



ARONVIT®



ANTI-INFLAMMATORY ACTIVITY

UNIQUE STANDARDIZED EXTRACT FROM ARONIA BERRIES

- *Aronia melanocarpa* (Michx.) Elliot | Aronia berry

Cardio protection

Metabolic protection

Reduces inflammation thanks to strong antioxidative activity



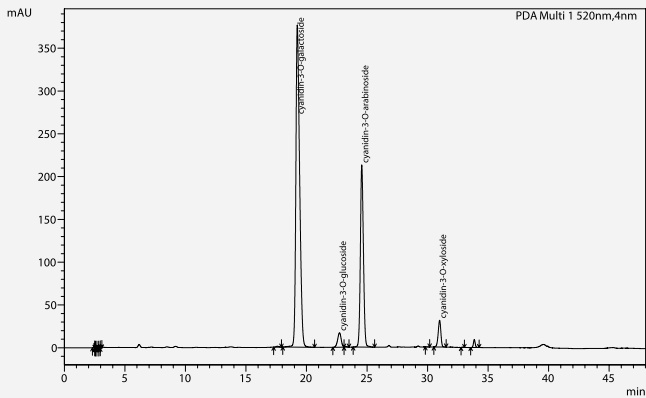
Aronia melanocarpa M.

- **CARDIO AND METABOLIC PROTECTION**
- **ANTIOXIDATIVE AND ANTI-INFLAMMATORY ACTIVITY**

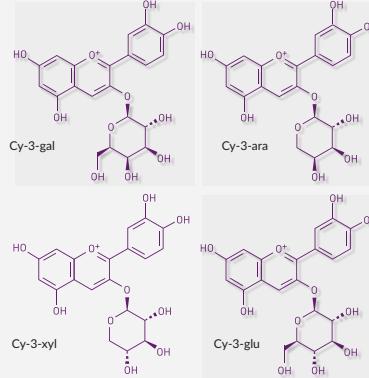


What is ARONVIT®

ARONVIT® is a unique, standardized extract from selected aronia berries. As a result of our own technology development efforts we have obtained a pioneering, prime quality extract with a rich anthocyanin content. Thanks to a high content of anthocyanins, **ARONVIT®** extract shows a wide range of beneficial health results, including a number of positive metabolic changes, as reported in literature.



Anthocyanin fractions: Cy-3-gal Cy-3-ara Cy-3-xyl Cy-3-glu



Specification

Thanks to procurement sources of raw materials from local contractors Greenvit® is able to fully manage product identity and quality. **ARONVIT®** has been standardized for the content of anthocyanins (HPLC) and polyphenols (UV) as well. To meet the needs of different recipients, Greenvit® is able to propose tailor-made solutions in the following extract versions:

Name	Anthocyanin content %	Polyphenol content %
ARONVIT® 25	25	50
ARONVIT® 20	20	30
ARONVIT® 15	15	22,5
ARONVIT® 10	10	15

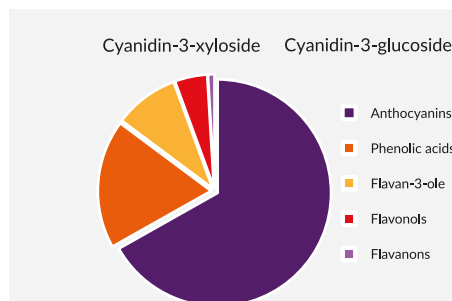


Fig. 1 The proportion of particular groups of active compounds in **ARONVIT®**, expressed as % of polyphenols determined by HPLC. The averaged results of analysis of three separate batches of the extract are presented.

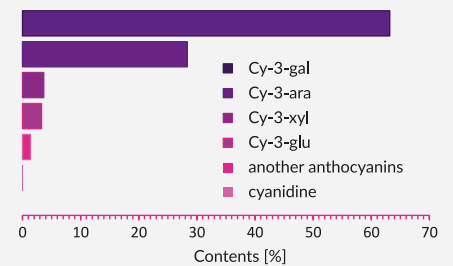


Fig. 2 Structure of anthocyanins in **ARONVIT®** Based on determinations carried out by HPLC. The averaged results of analysis of three separate batches of the extract are presented (Kucharska 2022)

Qualitative (LC-MS) and quantitative (HPLC) analysis of three batches of **ARONVIT®** extract* showed that the polyphenols in it include compounds belonging to anthocyanins, flavonols, flavanols, flavan-3-ols and phenolic acids (Figure 1). The predominant group of phenolic compounds identified in our extract are anthocyanins. This is confirmed by the results of published scientific reports (Zheng et al. 2003, Jakobek et al. 2007), which also indicate the quantitative predominance of anthocyanins among the phenolic compounds identified in chokeberry berries and the preparations obtained from them. The result of qualitative and quantitative identification of anthocyanins in **ARONVIT®** is shown in Figure 1.

ARONVIT® antioxidant activity - spectrophotometric analysis

The total content of phenolic compounds in 3 batches of **ARONVIT®** extract, determined by the method with Folin-Ciocalteu reagent in terms of gallic acid, was 63,458 mg GAE/100 g extract (Kucharska 2022*). This naturally translated into an above-average high antioxidant activity of our extract (Table).

Antioxidant activity - spectrophotometric analysis ARONVIT® (mMol Trolox / 100 g)			
Method used	DPPH	ABTS	FRAP
	336,05	394,88	352,56

*(A. Kucharska, Wrocław University of Life Sciences; 2022)

Antioxidant activity of **ARONVIT®** determined by spectrophotometric methods (averaged results of determinations performed for 3 separate batches of the extract production - batches 2022 y.)

Recommended use and dose

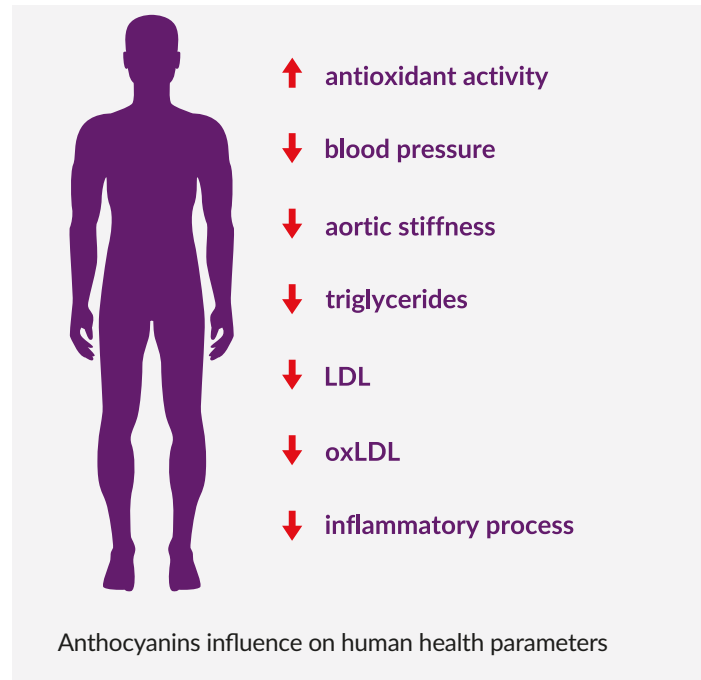
ARONVIT® is a dark purple to black fine powder with good technological properties. It can be suitably used in the form of syrup, capsule and tablets. The suggested daily dose is 50-150 mg.

Benefits of using ARONVIT® and target group

Aronia is the healthiest berry in the world, with one of the highest scores on the ORAC* scale. In other words, as an antioxidant, it has the highest capacity of absorbing reactive oxygen species (ROS). The bioavailability of polyphenols and anthocyanins in food depends mostly on food storage conditions and techniques of meals preparation. Processing and purification of vegetal food affect adversely the level of antioxidant substances. That's why **ARONVIT® standardized extract with the high content of anthocyanins and polyphenols is a perfect choice to ensure proven, versatile health benefits.**

ARONVIT® is recommended for use by all people exposed to adverse environmental factors, in particular in prevention and assistance to patients with:

- cardiovascular disorder
- diabetes
- hepatic disorders
- deteriorating lung function



ARONVIT® trademark

ARONVIT® registered trademark is the property of GREENVIT company. The trademark may be used solely together with the purchased extract complex.

Research on anthocyanins:

Anthocyanins belong to molecules classified as flavonoids from polyphenol family. They are widespread in the world of plants, and are found in lots of flowers and fruit. Their name (in Greek *Anthos* means flower and *kyanose* means blue) was initially used to describe the blue pigment of the cornflower (*Centaurea cyanus*). As compounds commonly found in plants, anthocyanins are a vital element in the human diet. Reactive oxygen species (ROS), i.e. free radicals and molecules which can generate them, are involved in several vital physiological processes. Because the excessive production of free radicals, like their shortage, may be harmful for the body, it is important to keep the balance between pro- and antioxidant mechanisms. Along with the better understanding of the role of oxidative stress caused by ROS in the occurrence of several chronic diseases, anthocyanins has started to be knowingly used as antioxidant compounds with beneficial health effects, and namely with antioxidant, anti-inflammatory, anti-atherosclerotic and antidiabetic action.[1][2] Based on NHANES 2007-2008 data, the average intake of anthocyanins in the U.S. was estimated at 11.6 mg/ person/day (+/-1.1mg) in adults >20 year old. [3]

Impact of anthocyanins on the cardiovascular system and in diabetes

Anthocyanins hold good for the improvement of lipid parameter, glucose levels, endothelial function and redox status in the body weight loss. In particular, anthocyanins show protection properties for the cardiovascular system and the heart muscle itself. The positive impact of anthocyanins on the cardiovascular system is associated with their anti-inflammatory properties, their ability to strengthen capillaries, and to slow down the aggregation and adhesion of blood platelets [4]. As it has been observed in animal and human models the vasodilator action, i.e. the relaxation of vascular smooth muscles, helps lower the blood pressure.[5][6]

Moreover, a diet rich in anthocyanins improves the plasma lipid profile by reducing the total cholesterol concentration, LDL fraction and triglycerides [7]. Additionally, by reducing the action of enzymes active in lipid metabolism, anthocyanins inhibit their oxidation and immunological response to LDLox and their capture by macrophages [8],[9]. The findings from studies conducted on animal models to analyze the protective effect of anthocyanins in insulin resistance and obesity showed that anthocyanins are effective in increasing tissue responsiveness to insulin, in reducing weight gain and lipid accumulation. For instance, in their study of 2017, Yamane et al. [10] demonstrated the suppression of elevation of postprandial blood glucose levels. Finally, anthocyanins help prevent the damage to blood vessels, typical in the course of diabetes, and the positive effect of anthocyanins on microcirculation translates into their positive impact on diabetic retinopathy.

Influence of anthocyanins on anti-inflammatory activity

The anti-inflammatory action of anthocyanins is manifested in the regulation of tension in capillary walls, which in turn reduces the cell inflammatory response. Anthocyanins inhibit, among all, NF-κB and the synthesis of inflammatory mediators (PGE2), and reduce the activity of COX-2. They regulate PLA2, COX-2, LOX enzymes and have the ability to regulate iNOS activity. As a part of their protective function in inflammatory processes, anthocyanins trigger the synthesis of prostacyclin (PGI2) produced in endothelial cells and foster their anti-aggregation action (like acetylsalicylic acid).[11][12]

Most recent reports on the impact of anthocyanins on lung functions

The study presented at the 2018 ATS (American Thoracic Society) conference confirms that the intakes of anthocyanins can be associated with a significantly lower deterioration of lung functions in the general population, and especially in individuals who have never smoked or quit smoking. The study* has showed a lower annual FEV1 decrease rate, the lowest annual FVC decline as well as the lowest annual FEV1 / FVC drop in people with the highest anthocyanin intakes, as compared to the lowest ones. In experimental studies on COPD (chronic obstructive pulmonary disease) anthocyanins were detected in the lung tissue and are now associated with the reduction in mucus secretion and inflammatory infiltrations. [13],[14]

Conclusion:

The positive effects of anthocyanin intake, as described above, occur as a result of a combined action of several mechanisms. While only some of them are directly connected with the antioxidative effect, and the majority is triggered by anthocyanin indirect action, **ARONVIT®** standardized extract with the rich content of anthocyanins is still a reliable everyday source of healthy dietary ingredients.

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*Spirometry test used to measure the volume of air which can be exhaled in one second (FEV1), the total amount of volume which can be exhaled after a deep breath (FVC) and their ratio: FEV1 / FVC.

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