IJNRD.ORG ISSN : 2456-4184

INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG

An International Open Access, Peer-reviewed, Refereed Journal

AN OVERVIEW OF ANTIMICROBEAL PROPERTIES OF RUTIN

Mahesh Dilip Mane, Nilesh Shashikant Patole, Sanket Arun Metkari, Vetal Nana Kodalkar
Assistant Professor
Mandesh Institute of Pharmaceutical Science and Research Center Mhaswad

Rutin, also known as sophorin, rutoside, and quercetin-3-rutinoside, is a polyphenolic flavonoidfound in buckwheat, onions, oranges, lemons, grapes, limes, and other foods. Fruits and vegetablessuch as berries, peaches, plums, apples, and tomatoes, as well as beverages for example, wine andblack tea. Sometimes known as vitamin P or purple, is a flavonoid glycoside. The antibacterial activity of rutin and other polyphenols in the food system has been examined insitu, and the resultsshow that flavonoids may play a role in food preservation. Antifungal effects of quercetin and rutinalone against C. However, when these compounds were tested in conjunction with am B, they were shown to be ineffective. They found that am B's antifungal activity had improved. Rutin was able to prevent the cell from replicating. With an IC50 of 110 M, it is capable of causing infection. Rutin was discovered to lower the infectivity of bacteria in another investigation. Having an IC50 of 200 M, the C4 subgeno type EV-A71.

Key words: Rutin, Antibacterial Activity, Antifungal activity, Antiviral

Introduction:

The current review article focused on the study of antimicrobial activity of the rutin (Antibacterial, Antifungal, Antiviral activities of rutin). Rutin gets its name from the plant Ruta graveolens (common Rue) (Figure 1), which has rutin in its aerial portions. Rutin, sometimes known as vitamin P or purple, is a flavonoid glycoside. More than seventy plant species and foodscontain quercitrin. buckwheat seeds, apricots, and other plant-based items Cherries, grapes, grapefruit, onion, plums, and oranges are just a few examples. It was first discovered in buckwheatin the 19 century[1] Rutin, also known as sophorin, rutoside, and quercetin-3- rutinoside, is a polyphenolic flavonoid found in buckwheat, onions, oranges, lemons, grapes, limes, and other foods. Fruits and vegetables such as berries, peaches, plums, apples, and tomatoes, as well as beverages for example, wine and black tea [2] Rutin is produced through a sequence of enzymaticchanges . Several methods for extracting rutin and rutin derivatives from plants have been proposed. Heat reflux extraction, ultrasound-assisted extraction, and other plants extraction, mechanochemically assisted extraction, solid phase micro extraction, supercritical fluid extraction, infrared assisted extraction, and so on

Pressurized liquid extraction with microwave-assisted extraction.[3] Plants in the Lythraceae family contain the highest amounts of rutin compaired to the other families, rutin Punica granatumbark is a symbol of Rutin content is highest. The bark of Lagerstroemia speciosa symbolises the one among the lowest.[6]

(Figure: 1)

A - Plant of Ruta graveolens, B - its flower, C - its leaves [1]

Content:

Synergistic activity of Rutin

When S. enteritidis was used as the test bacterium, the activities of galangin, kaempherol, myricetin, and setin were all increased in the presence of rutin. The inclusion of rutin significantlyreduced the MIC value for kaempherol. Morin reduced DNA synthesis, whereas rutin, at a dosageof 25 mgWml, aided this action. Rutin was studied for its synergistic effects on the action of flavonoids, despite the fact that it has no antibacterial properties. Quercetin and quercitrin, quercetin and morin, morin and rutin, and quercetin and rutin were all found to be much more active than either flavonoid alone.[5] Morin and rutin were found to be efficacious against MRSA ATCC 43300 when used together. [4]

Antibacterial properties

Rutin's antibacterial effectiveness against diverse bacteria strains has been thoroughly researched. It has been shown to have a significant inhibitory effect on the growth of the bacteria Escherichia coli. Rutin has been found to have inhibitory effects on Proteus vulgaris, Shigella sonnei, and Klebsiella species when measured in honey. It has also been shown to have antimicrobial action against Pseudomonas auruginossa and Bacillus subtilis. The antibacterial activity of rutin and other polyphenols in the food system has been examined in situ, and the results show that flavonoids may play a role in food preservation.[7]

Bernard et al. found that rutin had antibacterial activity against E.coli via inhibiting DNA isomerase IV. Rutin increased the antibacterial activity of other flavonoids against Bacillus cereusand Salmonella enteritidis in a study. The inclusion of rutin significantly reduced the minimum inhibitory concentration of kaempferol. [7] Quercetin is an aglycone produced when rutin is degraded by the enzyme rutinosidase.[10] Quercetin shows antibacterial activity against Staphylococcus aureus and Clostridium botulinum, as well as periodontal pathogens Actinobacillus actinomycetemcomitans and Porphyromonas gingivalis in vitro. Rutin has been demonstrated to be efficacious against Bacillus cereus, Salmonella enteritidis, and Candidaalbicans-induced arthritis. [11] Rutin has been proposed as a natural active antibacterial agent due to its antimicrobial activity against Streptococcus pyogenes, Enterococcus faecalis, and Bacillus subtilis. Pseudomonas aeruginosa, Klebsiella pneumoniae, and Staphylococcus aureusE.coli is a type of bacteria . Honey made by beesThe stingless bee made an appearance.ManaosensisMelipona compressipes Gram-positive and Gram-negative bacteria have antibiotic action. In these honey samples, microorganisms and rutin were discovered.[11] Rutin's antibacterial activity was also evaluated against all pathogenic bacterial flora of the gastrointestinal tract and compared to erythromycin to see if rutin or erythromycin was the activeprinciple.someother element Rutin was found to have powerful anti-cancer properties in investigations. B. cereus, P. aeruginosa, and K. pneumoniae resistance [12]

Antifungal effects:

With a minimum inhibitory concentration of 60 lg/ml, Rutin showed antifungal efficacy againstCandida gattii . Chemical alteration of rutin by the introduction of a replacement group was indicated to affect physicochemical parameters such as electron density, hydrophobicity, andsteric strain, which could be beneficial in terms of increasing antifungal activity. It's also been claimed that rutin could be used to treat septic arthritis caused by Candida albicans.[7]Rutin, which was isolated from tobacco leaves, proved hito be a good antifungal and antibacterial agent,since it demonstrated antifungal action against and antibacterial activity against. Candida albicans (Candida albicans) is a antimicrobial activity against Staphylococcus aureusaureusBacillus subtilisis a bacterium found in soil. E. coli is a type of bacteria. Klebsiella, as well as oxytoca, and that phytochemicals like rutin could help as medicinal agents of importance[13]

The antifungal effects of quercetin and rutin alone against C. neoformans were inconclusive. However, when these compounds were tested in conjunction with amB, they were shown to be ineffective. They found that amB's antifungal activity had improved.[14]

Antiviral activity of Rutin :

Rutin (C27H30O16), a flavonoid glycoside found in buckwheat, asparagus, citrus fruits, and some berries, suppress virus adsorption but not virus replication. DENV-2 replication is unaffected, and there is no prophylactic impact. prevent the spread of viruses. [6] It was evaluated on mouse fibroblasts for protection against the vesicular stomatitis virus and found to be effective for roughly 24 hoursWhen added at the stages of adsorption and penetration in the viralreplicative cycle, rutin provided enormous viral embarrassment in the case of canine distemper virus infection.Rutin from the plum (Prunus domestica L.) has been proposed as a potent inhibitorof hepatitis C virus (HCV) entry by halting the virus's early entry stage.[15]. Rutin was discoveredto be antiviral. The recombinant 3C protease screening test was used to screen for EV-A71. Rutinwas tested in vitro to see if it had any action. EV-A71 strain CMUH01 was examined (B5). Rutin was able to prevent the cell from replicating.With an IC50 of 110 M , it is capable of causing infection. Rutin was discovered to lower the infectivity of bacteria in another investigation.Having an IC50 of 200 M, the C4 subgenotype EV-A71. The mechanism that was expected to be discovered was identified as the MEK1-ERK signalling pathway has been suppressed [9] It is well known that Rutin's antiviral action is linked to its antiviral potential.impacting the reverse transcriptase and the viral envelope RNA viruses that are enclosed.[6]

Anti plasmodic activity :

Quercetin, quercetin-3ß-glucoside, and rutin were the most active inhibitors of both clones (different P. falciparum strains)at low micromolar concentrations. Both clones have analogues . All of the participants' activity against the field, flavonoids were in the sub-micromolar level. Themost common isolates include quercetin, silymarin, and rutin. Rutin had no effect on Plasmodiumjuxtanucleare, the Plasmodium species that causes avian maleria and Rutin shows activity againstplasmodium Falciparum[16]

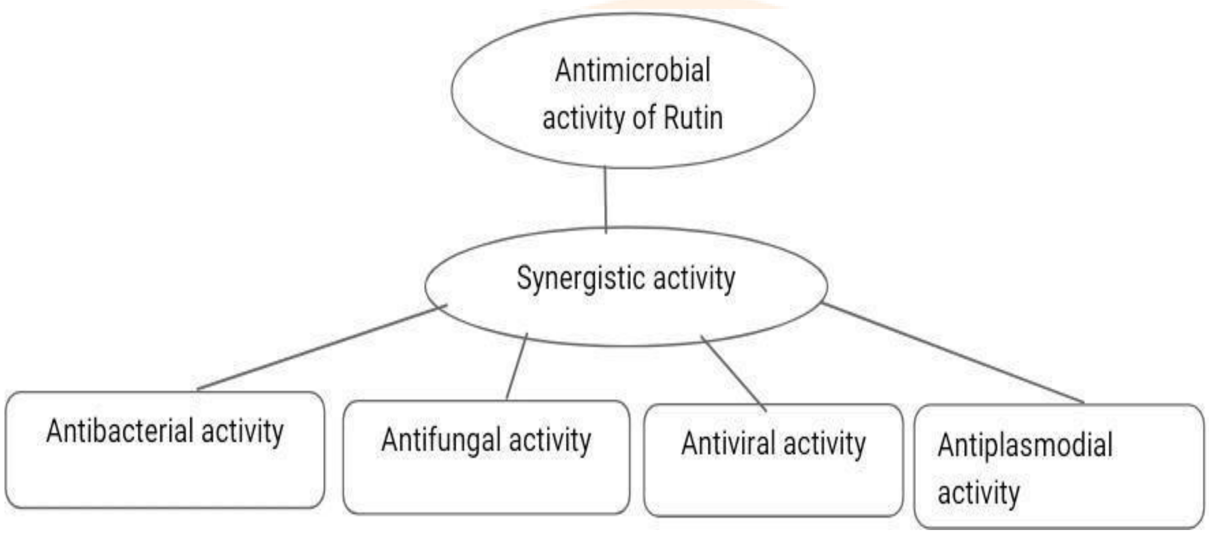

Figure No: 2
(Summary of Antimicrobial properties of Rutin)

CommonName	Part of plant	Rutin Content
Pomegranate	Bark	158.29
Lemon Balm	Leaves	133.09
African Marigold	Leaves	62.31
Basil	Leaves	25.74
Rosemary	Leaves	23.16
Lavender	Flower	7.29
Pomegranate	Leaves	9.82
Common Sunflower	Flower	19.67
Common Sunflower	Leaves	9.88

Table No:1

(Concentration of Rutin in different plants)[17]]

CommonName	Part of plant	Rutin Content
French Marigold	Flower	5.69
Peppermint	Leaves	9.97
Common Daisy	Flower	19.99
Paris Daisy	Flower	31.41
Thyme	Hurb	33.01
Pot Marigold	Leaves	71.73

Table No: 2

(Concentration of Rutin in different plants)[17]

Conclusion:

Rutin shows the antimicrobial activity i.e antibacterial activity, antifungal activity; antiviral activity .rutin has synergistic effect with quercetine to increase the antibacterial activity. Rutin in minimum inhibitory concentration shows good anifungal activity, and prevent the cell from the replication .Also rutin is able to prevent the cell from replication .finally it was concluded that Rutin shows antimicrobial activity and help to increase action of other chemical constituents like quercetin ,Morin.

References:

1. Prasad,R.,&Prasad,S.B.(2019).A review on the chemistry and biological properties of rutin,apromising nutraceuticalagent.Asian Journal Of harmacyand Pharmacology ,5(S1),1-20.https://doi.org/10.31024/ajpp.2019.5.s1.1

2. Agrawal, P. K., Agrawal, C., & Blunden, G. (2021). Rutin: A potential antiviral for repurposingas a SARS-Cov-2 main protease (Mpro) inhibitor. Natural Product Communications, 16(4), 1934578X2199172. https://doi.org/10.1177/1934578x21991723

3. Negahdari,R.,Bohlouli,S.,Sharifi,S.,MalekiDizaj,S.,RahbarSaadat,Y.,Khezri,K.,Jafari,S.,Ahmadian,E.,GorbaniJahandizi,N.,&Raeesi,S.(2020).Therapeutic benefits o f rutin and its nanoformulations. Phytotherapy Research,35(4),1719-1738.https://doi.org/10.1002/ptr.6904

4. Amin, M. U., Khurram, M., Khattak, B., & Khan, J. (2015). Antibiotic additive and synergisticaction of rutin, Morin and quercetin against methicillin resistant staphylococcus aureus. BMC Complementary and Alternative Medicine, 15(1). https://doi.org/10.1186/s12906- 015-0580-0

5. H., ASHIDA, H., & DANNO, G. (2002). Rutin-enhanced antibacterial activities of flavonoidsagainst Bacillus cereus and Salmonella enteritidis. Bioscience, Biotechnology, and Biochemistry, 66(5), 1009-1014. https://doi.org/10.1271/bbb.66.1009

6. De Magalhães, J., Nizer, W. D., Ferraz, A., Moraes, T. F., Ferreira, F., Magalhães, C. D., Vieira-Filho, S., & Duarte, L. (2020). Lack of activity of rutin isolated from Tontelea micrantha leaves against Vero and BHK, fungi, bacteria and Mayaro virus and its in silico activity. Journal of Pharmaceutical Negative Results, 11(1), 9. https://doi.org/10.4103/jpnr.jpnr_12_19

7. Ganeshpurkar, A., & Saluja, A. K. (2017). The pharmacological potential of rutin. SaudiPharmaceutical

Journal, 25(2), 149-164. https://doi.org/10.1016/j.jsps.2016.04.025

8. Keivan, Z., Boon-Teong, T., Sing-Sin, S., Pooi-Fong, W., Mohd, R. M., & Sazaly, A. (2014). In vitro antiviral activity of fisetin, rutin and naringenin against dengue virus type-2. Journal of Medicinal Plants Research, 8(6), 307-312. https://doi.org/10.5897/jmpr11.1046

9. Lalani, S., & Poh, C. L. (2020). Flavonoids as antiviral agents for enterovirus A71 (EV-A71). Viruses, 12(2), 184. https://doi.org/10.3390/v12020184

10. Luthar, Z., Germ, M., Likar, M., Golob, A., Vogel-Mikuš, K., Pongrac, P., Kušar, A., Pravst, I., & Kreft, I. (2020). Breeding buckwheat for increased levels of rutin, quercetin and other Bioactive compounds with potential antiviral effects. Plants, 9(12), 1638. https://doi.org/10.3390/plants9121638

11. Prasad,R.,&Prasad,S.B.(2019).A review on the chemistry and biological properties of rutin,apromising nutraceuticalagent.Asian Journal of Pharmacy and Pharmacology,5(S1),1-20.https://doi.org/10.31024/ajpp.2019.5.s1.1

12. Singh,M.,Govindarajan,R.,Rawat,A.K.,&Khare,P.B.(2008).Antimicrobial flavonoid rutin frompteris VittataL .Against pathogenic gastrointestinal microflora .American Fern Journal,98(2),98-103.https://doi.org/10.1640/0002-8444(2008)98[98:afrfpv]2.0.co;2

13. Prasad,R.,&Prasad,S.B.(2019).A review on the chemistry and biological properties of rutin,apromising nutraceuticalagent.Asian Journal of Pharmacy and Pharmacology,5(S1),1-20.https://doi.org/10.31024/ajpp.2019.5.s1.1

14 .Oliveira, V. M., Carraro, E., Auler, M. E., & Khalil, N. M. (2016). Quercetin and rutin as potential agents antifungal against Cryptococcus spp. Brazilian Journal of Biology, 76(4), 1029- 1034. https://doi.org/10.1590/1519-6984.07415

15.Agrawal,P.K.,Agrawal,C.,&Blunden,G.(2021).Rutin:Apotential antiviral for repurposingasa SARS-Cov-2mainprotease (Mpro)inhibitor .Natural Product Communications, 16(4),1934578X2199172.https://doi.org/10.1177/1934578x21991723

16 .Ganesh, D., Fuehrer, H., Starzengrüber, P., Swoboda, P., Khan, W. A., Reismann, J. A., Mueller, M. S., Chiba,

P., & Noedl, H. (2012). Antiplasmodial activity of flavonol quercetin andits analogues in plasmodium falciparum: Evidence from clinical isolates in Bangladesh and standardized parasite clones. Parasitology Research, 110(6), 2289-
2295. https://doi.org/10.1007/s00436-011-2763-z

17.Mostafa,N.(2017).Comparative analysis of rutin content insome Egyptianplants :AvalidatedRP-HPLC-DADapproach .European Journal of Medicinal Plants,19(2),1-8.https://doi.org/10.9734/ejmp/2017/33760