

## Review Article

# Potential Anticancer Properties of Grape Antioxidants

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Dietary intake of foods rich in antioxidant properties is suggested to be cancer protective. Foods rich in antioxidant properties include grape (*Vitis vinifera*), one of the world's largest fruit crops and most commonly consumed fruits in the world. The composition and cancer-protective effects of major phenolic antioxidants in grape skin and seed extracts are discussed in this review. Grape skin and seed extracts exert strong free radical scavenging and chelating activities and inhibit lipid oxidation in various food and cell models *in vitro*. The use of grape antioxidants are promising against a broad range of cancer cells by targeting epidermal growth factor receptor (EGFR) and its downstream pathways, inhibiting over-expression of COX-2 and prostaglandin E<sub>2</sub> receptors, or modifying estrogen receptor pathways, resulting in cell cycle arrest and apoptosis. Interestingly, some of these activities were also demonstrated in animal models. However, *in vivo* studies have demonstrated inconsistent antioxidant efficacy. Nonetheless, a growing body of evidence from human clinical trials has demonstrated that consumption of grape, wine and grape juice exerts many health-promoting and possible anti-cancer effects. Thus, grape skin and seed extracts have great potential in cancer prevention and further investigation into this exciting field is warranted.

## 1. Introduction

Grape (*Vitis vinifera*) is one of the world's largest fruit crops. Grape is also one of the most commonly consumed fruits in the world both as fresh fruit (table grape) and processed fruit (wine, grape juice, molasses, and raisins) [1, 2]. There are greater than one hundred grape species which are divided into 2 subgenera: *Euvitis* and *Afuscaninia*. Most of the species are in *Euvitis* subgenera [3]. Commercially cultivated grapes are usually classified as table or wine grapes depending on their intended method of consumption [4]. Table grapes usually bear large, seedless fruit berries with relatively thin skin, whereas wine grapes are smaller with thick skins [5]. Grapes are known to contain substantial amount of simple sugars especially glucose and fructose. For instance, wine grapes usually contain 19% or higher sugar content by fresh weight [6]. A growing body of epidemiological studies and randomized controlled human trials have associated the consumption of grapes, wine, and grape juice with a wide variety of health-promoting effects particularly the reduced

risk of cardiovascular diseases, type-2 diabetes, certain types of cancers, and other chronic complications [7–13].

## 2. Phenolic Antioxidants in Grapes

The beneficial effects of grape and relevant grape-derived food products are believed to be related to a variety of bioactive components in grapes [14–16]. One major group of these components is phenolic antioxidants typically including anthocyanins, catechins, resveratrol, phenolic acids, and procyanidins [17]. Based on our analysis, 100 grams of fresh grapes contain 63–182 mg of the phenolic compounds [18]. Flavonoids constitute the majority of phenolic compounds (65–76%) in grapes. In red grapes, anthocyanins are the major group of the flavonoids [18]. Most of grape phenolic antioxidants are distributed in grape skins or seeds [19]. For instance, resveratrols, anthocyanins, and catechins are concentrated in the skin part, while procyanidins are concentrated in grape seeds [20]. The commercial grape skin or seed extracts are made from grape pomace which is typically

# Anticancer And Cancer Chemopreventive Potential Of Grape

**Rajeev Bhat**



## **Anticancer And Cancer Chemopreventive Potential Of Grape:**

*Krebs bei Kleintieren: Behandlung und Prävention durch Pflanzenwirkstoffe* Michael Fischer, 2012-08 Die durchschnittliche Lebenserwartung von Kleintieren hat sich unter anderem durch eine altersgerechte Ernährung stetig erhöht. Nahrung mit einem hohen Anteil an sekundären Pflanzenstoffen kann das Krebsrisiko um 20% reduzieren. Zu den drei wichtigsten Krebsarten bei Kleintieren zählen Brusttumore, Hauttumore und Lymphsarkoma. Die wichtigsten Hautkrebsarten bei Kleintieren sind Mastzellentumore, Basalzellkarzinoma und Plattenepithelkarzinoma. Bei der Krebsprävention durch Nahrungsbestandteile kommt den sekundären Pflanzenstoffen die größte Bedeutung zu. Zu den sekundären Pflanzenstoffen zählen Vitamine und Nahrungspolyphenole, die größtenteils Flavonoide beinhalten. Sekundäre Pflanzenstoffe kommen hauptsächlich in pflanzlichen Nahrungsmitteln und Getränken vor und sind unter anderem in vielen Nahrungssupplementen oder Medikamenten mit pflanzlicher Basis zu finden. Aufgrund der Vielfältigkeit ihrer physiologischen Funktionen in pflanzlichen Geweben werden sekundäre Pflanzenstoffe mit pleiotropen Effekten in Verbindung gebracht. Es gibt mittlerweile viele Studien, die belegen, dass die tägliche Aufnahme von sekundären Pflanzenstoffen die Entstehung von mehreren Krebsarten reduzieren kann. Um jedoch überhaupt eine Wirkung erzielen zu können, ist eine ausreichende Bioverfügbarkeit der einzelnen Pflanzenstoffe notwendig. Durch gezielte Kombinationsbehandlungen kann die therapeutische Wirkung zusätzlich noch verbessert werden. Besonders hormonabhängige Krebsarten können durch pflanzliche Wirkstoffe mit phytoestrogenen Eigenschaften gehemmt werden.

Schutz vor Infektion Ruediger Dahlke, 2020-04-02 Was die Welt jetzt braucht: Angst regiert die Welt, ein unsichtbarer Feind hebt sie aus den Angeln. Covid-19: Wie oft die Corona-Krise sich zum Menschheitsproblem aus Krisenmanagement und Soforthilfen reichen nicht. Die Zeit ist berreift, das Belan der Wurzel zu packen. Es geht um unsere Gesundheit, unsere Zukunft und unser Geld. Aus dem Inhalt dieses aufregenden Buchs: Was sagt uns Covid-19 über uns selbst? Nicht immer auf unserer Seite. Die Agenda von Politik und Wirtschaft. Impfungen: Wirklich eine Erfolgsgeschichte auf der ganzen Linie? 10 gute Gründe sein Wohl in die eigenen Hände zu nehmen mit natürlichen und nachhaltigen Maßnahmen.

*Issues in Eating Disorders, Nutrition, and Digestive Medicine: 2011 Edition*, 2012-01-09 Issues in Eating Disorders Nutrition and Digestive Medicine 2011 Edition is a ScholarlyEditions eBook that delivers timely, authoritative and comprehensive information about Eating Disorders Nutrition and Digestive Medicine. The editors have built Issues in Eating Disorders Nutrition and Digestive Medicine 2011 Edition on the vast information databases of ScholarlyNews. You can expect the information about Eating Disorders Nutrition and Digestive Medicine in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed and relevant. The content of Issues in Eating Disorders Nutrition and Digestive Medicine 2011 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions and companies. All of the content is from peer-reviewed sources and all of it is written, assembled and edited by the editors at ScholarlyEditions and available exclusively from us. You now

have a source you can cite with authority confidence and credibility More information is available at <http://www.ScholarlyEditions.com>

*Plant Bioactives and Drug Discovery* Valdir Cechinel-Filho, 2012-05-22 An in depth exploration of the applications of plant bioactive metabolites in drug research and development Highlighting the complexity and applications of plant bioactive metabolites in organic and medicinal chemistry *Plant Bioactives and Drug Discovery Principles Practice and Perspectives* provides an in depth overview of the ways in which plants can inform drug research and development An edited volume featuring multidisciplinary international contributions from acclaimed scientists researching bioactive natural products the book provides an incisive overview of one of the most important topics in pharmaceutical studies today With coverage of strategic methods of natural compound isolation structural manipulation natural products in clinical trials quality control and more and featuring case studies on medicinal plants the book serves as a definitive guide to the field of plant biodiversity as it relates to medicine In addition chapters on using natural products as drugs that target specific disease areas including neurological disorders inflammation infectious diseases and cancer illustrate the myriad possibilities for therapeutic applications Wide ranging and comprehensive *Plant Bioactives and Drug Discovery* also includes important information on marketing regulations intellectual property rights and academic industry collaboration as they relate to plant based drug research making it an essential resource for advanced students and academic and industry professionals working in biochemical pharmaceutical and related fields

*Biodiversity and Biomedicine* Munir Ozturk, Dilsuza Egamberdieva, Milica Pešić, 2020-07-15 *Biodiversity and Biomedicine Our Future* provides a new outlook on Earth's animal plant and fungi species as vital sources for human health treatments While there are over 10 million various species on the planet only 2 million have been discovered and named This book identifies modern ways to incorporate Earth's species into biomedical practices and emphasizes the need for biodiversity conservation Written by leading biodiversity and biomedical experts the book begins with new insights on the benefits of biologically active compounds found in fungi and plants including a chapter on the use of wild fruits as a treatment option The book goes on to discuss the roles of animals such as amphibians and reptiles and how the threatened presence of these species must be reversed to conserve biodiversity It also discusses marine organisms including plants animals and microbes as essential in contributing to human health *Biodiversity and Biomedicine Our Future* is a vital source for researchers and practitioners specializing in biodiversity and conservation studies Students in natural medicine and biological conservation will also find this useful to learn of the world's most bio rich communities and the molecular diversity of various species Presents new developments in documenting and identifying species for biodiversity conservation and ethical considerations for biodiversity research Examines biodiversity as an irreplaceable resource for biomedical breakthroughs using available species for medical research Discusses challenges and opportunities for biodiversity protection and research in biosphere reserves

*Handbook of Plant Food Phytochemicals* Brijesh K. Tiwari, Nigel P. Brunton, Charles Brennan, 2013-04-01 Phytochemicals are plant derived chemicals which may

bestow health benefits when consumed whether medicinally or as part of a balanced diet. Given that plant foods are a major component of most diets worldwide, it is unsurprising that these foods represent the greatest source of phytochemicals for most people. Yet it is only relatively recently that due recognition has been given to the importance of phytochemicals in maintaining our health. New evidence for the role of specific plant food phytochemicals in protecting against the onset of diseases such as cancers and heart disease is continually being put forward. The increasing awareness of consumers of the link between diet and health has exponentially increased the number of scientific studies into the biological effects of these substances. The Handbook of Plant Food Phytochemicals provides a comprehensive overview of the occurrence, significance, and factors effecting phytochemicals in plant foods. A key objective of the book is to critically evaluate these aspects. Evaluation of the evidence for and against the quantifiable health benefits being imparted as expressed in terms of the reduction in the risk of disease conferred through the consumption of foods that are rich in phytochemicals. With world leading editors and contributors, the Handbook of Plant Food Phytochemicals is an invaluable cutting edge resource for food scientists, nutritionists, and plant biochemists. It covers the processing techniques aimed at the production of phytochemical rich foods which can have a role in disease prevention, making it ideal for both the food industry and those who are researching the health benefits of particular foods. Lecturers and advanced students will find it a helpful and readable guide to a constantly expanding subject area.

*Functional Foods and Nutraceuticals in Metabolic and Non-communicable Diseases* Ram B. Singh, 2021-11-30. *Functional Foods and Nutraceuticals in Metabolic and Non-communicable Diseases* presents strategies for the prevention of non-communicable diseases and undernutrition through the use of functional foods and nutraceuticals. Research has shown that the use of certain functional foods and nutraceuticals including spices, herbs, and millets, animal foods, and plant foods can play a role in the treatment and prevention of various diseases and in health promotion. Finally, the book explores epigenetic modulation as a new method for the development of functional foods and functional farming. Intended for nutritionists, food scientists, and those working in related health science professions, this book contributes to the discussions focused on nutritional transition, globalization, how to administer foods in the treatment of metabolic syndrome, hypertension, diabetes, heart attacks, neuropsychiatric disorders, bone and joint diseases, and carcinogenesis. Places emphasis on food diversity to provide perfect combinations of nutritional ingredients. Presents the utility and necessity of functional food production for health promotion. Offers suggestions to increase functional food production while simultaneously decreasing production costs.

*Natural Substances for Cancer Prevention* Jun-Ping Xu, 2018-02-01. *Natural Substances for Cancer Prevention* explores in detail how numerous investigations in chemical biology and molecular biology have established strong scientific evidence demonstrating how the properties of naturally occurring bioactive chemicals hamper all stages of cancers from initiation to metastasis. Accordingly, important goals for cancer prevention are the modification of our dietary habits and an increase in the intake of more anticancer related natural

substances More significantly the bioactive chemicals presented in the functional foods should be readily available inexpensive non toxic and nutritional

**Carcinogenesis** Kathryn Tonissen,2013-01-23 Carcinogenesis covers molecular biochemical and cellular processes that underpin this field The complex nature of cancer means that a broad understanding of these processes is advantageous when designing novel preventative therapeutic or diagnostic strategies This book commences with chapters discussing cancer predisposition and pre cancerous lesions Factors that initiate or progress cancer development including viral hormonal oncogenic and biochemical stimuli are then described as are interactions with the cancer extracellular environment Animal models are particularly useful for evaluating therapeutic or chemopreventive agents and examples are presented Finally natural products that either prevent or treat cancer are described Together these topics will provide the reader with examples of the latest cutting edge research and discoveries with the goal of stimulating further advances

**Biorefinery Production Technologies for Chemicals and Energy** Arindam Kuila,Mainak

Mukhopadhyay,2020-10-20 This book covers almost all of the diverse aspects of utilizing lignocellulosic biomass for valuable biorefinery product development of chemicals alternative fuels and energy The world has shifted towards sustainable development for the generation of energy and industrially valuable chemicals Biorefinery plays an important role in the integration of conversion process with high end equipment facilities for the generation of energy fuels and chemicals The book is divided into four parts The first part Basic Principles of Biorefinery covers the concept of biorefinery its application in industrial bioprocessing the utilization of biomass for biorefinery application and its future prospects and economic performance The second part Biorefinery for Production of Chemicals covers the production of bioactive compounds gallic acid C4 C5 and C6 compounds etc from a variety of substrates The third part Biorefinery for Production of Alternative Fuel and Energy covers sustainable production of bioethanol biodiesel and biogas from different types of substrates The last part of this book discusses sequential utilization of wheat straw material balance and biorefinery approach The approaches presented in this book will help readers users from different areas like process engineering and biochemistry to plan integrated and inventive methods to trim down the expenditure of the industrial manufacture process to accomplish cost effective feasible products in biorefinery

*Natural Products for Cancer Chemoprevention* John M. Pezzuto,Ole

Vang,2020-04-03 This book discusses the efficacy of various naturally occurring chemopreventive agents in preventing or delaying cancer It focuses on the holistic chemopreventive concept demonstrating the relevant response is the combined effect of a series of compounds that alone have been shown to have some effect in different experimental models Written by leading experts in the field the contributions provide details of research on various chemopreventive agents Offering insights into the unique molecular targets and mechanisms safety issues molecular efficacy and occurrence in nature of these compounds the book is a valuable resource for all scientists working in biomedicine and specifically in cancer research

*Handbook of Porous Carbon Materials* Andrews Nirmala Grace,Prashant Sonar,Preetam Bhardwaj,Arghya

Chakravorty,2023-03-06 This handbook summarizes the current advancements and growth in sustainable carbonaceous porous materials for fabrication and revival of energy devices fuel cells sensors technology solar cell technology stealth technology in addition to biomedical applications It also covers the potential applications of carbon materials in various fields such as chemical engineering biomedical and environmental sciences It also confers the prospective utilization of 2D and 3D hierarchical porous carbon in different interdisciplinary engineering applications The book discusses major challenges faced in the development of cost effective future energy storage strategies and provides effective solutions for improvement in the performance of carbon based materials Given the content this handbook will be useful for students researchers and professionals working in the area of material chemistry and allied fields

**Overcoming Cancer** Gary Null,2017-07-18 One word strikes more fear into a person s mind than any other cancer The physical mental emotional and financial toll that comes with a cancer diagnosis is immense and affects not only cancer patients but also families and entire communities The vast majority of individuals who lose the battle against cancer are treated with the standard orthodox therapy These people may never have questioned their oncologists believing that they were in the best possible hands with their physicians advanced education their knowledge of the latest treatments and all the tools of modern research at their disposals In *Overcoming Cancer* Gary Null explores the alternative treatments that most mainstream doctors will never discuss with their patients Did you know that eating melons balances your body s pH which can help slow the growth of cancer You were aware that fiber is an important part of a healthy diet but did you know that it lowers the risk of breast colorectal uterine and prostate cancers Find health and vitality with Dr Null s five most powerful tools for fighting cancer *The SAGE*

*Encyclopedia of Food Issues* Ken Albala,2015 The SAGE Encyclopedia of Food Issues explores the topic of food across multiple disciplines within the social sciences and related areas including business consumerism marketing and environmentalism In contrast to the existing reference works on the topic of food that tend to fall into the categories of cultural perspectives this carefully balanced academic encyclopedia focuses on social and policy aspects of food production safety regulation labeling marketing distribution and consumption A sampling of general topic areas covered includes Agriculture Labor Food Processing Marketing and Advertising Trade and Distribution Retail and Shopping Consumption Food Ideologies Food in Popular Media Food Safety Environment Health Government Policy and Hunger and Poverty This encyclopedia introduces students to the fascinating and at times contentious and ever so vital field involving food issues

**Drug Development for Cancer and Diabetes** K. Saravanan,Chukwuebuka Egbuna,Horne Iona Averal,S. Kannan,S. Elavarasi,Bir Bahadur,2020-08-30 Key features include Details the role of plants for the treatment and management of cancer and diabetes Discusses the role of phytochemicals as ligands for cancer and diabetic targets Reviews plants and the potential of phytochemicals as antidiabetic and anticancer drugs Explores the green biosynthesis of nanoparticles and their treatment efficiency

**Nutraceuticals in Cancer Prevention, Management, and Treatment** Raj K. Keservani,Bui

Thanh Tung, Sippy Singh, Rajesh K. Kesharwani, 2023-10-20 With chapters written by highly skilled and experienced scientists and researchers this book provides valuable information on specific nutraceuticals that offer benefits in the prevention management and treatment of cancer The volume covers the efficacy safety and toxicological aspects of nutraceuticals and addresses various novel drug delivery systems Key features Covers the applications and implications of nutraceuticals for cancer prevention and treatment including prostate cancer lung cancer breast cancer skin cancer colon cancer liver cancer cervical cancer Discusses the principles of nanotechnology in the delivery of nutraceuticals for the prevention and treatment of cancer Explores the role of antioxidants flavonoids and phytochemicals in cancer prevention **Seeds:**

**Anti-proliferative Storehouse for Bioactive Secondary Metabolites** Dilipkumar Pal, 2024-08-31 This book presents extensive and up to date information on the anti proliferative properties of various plant seeds for their application in pharmaceutical industry and medicinal research This information is imperative for understanding and developing high quality products from the seeds The book provides insights about anticancer and antitumour activities present in seeds Different chapters cover the traditional knowledge as well as recent innovations in various seeds such as prune pumpkin grape fruit sesame sunflower bitter gourd papaya mango apple black plum cumin water melon musk melon cotton carambola pear cardamon moringa wallich Chinese cabbage pistachio etc and their bioactivities for the applications in cancer and malignancy proliferation The book introduces the readers to seed as a bioactive compound and delineates the various health effects It further explains the relation between the different metabolites and their effect on cell proliferation Finally the book goes on to explain different seeds and their specific anti cancer properties This book is useful for students and researchers of pharmacology botany and cancer research It also caters to industry experts in pharmaceutical sciences **Valorization of**

**Agri-Food Wastes and By-Products** Rajeev Bhat, 2021-08-25 Valorization of Agri Food Wastes and By Products Recent Trends Innovations and Sustainability Challenges addresses the waste and by product valorization of fruits and vegetables beverages nuts and seeds dairy and seafood The book focuses its coverage on bioactive recovery health benefits biofuel production and environment issues as well as recent technological developments surrounding state of the art of food waste management and innovation The book also presents tools for value chain analysis and explores future sustainability challenges In addition the book offers theoretical and experimental information used to investigate different aspects of the valorization of agri food wastes and by products Valorization of Agri Food Wastes and By Products Recent Trends Innovations and Sustainability Challenges will be a great resource for food researchers including those working in food loss or waste agricultural processing and engineering food scientists technologists agricultural engineers and students and professionals working on sustainable food production and effective management of food loss wastes and by products Covers recent trends innovations and sustainability challenges related to food wastes and by products valorization Explores various recovery processes the functionality of targeted bioactive compounds and green processing technologies Presents emerging



technologies for the valorization of agri food wastes and by products Highlights potential industrial applications of food wastes and by products to support circular economy concepts *Multiple Biological Activities of Unconventional Seed Oils* Abdalbasit Adam Mariod,2022-01-26 *Multiple Biological Activities of Unconventional Seed Oils* brings detailed knowledge concerning the biological properties of oils antioxidant antimicrobial antidiabetic antitumor anti inflammatory etc the content of individual substances with health promoting properties methods for biological properties assay the influence of raw material quality and technological processes on the quality of oils and possible raw materials and oil contaminants with adverse health effects The book s chapters also highlight the unique properties of new oils along with their biological activities Less than a decade ago the vegetable oils on grocery store shelves were derived from conventional oil seeds e g cotton groundnut sesame corn sunflower and soybean However as consumers began to understand how fat intake affects overall health researchers plant growers and food manufacturers started to produce oils from unconventional sources This book highlights what we ve learned in the process Explores unconventional oils their different sources and where they grow worldwide Explains the medicinal uses of unconventional oils Details the biological activities antioxidant and physico chemical composition of unconventional oils *Valorization of Fruit Seed Waste from Food Processing Industry* Manoj Kumar,Kanika Sharma,Sneh Punia Bangar,2024-06-12 *Developments in Food Quality and Safety Series* is the most up to date resource covering trend topics such as Advances in the analysis of toxic compounds and control of food poisoning Food fraud traceability and authenticity Revalorization of agrifood industry Natural antimicrobial compounds and application to improve the preservation of food Non thermal processing technologies in the food industry Nanotechnology in food production and Intelligent packaging and sensors for food applications Volume 5 *Valorization of fruit seed waste from food processing industry Insights on Nutritional profile biological functions and applications* provides comprehensive information regarding different aspects of fruit seed waste which can be of great help to students research scholars professors and food industries for both theoretical and practical work This book covers the composition of different types of fruit seed waste including their biological and functional characteristics applications and extraction valorization methods for the production of value added products which will help to tailor the experiments for the development of advanced valorization technologies with respect to specific characteristics of each type of fruit seed waste The series is edited by Dr Jos Manuel Lorenzo and authored by a team of global experts in the fields of Food Quality and Safety providing comprehensive knowledge to food industry personals and scientists Covers the fundamentals and latest developments in valorization methods for different fruit seed waste Provides a comprehensive view of the recovery of valuable ingredients from fruit seed waste Thoroughly explores extraction methods for obtaining bioactive components characterization methods and phytochemical profile of the seed

## Whispering the Secrets of Language: An Psychological Journey through **Anticancer And Cancer Chemopreventive Potential Of Grape**

In a digitally-driven earth where screens reign supreme and quick connection drowns out the subtleties of language, the profound secrets and emotional nuances concealed within phrases often get unheard. However, nestled within the pages of **Anticancer And Cancer Chemopreventive Potential Of Grape** a fascinating literary treasure pulsating with organic feelings, lies a fantastic quest waiting to be undertaken. Penned by a talented wordsmith, this wonderful opus invites visitors on an introspective trip, softly unraveling the veiled truths and profound affect resonating within the very fabric of each and every word. Within the psychological depths of this emotional review, we will embark upon a genuine exploration of the book is key subjects, dissect their interesting writing style, and yield to the powerful resonance it evokes serious within the recesses of readers hearts.

[https://cmsemergencymanual.iom.int/About/book-search/fetch.php/breaking\\_bad\\_news\\_to\\_the\\_api.pdf](https://cmsemergencymanual.iom.int/About/book-search/fetch.php/breaking_bad_news_to_the_api.pdf)

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### **Anticancer And Cancer Chemopreventive Potential Of Grape Introduction**

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