, Diuretic Activity, Hepatoprotective Activity, Antioxidant Activity, Antihyperlipidemic Activity, Anticancer activity. Findings also suggest several new pharmacological activities. These validations of classical claim and reported pharmacological activity suggest that *Zeera siyahis* a very potent pharmacologically active herb and future research work should be directed in analysing these properties clinically in a structured scientific method.

17. Conclusion

In the present review we can concluded that the large number of peoples are suffering from several chronic diseases, due to significant variation in the climate and environment. The multidimensional approach of herbs can help in treating various chronic diseases and they can also be used as adjuvant therapy. These drugs have better acceptability, compatibility

with the physical body and lesser adverse effects. Based on these facts, this review can highlights the role of *Zeera Siyah* (*Carum carvi* Linn) in various treatments of various ailments and recommend that further phytochemical and clinical research should be done on this very potential traditional Unani Medicine for the discovery of safer drugs.

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