A Novel Treatment for A Novel Virus

A Summary of Proven Scientific Research

Compounds Found in the
Yucca Plant
Used for the Treatment or Prevention of Viral Infections and Other Human Maladies

Questions to be answered:

Can the resveratrol, saponins, and yuccaols found in the yucca plant be used to successfully treat and/or prevent viral infections such as Covid19?

Can these compounds be made into a liquid used in a nebulizer for respiratory infections such as Covid19?

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What is already known:

Compounds Found in the Yucca Plant

Resveratrol and other phenolics from the bark of Yucca

https://www.ncbi.nlm.nih.gov/pubmed/11262023

Abstract

Five phenolic constituents have been identified in Yucca schidigera bark, and their structures were established by spectral (FABMS and NMR) experiments. These included two known stilbenes, trans-3,4',5-trihydroxystilbene (resveratrol) and trans-3,3',5,5'-tetrahydroxy-4'-methoxystilbene, as well as three novel compounds, yuccaols A, B, and C, with spiro-structures rarely occurring in the plant kingdom. It is suggested that yuccaols A-C are biosynthethized via attachment of a stilbenic derivative to the carbocationic intermediate of the oxidative flavanone-flavonol conversion.

Determination of phenolic compounds in Yucca gloriosa bark and root by LC-MS/MS

https://www.ncbi.nlm.nih.gov/pubmed/18502074

Abstract

On the basis of the biological activities shown by yuccaols and gloriosaols from Yucca schidigera and Yucca gloriosa, the content of yuccaols and gloriosaols in two different parts of Y. gloriosa (roots and bark), was determined for each single compound, and compared with phenolic determination in Y. schidigera bark, concluding that Y. gloriosa bark and roots are rich sources of phenolic derivatives structurally related to resveratrol. LC/ESIMS (liquid chromatography coupled to electrospray mass spectrometry) qualitative and an LC/ESIMS/MS (liquid chromatography coupled to tandem electrospray mass spectrometry) quantitative studies of the phenolic fraction of Y. gloriosa were performed. LC/ESIMS/MS multiple reaction monitoring (MRM) method previously described for yuccaols in Y. schidigera was applied and optimized for separation and determination of gloriosaols and yuccaols in Y. gloriosa. Due to the sensitivity and the repeatability of the assay, we suggest this method as suitable for industrial quality control of raw materials and final products.

Yucca Leaf Protein Inhibits Virus Replication

Yucca leaf protein (YLP) stops the protein synthesis in HSV-infected cells and inhibits virus replication

https://www.ncbi.nlm.nih.gov/pubmed/1322646

Abstract

Yucca leaf protein (YLP), an inhibitor of tobacco mosaic virus isolated from the leaves of Yucca recurvifolia Salisb., exhibited potent activity against herpes simplex virus type 1 (HSV-1) with no cytotoxicity below 300 micrograms/ml. The inhibitory dose was varied with the time of addition; 50% effective concentrations (ED50) of YLP were 3, 19 and 95 micrograms/ml when YLP exposure was begun 3 h before virus infection, 0 h and 3 h after infection, respectively. This protein also inhibited the multiplication of herpes simplex virus type 2 and human cytomegalovirus. YLP has been shown to have a weak virucidal activity at higher concentrations. Analysis of early events following infection showed that YLP affected viral penetration in HeLa cells but did not interfere with adsorption to the cells. YLP was found to exert strong inhibition of protein synthesis in virus-infected cells but not in uninfected cells. This selective effect can be considered to attribute mainly to the antiviral activity of YLP.

Anti-platelet Properties of Yucca

Comparative anti-platelet and antioxidant properties of polyphenol-rich extracts from: berries of Aronia melanocarpa, seeds of grape and bark of Yucca schidigera in vitro

https://www.ncbi.nlm.nih.gov/pubmed/18231940

Abstract

The aim of the present study was to investigate and compare the anti-platelet action of extracts from three different plants: bark of Yucca schidigera, seeds of grape and berries of Aronia melanocarpa (chokeberry). Anti-platelet action of tested extracts was compared with action of well characterized antioxidative and anti-platelet commercial monomeric polyphenol-resveratrol. The effects of extracts on platelet adhesion to collagen, collagen-induced platelet aggregation and on the production of O2-* in resting platelets and platelets stimulated by a strong platelet agonist-thrombin were studied. The in vitro experiments have shown that all three tested extracts (5-50 microg/ml) rich in polyphenols reduce platelet adhesion, aggregation and generation of O2-* in blood platelets. Comparative studies indicate that all three plant extracts were found to be more reactive in reduction of platelet processes than the solution of pure resveratrol. The tested extracts due to their anti-platelet effects may play an important role as components of human diet in prevention of cardiovascular or inflammatory diseases, where blood platelets are involved.

Anti-viral Activity Against Human and Animal Viruses

Antiviral Activity of Resveratrol against Human and Animal Viruses

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4676993/

Abstract

Resveratrol is a potent polyphenolic compound that is being extensively studied in the amelioration of viral infections both in vitro and in vivo. Its antioxidant effect is mainly elicited through inhibition of important gene pathways like the NF-kß pathway, while its antiviral effects are associated with inhibitions of viral replication, protein synthesis, gene expression, and nucleic acid synthesis. Although the beneficial roles of resveratrol in several viral diseases have been well documented, a few adverse effects have been reported as well. This review highlights the antiviral mechanisms of resveratrol in human and animal viral infections and how some of these effects are associated with the antioxidant properties of the compound.

Introduction

Resveratrol (RSV) is a naturally occurring polyphenol stilbene found mostly in fermented grapes, mulberry, red wine, and peanuts. It is available in the trans- and cis-isomer forms; however, the cis-resveratrol isomer is unstable and easily transformed into the trans-form when reacted to light. It is insoluble in water but soluble in polar solvents such as ethanol and dimethyl sulfoxide. Resveratrol scavenges for superoxide and hydroxyl in vitro, as well as lipid hydroperoxyl radicals [1]. Previous studies have shown resveratrol to enhance longevity, regulate lipid levels, and act as a prophylactic compound against cancers and related viral infections [2]. It also attenuates superoxide generation in the mitochondria and inhibits mitochondrial dysfunction induced by arachidonic acid [2, 3]. The antiviral mechanisms and effects of RSV have been widely studied in a number of viruses which include influenza virus, hepatitis C virus [4], respiratory syncytial virus [5–9], varicella zoster virus [10], Epstein-Barr virus [11, 12], herpes simplex virus [13–16], human immunodeficiency virus [17, 18], African swine fever virus, enterovirus, human metapneumonia virus, and duck enteritis virus and in multiple sclerosis, whose animal models can be induced by viral infection. In almost all of these studies, RSV showed remarkable recession of the viral infection with the exception of multiple sclerosis and hepatitis C, where disease progression was worsened following administration of RSV [4, 19].

Conclusion

Resveratrol has shown a high antiviral potential that can be explored in both human and animal viral infections. Its main antiviral mechanisms were seen to be elicited through inhibition of viral protein synthesis, inhibition of various transcription and signaling pathways, and inhibition of viral related gene expressions. Even though there are still limitations on its bioavailability following intake, which is being widely studied, more studies should be focused on its direct use in the amelioration of viral infections in humans and companion animals.

Inhibition of MERS-CoV infection by Resveratrol (RSV)

Effective inhibition of MERS-CoV infection by resveratrol

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5307780/

Abstract

Background

Middle East Respiratory Syndrome coronavirus (MERS-CoV) is an emerging viral pathogen that causes severe morbidity and mortality. Up to date, there is no approved or licensed vaccine or antiviral medicines can be used to treat MERS-CoV-infected patients. Here, we analyzed the antiviral activities of resveratrol, a natural compound found in grape seeds and skin and in red wine, against MERS-CoV infection.

Methods

We performed MTT and neutral red uptake assays to assess the survival rates of MERS-infected Vero E6 cells. In addition, quantitative PCR, western blotting, and immunofluorescent assays determined the intracellular viral RNA and protein expression. For viral productivity, we utilized plaque assays to confirm the antiviral properties of resveratrol against MERS-CoV.

Results

Resveratrol significantly inhibited MERS-CoV infection and prolonged cellular survival after virus infection. We also found that the expression of nucleocapsid (N) protein essential for MERS-CoV replication was decreased after resveratrol treatment. Furthermore, resveratrol down-regulated the apoptosis induced by MERS-CoV in vitro. By consecutive administration of resveratrol, we were able to reduce the concentration of resveratrol while achieving inhibitory effectiveness against MERS-CoV.

Conclusion

In this study, we first demonstrated that resveratrol is a potent anti-MERS agent in vitro. We perceive that resveratrol can be a potential antiviral agent against MERS-CoV infection in the near future.

In our study, we firmly found that resveratrol alone inhibits MERS-CoV infection. Future study will evaluate the potential synergy between resveratrol and other potential anti-MERS-CoV compounds to treat MERS-CoV infections.

RSV Inhibits Emtricitabine (FTC)-resistant HIV-1

Targeting Host Nucleotide Biosynthesis with Resveratrol Inhibits Emtricitabine (FTC)-resistant HIV-1

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4469130/

Abstract

Objective

The M184V mutation in the HIV-1 reverse transcriptase (RT) gene is frequent (> 50 %) in patients, both in resource-rich and resource-limited countries, conferring high-level resistance (> 100-fold) to the cytosine analog RT inhibitors 3TC and FTC. The RT enzyme of M184V HIV-1 mutants has reduced processivity, resulting in reduced viral replication, particularly at low nucleotide (dNTP) levels. We hypothesized that lowering intracellular dNTPs with Resveratrol (RV), a dietary supplement, could interfere with replication of M184V HIV-1 mutants.

Design and Methods

Evaluation of the activity of RV on infection of primary peripheral blood lymphocytes (PBLs) by wild type and M184V mutant HIV-1. We assayed both molecular clones and primary isolates of HIV-1, containing M184V alone and in combination with other RT mutations. Viral infection was quantified by p24 ELISA and by quantitative real-time PCR analysis. Cell viability was measured by MTT assays.

Results

In virus infectivity assays, RV did not inhibit replication of wild-type NL43 (RV EC50 > 10 μM), but it inhibited NL43 184V mutant (RV EC50 = 5.8 μM). These results were confirmed by real-time PCR analysis of early and late products of reverse transcription. RV inhibited molecular clones and primary isolates carrying M184V, alone or in combination with other RT mutations (RV EC50 values ranging 2.5–7.7 μM).

Conclusions

RV inhibits HIV-1 strains carrying the M184V mutation in RT. We propose RV as a potential adjuvant in HIV-1 therapy, particularly in resource limited settings, to help control FTC-resistant M184V HIV-1 mutants.

Discussion

The dietary supplement RV modulates cell proliferation by inhibiting ribonucleotide reductase, preferentially depleting dATP and prolonging the cellular S phase [1, 2]. RV inhibition of cell proliferation is more potent in cancer cells (EC50 < 10 μM) than in normal cells or PBLs (EC50 >10 μM) [11, 12]. We have previously demonstrated that RV, which had no direct antiviral effects against wild-type HIV-1 or against thymidine or adenosine analog-resistant mutants,

enhances the antiviral activity of NRTIs [3, 4]. Clouser et al. have shown that RV and nucleoside analog decitabine are synergistic against HIV-1 [13].

We now demonstrate that treatment with RV alone is sufficient to inhibit HIV-1 mutants with the M184V mutation, present in > 50 % of treated patients [14]. RV inhibited viruses carrying M184V, singly or in combination with other mutations. These data are consistent with reduced processivity of 184V mutant RT [7], particularly at low dNTP levels [8, 9]. The decreased processivity of 184V RT mutants confers a viral replication disadvantage that has clinical benefit [15]. As such, maintenance of the M184V mutation is considered to be clinically useful to sustain this replication disadvantage even in the presence primary drug resistance. Our data suggest that RV could be used as an adjuvant in the treatment of HIV-1, helping to control replication of drug-resistant M184V mutants. In addition to this anti-HIV activity, adjuvant treatment with RV may be beneficial to HIV-1 patients by decreasing oxidative stress induced by thymidine analogs [16], and by decreasing protease inhibitor toxicity [17].

RV administration has shown no significant toxicity in humans [18, 19]. However, one caveat with its use is low bioavailability, with rapid metabolism into glucuronides and sulfates [20, 21]. Despite low bioavailability, it is intriguing that RV has shown beneficial effects in the treatment of some cancers, diabetes and cardiovascular disease, both in animals and in humans [18, 19]. It is possible that RV metabolites (mainly glucuronides and sulfates) may be converted back to active RV by cellular esterases and sulfatases [20, 21]. It is also possible that enterohepatic recirculation through biliary secretion of metabolites and subsequent deconjugation by gut microflora could explain the in vivo activity of RV [22]. In an effort to boost RV bioavailability, several derivatives and delivery approaches are being pursued [13, 23, 24].

Together, adjuvant treatment with RV, or with more bioavailable derivatives, may increase antiretroviral treatment success in patients by helping control replication of highly prevalent FTC-resistant M184V HIV-1 mutants.

RSV Influences the Immune Response

Influence of Resveratrol on the Immune Response

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6566902/

Abstract

Resveratrol is the most well-known polyphenolic stilbenoid, present in grapes, mulberries, peanuts, rhubarb, and in several other plants. Resveratrol can play a beneficial role in the prevention and in the progression of chronic diseases related to inflammation such as diabetes, obesity, cardiovascular diseases, neurodegeneration, and cancers among other conditions. Moreover, resveratrol regulates immunity by interfering with immune cell regulation, proinflammatory cytokines' synthesis, and gene expression. At the molecular level, it targets sirtuin, adenosine monophosphate kinase, nuclear factor-kB, inflammatory cytokines, anti-oxidant enzymes along with cellular processes such as gluconeogenesis, lipid metabolism, mitochondrial biogenesis, angiogenesis, and apoptosis. Resveratrol can suppress the toll-like receptor (TLR) and pro-inflammatory genes' expression. The antioxidant activity of resveratrol and the ability to inhibit enzymes involved in the production of eicosanoids contribute to its anti-inflammation properties. The effects of this biologically active compound on the immune system are associated with widespread health benefits for different autoimmune and chronic inflammatory diseases. This review offers a systematic understanding of how resveratrol targets multiple inflammatory components and exerts immune-regulatory effects on immune cells.

Conclusions

There is an abundance of experimental studies highlighting the regulatory mechanisms and the immunomodulatory role of resveratrol both in vivo and in vitro. These data reveal the promising role of resveratrol in the prevention and therapy of a wide variety of chronic diseases including cardiovascular, inflammatory, metabolic, neurological and skin diseases, and various infectious diseases (Figure 1). There are also increasing lines of evidence suggesting it has a potent chemosensitizing effect in various cancers. These studies show that resveratrol modulates many cellular and molecular mediators of the inflammatory response. Nevertheless, a few studies have reported that resveratrol can function as an antagonistic as well. Its effects are context-dependent (i.e., resveratrol might influence chemokines and cytokines in opposite ways in different tissues). Although, preclinical studies produced exciting results, nowadays many questions remain unanswered about the usage of resveratrol in the clinical setting just because the clinical evidence indicating that resveratrol is an effective therapeutic in humans are still lacking. Moreover, some official systematic clinical trials using resveratrol treatment in humans had some disappointing outcomes and the difficulties of the clinical application of resveratrol are enormous, such as its poor water solubility, bioavailability, and dosage. Therefore, various strategies are being implemented, which include the development of

resveratrol analogues [138] and formulations such as adjuvants, nanoparticles, liposomes, micelles, and phospholipid complexes, to improve its bioavailability. In addition, several other approaches have been employed to enhance its bioavailability, which include altering the route of administering resveratrol and obstructing the metabolic pathways via co-treatment with other agents. In fact, since resveratrol has multiple intracellular targets, additional data is needed to determine the consequences of the interaction or the synergistic effects between other polyphenols and vitamins, amino acids and other micronutrients or ordinarily used drugs. More detailed and well-controlled preclinical and clinical trials are inevitable to evaluate the efficacy of these new formulations as compared with the parental compound. Therefore, further studies in humans are required to improve its bioavailability and to clarify the mechanisms of action of resveratrol in several physiological conditions in order to make this agent a cutting-edge therapeutic strategy for the prevention and treatment of a wide variety of autoimmune and inflammatory chronic diseases.

RSV's Role in Autoimmune Disease

Resveratrol Role in Autoimmune Disease—A Mini-Review

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5748756/

Abstract

Autoimmune diseases are still considered to be pressing concerns due the fact that they are leaders in death and disability causes worldwide. Resveratrol is a polyphenol derived from a variety of foods and beverages, including red grapes and red wine. Anti-inflammatory, antioxidant, and antiaging properties of resveratrol have been reported, and in some animal and human studies this compound reduced and ameliorated the progression of autoimmune diseases, such as rheumatoid arthritis, systemic lupus erythematosus, psoriasis, inflammatory bowel disease, and type 1 diabetes mellitus. Thus, this review aims to summarize and critically analyze the role of resveratrol in the modulation of several organ-specific or systemic autoimmune diseases.

Concluding Remarks

In this review, we included some evidence of antioxidant and immunomodulatory effects for some autoimmune diseases that are directly and indirectly mediated by resveratrol, especially by modulating the immune system and interfering with multiple cellular and molecular processes. Resveratrol is capable of inhibiting T-cell differentiation, especially by inhibiting key cytokines, such as TNF-a, IL-17, IL-6, and IL-1ß. This compound is also key in the inhibition of inflammatory transcription factors, such as NF-kB and SIRT1—major regulators of the inflammatory response in some autoimmune diseases. Oxidative stress is other mechanism in which resveratrol is involved. It acts as a direct antioxidant by neutralizing ROS and also improves some antioxidant enzyme activity. In addition, resveratrol also inhibited autoantibody production by plasma cells, which are key factors in the progression of some autoimmune diseases. However, these effects were minimized by the high degree of heterogeneity by the approach of investigators in the in vivo studies, due to the lack of a standard model for these diseases in animals, lack of standardization in the design and duration of treatment, and the lack of agreement on the effective and tolerated dose. In terms of intervention, few studies have addressed the efficacy of resveratrol in autoimmune diseases in humans, making it difficult to obtain concrete evidence of the effect of this antioxidant. Overall, resveratrol appears to be a potent new drug for the therapy of these diseases. However, some barriers have to be overcome, such low bioavailability and adverse effects, as well as the effect of resveratrol administration on patient outcomes. These outcomes are limited by sample size, large range of dosage levels, and various populations and groups studied, although some studies have tried to increase bioavailability by encapsulation with delivery systems. Therefore, more studies and clinical trials should be performed to fully elucidate the beneficial effects of resveratrol supplementation on autoimmunity, as well as its toxic effects on human health.

Yucca Lectin as Potential Preventative of H1N1 Virus

Molecular modeling, docking and dynamics simulations of GNA-related lectins for potential prevention of influenza virus (H1N1)

https://www.ncbi.nlm.nih.gov/pubmed/21445708

Abstract

The Galanthus nivalis agglutinin (GNA)-related lectin family exhibit significant anti-HIV and anti-HSV properties that are closely related to their carbohydrate-binding activities. However, there is still no conclusive evidence that GNA-related lectins possess anti-influenza properties. The hemagglutinin (HA) of influenza virus is a surface protein that is involved in binding host cell sialic acid during the early stages of infection. Herein, we studied the 3D-QSARs (three-dimensional quantitative structure-activity relationships) of lectin- and HA-sialic acid by molecular modeling. The affinities and stabilities of lectin- and HA-sialic acid complexes were also assessed by molecular docking and molecular dynamics simulations. Finally, anti-influenza GNA-related lectins that possess stable conformations and higher binding affinities for sialic acid than HAs of human influenza virus were screened, and a possible mechanism was proposed. Accordingly, our results indicate that some GNA-related lectins, such as Yucca filamentosa lectin and Polygonatum cyrtonema lectin, could act as drugs that prevent influenza virus infection via competitive binding. In conclusion, the GNA-related lectin family may be helpful in the design of novel candidate agents for preventing influenza A infection through the use of competitive combination against sialic acid specific viral infection.

Yucca Saponins in Prevention of Rotavirus

Prevention of rotavirus infections in vitro with aqueous extracts of Quillaja Saponaria Molina (saponins similar to those in yucca plants)

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2921663/

Abstract

Background

Rotavirus is the leading cause of severe diarrhea disease in newborns and young children worldwide, estimated to be responsible for over 300,000 childhood deaths every year, mostly in developing countries. Rotavirus-related deaths represent approximately 5% of all deaths in children younger than 5 years of age worldwide. Saponins are readily soluble in water and are approved by the US FDA for inclusion in beverages intended for human consumption. The addition of saponins to existing water supplies offers a new form of intervention into the cycle of rotavirus infection. We believe that saponins will 'coat' the epithelium of the host's small intestine and prevent attachment of rotavirus.

Discussion

This experiment provides in vitro data for the possibility of including saponin in drinking water to prevent infections of rotavirus. We demonstrate that microgram amounts of extract, while exhibiting no cell cytotoxicity or direct virucidal activity, prevent rotavirus from infecting its host cells. In addition, the presence of residual amounts of extract continue to block viral infection and render cells resistant to infection for at least 16 h after the removal of the extract from the cell culture media.

Conclusion

We demonstrate that two Quillaja extracts possess strong antiviral activity at concentrations more than 1000-fold lower than concentrations exhibiting cell cytotoxicity. Extract concentrations as high as 1000 μg/ml are not cytotoxic, but concentrations as low as 1.0 μg/ml are able to block rotavirus and reovirus attachment and infection.

Yucca used as Cholinesterase Inhibitor

Yuccalechins A–C from the Yucca schidigera Roezl ex Ortgies Bark: Elucidation of the Relative and Absolute Configurations of Three New Spirobiflavonoids and Their Cholinesterase Inhibitory Activities

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6891570/

Abstract

The ethyl acetate fraction of the methanolic extract of Yucca schidigera Roezl ex Ortgies bark exhibited moderate acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) inhibitory activity (IC50 47.44 and 47.40 µg mL-1, respectively). Gel filtration on Sephadex LH-20 and further RP-C18 preparative HPLC of EtOAc fraction afforded 15 known and 3 new compounds, stereoisomers of larixinol. The structures of the isolated spirobiflavonoids 15, 26, and 29 were elucidated using 1D and 2D NMR and MS spectroscopic techniques. The relative configuration of isolated compounds was assigned based on coupling constants and ROESY (rotating-frame Overhauser spectroscopy) correlations along with applying the DP4+ probability method in case of ambiguous chiral centers. Determination of absolute configuration was performed by comparing calculated electronic circular dichroism (ECD) spectra with experimental ones. Compounds 26 and 29, obtained in sufficient amounts, were evaluated for activities against AChE and BChE, and they showed a weak inhibition only towards AChE (IC50 294.18 µM for 26, and 655.18 µM for 29). Furthermore, molecular docking simulations were performed to investigate the possible binding modes of 26 and 29 with AChE.

A great number of phenolic compounds have been identified as candidates for AD treatment [25,31,32]. They constitute of one of the widest chemical classes amongst plant secondary metabolites. To date, phenolic substances have been identified with many pharmacological effects including antioxidant, anti-inflammatory, antimutagenic, chemopreventive, anticancer, and antiviral activities. Some plant phenolics have been demonstrated to inhibit both AChE and BChE to varying extents. Most of these studies focused on in vitro tests, and only few studies were performed on insects, tissue, and animal models, with rarely any clinical studies [33]. Phenolics, besides their AChE and BChE inhibitory activities, also have very important antioxidant activity, which may enhance their protective effects. It has been proven that oxidative stress caused by reactive oxygen species (ROS) is involved in the aging processes. It has been suggested that free radicals damage mitochondria in certain areas of the brain that are particularly important for memory and cognitive processes and are associated with the pathogenesis of AD [34,35,36]. Hence, supplementation of the diet with antioxidants in people may reduce the risk of AD [34]. This was a major point of a number of studies performed on plants with high antioxidant potential [37]. Moreover, numerous reports indicated multitarget effects of resveratrol on AD [25]. Resveratrol oligomers showed a significant AChE/BChE inhibitory activity [38], and it was suggested to be used as a starting compound in the design of

multitargeted drugs for the treatment of AD [39]. The diverse biological effects of the constituents of Y. schidigera bark encouraged us to investigate further the structurally related compounds using modern chromatographic and spectroscopic techniques.

Discussion

The multistep purification of Yucca schidigera bark led to the isolation of three new spirobiflavonoids and confirmed the presence of numerous phenolic compounds, among which aromadendrin, naringenin, yuccalide A, and gloriosaols A and C–E are reported for the first time in this plant. Structures of isolated compounds were elucidated using various spectroscopic methods, including HRESIMS, UV, and ECD spectroscopy and optical rotations. For the new compounds, the relative configuration was established based on NMR chemical shifts, H–H and C–H coupling constants, DP4+ probability calculations, and NOE effects observed in the 2D-ROESY NMR spectra. Here, we report for the first time the usage of 1JCH, 2JCH, and 3JCH coupling constants in the determination of relative stereochemistry of flavan-3-ols and spirobiflavonoids. Additionally, the absolute configuration of chiral spirobiflavonoids has been described for the first time using ab initio calculations of ECD spectra. The identification of stereochemistry of such compounds reported so far was based on a comparison of the ECD spectra with larixinol (abiesinol E), which possesses the 2?R,3?R,2R,3R absolute configuration established by the X-ray crystallographic analysis [19], or chemical methods [20]. Our work, to the best of our knowledge, is the first report on the cholinesterase inhibitory activity of spirobiflavonoids. Tested compounds, yuccalechins B (26) and C (29), turned out very weak, but they were selective inhibitors of AChE.

Conclusion

This scientific review is just a small sample of the research that has already been completed that includes the yucca plant and its beneficial compounds. The primary goal in compiling this brief review and submitting it to you is to bring awareness of the proven medical benefits of yucca and for this awareness to be a catalyst for more investigation into the antiviral uses of the yucca plant.

This review can be found online at: https://NaturalYuccaProducts.com/ScientificReview