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Research Article

Comparative In Vitro Assessment of The Anti-Urolithiatic Potential of Portulaca Oleracea and Clitoria Ternatea

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ABSTRACT

Despite advances in modern medicine, the urolithiasis continues to be a source of concern for mankind, as there is no effective treatment for kidney stones. In the present study we investigated antiurolithiatic activity of Portulaca oleracea and Clitoria ternatea against calcium oxalate precipitation. Both the extracts are dissolved in water and the concentration of 300, 500, 700 and 900 µg/ml are obtained. A mixture of 1 ml of artificial urine and 0.5 ml of extract solution is taken in the cell. A blank reading is taken and then 0.5 ml of 0.01 M sodium oxalate solution is added and immediately absorbance is measured for a period of the 10 minutes with 2 minutes interval at 620 nm. The results of ethanolic plant extracts of Portulaca oleracea exhibits dose and time-dependent % inhibition. The inhibition started by 300 µg/ml with 15.77% and maximum inhibition 900 µg/ml was observed at 37.2%. The results of ethanolic plant extracts of Clitoria ternatea exhibits dose and time-dependent % inhibition. The inhibition started by 300 µg/ml with 22.14% and maximum inhibition 900 µg/ml was observed at 64.22% respectively. Both the extract shows significant dose and time-dependent % inhibition. This study emphasized the need to carry out in-depth pharmacological evaluations of this property in other dissimilar models and further isolation of chemical constituents responsible for anti urolithiatic activity.

INTRODUCTION

Anti-Urolithiatic Activity:

Urolithiasis, originating from the Greek words “ouron” (urine), “oros” (flow), and “lithos”

(stone), is a complex urinary disorder marked by the formation of calculi within the kidneys, bladder, or urethra. Although it has affected humans for centuries, urolithiasis continues to present major medical and public health concerns. The most prevalent type of stones are calcium

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oxalate (CaOx) calculi, which develop when calcium binds with oxalate in the urine to form crystalline deposits. Other types of stones include uric acid, cystine, struvite, xanthine, ammonium acid urate, drug-induced, and dihydroxyadenine calculi¹. Urinary stone formation is a common condition with a rising global incidence and prevalence, particularly in industrialized nations [2,4–10]. This trend highlights the influence of lifestyle, dietary habits, and improved access to medical diagnostics and care. The development and chemical composition of renal stones are influenced by both age and gender, with most cases occurring in older individuals. Recent clinical studies have revealed not only changes in the frequency and composition of urinary calculi but also shifts in age- and gender-related distribution. Although urinary stone disease is relatively uncommon in children and its overall incidence remains stable, factors associated with metabolic syndrome—such as obesity—have been identified as potential risk factors for stone formation even in pediatric populations². Kidney stones represent one of the most painful and prevalent urological disorders, affecting approximately 5–15% of adults. Research shows that nephrolithiasis occurs more frequently in men (about 12%) than in women (around 6%), with the highest incidence reported between 20 and 40 years of age in both sexes. In developed nations, urinary stone disease affects nearly 10–12% of the population. Recent years have witnessed a noticeable increase in both the frequency of cases and the occurrence among younger individuals. With a prevalence exceeding 10% a recurrence rate approaching 50%, kidney stones constitute a major public health concern and impose a substantial burden on healthcare systems³. Urolithiasis refers to the formation of kidney stones resulting from the accumulation of excess mineral deposits within the urinary tract. The condition is characterized by the crystallization of

minerals in the kidneys, ureters, or bladder. It develops when the balance between stone-inhibiting substances (such as magnesium) and stone-promoting factors (like uric acid) becomes disrupted in the kidneys⁴.

Portulaca Oleracea:

Portulaca oleracea, is a highly variable, weedy plant in the purslane family (Portulacaceae) with a wide distribution. Purslane (*Portulaca oleracea* L.) is valued by both agriculturalists and nutritionists for its nutritional and medicinal importance. Commonly found as a weed in turfgrass and crop fields, it thrives in diverse climates worldwide. Widely consumed as a potherb in Central Europe, Asia, and the Mediterranean, purslane is eaten raw in salads, cooked, or pickled. Medicinally, it has been used to treat burns, headaches, and disorders of the intestine, liver, and stomach, as well as cough, arthritis, and shortness of breath. It also functions as a purgative, cardiac tonic, emollient, muscle relaxant, anti-inflammatory, and diuretic, and has applications in managing osteoporosis and psoriasis⁵. Numerous bioactive constituents have been isolated from *Portulaca oleracea*, including flavonoids, alkaloids, fatty acids, terpenoids, polysaccharides, vitamins, sterols, proteins, and minerals⁶. Purslane exhibits remarkable antioxidant potential, primarily due to its high levels of vitamin A, ascorbic acid, flavonoids, and polyphenolic compounds. These constituents not only act as direct free radical scavengers but also enhance the activity of key antioxidant enzymes, including glutathione reductase, glutathione peroxidase, superoxide dismutase, and catalase⁷. The leaves are infused in linseed oil to prepare a liniment used for relieving neck stiffness. In traditional Indian medicine, the plant is employed to treat excessive menstrual bleeding, stomachache, hemoptysis, and gastric inflammation. A mixture of its juice with honey is



used to alleviate cough. Additionally, the herb is prescribed for managing cardiovascular disorders, dysuria, hematuria, gonorrhea, dysentery, sore nipples, and oral ulcers⁸.

Clitoria Ternatea

Clitoria ternatea, commonly known as butterfly pea, is a perennial twining herb belonging to the family Leguminosae (formerly Papilionaceae). The plant has terete, slightly pubescent stems and imparipinnate leaves with petioles measuring 2–2.5 cm in length and stipules about 4 mm long, linear, and acute. The leaflets, typically 5–7 in number, are subcoriaceous, elliptic-oblong in shape, measuring 2.5–5 × 2–3.2 cm, and are obtuse or acute at the apex. The flowers are axillary and solitary, usually bright blue or occasionally white with an orange center. The pods contain 6–10 smooth, golden-brown seeds. Two common varieties—one bearing white flowers and the other blue—are widely cultivated as ornamental plants in Bangladesh. The butterfly pea, also known as blue pea (*Clitoria ternatea*), is a popular garden plant noted for its striking 1-2-inch long blue flowers with wavy margins and a white center¹¹.

In traditional Ayurvedic medicine, *Clitoria ternatea* has been used for centuries as a memory enhancer and as a remedy for stress, anxiety, depression, convulsions, and insomnia. The tribal communities of Tripura use its leaves and roots to treat urinary tract infections, burning sensations during urination, and frequent urination (Hossan et al., 2010). In traditional Chinese medicine, it has been used to manage sexual disorders such as infertility and gonorrhea, to control menstrual flow, and as an aphrodisiac. Experimental studies have shown that the methanolic root extract of *Clitoria ternatea* possesses nootropic, anxiolytic, antidepressant, anticonvulsant, and antistress properties. The plant contains several active compounds, including tannins, resins, starch,

taraxerol, and taraxerone. Recently, biologically active peptides known as cliotides have been isolated from the heat-stable fraction of *Clitoria ternatea* extract. These peptides, which belong to the cyclotide family, show strong antimicrobial activity against *E. coli*, *K. pneumoniae*, and *P. aeruginosa*, and hold potential for development as novel antimicrobial and anticancer agents¹².

Anti urolithiatic activity:

Experimental Design:

The effect of the extract on calcium oxalate crystallization was evaluated by monitoring turbidity changes during crystal formation in artificial urine following the addition of 0.01 M sodium oxalate solution. The precipitation of calcium oxalate at 37 °C and pH 6.8 was assessed by measuring turbidity at 620 nm using a UV–Visible spectrophotometer⁹.

Preparation of Synthetic Urine:

Synthetic urine was prepared by dissolving specific quantities of various constituents in deionized water to simulate the chemical composition of human urine. The formulation included, by dissolving 3.8 g of potassium chloride, 8.5 g of sodium chloride, 24.5 g of urea, 1.03 g of citric acid, 0.34 g of ascorbic acid, 1.18 g of potassium phosphate, 1.4 g of creatinine, 0.64 g of sodium hydroxide, 0.5 g of calcium chloride, 0.47 g of sodium bicarbonate, and 0.28 mL of sulfuric acid in 500 mL of deionized water. The solution was continuously stirred for one hour to ensure complete dissolution of all components. The prepared synthetic urine was then stored under appropriate conditions until further use¹⁰.

Study Without Inhibitor:

A volume of 1.0 mL of artificial urine was transferred into a cuvette, followed by the addition



of 0.5 mL of distilled water, and the blank absorbance reading was recorded. Subsequently, 0.5 mL of 0.01 M sodium oxalate solution was added, and the change in turbidity was measured immediately. Absorbance readings were recorded at regular intervals over a period of 10 minutes.

Study With Inhibitor:

The plant extract was dissolved in distilled water to obtain concentrations of 100, 300, and 500 µg/ml. A mixture containing 1.0 mL of artificial urine and 0.5 mL of the extract solution was placed in the cuvette, and the blank reading was recorded. Then, 0.5 mL of 0.01 M sodium oxalate solution was added, and absorbance was measured immediately at 620 nm for a duration of 10 minutes, with readings taken every 2 minutes.

The percentage inhibition of calcium oxalate crystallization was calculated using the formula:

$$\% \text{ Inhibition} = \frac{(\text{Absorbance of Control} - \text{Absorbance of Test})}{\text{Absorbance of Control}} \times 100$$

RESULTS

Portulaca oleracea

Calcium oxalate crystallization inhibition by plant extract of *Portulaca oleracea*. The weight of *Portulaca oleracea* plant powder = 62gm

Weight of the extract obtained = 4.7gm

% yield = Weight of the extract ÷ Weight of powder × 100

$$= 4.7 \div 62 \times 100$$

$$= 7.58\% \text{ w/w}$$

% inhibition = 30.64%

Absorbance value of *Potulaca oleracea*

Determination of plant extract

Sl. No	% Inhibition at time in mins	Without inhibition	With inhibition	% Inhibition	With inhibition	% Inhibition	With inhibition	% Inhibition	With inhibition	% Inhibition
			300	300%	500	500%	700	700%	900	900%
1	0	0.945	0.797	15.66%	0.705	25.39%	0.628	33.54%	0.516	45.39%
2	2	1.052	0.782	25.85%	0.687	34.69%	0.608	42.20%	0.504	52.09%
3	4	1.053	0.759	27.92%	0.666	36.75%	0.589	44.06%	0.482	54.22%
4	6	1.056	0.726	31.25%	0.641	39.29%	0.568	46.21%	0.456	56.81%
5	8	1.057	0.681	35.57%	0.615	41.81%	0.552	47.77%	0.448	57.61%
6	10	1.056	0.643	39.10%	0.593	43.84%	0.532	49.62%	0.413	60.89%

Influence of extract of *Portulaca oleracea* on Calcium oxalate precipitation

Concentration of extract (µg/ml)	% Inhibition
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300	29.22%
500	36.96%
700	43.90%
900	54.50%



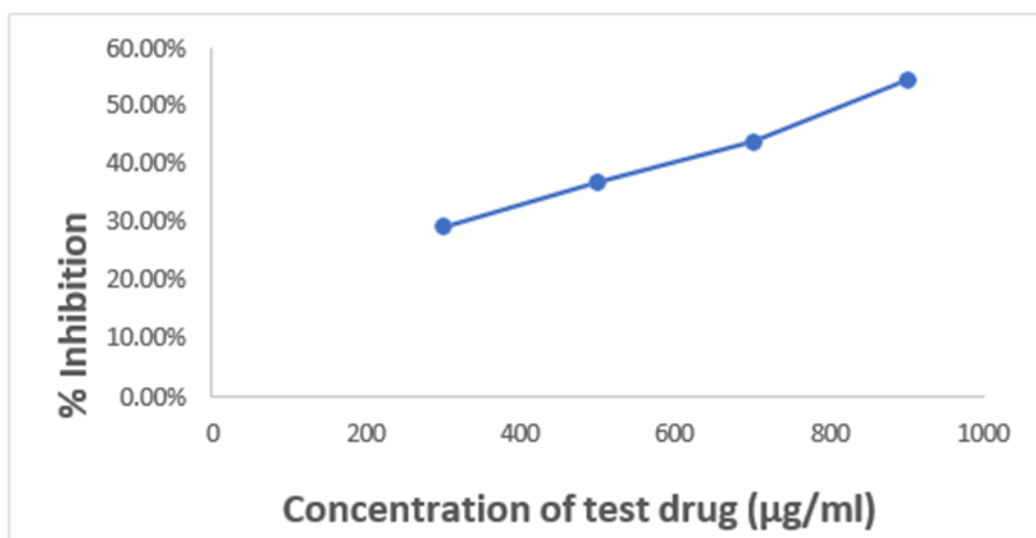


Figure: Effect of extract on calcium oxalate precipitation

Clitorea ternatea:

Calcium oxalate crystallization inhibition by seed extract of *Clitorea ternatea*. The weight of *Clitorea ternatea* seed powder = 246.42gm

Weight of the extract obtained = 23.92gm

% Yield = Weight of the extract ÷ Weight of powder × 100 = 23.92 / 246.42 × 100 = 9.7%

Absorbance value of *Clitorea ternatea*.

Determination of plant extract

SL NO	% Inhibition at time in mins	Without inhibition	With inhibition	% Inhibition	With inhibition	% Inhibition	With inhibition	% Inhibition	With inhibition	% Inhibition
			300	300%	500	500%	700	700%	900	900%
1	0	1.076	0.910	15.97%	0.848	21.69%	0.737	32.22%	0.614	40.07%
2	2	1.079	0.900	16.89%	0.825	23.82%	0.723	33.25%	0.610	43.68%
3	4	1.083	0.889	17.91%	0.789	27.14%	0.714	34.08%	0.607	43.94%
4	6	1.085	0.877	19.02%	0.786	27.42%	0.700	35.37%	0.603	44.33%
5	8	1.087	0.865	20.12%	0.780	27.97%	0.697	35.65%	0.595	44.96%
6	10	1.089	0.850	21.51%	0.774	28.53%	0.690	36.28%	0.589	45.61%

Influence of extract of *Clitorea ternatea* on Calcium oxalate precipitation

Concentration of extract (µg/ml)	% Inhibition
300	18.57%

500	26.09%
700	34.47%
900	43.43%

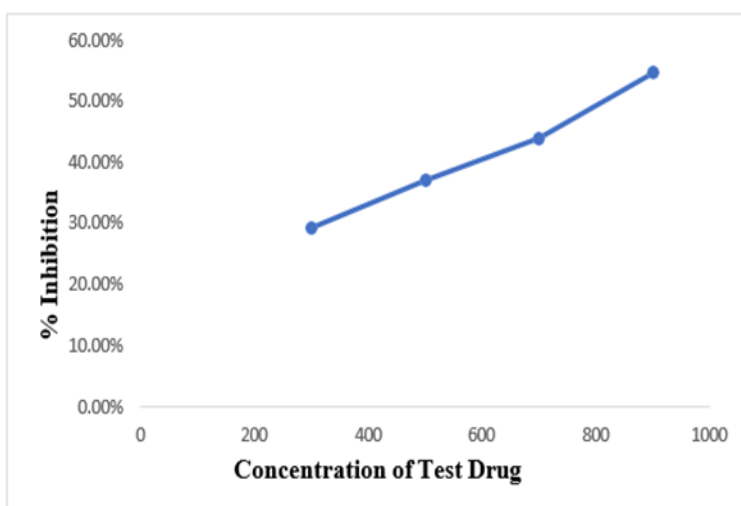


Figure: Effect of extract on calcium oxalate precipitation

Determination of standard drug

Sl.No	% Inhibition at time in mins	Without inhibition	With inhibition	% Inhibition	With inhibition	% Inhibition	With inhibition	% Inhibition	With inhibition	% Inhibition
			100	100%	300	300%	500	500%	700	700%
1	0	0.295	0.173	41.35%	0.130	55.93%	0.101	65.76%	0.052	82.37%
2	2	0.299	0.189	36.78%	0.146	51.17%	0.09	69.89%	0.065	78.26%
3	4	0.305	0.218	28.52%	0.163	46.55%	0.112	63.27%	0.071	76.72%
4	6	0.342	0.256	25.14%	0.171	43.93%	0.14	59.06%	0.089	73.97%
5	8	0.380	0.287	24.47%	0.227	40.26%	0.167	56.05%	0.11	71.05%
6	10	0.397	0.307	22.67%	0.252	36.52%	0.20	49.62%	0.124	68.76%

Influence of Standard drug on Calcium oxalate precipitation

300	45.72%
500	60.60%
700	75.18%

Concentration of extract (µg/ml)	% Inhibition
100	29.82%

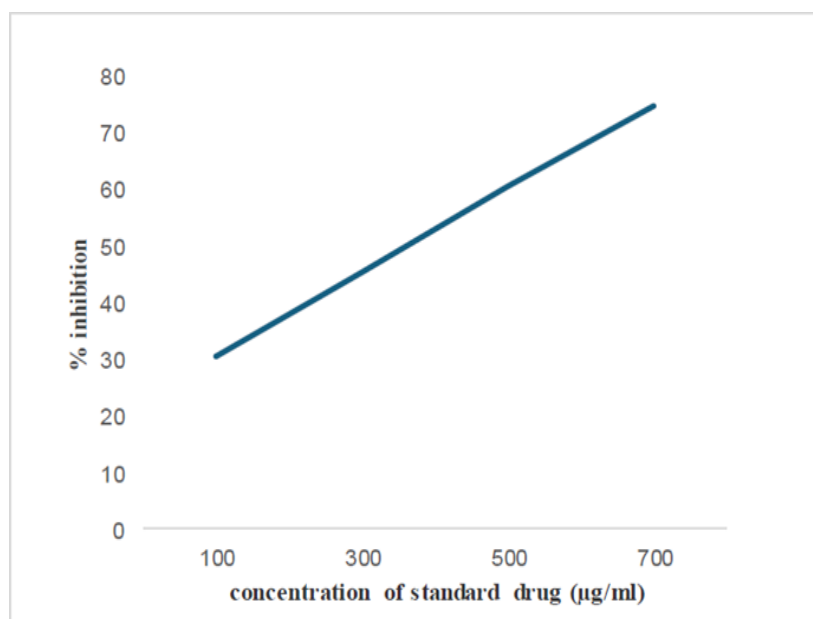


Figure: Effect standard drug on calcium oxalate precipitation

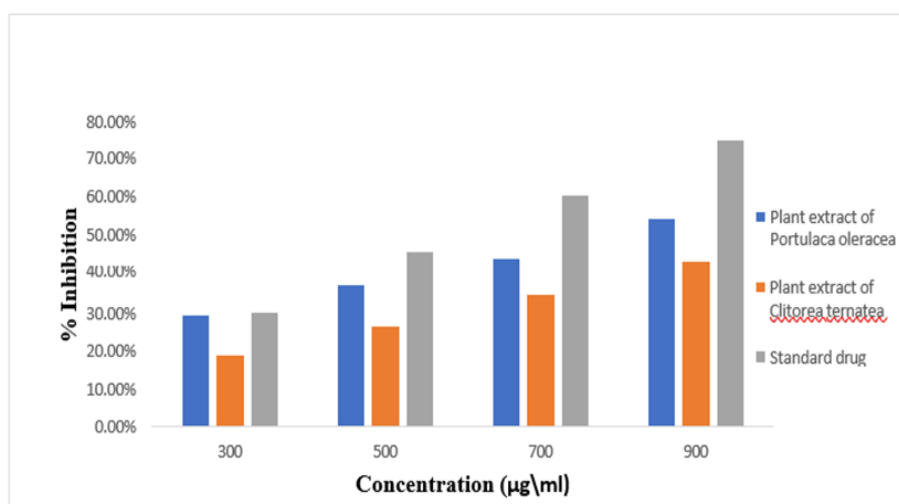


Figure: Comparison of standard drug and plant extract

DISCUSSION:

The results of *In-vitro* Anti-Urolithiasis activity of ethanolic plant extracts of *Portulaca oleracea* exhibits dose and time-dependent % inhibition. The inhibition started by 300 µg/ml with 29.22% and maximum inhibition 900 µg/ml was observed at 54.50%. The results of *In-vitro* Anti-Urolithiasis activity of ethanolic plant extracts of *Clitorea ternatea* exhibits dose and time-dependent % inhibition. The inhibition started by 300 µg/ml with 18.57% and maximum inhibition 900 µg/ml was

observed at 43.43%. The results of *In-vitro* Anti-Urolithiasis activity of standard drug (Cystone) exhibits dose and time- dependent % inhibition. The inhibition started by 100 µg/ml with 29.82 % and maximum inhibition 700 µg/ml was observed at 75.18%. Both the extract shows significant dose and time- dependent % inhibition. when extracts compared with standard drug, the ethanolic extract of *Portulaca oleracea* exhibits maximum % of inhibition and significantly reduces the calcium oxalate precipitation. both the drugs reduce precipitation and shows the anti- urolithiatic

property. Further studies on isolation and screening of these drugs are required. *Portulaca oleracea* is selected for antiurolithiatic study due to its traditional use in urinary ailments, diuretic and antioxidant properties, nephroprotective effects, and promising phytochemical profile that can prevent or dissolve urinary stones.

CONCLUSION:

Based on results, it has concluded that the ethanolic extract of *Portulaca oleracea* and *Clitorea ternatea* of doses 300, 500, 700 and 900µg/ml has possessed Antiurolithiatic property. The ethanolic extract of *Portulaca oleracea* with same dose shown significant percentage of inhibition than the ethanolic extract of *Clitorea ternatea*. *Portulaca oleracea* is selected for antiurolithiatic study due to its traditional use in urinary ailments, diuretic and antioxidant properties, nephroprotective effects, and promising phytochemical profile that can prevent or dissolve urinary stones. This study emphasized the need to carry out in-depth pharmacological evaluations of this property in other dissimilar models and further isolation of chemical constituents responsible for antiurolithiatic activity.

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REFERENCES

1. Allam EA. Urolithiasis unveiled: pathophysiology, stone dynamics, types, and inhibitory mechanisms: a review. African Journal of Urology. 2024 Jul 23;30(1):34.
2. Knoll T. Epidemiology, pathogenesis, and pathophysiology of urolithiasis. European urology supplements. 2010 Dec 1;9(12):802-6.
3. Padmavathi P, Rao MP. Nutritive value of *Sauropus androgynus* leaves. Plant Foods for Human Nutrition, 1990; 40: 107-13.
4. Singh S, Singh DR, Salim KM, Srivastava A, Singh LB, Srivastava RC. Estimation of proximate composition, micronutrients and phytochemical compounds in traditional vegetables from Andaman and Nicobar Islands. International Journal of Food Sciences and Nutrition, 2011; 1, 62(7): 765-73.
5. Uddin, Md Kamal, et al. "Purslane weed (*Portulaca oleracea*): A prospective plant source
6. of nutrition, omega - 3 fatty acid, and antioxidant attributes." The Scientific World Journal 2014.1 (2014): 951019.
7. Zhou, Yan-Xi, et al. "Portulaca oleracea L.: a review of phytochemistry and pharmacological effects." BioMed research international 2015.1 (2015): 925631.
8. Chetehouna S, Atoussi O, Derouiche S. An overview of *Portulaca oleracea*: Phytochemistry and pharmacological activities. International Journal of Pharmacognosy and Clinical Research. 2021;3(1):15-8.
9. Chugh, Vishal, et al. "Purslane (*Portulaca oleracea* L.): An underutilized wonder plant with potential pharmacological value." The pharma innovation journal 8.6 (2019): 236-246.
10. Kumar S. In-vitro Antiurolithiatic potential of leaves of *Anneslea fragrans* wall. against Calcium oxalate kidney stones and its FT-IR analysis. Research Journal of Pharmacy and Technology, 2022; 15(4): 1671
11. . Begum V.H., Ismail T.S., Gopalakrishnan S and Elango V. Anti-inflammatory activity of



Salacia oblonga Wall., and Azima tetracantha Lam., *J. Ethnopharmacol.* 56(2), 145- 152.

12. Sarma, D. Sai Koteswar, et al. "Review on Clitoria Ternata." *International Journal of Pharmaceutical Sciences and Medicine* 8.9 (2023): 43-58.
13. Debnath, Mr Abhijit. Phytochemical analysis and antimicrobial activity of Aparajita (Clitoria ternatea Linn.) against rice pathogens. Diss. Assam Agricultural University Jorhat, 2018.

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