World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-23, June 2023
ISSN: 2749-3644

GALLIC ACID AND ITS SYNTHESIS OF PROPYL ETHER

Yuldasheva M.R., Kadirova Sh.O.
National University of Uzbekistan named after M. Ulugbek, department of Organic Chemistry

Article history:

Received: April 4th 2023
Accepted: May 6th 2023
Published: June 6th 2023

Abstract:

Gallic acid and its propyl ester are present as one of the major phenolic compounds in many plants, including fruits and vegetables. Gallic acid propyl ester is used as a feedstock for food, cosmetics, inks and paints, as an antioxidant in the pharmaceutical industry and for various industrial purposes. Gallic acid was treated with propyl alcohol in an acid medium to obtain gallic acid propyl ester in laboratory conditions.

Keywords: gallic acid, rufigalic acid, iron(III) ion, iron(II) ion, gallic acid propyl ester, IR spectrum, glucose, penta-O-galloylglucose, tannin.

INTRODUCTION: Gallic acid (3,4,5-trihydroxybenzoic acid) is a polyhydroxyphenolic compound found in various natural foods such as green tea, strawberries, grapes, bananas, apples, and many other fruits. Gallic acid and its structurally related compounds are widely distributed in fruits and plants. Gallic acid and its catechin derivatives are also present as one of the main phenolic components in black and green tea. Gallic acid esters are used in various industrial applications as antioxidants in the food, cosmetic and pharmaceutical industries. Gallic acid is also used as a starting material for inks, dyes and color developers. Studies using these compounds have shown that they have many potential therapeutic properties, including anticancer and antimicrobial properties. Oxidative stress also contributes to inflammation in inflammatory bowel disease[1-3].

LITERATURE REVIEW: Gallic acid is a powerful antioxidant.Gallic acid is an aromatic hydroxycarboxylic acid, a phenolcarboxylic acid. Gallic acid was first discovered in 1785 by C. W. Scheele in an extract obtained from oak leaves. Gallic acid is a colorless crystalline substance that darkens on light, easily soluble in hot water 33 g/100 ml (100^0C), ethanol 27.2 g/100 ml (25^0C), diethyl ether 2.5 g/100 ml (15^0C), 1.16 g/100 ml (25^0C), poorly soluble in cold water, insoluble in glycerin, acetone, chloroform and benzene. Gallic acid is a strong reducing agent that reduces gold and silver salts to metals, and iron (III) ions to iron (II) ions. It forms a blue complex with ferric chloride. During dry distillation, gallic acid is decarboxylated to form pyrogallol. When heated with concentrated sulfuric acid, a condensation product is formed - rufigalic acid (hexahydroxyanthraquinine). Gallic acid is easily oxidized in air in the form of solutions of metal salts. Gallic acid is oxidized to ellagic acid. Hydrogenation on a rhodium aluminum catalyst converts gallic acid to hexahydrogallic acid. Gallic acid forms intermolecular esters (depsides), such as metadigallic, metatrigallic acids and cyclic esters (depsidones). Gallic acid is obtained by alkaline, acid or enzymatic hydrolysis of tannins. It is converted to penta-O-halloylglucose, the main intermediate in the biosynthesis of gallo- and ellagitannins, through a series of successive galloylation reactions. Gallic acid is found in free form in some plants, for example, sumac, tea leaves, oak bark, pomegranate roots, grape leaves. Esters of gallic acid with polyhydric alcohols such as glucose form hydrolysable tannins. Gallotannins accumulate in significant amounts in plants; for example, Chinese sumac contains up to 70% tannin (by weight of dry matter). Propyl gallate has excellent antioxidant capacity and some pharmaceutical potential. Propyl gallate is a phenolic antioxidant widely used in the food, cosmetic and pharmaceutical industries. Food additives have been used for preservation since ancient times[4-7].

EXPERIMENTAL PART. The general procedure for the synthesis of gallic acid propyl esters is as follows: to a mixture of gallic acid (0.1 g, 0.59 mmol) in 10 ml of esterified propyl alcohol, add 0.5 ml of concentrated H_2SO_4. The solution was stirred at reflux for 3 to 7 hours and the esterification process was monitored by thin layer chromatography. After completion of the reaction, the excess alcohol was evaporated under reduced pressure, the product was diluted with 10 ml of ethyl acetate and washed with 15 ml of water. After separation of the organic phase, the aqueous phase is extracted three times with 10 ml of ethyl acetate, the combined organic phases are treated with 10 ml of 5% $NaHCO_3$ aqueous solution. The organic phase is dried with anhydrous Na_2SO_4, filtered and evaporated under reduced pressure. The product is checked by thin layer chromatography (hexane/ethyl acetate 1:1)[8-14].

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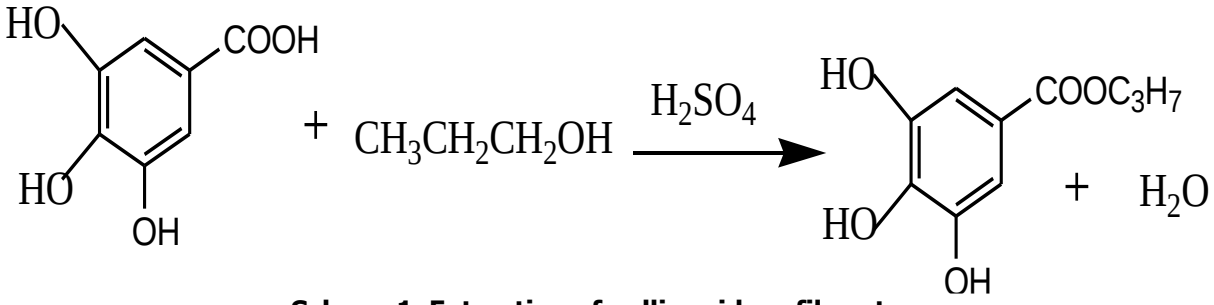
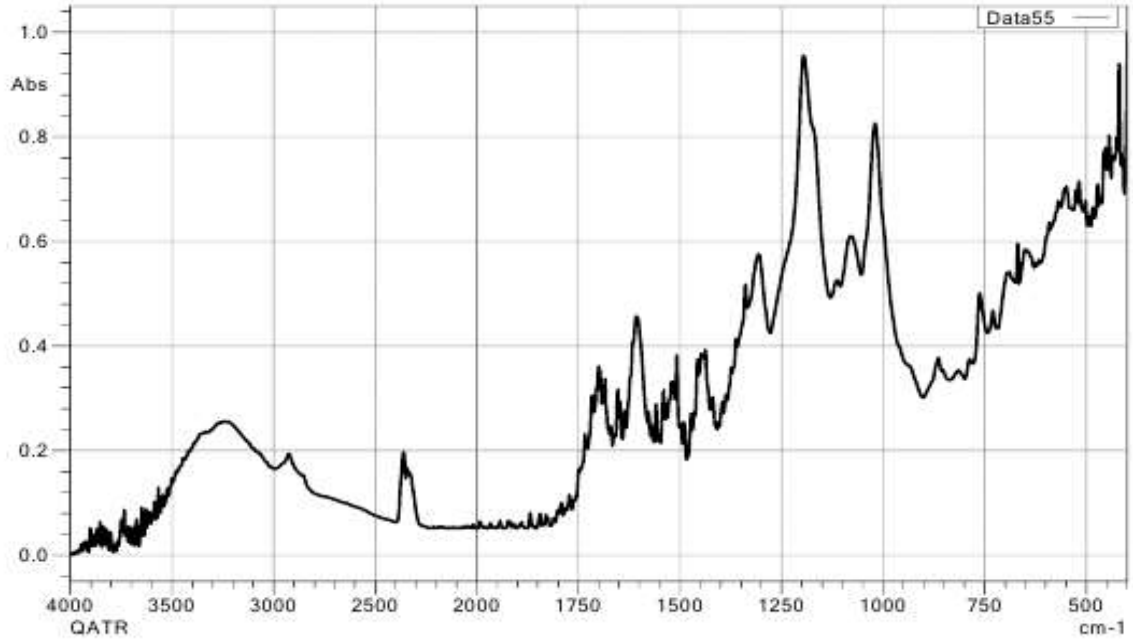


Scheme1. Extraction of gallic acid profile ester.



Rice 1. IR spectrum of the profile gallic acid ester

CONCLUSION/RECOMMENDATIONS: gallic acid and its propyl ester are present as one of the main phenolic constituents of many plants, including black and green tea. Gallic acid propyl ester is used as a feedstock for food, cosmetics, inks and paints, as an antioxidant in the pharmaceutical industry and for various industrial purposes. Studies have shown that they have anti-cancer, antimicrobial, and anti-inflammatory properties.

REFERENCES:

1. Caffrey, C.R.; Steverding, D.; Ferreira, R.S.; de Oliveira, R. B.; O'Donoghue, AJ; Monti, L.; Ballatore, K.; Bachovchin, K.A.; Ferrins, L. // Pollastri, Member of Parliament; and others. Discovery and development of drugs for kinetoplastic diseases // In Burger's Medical Chemistry, Drug Discovery and Development, 8th ed.; Abraham, J. D., Myers, M., eds.; John Wiley & Sons: New York, NY, USA 2021; Volume 7, pp. 255–334.
2. Cragg, G.M.; Newman, D.J // Natural products: a constant source of new drugs // Biochem. Biophysics. Acta 2013, 1830, 3670–3695.
3. Cheuka P.M.; Maioca, G.; Mutai, P.; Chibale, K. // The Importance of Natural Products in Drug Discovery and Development for Neglected Tropical Diseases // Molecules 2016, 22, 58.
4. Kueva S.; Moreno-Arribas, M.V.; Martin-Alverez, PJ; Bills, G.; Vincent, M.F.; Basilio, A.; Lopez Rivas, K.; Requena, T.; Rodriguez, J. M.; Bartolome, B. // Antimicrobial activity of phenolic acids against commensal, probiotic, and pathogenic bacteria. Res. microbiol. 2010, 161, 372–382.
5. Amishigo, K.M.; Antwi, California; Ajimani, J. P.; Gvira, T.M. // In vitro antitrypanosomal effects of selected phenolic acids on

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Available Online at: https://www.scholarexpress.net
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ISSN: 2749-3644

Trypanosoma brucei. PLoS ONE 2019, 14, e0216078.

6. R.N. Rakhimov,N.G. Abdulladjanova,J.F. Ziyavitdinov,Sh.O .Kadirova,A.Dj. Kurbanova **//** Chemical composition of euphorbia sequieriana neck // International Journal of Education, Social Science & Humanities. Finland Academic Research Science Publishers ISSN: 2945-4492, SJIF 7.502 Impact factor Volume-11, Issue-5, 2023
7. Danila, Ana-Maria; Kotani, Akira; Hakamata, Hideki; Kusu, Fumiyo (2007). // Determination of rutin, catechin, epicatechin and epicatechin gallate in Mench by microhigh performance liquid chromatography with electrochemical detection // Journal of Agricultural and Food Chemistry. 55(4): 1139–1143. doi: 10.1021/jf062815i. PMID 17253718.
8. Suquet, Jean-Marc; Chenier, Véronique; Brosso, Frank; Mutune, Michel (1996). // Polymeric proanthocyanidins from grape skin // Phytochemistry. 43(2): 509–512. doi: 10.1016/0031-9422(96)00301-9.
9. Saclar. Seine, Ertas. Erdal, Ozdemir. Ibrahim S, Karadeniz. Bulent (October 2015). // Influence of different brewing conditions on catechin content and organoleptic perception of Turkish green tea infusions // Journal of Food Science and Technology. 52(10): 6639–6646. doi: 10.1007/s13197-015-1746-y. PVC 4573099. PMID 26396411.
10. Katavich P.L, Lamb K, Navarro H, Prisinzano T.E. (August 2007). // Flavonoids as opioid receptor ligands: identification and preliminary structure-activity relationships // J. Nat. Prod. 70(8): 1278–82. doi: 10.1021/np070194x. PVC 2265593. PMID 17685652.
11. Raximov R.N, Ibragimov A.S, Kadirova Sh.O, Yodgorov B.O, Abdulladjanova N.G // Hippophae rhamnoides l. (elaeagnaceae) plant polyphenols // Academic Reserch in Educational Sciences, Volume 2, ISSUE 8, ISSN 2181-1385, Cite Factor 0.89, SIS:1.12, SJIR: 5.7, UIF:6,1, DOI:10.24412/2181-1385-2022-2-346-351
12. Kadirova Sh.O., Yuldasheva M.R., Rakhimov R.N. // Chemical composition of the plant Euphorbiahumifusa (willd.) // International scientific and practical conference "Fundamental and practical aspects of functional polymers" Tashkent, March 17-18, 2023, pp.558-559.
13. Yuldasheva M.R, Kadyrova Sh.O, Kholmurodova Z.Z, Umaralieva M.D. // Occurrence and chemical activity of gallic acid in nature // Collection of the VI international scientific and practical conference on the topic of Abu Ali Ibn Sina and innovations in modern pharmaceuticals Tashkent -2023. p.219.
14. A.S.Ibragimov, A.X.Rasulov, Sh.O.Kadirova, R.N.Rakhimov, N.G.Abdiulladjanova // Hyppophae rhamnoids l. (elaeagnaceae) plant polyphenols // Actual problems of the chemistry of natural compounds, Scientific conference of young scientists, march 17. 2022. P. 154.