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File: ■ Montmorency Tart Cherry (*Prunus cerasus*, Rosaceae) ■ Exercise Recovery

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RE: Tart Cherry Powder Reduces Muscle Soreness after Intense Exercise

Levers K, Dalton R, Galvan E, et al. Effects of powdered Montmorency tart cherry supplementation on an acute bout of intense lower body strength exercise in resistance trained males. *J Int Soc Sports Nutr*. November 16, 2015;12:41. doi: 10.1186/s12970-015-0102-y.

Two previously published studies demonstrate that tart cherry (*Prunus cerasus*, Rosaceae) whole fruit, concentrates, and cultivar juice blends decrease muscle damage, oxidative stress, inflammation, and muscle pain associated with high-intensity resistance-based strength training.[1,2] The purpose of this randomized, double-blind, placebo-controlled study was to evaluate if a powdered supplement derived from tart cherry skins would behave similarly and reduce markers of muscle damage, muscle soreness, inflammation, oxidative stress, and strength loss during subsequent exercise performance.

A convenience sample of healthy, resistance-trained men (n = 23; mean age, 20.9 ± 2.6 years) were recruited at Texas A&M University; College Station, Texas. Included subjects were in a progressive resistance training program that included regular squat exercise for ≥ 6 months prior to study recruitment and were able to perform a standard barbell back squat in a Smith machine rack of ≥ 1.5 times their body weight. Excluded subjects had any metabolic disorder; were taking thyroid, hyperlipidemic, hypoglycemic, antihypertensive, anti-inflammatory, or androgenic medications; had a history of hypertension, hepatorenal, musculoskeletal, autoimmune, and/or neurological disease; or were allergic to cherries or any cherry components (e.g., polyphenols, anthocyanins, and anthocyanidins).

Following baseline measurements, subjects were matched based on relative maximal back squat strength, fat free mass, body weight, and age, and were randomly assigned to receive placebo (n=12; rice [*Oryza sativa*, Poaceae] flour) or 480 mg powdered tart cherry capsule (n=11; CherryPURE® Freeze Dried Tart Cherry Powder; Shoreline Fruit, LLC; Traverse City, Michigan) with breakfast, at 8:00 am, for 10 days. Prior testing found that 290 mg of CherryPURE provides approximately 600 mg phenolic compounds and 40 mg anthocyanins, which is equivalent to consuming 10.5 fluid ounces of tart cherry juice.

The resistance exercise challenge (10 sets × 10 reps of barbell back squat) occurred on day 7 of supplementation, but assessments occurred at baseline, day 7, day 8, and day 9. Anthropometrics and body composition were assessed at each visit and muscle soreness perception was assessed via pressure application on the dominant leg quadriceps in 3 locations (the locations were marked so the same spots could be measured at all visits). Muscle soreness and isokinetic maximal voluntary contraction knee extension, flexion, and total work performance were measured pre-lift, 60 min post-lift, 24 h post-lift, and 48 h post-lift. Fasting blood was obtained at each visit for analysis of markers of anabolic/catabolic hormones, markers of oxidative stress, and cytokine/chemokine markers of inflammation. Subjects were instructed not to change their diet during the study and to record all food and beverages in a daily diary for the first 4 days.

According to the demographics, baseline characteristics, and dietary intake, the groups were well matched. Muscle soreness increased over time in both groups in all 3 muscle areas. There were 3 muscle areas measured and 3 time points assessed for soreness. Only 1 muscle group at 1 time point had a significant difference between groups; specifically, at 24 h post-lift, the vastus lateralis muscle had significantly less soreness in the tart cherry group compared with the placebo group ($P < 0.05$). Isokinetic maximal voluntary contraction knee extension, flexion, and total work performance all increased significantly over time ($P < 0.001$). Only flexion was significantly different between groups; however, this measure was significantly different at all time points including baseline. Therefore, it is unclear whether tart cherry's effect on work performance was truly significantly different from placebo.

When evaluating biomarkers for muscle catabolism, secondary muscle damage, and physiological stress, creatinine, total bilirubin, cortisol, alanine aminotransferase, aspartate aminotransferase, and total protein showed a significant decrease post-lift in the tart cherry group compared with the placebo group ($P < 0.05$ for all). All are known to increase after strenuous activity and are markers for secondary muscle damage/protein catabolism. There were no significant effects on markers of inflammation/anti-inflammation and oxidation/antioxidation in either group. For markers of immune response to exercise, the tart cherry group had significantly higher lymphocytes and white blood cells at 24 h and 48 h post-lift compared with placebo ($P < 0.05$). The authors report some significant changes in parameters that differed from baseline/pre-lift; however, only the parameters that were statistically different from placebo are detailed here.

The authors conclude that the tart cherry skin formulation was "effective in promoting decreased perceptions of muscle soreness following intense resistance exercise." This finding is supported by the reduced markers for muscle catabolism and physiological stress compared with placebo. Together these show that the tart cherry skin formulation "may have dampened the effects of the secondary muscle damage response."

According to the authors, this is the first study evaluating a powdered, encapsulated form of tart cherry rather than a juice or concentrate. While it was anticipated that the tart cherry supplement would lessen exercise-induced oxidative stress and inflammation, there was no effect on these markers. The authors suggest that further studies should be conducted during endurance exercise, which produces more oxidative stress and inflammation, to better evaluate the effect of the product on those markers. The authors'

overall conclusion is that the tart cherry formulation is effective at reducing muscle soreness, but only 1 muscle group at 1 time point had significantly decreased soreness compared with placebo.

Acknowledged limitations include the large number of blood draws during a short period that might not have allowed for proper measurement of the full pharmacokinetic profile, and differences in nutrition and hydration among subjects might have influenced results. A further limitation of the study was the lack of subject-reported outcome surveys to determine whether the subjects actually experienced a clinically relevant decrease in soreness. Also, long-term effects are not known.

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—Heather S. Oliff, PhD

References

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[2]Bowtell JL, Sumners DP, Dyer A, Fox P, Mileva KN. Montmorency cherry juice reduces muscle damage caused by intensive strength exercise. *Med Sci Sports Exerc*. 2011;43(8):1544-1551.

Referenced article can be accessed at http://jissn.biomedcentral.com/articles/10.1186/s12970-015-0102-y.