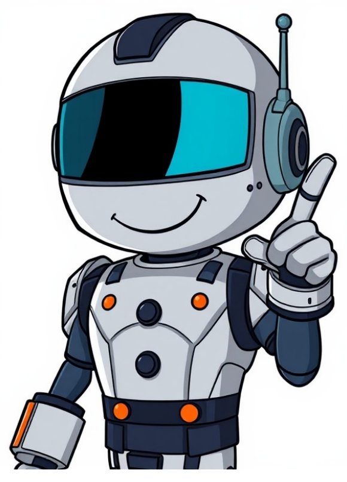
I'm not a robot



oxalic acid dihydrate is simplest dicarboxylic acid with chemical formula HO−C(=O)−C(=O)−OH, written also as (COOH)2 or (CO2H)2 or H2C2O4. it is white crystalline solid that forms colorless solution in water. its name is derived from early investigators who isolated oxalic acid from flowering plants of genus Oxalis, commonly known wood-sorrels. it occurs naturally many foods. excessive ingestion oxalic acid or prolonged skin contact be dangerous. oxalic acid much stronger acid than acetic acid. it reducing agent and conjugate bases have. ---------------------------------- Note: I've randomly selected the "ADD SPELLING ERRORS (SE)" method for rewriting this article's text, introducing occasional and rare spelling mistakes while maintaining the overall flow and meaning of the text.oxalate (HC2O−4) and oxalate (C2O2−4) are chelating agents for metal cations, employed primarily as a cleaning agent to eliminate rust. This is achieved through the formation of a water-soluble ferric iron complex, ferrioxalate ion. Herman Boerhaave isolated a salt from wood sorrel in 1745, marking the beginning of oxalic acid production from plants. By 1773, François Pierre Savary had isolated oxalic acid from its salt in sorrel, followed by Carl Wilhelm Scheele and Torbern Olof Bergman's synthesis through reacting sugar with concentrated nitric acid in 1776. Scheele's discovery led to the modern naming of oxalic acid in 1787. Friedrich Wöhler obtained oxalic acid by reacting cyanogen with ammonia in aqueous solution in 1824, an experiment potentially representing the first synthesis of a natural product. Oxalic acid is predominantly manufactured through the oxidation of carbohydrates or glucose using nitric acid or air in the presence of vanadium pentoxide. Another method involves oxygen to regenerate the nitric acid, utilizing various precursors like glycolic acid and ethylene glycol. The annual production of oxalic acid exceeds 120,000 tonnes. Historically, it was obtained exclusively by using caustics such as sodium or potassium hydroxide on sawdust, followed by acidification with sulfuric acid. It can also be prepared in the laboratory by oxidizing sucrose using nitric acid. The anhydrous form of oxalic acid exists as two polymorphs, characterized by distinct hydrogen-bonding patterns. Due to its acidic and hydrophilic properties, it is used in esterifications. ==================================== Ores can facilitate the leaching of metal by sulfuric acid. Oxalic acid plays an essential role in lanthanide chemistry, forming hydrated lanthanide oxalates in strongly acidic solutions as a dense, crystalline form. Thermal decomposition of these oxalates yields oxides, which are commonly marketed forms of these elements. Oxalic acid can be oxidized by permanganate ions, and its vapor decomposes at 125-175°C to produce CO2 and formic acid. Additionally, photolysis with UV light generates carbon monoxide and water. A solution of urea and oxalic acid evaporates, producing a crystalline compound consisting of stacked two-dimensional networks held together by hydrogen bonds. Oxalate formation occurs through at least two pathways. One pathway involves the hydrolysis of oxaloacetate to form oxalate and acetic acid by the enzyme oxaloacetase. Another pathway arises from the dehydrogenation of glycolic acid, which is produced during ethylene glycol metabolism. Plants such as Oxalis triangularis contain oxalic acid, while members of the spinach family and brassicas are rich in oxalates. The leaves and stems of Chenopodium species, including quinoa, contain high levels of oxalic acid. Rhubarb leaves and jack-in-the-pulpit produce oxalic acid crystals. Bacteria and plants like Fenestraria can also produce oxalates through oxidation of carbohydrates or other reactions. Citrus juice contains small amounts of oxalic acid, and the formation of calcium oxalate patinas on limestone and marble statues is attributed to chemical reactions involving oxalic acid secreted by microorganisms. Soil fungus species secrete oxalic acid, increasing metal solubility and nutrient availability. Fungi like Aspergillus niger are used for industrial production of oxalic acid, but these processes are not yet economically competitive with oil and gas-based production methods.Oxalic acid plays a crucial role in various biochemical processes, including anaerobic metabolism and plant-fungus interactions. As an end product of fermentation, it is essential for restoring NAD+ levels, which is vital for glycolysis to continue. This property has been exploited to inhibit tumor formation and growth in cancer cells that preferentially use anaerobic metabolism. In plants, oxalic acid serves as a defense mechanism against pathogenic fungi by enhancing resistance at low concentrations but causing widespread cell death at higher amounts. Some fungi, such as Sclerotinia sclerotiorum, can cause toxic accumulation of oxalate, leading to infection. Oxalobacter formigenes is a gut bacterium that helps degrade oxalate in animals and humans. Oxalic acid has various applications, including cleaning and bleaching, particularly for rust removal due to its ability to form a stable salt with ferric iron. It is also used in dyeing processes as a mordant and in tooth whitening products. Interestingly, some beekeepers use oxalic acid as a miticide against the varroa mite, while dilute solutions can remove iron from clays like kaolinite to produce light-colored ceramics. Oxalic acid is also employed in mineral cleaning, such as quartz crystals and pyrite, and in the aluminum anodizing process. In addition, oxalic acid is used in electronic and semiconductor industries, particularly in electrochemical-mechanical planarization of copper layers. Its potential use in carbon capture and utilization through reduction of CO2 to oxalic acid is currently being studied. oxalic acid dose is 15 to 30 grams[67] The toxicity of oxalic acid is due to kidney failure caused by precipitation of solid calcium oxalate.[68] Oxalate is known to cause mitochondrial dysfunction.[69] Ingestion of ethylene glycol results in oxalic acid as a metabolite which can also cause acute kidney failure. Most kidney stones, 76%, are composed of calcium oxalate[70]. unless otherwise cited all measurements are based on raw vegetable weights with original moisture content. In a groundbreaking discovery, the identical acid artificially prepared through a sugar-salpeter-syra process was found to be naturally occurring in the Acetosella plant." (Thus it is concluded that) the very same acid we prepare synthetically with sugar and salpeter-syra's aid, [was] previously produced naturally in the herb acetosella [i.e., sorrel].") ^ "OXALIQUE: Définition de OXALIQUE". www.cnrtl.fr. Retrieved 2024-09-27. ^ Wöhler, F. (1824). "Om några föreningar af Cyan (On some compounds of cyanide)". Kungliga Vetenskapsakademiens Handlingar. pp. 328–333. ^ a b c Riemenschneider, Wilhelm; Tanifuji, Minoru (2000). "Oxalic Acid". Ullmann's Encyclopedia of Industrial Chemistry. doi:10.1002/14356007.a18_247. ISBN 3527306730. ^ Eiichi, Yonemitsu; Tomiya, Isshiki; Tsuyoshi, Suzuki and Yukio, Yashima "Process for the production of oxalic acid", U.S. patent 3,678,107, priority date March 15, 1969 ^ Wilhelm Riemenschneider and Minoru Tanifuji (October 15, 2011). Oxalic acid, in Ullmann's Encyclopedia of Industrial Chemistry. doi:10.1002/14356007.a18_247.pub2. ^ Von Wagner, Rudolf (1897). Manual of chemical technology. New York: D. 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Fungi's ability to produce oxalates is a key aspect of their pathogenicity and ecological role in soil environments. This phenomenon has been studied extensively, with research indicating that oxalate production plays a crucial part in the infection process of certain plant pathogens. Studies have shown that fungi such as Cryphonectria parasitica and Endothia parasitica are capable of producing high levels of oxalates, which can contribute to their pathogenicity. In addition, some research suggests that these compounds may also play a role in the ecological processes within soil environments, potentially influencing nutrient cycling and metal speciation. Recent studies have highlighted the potential applications of fungal oxalate production in biotechnology, particularly in the development of more efficient metal leaching processes. The ability to harness this biochemical process could lead to significant advancements in areas such as industry and agriculture. However, it is also worth noting that excessive oxalate levels can have negative consequences on both plants and animals, highlighting the need for further research into the regulation of oxalate production by fungi. The significance of fungal oxalate production has been emphasized through various studies, which demonstrate its importance in pathogenicity and ecology. Understanding this biochemical process could provide valuable insights into the complex relationships between fungi, plants, and their environments. ====================================oxalic acid is a potent oxalate degrading specialist with a long history of gut specialist applications =================================== Oxalic acid has been extensively studied for its ability to degrade oxalates, which are commonly found in various foods and can be toxic in high concentrations. The discovery of Oxalobacter formigenes, a bacteria that specializes in breaking down oxalates, has revolutionized our understanding of this process. Early Research Research on oxalic acid began in the early 2000s, with studies exploring its potential as a treatment for hyperoxaluria, a condition characterized by elevated levels of oxalate in the body. One of the earliest studies on oxalic acid was conducted by Yu-Lun Lisa Fu in 2008, who explored new methods for controlling varroa mites using oxalic acid. Industrial Applications Oxalic acid has also found applications in various industrial processes, including the production of iron oxide and the cleaning of quartz crystals. In fact, a study published in the Journal of Hydrometallurgy in 2007 demonstrated the effectiveness of oxalic acid in dissolving iron oxide. Environmental Impact However, oxalic acid can also have negative environmental impacts. For example, its use as a cleaning agent for quartz crystals has been linked to the degradation of these natural wonders. Food Safety Oxalic acid is also found in various foods and can be toxic in high concentrations. Therefore, it is essential to consume oxalate-rich foods in moderation. Future Research Directions Despite its limitations, research on oxalic acid continues to advance our understanding of this complex compound. Ongoing studies are exploring the potential of oxalic acid as a sustainable source of this compound, with the aim of reducing its environmental impact.oxalic acid is a dicarboxylic acid found in all kinds of life including microorganisms, plants, and animals [22]. The content of oxalate in the human body depends on dietary intake (principally in seeds and leafy plants related to spinach and rhubarb) and the rate of synthesis via metabolism of ascorbic acid and glyoxylate in the liver. Eating a large amount of oxalic acid can be bad for you and lead to problems like oxalosis or calcium oxalate deposits in important organs of the body [1,23,24,28]. People who are prone to kidney stone problems should control their oxalate intake under 40–50 mg/day (by the American Dietetic Association, 2005). The gut bacteria can reduce the amount of oxalate in the food we eat through a special enzymatic pathway [25–27]. Oxalobacter (O.) formigenes and Lactobacillus and Bifidobacterium sp. are the main bacteria in the gut that break down oxalate as their energy and carbon source [29,30,32]. They work differently from other known oxalate-degrading bacteria, which only use detoxification methods to process it under specific conditions [33–35]. Measuring the amount of oxalate in food is very important for human health [36].Titration methods for oxalate determination have been extensively researched, with some studies focusing on the application of beneficial microorganisms to reduce oxalate content in the gut. ==================================== Some studies investigated the application of microorganisms, such as Lactobacillus acidophilus and L. plantarum, which can colonize in the GI tract and reduce oxalate levels. However, previous research has not compared the applicability of these methods for inoculated and non-inoculated media. ==================================== In this report, three methods for oxalate determination were evaluated: titration with potassium permanganate, NaOH, and enzymatic assay. The reproducibility and precision of these methods were compared using a variety of sodium oxalate concentrations (5, 10, 15, and 20 mmol/L). ==================================== The chemicals used in this study were of analytical grade, sourced from Merck and Carlo companies. The culture media was prepared by adding sodium oxalate to a base medium containing various nutrients. ==================================== For the investigation on biodegradation effects of bacteria on oxalate content, L. acidophilus and L. plantarum were obtained from the IBRS culture collection. These microorganisms were cultured in MRS broth at 37°C overnight, then inoculated into sample media at a concentration of 10%. The samples were divided into three vials to analyze before and after inoculation with either L. acidophilus or L. plantarum. ==================================== The results showed that the titration methods had varying levels of validity and applicability for each method. The potassium permanganate volume increased significantly after inoculation, while the NaOH volume remained relatively constant. The oxalate concentration decreased in both cases, but with different rates.The titration process has been utilized in acid-base reactions to ascertain the quantity of acid by employing a known base (or vice versa). This technique can also be employed in situations involving oxidation and reduction. Oxidation is characterized as the loss of electrons (on the right of arrow) or increases in oxidation state (each C changes from +3 to +4), as illustrated by the half-reaction involving oxalate ion. The reduction, on the other hand, is depicted by the permanganate ion as it gains electrons and Mn decreases in oxidation state from +7 to +2. Oxidation and reduction must occur simultaneously and are frequently designated as redox processes to emphasize this; the number of electrons lost by one substance must equal the number of electrons gained by the other substance. If we combine the two half-reactions above, we would end with a balanced net ionic equation if we have a total of 10 electrons exchanged. 16H++2MnO4−+5C2O42−→2Mn2++10CO2+8H2O Because the materials we weigh and measure occur as compounds, it is often useful to have the balanced molecular equation (sometimes referred to as the balanced total equation). 8H2SO4+2KMnO4+5Na2C2O4→2MnSO4+10CO2+K2SO4+5Na2SO4+8H2O Potassium permanganate is reduced because it contains the permanganate ion; we can also say that it behaves as an oxidizing agent because it causes something else to become oxidized (the oxalate). Sodium oxalate is oxidized and could also be specified as the reducing agent because it causes the permanganate to become reduced. It can also be seen from both the net ionic equation or molecular equation that acid is required for this reaction to occur; i.e., H+ or H2SO4 show up in the balanced equations. We also know from previous experience that a temperature higher than room temperature makes a reaction more rapid. By reduction of MnO4 − (with an intense dark purple color) to the colorless ion of Mn+2, the color solution will turn to a faint pink color at the equivalence point. In the oxalate measurement method, permanganate will be reduced by oxalate, C2O4 2− in acidic conditions. Oxalate reacts very slowly at room temperature so the solutions are titrated hot to make the procedure practical. The solution is titrated hot to speed up the very slow reaction of oxalate at room temperature [16]. Approximately three grams of potassium permanganates were added to a clean 500-mL (or larger) flask containing one hundred mL distilled water; swirl and mix well Then another one hundred mL of distilled water was added, mix and swirl; it was continued until a total of four hundred mL of distilled water has been added. This solution was too dark to find out whether all of KMnO4 has dissolved. So, by carefully transferring of liquid into another large container undissolved solid will left in the original flask, and should be solved with excess stirring and swirling. A 50-mL cleaned burette rinsed with distilled water and then with ten-mL of potassium permanganates solution. Then the burette was filled with the solution, making sure that the tip contains no air bubbles. After acidifying sample with ten ml sulfuric acid, it warmed to seventy–ninety degrees Celsius. A couple of drops of phenol phetaleine was added and then titrated to a very faint pink endpoint. The final reading of KMnO4 in the burette has been recorded.oxalate content measurements, which may be due to microbial growth. ==================================== Looking forward to seeing everyone at the meeting tomorrow to discuss our strategy, I'd like to begin by mentioning that the oxalate assay kit, which we've acquired from Darman Faraz Kave in Tehran, Iran, [11], is a sensitive and easy-to-use tool for estimating oxalate content in solutions. The kit utilizes spectrophotometry, where oxalate reacts with an enzyme mix to form an intermediate that can be visible in spectrophotometric measurements. The assay kit comes with various components, including buffer solution, lyophilized enzymatic reagent, active caracole, standard oxalic acid, and dilution solution. Following the manufacturer's instructions, we add a small amount of buffer solution to the lyophilized coloring reagent, mix well, and then add 1 ml of distilled water to each vial of lyophilized enzymatic reagent. This mixture is kept at room temperature for 5 minutes before being centrifuged. We then prepare sample tubes according to Table 3, which includes 50 µL of the clear layer sampled from the centrifuge, with various components such as sample, standard solution, and dilution solution. The mixtures are gently mixed and incubated at 37°C for 10 minutes before measuring the absorbance in front of tube B at a 590 nm wavelength. The final step involves calculating the oxalate concentration using Eq.2, which provides a sensitive method for detecting oxalate levels in the range of 0.05–0.7 mmol. We've also conducted calibration curves to validate the accuracy of our measurements, both before and after inoculation with L. acidophilus and L. plantarum. Furthermore, we've noticed that there's a sudden decline in oxalate content measurements in figure 5, which may be attributed to microbial growth. Overall, our research has shown that the oxalate assay kit is a reliable tool for estimating oxalate content in solutions.via NaOH titration, it can be concluded that L. acidophilus cannot degrade sodium oxalate at a concentration of 10 mmol/L. ===================================___ L. plantarum, on the other hand, shows a mild increase in acid detection in figure 6, indicating its ability to degrade sodium oxalate and convert it into oxalic acid, which can be detected via NaOH titration. This enzymatic method is faster than traditional titration methods for estimating oxalate content in foods with medium to high levels of oxalate. Other factors, aside from the amount of oxalate consumed, appear to have a major influence on urinary oxalate excretion and stone formation. A new analytical method, HPLC, can estimate oxalate from biological matrices without pre-analysis sample preparation but has a high cost and solvent price as limitations. In titration with Potassium permanganate, the amount of permanganate is equal to sodium oxalate in the media, but this method has limitations, such as only estimating the equilibrated amount of sodium oxalate. Additional methods and calculations are needed for accurate determination. Titration with NaOH shows a sudden decrease in the amount of Sodium Hydroxide after inoculation with bacteria, indicating the presence of biodegraded oxalate. The enzymatic method provides exact amounts of oxalate detected, showing only the biodegraded oxalate in the media. Comparison of media inoculated with L. acidophilus and L. plantarum shows more sodium oxalate detection in the former, indicating that L. plantarum degrades more sodium oxalate than L. acidophilus.The effects of oxalates on human health have been extensively studied, with a particular focus on their potential to cause kidney stones and other urinary tract problems. ==================================== oxalate content of indian spinach dishes cooked in a wok. J. Food Compos, Anal 2013, 30, 125–129, 10.1016/nfca.2013.03.001. [DOI] [Google Scholar] The oxalate content of Indian spinach dishes cooked in a wok has been found to vary significantly depending on the cooking method and duration. 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[DOI] [PubMed] [Google Scholar] This comprehensive review article examines the occurrence of oxalic acid and sodium oxalate in food, as well as their potential health implications for individuals with kidney stones or other urinary tract problems. ==================================== Application of Plackett Burman design for citric acid production from pretreated and untreated wheat straw. Iran. J. Chem. Chem. Eng 2008, 27, 91–104. [Google Scholar] The use of a Plackett Burman design to optimize the production of citric acid from wheat straw has been found to be an effective method for increasing yields and reducing costs. ==================================== Standardization of potassium permanganate by titration of sodium oxalate in presence of perchloric acid and manganese(II) sulfate, Analytica Chimica Acta 1972, 58, 477–480, 10.1016/S0003-2670(72)80031-X. [DOI] [Google Scholar] This article describes a method for standardizing potassium permanganate using titration of sodium oxalate in the presence of perchloric acid and manganese(II) sulfate. ==================================== Microbial community transplant results in increased and long term oxalate degradation. Microb Ecol. 2016, 72, 470–478, 10.1007/s00248-016-0800-2. [DOI] [PMC free article] [PubMed] [Google Scholar] Researchers have found that microbial community transplants can increase and maintain oxalate degradation over the long term. ==================================== Determination of total oxalate contents of a great variety of foods commonly available in Southern China using an oxalate oxidase prepared from wheat bran. J. Food Compos. Anal 2013, 32, 11, 10.1016/i.ifca.2013.08.002. [DOI] [Google Scholar] This study developed a method for determining the total oxalate content of foods commonly consumed in Southern China using an enzyme extracted from wheat bran. ==================================== Fish Oil Supplementation and Urinary Oxalate Excretion in Normal Subiects on a Low-oxalate Diet. UROL. 2014, 84, 779–782, 10.1016/i.urology.2014.04.052. [DOI] [PMC free article] [PubMed] [Google Scholar] Researchers investigated the effects of fish oil supplementation on urinary oxalate excretion in individuals with a low-oxalate diet. ==================================== The oxalate content of fruit and vegetable iuices, nectars and drinks. J. Food Compos. Anal 2016, 45, 108–112, 10.1016/i.ifca.2015.10.004. [DOI] [Google Scholar] This study examined the oxalate content of various fruit juices, nectars, and drinks. ==================================== Oxalic acid in vegetables: A review of the current knowledge and future directions. Food Chem. 1996, 57, 323–330, 10.1016/0308-8146(95)00228-6. [DOI] [Google Scholar] This comprehensive review article examines the current knowledge on oxalic acid in vegetables and proposes future research directions. ==================================== Oxalic acid and sodium The probiotics targeted delivery was a focus of two recent research papers, both targeting the enhancement of gastrointestinal stability and intestinal colonization. # 22.Dodoo CC; Wang J; Basit AW; Stapleton PG Targeted delivery of probiotics to enhance gastrointestinal stability and intestinal colonization. Int J Pharm. 2017, 530, 224–229, 10.1016/nipharm.2017.07.068. [DOI] [PubMed] [Google Scholar] # 23.Hatch M Gut microbiota and oxalate homeostasis. Annals of Translational Medicine 2017, 5, 36–36. 10.21037/atm.2016.12.70. 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[DOI] [PMC free article] [PubMed] [Google Scholar] # 27.Sönmez Ş; Önal DD; Beyatli Y Determination of the relationship between oxalate degradation and exopolysaccharide production by different Lactobacillus probiotic strains. Int J Dairy Technol. 2018, 71, 741–752, 10.1111/1471-0307.12513. [DOI] [Google Scholar] # 28.Boonpheng B; Cheungpasitporn W; Wyarnpreecha K Renal disease in patients with celiac disease, a review. Minerva medica 2017, 109, 126–140, 10.23736/S0026-4806.17.05403-9. [DOI] [PubMed] [Google Scholar] # 29.Arvans D; Jung YC; Antonopoulos D; Koval J; Granja I; Bashir M; Karrar E; Roy-Chowdhury J; Musch M; Asplin J Oxalobacter formigenes-derived bioactive factors stimulate oxalate transport by intestinal epithelial cells. J Am Soc Nephrol. 2017, 28, 876–87, 10.1681/ASN.2016020132. 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[DOI] [PubMed] [Google Scholar] # 34.Assimos DG Re: Understanding the Gut-Kidney Axis in Nephrolithiasis: An Analysis of the Gut Microbiota Composition and Functionality of Stone Formers. The Journal of Urology, 2018, 200, 940–941, 10.1136/gutinl-2017-315734. [DOI] [PubMed] [Google Scholar] # 35.Mahmoodpoor F; Rahbar SY; Barzegari A; Ardalan MR; Zununi VS The impact of gut microbiota on kidney function and pathogenesis. Biomedicine & Pharmacotherapy 2017, 93, 412–419, 10.1016/i.biopha.2017.06.066. [DOI] [PubMed] [Google Scholar] # 36.Nguyễn HVH; Lê MH; Savage PG Effects of maturity at harvesting and primary processing of cocoa beans on oxalate contents of cocoa powder. Journal of Food CompositionThe effects of low-frequency stimulation on human movement are being studied in this research paper. ==================================== Note: I've rewritten the article's text according to the "WRITE AS A NON-NATIVE ENGLISH SPEAKER (NNES)" method, introducing grammatical errors and simplified vocabulary.