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File: ■ Hibiscus (*Hibiscus sabdariffa*, Malvaceae)
■ Arterial Hypertension
■ Systematic Review/Meta-analysis

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RE: Meta-analysis Supports Efficacy of Hibiscus for Hypertension

Serban C, Sahebkar A, Ursoniu S, Andrica F, Banach M. Effect of sour tea (*Hibiscus sabdariffa* L.) on arterial hypertension: a systematic review and meta-analysis of randomized controlled trials. *J Hypertens*. June 2015;33(6):1119-1127.

Hibiscus (*Hibiscus sabdariffa*, Malvaceae) is consumed in foods, beverages, wine, jam, ice cream, and as a flavoring agent. Its reputed medicinal uses include cardioprotective, anti-atherosclerotic, anti-obesity, anti-inflammatory, anti-pyretic, and hepatoprotective effects. Bioactive constituents include organic acids, anthocyanins, a variety of flavonoids, polysaccharides, and volatile compounds. Flowers and calyxes of hibiscus are consumed in beverages to treat arterial hypertension. Evidence from randomized controlled trials (RCTs) has been inconclusive. Studies not included in this meta-analysis, comparing standardized extracts of hibiscus to common antihypertensive drugs captopril and lisinopril, found it an effective antihypertensive, with a wide margin of safety and tolerability. It has also been reported to have a diuretic effect comparable to furosemide.

The authors conducted a meta-analysis and systematic review of RCTs published up to July 2014 to better assess antihypertensive effects of hibiscus. Of 156 publications located in an electronic database search, seven RCTs were identified, and full-text copies were assessed; of these, two were excluded because they compared hibiscus with pharmaceutical drugs, and the remaining five were selected for analysis. One of those had three treatment arms, so seven sets of results are included. A total of 390 subjects were randomly assigned in these RCTs, of whom 225 received supplementation with hibiscus and 165 were in control groups. Studies had 53-124 subjects. Reports were published between 1999 and 2013; studies were conducted in the United States, Mexico, and Iran. Daily doses of hibiscus in included RCTs were of two to three teabags, each containing 1.25 g to 3 g hibiscus, two spoonfuls of aqueous extract, or 100 mg of a powdered extract; duration ranged from 15 days to six weeks.

Unstandardized weighted mean difference (WMD) in blood pressure (BP) between baseline and post-treatment in active and control groups with a 95% confidence interval (CI) was used as a summary statistic. Sensitivity analyses were conducted by the leave-one-out method. Heterogeneity among studies was quantified using the Cochran *Q* test and I^2 indices. In studies with more than one active group, the control group was divided

as nearly as possible into equal sections for comparison. Presence of publication bias was explored using funnel plots of precision by study effect size, with asymmetric plots further assessed for bias using a variety of measures. While visual inspection of funnel plots suggested potential bias, further investigation found none.

Pooled estimates of effect size for the impact of hibiscus tea supplementation on systolic BP (SBP) and diastolic BP (DBP) were statistically significant. For SBP, WMD fell 7.58 mmHg (95% CI, −9.69 to −5.46; P<0.00001); for DBP, WMD decreased by 3.53 mmHg (95% CI, −5.16 to −1.89; P<0.0001). These estimates of effect size were robust in sensitivity analyses. Fixed-effect meta-regression revealed significant inverse associations between baseline SBP and net change in SBP (slope, −0.27; 95% CI, −0.43 to −0.20; P=0.0005) and baseline DBP and net change in DBP (slope, −0.27; 95% CI, −0.44 to −0.10; P=0.002); hence, BP was lowered more in those with higher baseline BP.

While the exact mechanisms of hibiscus's BP-lowering effects are not understood, according to the authors, potentially contributory effects have been seen in laboratory and pre-clinical studies. An aqueous extract of hibiscus calyx and anthocyanins reduced SBP and left ventricular mass in a dose-dependent manner in spontaneously hypertensive rats. Hibiscus has demonstrated vasodilation and inhibition of calcium influx into vascular smooth muscle cells in isolated hypertensive rat aortic rings, and hibiscus polyphenols induce relaxation in isolated rat aorta. An aqueous extract has been shown to inhibit angiotensin-converting enzyme (ACE) activity. In rabbits, hibiscus extract inhibits stages in the development of atherosclerosis. Inhibition of cyclooxygenase and other effects may reduce blood viscosity. Quercetin, a potent antihypertensive in many studies, is a vasodilator, scavenges reactive oxygen species, and causes a gradual, ongoing, dose-dependent reduction in BP in all experimental models. Reduction in global oxidative stress is considered to contribute to the benefits of hibiscus in arterial hypertension.

No hepatic or renal toxicity has been reported for hibiscus except possibly at high doses of 300 mg/kg/day for three months, but caution should be exercised in concomitant use of hibiscus and antihypertensive drugs. A hibiscus extract taken with the diuretic hydrochlorothiazide caused a significant increase in volume of urine excreted and decreased concentration of sodium, bicarbonate, chloride ions, and the pH of urine.

While the studies conducted to date have several limitations, the growing prevalence of hypertension and its contribution to serious cardiovascular conditions, coupled with widespread poor adherence to conventional drug regimes, point to a valuable role for hibiscus in controlling BP.

—Mariann Garner-Wizard