

Aronia Berries

Nutritional composition and health research

Dr Emma Derbyshire, PhD, Nutritional Insight

Aronia berries have been gaining increased scientific interest for their health benefits. Over the last decade alone, at least 9 review papers and 15 trials have been published studying their potential health effects. Presently, the evidence-base suggests that the consumption of aronia berries and their bioactives could contribute to the prevention of cardiovascular disease and diabetes, namely by improving lipid profiles, reducing inflammation and oxidative stress. Benefits for elite athletes are also emerging with aronia berry ingestion being linked to reduced inflammation and oxidative damage, which could aid recovery. Despite the growing evidence-base there is a lack of generic awareness about these berries. The present article introduces aronia berries, their nutritional properties and evaluates the scientific evidence.

Introduction

Aronia berries originated from eastern regions of North America and Canada migrating to Europe in around 1900.^{1,2} After this period they began to be cultivated in East European countries and Germany.^{1,2} There are different species of aronia berries – *Aronia melanocarpa* (black chokeberry), *Aronia arbutifolia* (red chokeberry) and *Aronia prunifolia* (a hybrid of the black and red).^{3,4} Subsequently, aronia berries are sometimes referred to as ‘chokeberries’, ‘black apple berries’ or ‘rowanberries’ but for the purpose of the review will be referred to as aronia berries.² Aronia berries grow on shrubs, reaching atypical height of 2-3 metres, and produces small white flowers which ripen into either deep purple-black berries or bright red berries.²

Aronia berries are abundant in phenolics – chiefly anthocyanins which have high antioxidative activity, helping to sequester reactive oxygen species (ROS) and being responsible for the berries distinctive colour pigmentation.⁵ ROS are generated as a part of normal human cell metabolism but also by external factors – e.g. air pollutants and a surplus of these can be highly reactive and damaging to cell structures, altering their functions.⁶ Having a state of ‘equilibrium’ between oxidants and antioxidants is therefore important.⁶ The term ‘oxidative stress’ is used when there is a state on imbalance between ROS production and antioxidant defences.⁷ Ageing, for example, is naturally associated with increased levels of ROS whilst certain chronic health conditions – e.g. cardiovascular disease, kidney disease, chronic obstructive pulmonary disease, cancer and neurodegenerative diseases are also associated with increased levels of oxidative stress.⁷

Increasing evidence from *in vitro* and *in vivo* experiments demonstrates that aronia berries – particularly *Aronia melanocarpa* – have strong antioxidant profiles due to their concentrated and varied polyphenol profiles providing proanthocyanidins, anthocyanins, flavonols, flavanols, phenolic acids, chlorogenic acids and quercetin derivatives.^{8, 9} In black aronia berries, proanthocyanidins contribute to most of their antioxidant activity and also possess antimicrobial properties.¹⁰

As shown in **Table 1**, aronia berries also provide useful amounts of vitamin C, folate, vitamin B1, B2, B6, niacin, pantothenic acid and vitamin K in addition to certain organic acids (l-Malic acid, citric acid) and phytochemicals (carotenoids and phenols). Given the strong presence of bioactive and nutritional compounds, aronia berries are thought to have great medicinal and therapeutic potential with possible anti-inflammatory, antiproliferative, gastroprotective and hepatoprotective properties.¹¹

A prior review of 13 studies published a decade ago concluded that aronia berries and their related bioactives could be useful functional foods for diseases or disorders associated with higher levels of oxidative stress.¹² The present article aims to provide an updated review reviewing the evidence-base in relation to aronia berries and health.

Approach

In recent years a growing number of scientific articles have been published investigating links between aronia berries and aspects of health. Given this, a Pub Med search for human randomised controlled trials and clinical trials published in the last 10 years (between 2010 and 2020) was undertaken. The term ‘Aronia berry/ies’

formed the basis of the search. Article reference lists were also searched.

Results

Nine main reviews over the last decade have evaluated the role of aronia berries – particularly *Aronia melanocarpa* and their associated anthocyanins (**Table 2**). The majority of these conclude that their antioxidant properties could benefit certain health conditions including cardiovascular disease,^{11, 13, 14} diabetes and lipid levels^{11, 15-17} inflammation related to obesity^{18, 19} and inflammation and oxidative stress related to intensive exercise.²⁰⁻²²

Fifteen trials have been published over the last 10 years (**Table 3**). Most recently Istas *et al.* (2019)²³ provided 66 males with 75 g *Aronia melanocarpa* berries (equivalent to 116 mg polyphenols), a whole fruit powder or placebo over 12-weeks.

Table 1: Bioactive & Nutritional Profile of Aronia Berries

Vitamins	Aronia berries (different cultivars)
Vitamin C	13-270 mg/kg FW
Folate	200 µg/kg FW
Vitamin B1	180 µg/kg FW
Vitamin B2	200 µg/kg/FW
Vitamin B6	280 µg/kg/FW
Niacin	3000 µg/kg FW
Vitamin K	242 µg/kg FW
Organic Acids	
l-Malic acid	13.1 g/kg FW
Citric acid	2.1 g/kg FW
Phytonutrients	
Carotenoids	48.6 mg/kg FW
Phenols (total)	7849* mg/100g DW

Key: DW = dry weight; FW = fresh weight;
* sum of single compounds determined by HPLC/DAD
Source: Adapted from Kulling *et al.* (2008)²