Phytochemicals & Age-Related Diseases

Fitokimyasallar ve Yaşla İlintili Hastalıklar

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ABSTRACT Phytochemicals—the bioactive nonnutrient plant compounds in fruit, vegetables, whole grains, and other plant foods—have been linked to reductions in the risk of age-related diseases such as atherosclerosis, cancer, diabetes, osteoporosis, vascular diseases and metabolic syndrome.

Key Words: Reactive oxygen species, Oxidative damage, Phytochemicals, Age-related diseases

ÖZET Meyve, sebze, tam tahıl ürünleri ve diğer bitkisel besinlerde bulunan ve bioaktif besin bileşeni olarak kabul edilen fitokimyasallar; ateroskleroz, kanser, diyabet, osteoporoz, vasküler hastalıklar ve metabolik sendrom gibi hastalık riskinin azalmasında potansiyel bir etki gösterirler.

Anahtar Kelimeler: Reaktif oksijen türleri, oksidatif hasar, fitokimyasallar, yaşla ilintili hastalıklar

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Free radicals and other reactive oxygen species (ROS) are derived either from normal essential metabolic processes in the human body or from external sources such as exposure to X-rays, ozone, cigarette smoking, air pollutants and industrial chemicals. ROS react with biological molecules, such as DNA, proteins, and lipids, causing structural and functional damage. Oxidative damage has been implicated in carcinogenesis, the ageing process and several age- related degenerative diseases.[1,2] Phytochemicals—the bioactive nonnutrient plant compounds in fruit, vegetables, grains, and other plant foods— may provide desirable health benefits beyond basic nutrition to reduce the risk of age-related diseases. Phytochemicals can have complementary and overlapping mechanisms of action, including modulation of detoxification enzymes, scavenging of oxidative agents, stimulation of the immune system, regulation of gene expression in cell proliferation and apoptosis, hormone metabolism, and antibacterial and antiviral effects.[3-5]

The biological effect and food sources of these compounds are presented in Table 1.

TABLO 1: Potential Health Benefits of Selected Bioactive Compounds for Age-Related Diseases.

Bioactive Compounds	Potential Beneficial Biological Effects	Sources
Carotenoids	AOx	Tomatoes, tomato products[6]
Lycopene	Tumor initiation/promotion ↓	
a- Carotene	Apoptosis ↑, Cell cyle progression ↓	
b- Carotene	IGF-1 ↓, and IGFBP-3 ↑	
Lutein	Increase gap junction communication	
Zeaxanthin	Inhibit androgen/estrogen signaling	
Phytoene	Induce detoxification enzymes	
Phytofluene	Decrease cell surface adhesion and intima-media thickness	
	LDL-C and LDL-C oxidation ↓	
	Hypertension ↓	
	Decrease C-reactive protein	
Carotenoids	AOx	Dark green leafy vegetables, broccoli,
Lutein	Macular degeneration risk ↓	egg yolks[7]
Zeaxanthin		
Anthocyanidins	AOx, antimutagen	Berry fruits[8,9]
Petunidin	Tumor initiation/promotion ↓	
Peonidin	Cytotoxicity ↓	
Delphinidin	Angiogenesis ↓	
Cyanidin	Carcinogen detoxification	
Malvidin	Apoptosis ↑	
	LDL-C oxidation ↓	
	Platelet aggregation ↓	
Ellagitannin	AOx	Pomegranate[10]
Ellagic acid	Tumor initiation/promotion ↓	
Gallotannin	Cell-cycle arrest ↑	
Delphinidin	Apoptosis ↑	
Cyanidin	Angiogenesis ↓	
Pelargonidin	Anti-inflammatory effect	
Quercetin	Antiatherosclerotic effect	
Kaempferol	Antihypertensive effect	
Luteolin glycoside	Lower Risk of Alzheimer's disease	
Punicalagin		
Monoterpen	AOx, antimutagen	Citrus fruits[11]
d-Limonen	Tumor initiation/promotion ↓	
Perillic acid	Carcinogen detoxification	
Flavanon	TC and LDL-C oxidation ↓	
Tangeritin	Hypertension ↓	
Naringenin	HMG CoA reductase ↓	
Hesperitin	HDL-C ↑	
Isosakuratenin		
Heridictyol		
Narirutin		
Neohesperidin		
Neoeriocitrin		
Naringin		

TABLO 1: *Devamı...*

Resveratrol Catechin Epicatechin Quercetin Anthocyanin Polyphenolic tannins	AOx, antimutagen Tumor initiation/promotion ↓ Carcinogen detoxification Carcinogen activation ↓ Anti-inflammatory effect Apoptosis ↑ Angiogenesis ↓ LDL-C oxidation ↓ Platelet aggregation ↓ Thrombosis ↓ Eicosanoid synthesis ↓ Hypertension ↓ Estrogen/antiestrogen	Grapes, red wine peanuts[12,13]
Flavanols EC ECG EGC EGCG theaflavin theaflavin-3-monogallat theaflavin-3'-monogallat theaflavin-3,3'-digallat	AOx, antimutagen Tumor initiation/promotion ↓ Carcinogen detoxification Apoptosis ↑, Angiogenesis ↓ LDL-C oxidation ↓ Platelet aggregation ↓	Green/black tea[14,15]
Flavonols Kaempferol Quercetin Myricetin	AOx, antimutagen Tumor initiation/promotion ↓ Platelet aggregation ↓ TC↓, LDL-C oxidation ↓ HDL-cholesterol ↑ Platelet aggregation ↓ Eicosanoid synthesis ↓	Onion,apple, tea, berries, olives, broccoli, lettuce, red wine, cocoa/chocolate[16]
İsoflavones Genistein Daidzein	AOx, estrogen/antiestrogen,antimutagen Apoptosis ↑ Anjiogenesis ↓ TC and LDL-C ↓, LDL-C oxidation ↓ TG ↓, HDL-C ↑, Thrombosis ↓ Osteoporosis ↓ Adverse effect: Procarcinogen potential?	Soybeans, legumes[17]
Organosulfur compounds Allicin, diallyl sulfide, diallyl disulfide, allyl mercaptan	AOx, antimutagen Carcinogen detoxification Tumor initiation/promotion ↓ Apoptosis TC and LDL-C ↓, TG ↓ Cholesterol and FA synthesis ↓ Blood Pressure ↓ Thrombosis ↓	Garlic, onion, leek[18]
İsothiocyanates Phenethyl (PEITC) Benzyl (BITC) Sulforaphanes	Tumor initiation/promotion ↓ Carcinogen activation ↓ Carcinogen detoxification Apoptosis ↑	Cruciferous vegetables[19]
Dietary Fibers B-Glucan Pectin Psyllium	Tumor initiation/promotion ↓ TC and LDL-C and TG ↓ Diverticular disease ↓ Blood sugar regulation	Oats ,Barley ,Yeast Fruits ,Vegetables Whole grains[20,21]

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