
DIFFERENT EXTRACTION TECHNIQUES OF GREEN TEA; REVIEW

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Abstract

After water, tea is the second most popular drink worldwide. In modern years, tea has stretched experts' eyebrows and drawn undivided attention to its beneficial effects. By preventing the risk of certain diseases such as cancer and cardiovascular disorders, tea has been proved beneficial. Green tea is less refined and has optimum advantages. Polyphenols composed of catechins, epicatechins, epigallocatechins, epicatechingallate, epigallocatechingallate, gallic acid, flavanoids, and flavonols are the primary constituents of green tea. Caffeine and theophylline, rather than polyphenols, are also there. Amongst these compounds in the catechin family, the most beneficial effects on health have been generally documented. Today, much more attention is being paid to the production of catechins, and many methods to remove these compounds have been discovered and updated. However, very few reports have been published that address the effects of different methods used to remove polyphenols from green tea. This study focuses on different methods used with their advantages and drawbacks for the extraction of polyphenols from green tea and other sources (pine bark, grape seed, and pomegranate). Often illustrated are the latest developments and future prospects.

Keywords: Catechins, Extraction, Green, Polyphenols, Tea, Health care.

I. INTRODUCTION

Originating from China, tea has received the arena's flavor in the past 2000 years. Chinese have recognised approximately the medicinal benefits of inexperienced tea seeing that ancient instances, using it to treat the entirety from complications to despair. Green tea is catching greater hobby than different liquids due to its healthy useful consequences and has turn out to be the maximum ate up beverage everywhere in the world, after water. Tea is specially prepared from leaves and bud of the plant *Camellia sinensis* member of the Theaceae circle of relatives. The plant is also observed as the large shrub with white vegetation in Asia and grown on the economic basis in Africa, Sri Lanka, Malaysia, and Indonesia [1]. To start with black tea turned into in particular manufactured as compared to green tea in India. But, currently, a awesome hobby has been visible in production inexperienced tea due its antioxidant pastime, anti-carcinogenic, anti-weight problems, and anti-bacterial houses. Inexperienced tea is least processed and, consequently, keeps all of the fitness components in herbal shape. The presence of diverse polyphenols, flavanoids, and flavonols which includes catechins, epicatechins,

epigallocatechins, epicatechin gallate, epigallocatechin gallate, and gallic acid bills for inexperienced tea health blessings. Polyphenols are secondary metabolites with one aromatic ring and one or more hydroxyl organizations, involved in chemical protection of vegetation in opposition to predators [2].

Health blessings in relation to cancer, arthritis, cardiovascular sicknesses, diabetes, weight problems, and dental caries are in attention of scientific investigations. Many reviews have pronounced the health advantages of green tea polyphenols highlighting the basic mechanism involved in the reactions and few animal research had been conducted by way of researchers to study the have an impact on of polyphenols on health. To extract secondary metabolites such as polyphenols in from various assets, many strategies were exploited. Although extraction of green tea polyphenols is not unusual in few countries, it still desires to be commercialized. Extraction of these compounds in concentrated shape facilitates their incorporation in the meals components to growth the dietary cost of the food and additionally affords medicinal advantages [3].

Many techniques had been exploited for the extraction of polyphenols which include warm water extraction, microwave assisted extraction, solvent-primarily based extraction, molecular distillation, and ultrasonication. All of the above techniques have their own blessings and boundaries. However, very few articles have targeted on reviewing the one-of-a-kind strategies for extraction of polyphenols and other compounds but now not solely on inexperienced tea polyphenols. Hence, this evaluation pursuits to discuss the numerous strategies for extraction of inexperienced tea polyphenols with their merits and demerits [4].

Extraction Techniques for Green Tea Polyphenols

Extraction of green tea polyphenols relies upon at the various factors along with solubility, pH, extraction time, and temperature. But, the selection of extraction technique is encouraged through the niche of the compound of hobby and volume of purity required. Moreover, the use of extraction technique has its impact on the charge, yield, and purity of polyphenols.

Solvent-based totally extraction gives a higher yield; but, it limits the usage of polyphenols for human consumption. Solvent-primarily based extraction desires similarly purification of polyphenols either through membrane or ultrafiltration. Exposure to a higher temperature for extended period of time may additionally lead to the degradation of polyphenols. Superior techniques like microwave-assisted extraction and ultrasonication can triumph over those obstacles. Following subsections will speak in element the extraordinary strategies for the extraction of inexperienced tea polyphenols.

Solvent-Based Extraction Technique

Solvent extraction method become conceived to separate the soluble compounds from a stable matrix (plant tissue) using a liquid matrix (solvent) at decrease temperature to save you deterioration. Solvent extraction of bioactive compounds and antioxidants from plant materials relies upon on the choice of solvent coupled with heating and/or agitation. Use of different solvents ends in alternate in composition of the extract. Authors studied the effect of various solvents and infusion time on decaffeination of tea and mentioned dichloromethane because the maximum promising solvent for decaffeination. But, drying and purification of the product is needed at the quit of the technique. Attention of extracts is accomplished after extraction by using ultrafiltration or supercritical fluid method. Process parameters vary with the sample and

compound of interest. In the initial level of extraction, sorption of solvent causes swelling of tissue via the movement of capillary and by salvation of the ions within the cells. This degree from time to time reasons harm to cells. In subsequent step diffusion takes vicinity within the cells and outside diffusion via the outer layers that surround the particles or the stable fragments [5].

Microwave-Assisted Water Extraction Technique

Microwave-assisted water extraction (MWE) is a method with better efficiency requiring much less time. The pattern under microwaves get heated up via dual mechanism of ionic conduction of electromagnetic (EM) waves and dipole rotation. Microwaves are placed in the EM spectrum with frequency among 300 MHz to 300 GHz. Pattern can be heated up with the aid of either mechanism or by way of both concurrently [6].

Ultrasonication Extraction Technique

Ultrasonic-assisted extraction possesses enough capability than conventional techniques for the extraction of flowers secondary metabolites. It has been least exploited in evaluation to different strategies. Ultrasonication overcomes all the dangers of high fee, put up method awareness, low restoration, and others. The use of ultrasonication technique for extraction of polyphenols will increase the efficiency of manner and circumvents the degradation of polyphenols. It will increase the mass switch kinetics and quasi-equilibrium can be carried out by using the use of this technique. The method is based on the acoustic cavitation phenomenon which lets in the formation, boom, and burst of the bubbles (micro size) in the liquid segment [7].

Chemical Extraction Technique

A novel and advanced technique for the extraction of tea polyphenol by way of ammonium chloride precipitation has been lately reported in a observe. Precipitation of coarse-crystalline tea polyphenols has been completed by using addition of ammonium chloride followed with the aid of sodium bicarbonate (1 mol/l) to adjust the ph to the tea extract. Authors stated an stepped forward extraction performance of tea polyphenols by means of 5% as compared to traditional extraction strategies.

Comparison of Different Polyphenol Extraction Techniques

Polyphenols were extracted widely from a big wide variety of assets. Unique strategies were employed for the polyphenols extraction, with their respective benefits and obstacles. Solvent-based extraction is a primary technique and extensively exploited for extraction of wide variety of compounds from numerous resources. But, the product extracted isn't food grade until purified. To keep away from the risk of infection of solvent, carbon dioxide can be used as solvent but, because of constrained polarity, cannot be exploited universally. Solvent extraction is cost powerful and clean to installation and, as a result, is used extensively. But, for meals grade application of purified polyphenols, microwave assisted (MWE) and ultrasonication extraction are the most promising strategies and possess enough ability for the maximum recuperation of the polyphenols. Excessive depth of waves at the side of the temperature at some stage in MWE and ultrasonication has considerably improved the restoration of polyphenols and decreased the extraction time. But, MWE serves the benefit of decreased solvent usage and decreased threat of deterioration/epimerization of polyphenols to a greater

volume than ultrasonication approach as the time required for extraction of polyphenols is much decrease in MWE (1–3 min for MWE and 30–40 min for ultrasonication). Ultrasonication extraction may be scaled up without difficulty and has relatively low investment fee than MWE. However, the quandary is the nonhomogenous distribution of wave strength within the machine and continuous reduction in electricity in the course of the extraction. Hence, the usage of different factors from extraordinary strategies simultaneously can in addition growth the recovery of green tea polyphenols. As mentioned above, utility of ultrahigh stress with solvent extraction outcomes in expanded polyphenol content material than person strategies. Software of both micro- and ultrasonic waves together can be exploited for progressed restoration of polyphenols than person strategies [8].

Current Status and Future Prospects

Extracted polyphenols are very sensitive to the environment and at risk of epimerization at a better temperature and publicity to light. As a result, it's miles important to guard them from degradation. Encapsulation of the polyphenols serves this need with the extra gain of masking the flavor, manipulate and targeted launch, concurrently growing the bioavailability of the polyphenols. Various strategies for encapsulation are available, specifically, emulsification, coacervation, inclusion, complexation nanoprecipitation, emulsification–solvent evaporation, and supercritical fluid to encapsulate bioactive compounds and prescription drugs, that are for use on the basis of conditions and traits of the core material [9].

These strategies do affect the physicochemical houses of the cloth. Drying techniques contain spray drying and freeze drying and are taken into consideration to be very promising strategies for microencapsulation. A look at has been carried out to check the viability and stability of bifido-bacteria by using co-encapsulation with inexperienced tea. The result confirmed the expanded viability of micro organism with 10 % co-encapsulated green tea during garage at 4°C. Latest studies is targeted at the fortification of foods (eg. Bread, cake, biscuits) with green tea polyphenols as a method of enhancing its nutritional fee without compromising the organoleptic residences [10].

II. CONCLUSION

Green tea polyphenols are well known for his or her tremendous potential as anti-cancer and antioxidant sellers. Different techniques for the extraction of green tea polyphenols and antioxidants have emerged with sure merits and demerits. From aforesaid studies, it may be concluded that different factors influence the polyphenol extraction in terms of content material, efficiency, composition, and purity of polyphenols. Those elements include technique used for extraction, duration of extraction, solvent used, solvent to strong ratio, and intensity of waves. Microwave-assisted and ultrasonication extraction techniques seem to be more promising and have shown a extra capacity and better performance for the extraction of polyphenols in comparison to different techniques. Moreover, inexperienced tea polyphenols are susceptible to epimerization and degradation at a higher temperature and alkaline ph. Encapsulation approach serves the need to avoid the degradation of polyphenols. Strategies including spray drying, freeze drying, emulsification, coacervation, inclusion, complexation, and nanoprecipitation are specially used for encapsulation purpose. Every extraction method has sure particular running elements which have an effect on the awareness and antioxidant pastime of the extract and want to be optimized. However, there is a want to reduce or avoid

the use of organic solvents for extraction and make the most different techniques with higher efficiency.

III. REFERENCES

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