

Mixed Flavonoid Supplementation Attenuates Post-Exercise Plasma Levels of Protein Carbonyls and 4-Hydroxynonenal Protein Adducts Levels in Endurance Athletes (P23-009-19)

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Objectives: To investigate the influence of 2-wks mixed flavonoid (FLAV) versus placebo (PL) supplementation on oxinflammation markers after a 75-km cycling time trial in endurance athletes.

Methods: Participants included 22 cyclists (42.3 ± 1.7 y). The research design was a double blinded, placebo controlled, randomized, crossover trial, with a 2-wk washout period. Blood samples were collected before and after 2-wks supplementation, and then 0 h, 1.5 h, and 21 h post-75 km cycling (176 ± 5.4 min, $73.4 \pm 2.0\%$ VO_{2max}). Three-day food records were logged by the athletes at the end of each supplementation period. The supplement provided 678 mg flavonoids with quercetin (200 mg), green tea catechins (368 mg, 180 mg EGCG), and anthocyanins (128 mg) from bilberry extract, with caffeine, vitamin C, and omega 3 fatty acids added as adjuvants. Blood samples were analyzed for blood leukocyte counts, oxinflammation

biomarkers including 4-hydroxynonenal (4HNE), protein carbonyls (PCARB), and peripheral blood mononuclear (PBMC) mRNA expression for cyclooxygenase-2 (COX-2), glutathione peroxidase (GPX), and NAD(P)H dehydrogenase quinone 1 (NQO1).

Results: Diet flavonoid intake averaged 110 ± 26.3 mg/d. Each of the blood biomarkers was elevated post-exercise (time effects, all $P < 0.01$), with lower plasma levels for 4HNE (at 21 h post-exercise) and PCARB (21 h post-exercise) in FLAV versus PL (interaction effects, $P = 0.008$, $P = 0.023$ respectively). Although elevated post-exercise, no trial differences for blood leukocytes ($P = 0.499$) or PBMC mRNA expression for COX-2 ($P = 0.322$), GPX ($P = 0.839$), and NQO1 ($P = 0.682$) were measured.

Conclusions: Flavonoid supplementation prior to intensive exercise decreased plasma peroxidation and oxidative damage as determined by 4HNE protein adducts and protein carbonyls. Post-exercise increases were similar between FLAV and PL groups for PBMC mRNA expression for COX-2 and the nuclear factor erythroid 2-related factor 2 (Nrf2) related genes GPX and NQO1. Lipid peroxidation and protein carbonylation may have been reduced through direct ROS quenching by flavonoid metabolites or Nrf2 activation at earlier time points. Flavonoid supplementation mitigated post-exercise oxidative stress in endurance athletes with low dietary flavonoid intake.

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