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A Systemic review on Antioxidant Potential of Berries used in Imuuxanth by Renatus

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Abstract

Food items which are plant based such as Berries, Vegetables and Fruit have significant effects on health, they pertain potential to boost up immune system. There have been researches and documents journaled supporting roles of phytochemicals extricated from berries in modulation of immune system. The primary phytochemicals in berry fruits are phenolic composites including flavonoids (anthocyanins, flavonols, flavones, flavanols, flavanones, and isoflavonoids), tannins, and phenolic acids. The presence of unequivocal Amount of polyphenols makes berries active against oxidative stresses (Antioxidant) and inflammation (Anti-inflammatory) in reverberations these berries show therapeutics such as Antidiabetics, Anticancerous, Anti-neurological muddles. This review examines berries which were used in imuuxanth formulation developed by Renatus Wellness: blackberries, blackcurrants, blueberries, cranberries, raspberries, black raspberries, and strawberries and their polyphenols having antioxidant potential Nevertheless, future clinical trials are required to study and improve the bioavailability of berries' phenolic compounds and extend the evidence that the active compounds of berries can be used as medicinal foods against various diseases.

Keywords: Antioxidant, Berries, Imuuxanth, Renatus

Background

According to botanical terminology, a berry is a simple fruit with seeds and pulp produced from the ovary of a single flower with a fleshy pericarp, the term "berry" is also commonly used to refer in general to a small, pulpy and often edible fruit. Blueberries may be categorized as berries under both definitions, but grapes are berries only according to the botanical definition. Moreover, while strawberries and blackberries are typically referred to as berries, they are not officially categorized as such [1]

Berries belong to several families, although the two key examples are the Rosaceae, including black chokeberry (Aronia melanocarpa), strawberry (Fragaria ananassa), red raspberry (Rubus ideaus), black raspberry (Rubus occidentalis), blackberry (Rubus fruticosus) and cloudberry (Rubus chamaemorus), and the Ericaceae, including cranberry (Vaccinium macrocarpon), bilberry (Vaccinium myritillus), lowbush blueberry (Vaccinium angustifolium), highbush blueberry (Vaccinium corymbosum). Examples of berries from other families include blackcurrants (Ribes nigrum; family: Grossulariaceae), sea buckthorn (Elaaagnus rhamnoides (L.); family: Elaeagnaceae) and grapes (Vitis; family: Vitaceae).[2]

Numerous studies and reviews have reported on the relationship between fruit input and health. Some berries are presently used as constituents in functional foods and salutary supplements. Berries are rich in nutrients and phytochemicals, which have been proven to ameliorate health and help variegated habitual conditions during in vivo and in vitro studies

The primary phytochemicals in berry fruits are phenolic compounds including flavonoids (anthocyanins, flavonols, flavones, flavanols, flavanones, and isoflavonoids), tannins, and phenolic acids [3].

Berries are not only a source of non- nutritional mixes, including phenolics, but are also a rich source of wide variety of nutritive mixes, including sugars (glucose, fructose) and minerals (phosphorus, calcium, iron, potassium, magnesium, manganese, sodium and bull In addition, iron and manganese are important factors of antioxidant enzymes. Berries contain a large amount of the vitamins A, C and E, which act as antioxidants and may reduce the inflammation process [4].

Blueberries have antioxidant andanti-inflammatory goods and also retain neurocognitive benefits. The consumption of blueberry juice bettered memory function in aged grown-ups with early memory decline [5]. Black snorts are sources of phenolic composites similar as ellagic acid and anthocyanins that have implicit cancer chemopreventive exertion, verified from the results of mortal clinical trials[6]. Blackcurrant greasepaint reduced the exertion of some colon cancer labels by acting as a prebiotic agent [7]. The antioxidant andanti-inflammatory parcels of strawberries (due to their high content of bioactive composites similar as vitamins and phenols) has been displayed in several in vitro and in vivo studies [8]. This review examines generally consumed berries blackberries (Rubussp.), blackcurrants (Ribes nigrum), blueberries (Vacciniumsp.), cranberries (Vaccinium macrocarpon), snorts (Rubus idaeus), black snorts (Rubus occidentalis), and strawberries(Fragaria ananassa) and their polyphenols as implicit medicinal foods(due to the presence of pharmacologically active composites) in the treatment of varied conditions and diseases These berries were implicated by Imuuxanth offered by Renatus Wellness as powerful antioxidant Drink and immune system booster. These berries are precisely arranged. The biologically active factors of berries retain antioxidant, antihyperlipidemic, antihypertensive, andanti-proliferative goods and anti-inflammatory, antibacterial, and antiviral responses[9]. Polyphenols have a low bioavailability. Adding their bioavailability can reduce the number of biotransformations of active composites in the gastrointestinal tract and ameliorate the health benefits of berries [10]. This review discusses the studies conducted in vivo which consider the berries' polyphenol bioavailability. Hence, this comprehensive review shows that berries and their bioactive composites retain medicinal parcels and remedial eventuality.

Some important Phenolic compounds

Anthocyanins

Anthocyanins confer the blue, florid and red color of numerous fruits, including berries. still, berry anthocyanins aren't only responsible for fruit color, but also may be used as natural colors for the food assiduity[11].In addition, anthocyanins are known to be one of the most important natural antioxidants. Berries are one of the richest sources of anthocyanins among all the fruits [12] and are set up at the loftiest attention in the skins of berries. Anthocyanins correspond of an sweet ring clicked to a heterocyclic ring containing oxygen, which is also clicked by a carbon- carbon bond to a third sweet ring. They can be classified into six forms grounded on the presence of hydroxyl and methoxyl negotiations on the B- ring cyanidin, malvidin, peonidin, petunidin, pelargonidin and delphinidin [13].

Lee et al. (2015) [14] noted that the total antioxidant capacity of berries rich in distinct anthocyanins is derived from both anthocyanin composition and the antioxidant capacity of individual anthocyanins

Other Phenolic Compounds

A wide range of other secondary composites are also available in different types of berries. Strawberries, blueberries and chokeberries which are rich sources of flavon-3-ols, while red raspberries and black currant berries give high situations of similar tannins as ellagitannins. In addition, berries are good sources of similar phenolic acids as ellagic acid, chlorogenic acid and gallic acid blueberry, for illustration, contains up to 2 g/ kg FW of chlorogenic acid [15]. The absorbance rate varies depending on the type of acid, with chlorogenic acid being inadequately absorbed, and gallic acid fleetly absorbed. Ellagic acid represents about 50 of the total phenolic composites in cranberries and snorts [16]. In addition, both berries rich in resveratrol, which belongs to the group of stilbenes?

Other authors have reported that berry seeds may be a source of phenolic compounds: grape seeds were found to contain various phenolic acids including gallic acid, p-qumaric acid and ferulic acid [17]. Duba and Fiori (2015) [18] have also reported a large amount of phenolic acids, flavonoids, tannins and stilbenes in grape seed oil, with the main phenolic components being epicatechins, catechins, procyanidins and resveratrol [19]. The total amounts of phenolic compounds extracted.

In grape seed oil obtained by cold- pressing is about 2.9 mg/ kg; this quantum includes small quantities of resveratrol(0.3 mg/ kg), catechin and epicatechin (1.3 mg/ kg) [20]. Another source of phenolic composites, including thE flavonoids rutin and quercetin, is ocean buckthorn oil painting uprooted from the berry pulp and seeds [21]. Numerous phenolic composites are set up in the small seeds on the outside of strawberries; their antioxidant value is about 14 of the entire value of the fruit. Analogous bioactive composites, including phenolic composites, are set up in berries and berry leaves, i.e., fresh and dried leaves of sea buckthorn have different anthocyanins and flavonoids, similar as gallocatechin and epicatechin [22]. Berry leaves are one of the richest sources of chlorogenic acid.

Oxidative Stress Suppression by Different berries

The formation of high amounts of free radicals may generate oxidative stress, leading to many degenerative disorders and aging. The antioxidant property of berries connects with active oxygen radical scavengers such as vitamin C, phenolic compounds, and carotenoids. The antioxidant capacity of berries is four times higher than other fruits and ten times higher than vegetables. Studies have confirmed that strawberries' antioxidant ability closely correlates with their potent phenolic compounds and vitamin C content [23]. Vitamin C is the essential antioxidant component in strawberries, followed by anthocyanins and then hydroxycinnamic acids (mainly p-coumaric acid derivatives and flavanols) [24]. Strawberry consumption increases plasma antioxidant capacity, reduces oxidative damage of plasma proteins and increases vitamin C levels in the serum [25]. Moreover, strawberry extracts prevent ethanol-induced gastric damage in vivo. Therefore, a diet rich in strawberries positively improves gastric diseases caused by oxidative damage [26]. Raspberries exhibit many antioxidant components and possess high radical scavenging activity. Lyophilized aqueous extracts of different types of raspberries contain p-coumaric acid, which is mainly responsible for free radical scavenging of raspberries [27] . Anthocyanins, ellagitannins, and polyphenols also showed antioxidant and tumor proliferation inhibitory activities [28]. Studies show that the 75% antioxidant capacity of raspberries is associated with anthocyanins and ellagitannins [29]. Cyanidin 3-rutinoside and cyaniding 3-xylosylrutinoside are found in black raspberries in the highest concentration [30] and are its primary antioxidants which, together with the other bioactive constituents of black raspberries, show potential biological activity in clinical trials for the therapy ofvarious types of cancer [31].

Blueberries contain high amounts of polyphenols, procyanidins, and anthocyanins, have high antioxidant properties, and reduce oxidative stress. They work as radical scavengers and help prevent various diseases, including cancer [32]. The antioxidant capability of blueberries is higher in the early ripening set than in ripe berries due to the higher concentrations of hydroxycinnamic acid and flavonols in immature berries [33]. Hydroxycinnamic acids and anthocyanins of blueberries effectively reduce oxidative stress in endothelial cells and ovarian, murine melanoma, and cervical cancer cell lines [34]. In addition, inscribed significant increases in the hydrophilic and lipophilic antioxidant capacity of human plasma following the ingestion of blueberries [35]. The antioxidant properties of blackcurrant are mainly associated with anthocyanins [36]. Nour and his co-workers [37] indicated a high correlation between antioxidant activity and the total concentration of anthocyanins. Phenolics are a significant contributor to antioxidant activity in blackcurrants, but vitamin C also makes an essential contribution to antioxidant activity.

Blackcurrant is high in ascorbic acid (50 to 280 mg/100 g) and flavonoids content, which increases both the antioxidant capacity of the berries and their potential to help health benefits[38]. Human and animal studies have shown the effects of blackcurrants on athletic training and performance. Blackcurrants lower oxidative stress-related injuries that can cause fatigue and damage. Thus, blackcurrants are likely an essential source of antioxidants for the human diet [39]. Cranberries are one of the best antioxidants among berries due to phytochemicals such as benzoic and cinnamic acid derivatives and flavonols. The anthocyanins and flavanols of cranberries can inhibit oxidative damage induced by ROS and have higher radical scavenging activity than vitamin E. Cranberry bioactive compounds have antioxidant effects both in vitro and in vivo. The PACs of cranberries help inhibit oxidative stress and possess antibacterial properties [40]. Consumption of cranberry juice has improved plasma antioxidant capacity, and thereby decreased the circulating concentrations oxidized low-density lipoprotein (LDL) cholesterol in women with metabolic syndrome, as well as decreased blood markers of oxidative stress in healthy volunteers and patients with cardiovascular risk factors [41.]

Antioxidant Capacity of Cranberries The great antioxidant properties of cranberries ranks them as one of the best among many other fruits due to phytochemicals, such as benzoic and cinnamic acid derivatives, and flavonols. Antioxidant capacity of cranberries is influenced by several factors as listed in Table 5. Cranberry extracts (processed cranberry juice) differ in their range of phenolic compounds (polar, non-polar, and anthocyanins) and their capacity to scavenge free radicals [42]. TAC of cranberries begins to increase when the cranberries cumulate more anthocyanins [43]. The antioxidant activity in cranberries might increase with the time of drying. The measured increase after drying was about 1.3-times higher than before drying [44].

The antioxidant activity of blueberry depends on their phytochemical complex, being mainly represented by anthocyanins, procyanidins, chlorogenic acid, and other flavonoid compounds [45]. It is supposed that the major contributors to their antioxidant activity are mainly anthocyanins, responsible for about 84% of TAC, and not ascorbic acid [46]. Ascorbic acid, which is present in blueberries in a significant amount, was found to contribute to antioxidant capacity only with a small portion up to 10% [47]. In contrast with some other berries, antioxidant activity of blueberries is higher in early maturation stages and during initial pigmentation than in the ripe stage. This is related to a high level of hydroxycinnamic acids and flavonols before ripening. The lesser antioxidant capacity of mature blueberries may indicate that anthocyanins have lower antioxidant potential than other phenolic compounds, such as flavonols [48].

Antioxidant capacity of blackberries is influenced by several factors as listed in Table 3. The antioxidant capacity of blackberries is affected by concentrations of the extract that could be applicable into functional foods as a natural pigment. Ascorbic acid is not an influential contributor to the antioxidant capacity [49]. A relevant correlation was observed between total polyphenols and TAC, and/or total anthocyanins. The relationship between radical scavenger activity and total polyphenols is qualified as being closer than that between the radical scavenging activity and total anthocyanins [50]. Therefore, both phenolics and anthocyanins influence antioxidant activity considerably.

The total antioxidant capacity of the raspberries species and strawberries are similar to each other, but it is about three-fold lower than in blueberries. During their storage there could be an increase of TAC at temperatures > 0 °C (followed by the rise of anthocyanins content and TPC) [51]. he antioxidant capacity of raspberries, similarly to other berries, is correlated with various bioactive compounds that have antioxidant properties. Anthocyanins, tannins, total phenolics, and ascorbic acid were studied widely due to their possible correlation. Phenolic compounds, such as p-coumaric acid or ellagic acid and their esters, are supposed to be more highly correlated to antioxidant capacity than anthocyanins, than ascorbic acid [52]. However, the overall antioxidant capacity may be clarified by insight into the connection of different BAC, working additively or synergistically in relation to the total antioxidant capacity of raspberry. Raspberries with higher contents of phytochemicals showed higher antioxidant capacity [53].

The antioxidant capacity of berries, such as strawberries, is strongly related to the present effective oxygen radical scavengers. To those compounds belong phenolics, most of which express relevant in vitro and in vivo antioxidant activities and ascorbic acid. Considerable increases in the plasma total antioxidant capacity (TAC) and ascorbic acid during 16-day strawberry consumption (500 g of strawberries) were progressively observed after strawberry supplementation [53]. Plasma polyphenols, such as anthocyanins, after consuming strawberry beverages was also studied and pelargonidin-O-glucuronide was found as the most abundant metabolite. In general, the TAC values of strawberries are similar to raspberries and blackberries and less than in blueberry species. However, TAC of strawberries could be influenced by storage time and temperature that is accompanied by increases in strawberry anthocyanins [54]. The antioxidant capacity of strawberry fruit during period of a week could increase by an average of 1.5-fold, with the highest increase occurring at 10 and 20 °C than TAC of those stored at lower temperatures (0 or 5 °C) [56]. TAC also increases with maturation from green to red fruit [55].

Conclusion

Renatus wellness had used blackberries, blackcurrant, blueberries, cranberries raspberries strawberries in the composition of Imuuxanth. Berries such as raspberries blueberries strawberry in addition to its nutrition such as vitamins minerals are also rich in anthocyanins flavonoids and phenolic acids. This review has completely focussed on the presence of Anthocyanins in the berries and their importance in reducing oxidative stress. Anthocyanins have been considered as one of the best anti-oxidant source and hence should be implemented in Daily Diet. Berries are natural and very rich source of Source of anthocyanins hence it is advisable to utilise market-based formulations prepared by Renatus named as imuuxanth as it as it possess berries as their core ingredients. Renatus imuuxanth has included berries which are exotic and expensive for Daily Utility. A simple sachet or tablet mixed with water or fruit juices can do wonders. The ORAC value (oxygen radical absorbance capacity) has been evaluated for above mentioned berries and they have shown a huge spike in comparison to any other oxidant source there Their values lie between 180 µmol to 250 µmol.

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