



Review on Phytochemicals with their biological roles?

Shweta Sharma*

Department of Chemistry and Biochemistry, Vikram University, Ujjain (M.P.) India

*Corresponding author: sharma.harshali10@gmail.com

Abstract

Phytochemicals are non-nutritive, secondary metabolites of plants that have protective or disease preventive properties. Mostly these are non-essential nutrients, are found in fruits, vegetables, whole grains, legumes, beans, herbs, spices, nuts, and seeds and are classified according to their chemical structures and functional properties. Some of the well-known phytochemicals are lycopene in tomatoes, isoflavones in soy and flavanoids in fruits. Foods containing phytochemicals are already part of our daily diet. The same have been reported for their anti-oxidative, anti-diabetic, anti-cancer, anti-inflammatory activities. Some of these knowm compounds are reviewed here.

Keywords: Phytochemicals, antioxidants, flavanoids, plants, secondary metabolites.

Introduction

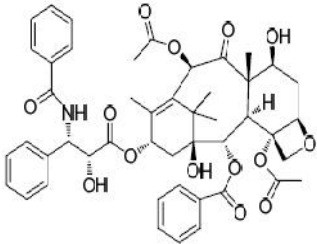
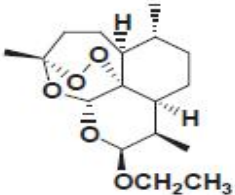
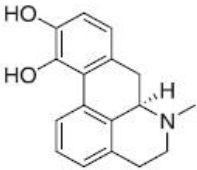
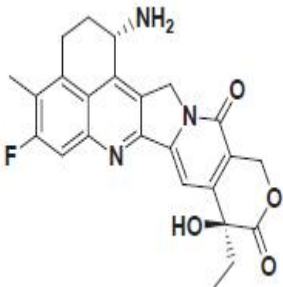
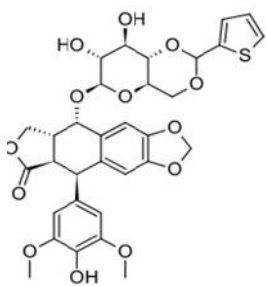
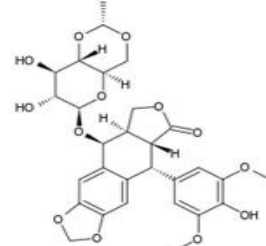
During normal metabolic reactions plants synthesizes a number of primary and secondary metabolites. Primary metabolites are used by plants but secondary metabolites are not-required by plants. These secondary metabolites have various pharmacological or biological activity for use in pharmaceutical drug discovery and drug design. These are extracted from tissues of plants or micro-organism or fermentation broths. Today's most of the medicines are obtained

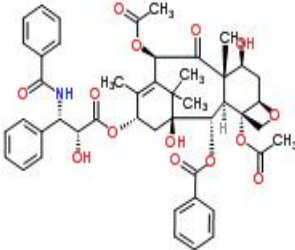
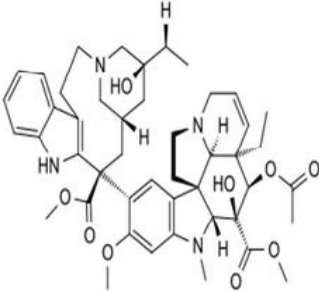
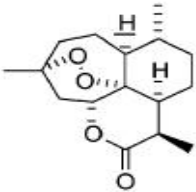
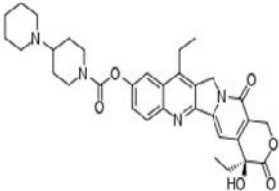
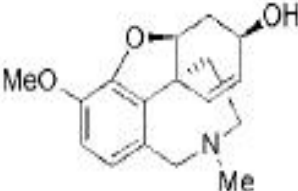
directly from a natural source. Plants have been utilized as medicines for thousands of years.'

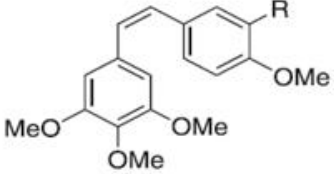
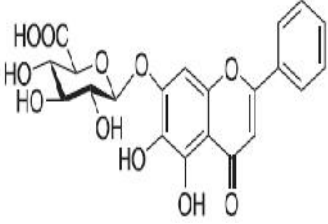
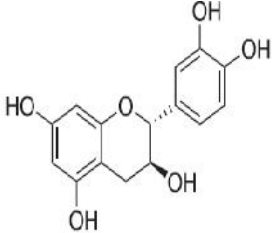
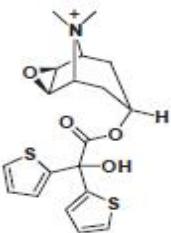
The aim of this review paper to sum up the recent, various evidences for protective and health-promoting effects of phytochemicals those have the potential of being included into foods or food supplements, or into pharmaceuticals, discovery and use of phytochemicals as nutraceuticals. A number of plants with their effective metabolites have been studied which are summarized in the present review article.

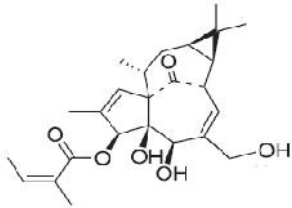
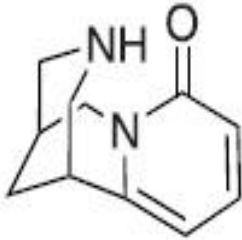
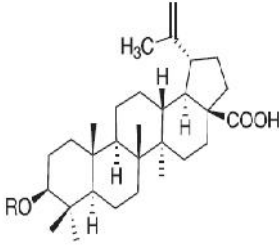
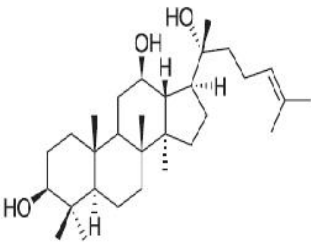
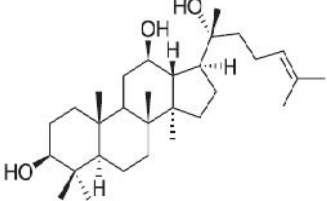
(Table-1.1) Traditional medicinal practices have formed the basis of most of the early medicines followed by subsequent clinical, pharmacological and chemical studies for examples are as follow:

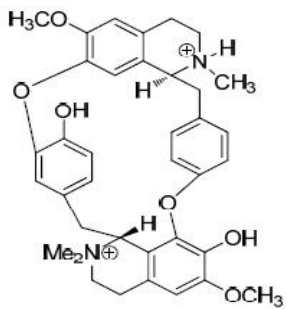
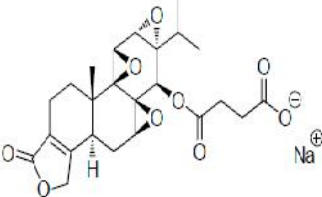
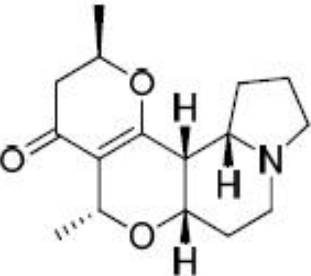
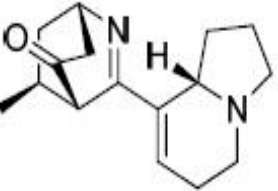
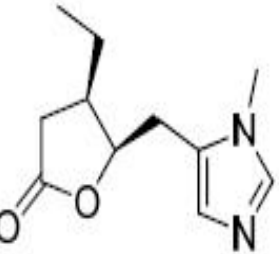
Phytochemical	Derived from the plant	Cure disease	Structure of compounds	Reference
Morphine	<i>Opium poppy</i> ⁸	Painkiller		8.

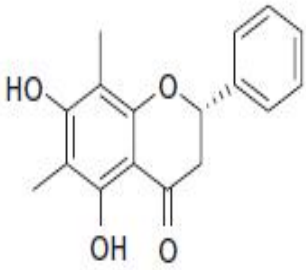
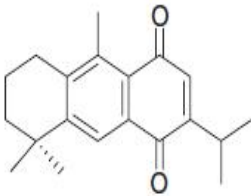
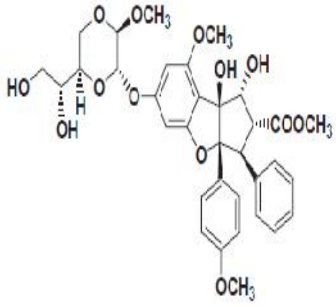
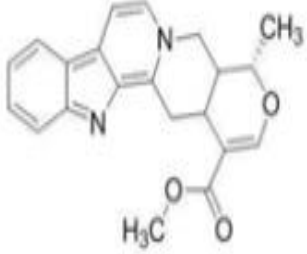
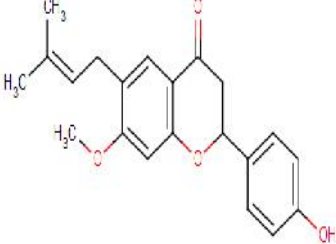
<p>Paclitaxel (Taxol®)</p>	<p>The bark of <i>Taxus brevifolia</i> (Pacific Yew)⁹</p>	<p>Breast cancer drug, active chemotherapeutic agents in lung cancer</p>	
<p>Arteether, is a semi synthetic derivative of artemisinin.¹⁰</p>	<p><i>Artemisia annua</i> L. (Asteraceae)</p>	<p>Antimalarial drug</p>	
<p>Apo-morphine (4, Apokyn)</p>	<p>Synthetic derivative of morphine (1) & derivative triptolide¹¹</p>	<p>Treatment for parkinson's disease</p>	
<p>tecan</p>	<p><i>Camptotheca acuminata</i> Decne.</p>	<p>An anticancer agent¹³</p>	
<p>Teniposide</p>	<p><i>Podophyllum</i> species</p>	<p>It is used for testicular and lung cancer.¹⁴</p>	
<p>Etoposide</p>			

Taxol	<i>Taxus brevifolius</i>	It is used for the treatment of breast cancer, metastatic ovarian cancer and lung cancer ¹⁵ .		15.
Vinblastine	<i>Catharanthus roseus</i> ¹⁶	It is used for the treatment of hodgkins, choriocarcinoma, non-hodgkins lymphomas, leukemia in children, testicular and neck cancer.		16.
Artemisinin	<i>Artemisia annua</i> .	It is used to treat fever. ¹⁷		17.
Irinotecan (Campto®)	<i>Camptoteca acuminata</i> . ^{18, 19}	It is a drug used for the treatment of cancer.		18, 19.
Derived from the plant		Cure disease	Structure of compounds	Reference
<i>Galanthus woronowii</i> Losinsk.		Symptomatic treatment of patients with early-onset alzheimer's disease ²⁰ .	 Galantamine	20.

<p><i>Combretum caffrum</i> Kuntze</p>	<p>Treat anaplastic thyroid cancer in combination with other anticancer drugs and also for myopic muscular degeneration, both in phase II clinical trials^{21,22}. It is a vascular targeting agent that functions by destroying existing tumor vasculature by inducing morphological changes within the endothelial cells</p>	 <p>6R = OPO₃Na₂</p> <p>CombretastatinA4 phosphate</p>	<p>21, 22.</p>
<p>A plant-derived compound</p>	<p>Flavocoxid is currently undergoing a phase I clinical trial in the USA for the treatment of knee osteoarthritis.²³</p>	 <p>(16) Baicalin</p>	<p>23.</p>
<p><i>Cathechin</i> <i>Mimosa catechu</i> (<i>Acacia catechu</i> L.f)</p>	<p>Combination of green tea catechins and anticancer drugs.²⁴</p>	 <p>(17) Catechin</p>	<p>24.</p>
<p><i>Atropa belladonna</i> L. (Solanaceae)</p>	<p>Chronic obstructive pulmonary disease (COPD)^{25,26}</p>	 <p>Tiotropium</p>	<p>25, 26.</p>

<p><i>Euphorbia peplus</i> L.</p>	<p>Skin conditions such as warts and actinic keratoses²⁷</p>	 <p>Ingenol 3-angelate</p>	<p>27.</p>
<p><i>Cytisus laburnum</i> L.</p>	<p>To treat tobacco dependence in eastern Europe²⁸</p>	 <p>Cytisine</p>	<p>28.</p>
<p>Korean ginseng (<i>Panax ginseng</i> C. A. Mey.)</p>	<p>Apoptotic effects on cancer cells through various signaling pathways, and has also been reported to be cytotoxic against multidrug-resistant tumors²⁹</p>	 <p>Protopanaxadiol</p>	<p>29.</p>
<p>It is widely distributed in the plant kingdom, along with various derivatives</p>	<p>Anticancer, antibacterial, antimalarial, anti-HIV, anthelmintic, anti-inflammatory, and antioxidant properties³⁰</p>	 <p>Betulinic acid R=H</p>	<p>30.</p>
<p>Derived from betulinic acid</p>	<p>Antiretroviral drug³¹</p>	 <p>Bevirimat</p>	<p>31.</p>

<p>Climbing plant, <i>Chondrodendron tomentosum</i></p>	<p>A muscle relaxant in surgical operations, reducing the need for deep anesthesia.</p>	 <p>Tubocaurarine</p>	<p>32.</p>
<p><i>Tripterygium wilfordii</i></p>	<p>Autoimmune and inflammatory diseases in the People's Republic of China^{33,34}</p>	 <p>PG490-88</p>	<p>33, 34.</p>
<p>Australian rainforest tree, <i>Elaeocarpus grandis</i>.</p>	<p>An unusual combination of isoquinuclidinone and indolizidine ring systems. Both 26 and 27 exhibit binding affinity for the human μ-opioid receptor and are potential leads for analgesic agents³⁵.</p>	 <p>Grandisines A</p>  <p>Grandisines B</p>	<p>35.</p>
<p><i>Pilocarpus jaborandi</i> (Rutaceae)</p>	<p>Eye drops are used for treating glaucoma. Pilocarpine tablets are used for treating dry mouth due to radiation treatment or dry mouth and dry eyes due to a condition called sjogren's syndrome.³⁶</p>	 <p>Pilocarpin</p>	<p>36.</p>

<p>The root extract of <i>Bauhinia purpurea</i> L. (Leguminosae).</p>	<p>Antimalarial activity, demethoxymatteucinol (29) (IC₅₀ = 9.5 mm against K1).³⁷</p>	 <p>Demethoxymatteucinol</p>	<p>37.</p>
<p><i>Zhumeria majdae</i> Rech. F.& Wendelbo (Lamiaceae)</p>	<p>Antiplasmodial activity with IC₅₀ values of 4.4 and 4.7 mm against D6 and W2 strains, respectively. This compound was further found to have mild cytotoxicity towards cancer cell lines (IC₅₀ = 15.2–50.6 mm).³⁸</p>	 <p>12,16-dideoxy-aegyptinone B</p>	<p>38.</p>
<p><i>Aglaiia sylvestris</i> (M. Roemer) Merrill (Meliaceae) (later re-identified as <i>Aglaiia foveolata</i> Pannell)³⁹</p>	<p>Silvestrol was cytotoxic against lung, prostate, and breast cancer cells as well as against umbilical vein endothelial cells (HUVEC, ED₅₀=4.6 nm).</p>	 <p>Silvestrol</p>	<p>39.</p>
<p><i>Rauwolfia serpentina</i>³²</p>	<p>It is used in the treatment of hypertension and lowering of blood pressure.</p>	 <p>Serpentine</p>	<p>32.</p>
<p><i>Fructus psoraleae</i>.</p>	<p>Bavachinin significantly reduces asthmatic inflammation and hyper responsiveness through the selective inhibition of Th2 cytokine production and cardiovascular disease.⁴⁰</p>	 <p>Bavachinin</p>	<p>40.</p>

Discussion

Although plants are used indigenously by people of many continents for a long time, only recently has scientifically supported nutritional and medical evidence allowed phytonutrients to come out as being potentially effective. The 'new' nutraceuticals of plant origin may be considered a vital aspect of dietary disease-preventive food components. Careful studies are being done on the various phyto-nutrients for their roles in the prevention of diseases. The given information might be useful.

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How to cite this article:

Shweta Sharma. (2017). Review on Phytochemicals with their biological roles?. Int. J. Adv. Res. Biol. Sci. 4(1): 69-77.

DOI: <http://dx.doi.org/10.22192/ijarbs.2017.04.01.008>