Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 12s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Evaluation of Antioxidant and Antimicrobial Properties of Lemon and Pomegranate

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Cite this paper as: Md. Rageeb Md. Usman, Mansi Prasad Upasani, Mohammed Zuber Shaikh, (2025) Evaluation of Antioxidant and Antimicrobial Properties of Lemon and Pomegranate. *Journal of Neonatal Surgery*, 14 (12s), 219-224.

ABSTRACT

Antioxidant is defined as any substance that prevents oxidation of the substrate. This study was aimed at assessing the effect of Pomegranate and lemon antioxidant and antimicrobial properties. various components present in lemon and pomegranate shows antioxidant and antimicrobial properties determine according to various study's. Citrus fruit is a rich source of bioactive chemicals, little is known about the possible health benefits of the seeds. This study investigates the antioxidant and antibacterial parcels of Citrus Ten. & Pasq. (Family Rutaceae) seeds excerpts as well as their ingredients, to identify implicit operations for this underutilized resource (phytochemical study of bomb seed). Skin conditions similar as dermatitis, prurigo, and scabies present a major health concern in the Eastern Cape, South Africa, where there's a failure of dermatologists, compounded by the fact that utmost dermatologists are centered near civic areas and are not accessible to 70 of the pastoral population. The loftiest antibacterial exertion was attained with the acetone excerpt of C. limon against Enterococcus faecalis and Bacillus subtilis, and the most susceptible bacteria grounded on the overall mean inhibition compasses were the gram-negative Salmonella typhimurium, Shigella sonnei and the gram-positive E. faecalis and B. subtilis. Pomegranate is an important source of bioactive composites and has been used for folk drug for numerous centuries. Pomegranate juice has been demonstrated to be high in antioxidant exertion and is effective in the forestallment of atherosclerosis. In a study it's set up that pomegranate peel had the loftiest antioxidant exertion among the peel, pulp and seed fragments. The peels uprooted from colorful citrus species are a major source of phenols, flavonoids and anti-microbial agents

Keywords: *Antimicrobial, Antioxidant, efficacity, Citrus limon, Skin conditions, Pomegranate.*

1. INTRODUCTION

Antioxidant is defined as any substance that, when present at low attention compared with those of an oxidizable substrate, significantly detainments or prevents oxidation of that substrate. Botanical Name The bomb (Citrus limon) is a species of small evergreen tree in the Citrus rubric of the flowering factory family Rutaceae, native to Asia, including Northeast India where it was first grown. It's a mongrel of citron and bitter orange. The bomb tree produces a pointed round unheroic fruit (1) Pomegranate (Punica granatum L.) is an important fruit of tropical and tropical regions, which began in the Middle East and India (2)

Lemon contains multitudinous phytochemicals, including polyphenols, terpenes, and tannins. Lemon juice contains slightly more citric acid than lime juice (about 47 g/ L), nearly double as important as grapefruit juice, and about five times as much as orange juice. Pomegranate seed has important antioxidants, anti-inflammatory composites, vitamin E, sterols, phenols and high amounts of precious adipose acids similar as punicic acid and natural estrogen (3,4)

Antimicrobial Properties of Pomegranate and lemon

Pomegranate (Punica granatum) Pomegranate is rich in polyphenols, particularly ellagitannins and anthocyanins, which contribute to its antimicrobial properties:

• Ellagitannins: Exhibit broad-spectrum antimicrobial activity against Gram-positive and Gram-negative bacteria, fungi, viruses, and parasites.

• Anthocyanins: Provide antioxidant and antimicrobial benefits.

• Punicalagin: A major component in pomegranate extracts, known for its potent antimicrobial effects. Pomegranate extracts have been effective against pathogens like Staphylococcus aureus and Escherichia coli, showing potential as natural antimicrobial agents. (4)

Antimicrobial Properties of Lemon have notable antimicrobial properties due to their rich composition of bioactive compounds. Here's a brief overview of their antimicrobial benefits: -

Lemon (Citrus limon) Lemon contains several compounds that contribute to its antimicrobial activity: (5)

• Citric Acid: Helps inhibit the growth of bacteria and fungi.

• Limonene: A major component of lemon oil, known for its antibacterial properties.

• Flavonoids: These compounds have antioxidant and antimicrobial effects.

• Vitamin C: Contributes to the overall antimicrobial activity. Lemon peel extracts have shown strong antimicrobial activity against various pathogens, including Escherichia coli and Pseudomonas aeruginosa.

• **Antioxidant Properties of Pomegranate** (6,7)

Pomegranates are renowned for their antioxidant properties, thanks to their rich content of bioactive compounds. Here's a detailed look at the antioxidant properties of each:

Pomegranate: Pomegranate is exceptionally rich in antioxidants, primarily due to the following compounds:

1. Ellagitannins: Such as punicalagins, which are highly effective at neutralizing free radicals and protecting cells from oxidative stress.

2. Anthocyanins: Pigments that give pomegranate its vibrant red colour and have strong antioxidant properties.

3. Vitamin C: Like lemon, pomegranate also contains vitamin C, contributing to its antioxidant capacity.

Phenolic Compounds: Including gallic acid and ellagic acid, which further enhance its antioxidant activity.

Antioxidant Properties of Lemon

Lemon contains several powerful antioxidants that contribute to its health benefits:

1. Vitamin C: A potent antioxidant that helps neutralize free radicals, boosts the immune system, and promotes healthy skin.

2. Flavonoids: Such as hesperidin and eriocitrin, which have strong antioxidant and anti-inflammatory properties.

3. Carotenoids: Compounds like beta-carotene that help protect cells from oxidative damage.

4. Citric Acid: Helps enhance the antioxidant effects of vitamin C.

2. MATERIALS AND METHOD

Method of Extraction

- **Vacuum distillation**

Vacuum distillation is distillation performed under reduced pressure, which allows the sanctification of mixes not readily distilled at medium pressures or simply to save time or energy. This fashion separates mixes predicated on differences in their boiling points(8). This fashion is used when the boiling point of the asked conflation is delicate to achieve or will beget the conflation to decay. Reduced pressures drop the boiling point of mixes. The reduction in boiling point can be calculated using a temperature- pressure nomograph using the Clausius – Clapeyron relation. (9). Vacuum distillation is distillation performed under reduced pressure, which allows the sanctification of mixes not readily distilled at medium pressures or simply to save time or energy. This fashion separates mixes predicated on differences in their boiling points. This fashion is used when the boiling point of the asked conflation is delicate to achieve or will beget the conflation to decay. Reduced pressures drop the boiling point of mixes. The reduction in boiling point can be calculated using a temperature- pressure Artificial- scale vacuum distillation has several advantages. near boiling mixtures may bear multitudinous equilibrium stages to separate the pivotal factors(10). One tool to reduce the number of stages demanded is to use vacuum distillation. Vacuum distillation c generally used in oil painting oil refineries have compasses ranging up to about 14 measures (46 bases), heights ranging up to about 50 measures (164 bases), and feed rates ranging up to about 25,400 cubical measures per day (160,000 barrels per day). (10)

- **Soxhlet Extraction**

Soxhlet birth is a continuous solid/ liquid birth. A solid which contains the material to be pulled is placed in what is called a thimble. A thimble is made from a material which will contain the solid but allow liquids to pass through. A lot like sludge paper. The thimble containing the material is placed in the Soxhlet extractor. An organic soap is also toast at affluence. As it boils its vapours rise and are condensed by a condenser. (10). Soxhlet birth has traditionally been used for a solid sample with limited solubility in a soap in the presence of insolvable impurities. A porous thimble loaded with a solid sample is placed inside the main chamber of the Soxhlet extractor. By refluxing the soap through the thimble using a condenser and a siphon side arm, the birth cycle is generally repeated multitudinous times. Soxhlet birth is a rugged, well- established fashion

and permits unattended birth. still, it requires a long birth time and the consumption of a large amount of soap. (11) Soxhlet birth is a truly useful tool for primary purposes in which the analyte is concentrated from the matrix as a whole or separated from poking substances. Sample drug of environmental samples has been developed for decades using a wide variety of ways. Solvent birth of solid samples, which is generally known as solid liquid extraction also appertained to as filtering or Lixiviation in the sequestration of Lemon from the unreacted linalyl acetate l was done chemically by using logged result of sodium hydrogen bisulphate. Product was mixed with saturated result of NaHSO3 and stirrer for 20 min. The white China bisulphate formed also filtrate and washed with chloroform. The filtrate was vacuumed faded to unreacted linalyl acetate. The dried white China was dropped with 25 sodium hydroxide w/ v to gain organic and arid caste. The organic caste was pulled with chloroform. soap was also vacuumed removed. more correct use of the physicochemical language), is one of the oldest styles for solid sample pretreatment(12)

- **Testing Antibacterial and Antifungal exertion of Pomegranate and Lemon Extract**

Microbial Strains recently grown bacterial societies of B. K. pneumoniae, P. aeruginosa. S. epidermidis, and fungal societies of C. albicans and C. glabrata were used. Bacteria were cultivated on nutrient agar plates overnight (at 30 ◦ C for B. cereus and S. epi- dermidis, and 37 ◦ C for other bacteria). Incitement species were dressed over two days at 37 ◦ C on malt extract agar.

- **perceptivity Testing**

Sterile paper discs (6 mm in fringe) were loaded with 40 µL stock result of either PE or LE (at a attention 0.1 g/ mL); 20 µL of each extract (or autoclaved water) was first loaded, also dried for 10 min at 50 ◦ C, with the procedure repeated twice. However, the loaded discs were stored in the refrigerator for subsequently operation, if not used directly. perceptivity tests were performed as previously described (13). In brief, 1 mL of saline was added in each plastic birthstone. One to three colonies of the bacteria were taken with a rustic skewer and released into the saline. perceptivity testing was achieved by comparison with the 0.5 McFarland standard, followed by lacing 20 µL of the bacteria sample in 1 mL of saline, and swabbing onto Mueller – Hinton agar(14). For fungi, the drug procedures were similar (except distilled water rather than saline was used and no further dilution of the original suspension was demanded), and the suspensions were swabbed onto malt extract agar for perceptivity testing. Discs loaded with PE, LE, and water(control) were placed onto plates (swabbed with microbial strains) and pressed slightly to the agar(15). As a control, discs with autoclaved water were placed onto each plate. Plates were also incubated overnight at the permissive temperature for each strain. Antibacterial and antifungal exertion were assessed as compasses of ZOI, and cinema of the plates were taken against a dark background next to a autonomous (16)

Antioxidants Extraction

FRAP assay

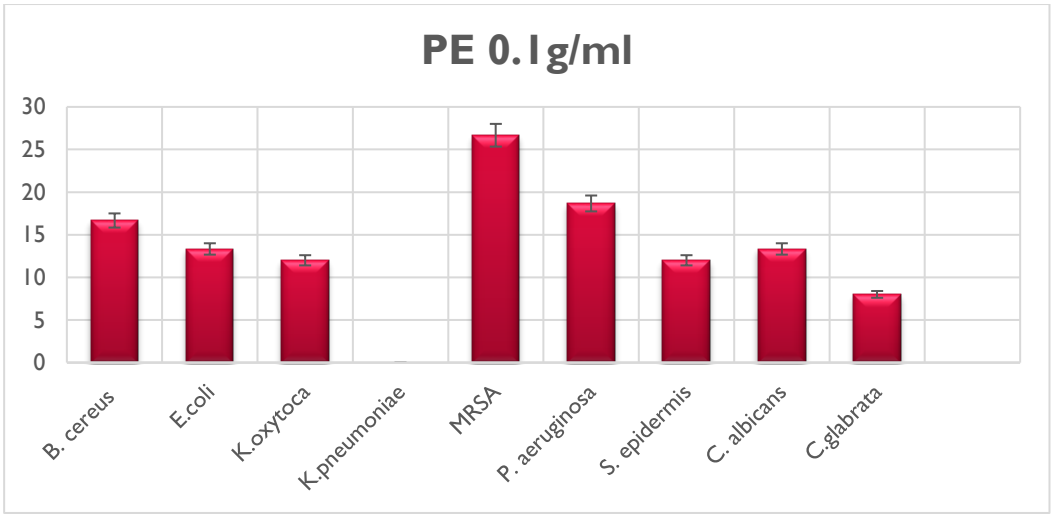
A simple, automated test measuring the ferric reducing ability of tube, the FRAP assay, is presented as a new system for assessing "antioxidant power. Ferric to ferrous ion reduction at low pH causes a varicolored ferrous- tripyridyltriazine complex to form. FRAP values are attained by comparing the absorbance change at 593 nm in test response mixtures with those containing ferrous ions in given attention. The ferric reducing- antioxidant power test was conducted according to Benzie and Strain (1996). Acetate buffer (0.3 M, pH 3.6) was prepared by dissolving 3.1 g $C_2H_3O_2Na \cdot 3H_2O$ and 16 ml of acetic acid in 1 l of distilled water. TPTZ (- tripyridyl- S- triazine) result was prepared by dissolving 23.4 mg of TPTZ in 7.5 ml of 40 mM HCl result. Ferric result (20 mM) was prepared using $FeCl_3 \cdot 6H_2O$. The final working FRAP reagent was set recently by mixing acetate buffer, TPTZ and ferric results at a rate of 1011, and was warmed to 37 °C. Aliquots (200 µl) of each extract were mixed with 1.8 ml of FRAP reagent and the absorbance of the response amalgamation was measured at 593 nm after incubation at 37 °C for 10 min. Waterless standard results of $FeSO_4 \cdot 7H_2O$ (0 – 1,000 µmol/ l) were used for the calibration wind(16).

3. RESULTS AND DISCUSSION

Antimicrobial goods of Lemon and Pomegranate Extracts

perceptivity Testing and Modes of Inhibition –

ZOI results are presented in Supplementary paraphernalia S1. Pomegranate Extracts inhibited the growth of B. cereus (ZOI 16.67 ± 1.15 mm), MRSA (ZOI 26.67 ± 1.15 mm), E. coli (ZOI 13.33 ± 1.15 mm), P. aeruginosa (ZOI 18.67 ± 1.15 mm) and C. albicans (ZOI 13.33 ± 1.15 mm), K. oxytoca (ZOI 12 ± 0 mm), S. epidermidis (ZOI 12 ± 0 mm), and C. glabrata (16 ± 0 mm). No zones of inhibition were observed for K. pneumoniae. Lemon was effective in inhibiting B. cereus (ZOI 8 ± 0 mm) and MRSA (ZOI 9.33 ± 1.15 mm), but to a lower extent than PE. ZOI for C. glabrata was reduced with LE (ZOI 8 ± 0 mm) Antioxidant effect of lemon and pomegranate.



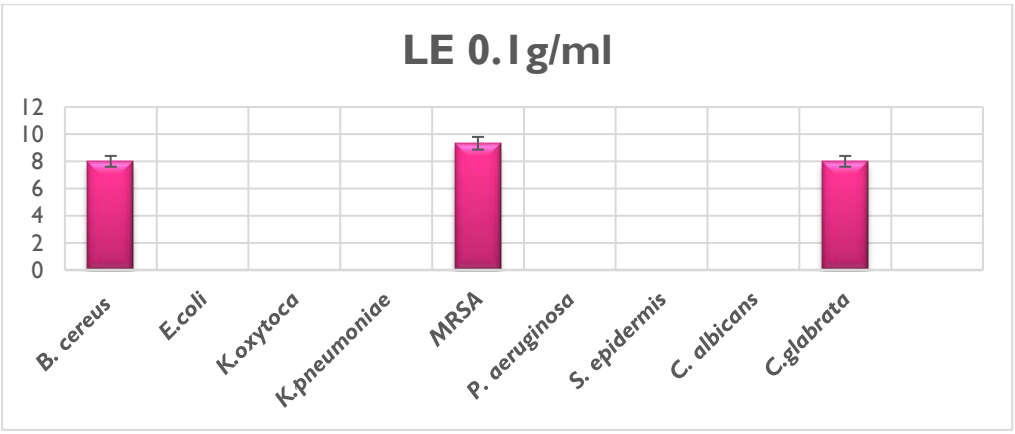


Fig. No. 1: Antimicrobial activity of lemon and pomegranate extract

Antioxidant effect of lemon and pomegranate

Ferric reducing/ antioxidant power (FRAP assay)

The FRAP assay treats the antioxidants contained in the samples as reductants in a redox linked colorimetric response and the value reflects the reducing power of the antioxidants. The procedure is fairly simple and easy to homogenize. thus, it has been used constantly in the assessment of antioxidant exertion of various fruits and vegetables and some natural samples, though we understand that it has some limitations. predicated on FRAP value, the peel extract was much stronger than the pulp extract in reducing power in a cure-dependent manner (Fig.), indicating that peel extract has further implicit antioxidant exertion. We further compared the scavenging or precautionary capacity of peel and Seed extracts against several common free revolutionaries in vitro. The superoxide anion is a well- recognized free radical species and is generated continuously by several cellular processes.

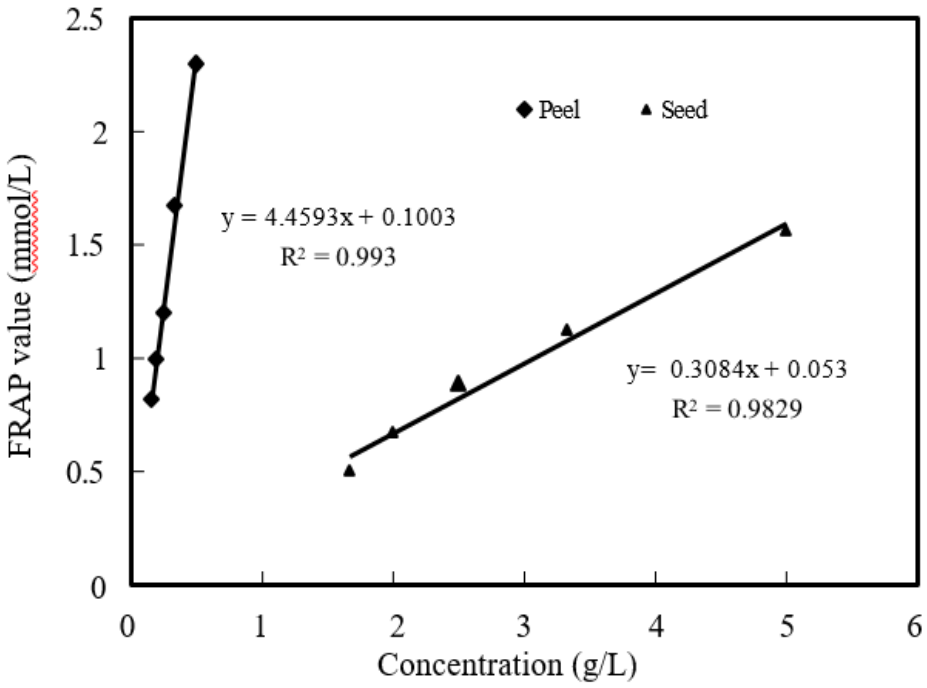


Fig. No. 2: Antioxidant activity of lemon and pomegranate extract measured FRAP assay

4. CONCLUSION

The study concluded that lemon and pomegranate plant extracts are precious sources of antioxidants and antimicrobials, suitable for use in skincare products Antioxidant parcels Both lemon and pomegranate extracts demonstrated significant antioxidant exertion, which helps in negative free revolutionaries and preventing cellular damage. The extracts were tested using various assays, and the results indicated strong antioxidant eventuality, making them suitable for addition in skincare formulations2. Antimicrobial parcels the antimicrobial evaluation showed that both extracts retain bactericidal and fungicidal parcels. Lemon extract displayed moderate antimicrobial exertion, while pomegranate extract showed stronger goods against a range of pathogens, including Gram-negative and Gram-positive bacteria, as well as incitement species1.

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