

Liz Williams

Alyssa Janic

NFSC 345

April 27, 2011

Term Paper Final Draft

Bitter orange supplementation is often used by individuals that are attempting to lose weight. However, it is controversial whether bitter orange supplementation is effective and safe. We chose this topic because bitter orange has been titled a dirt dozen, meaning one of the top 12 most dangerous supplements causing serious adverse events. With this we evaluated two studies on the safety and efficacy of the supplement, the first being a pro study which supported that bitter orange supplementation is safe and effective for individuals trying to lose weight: “Effects of Citrus aurantium Extract, Caffeine, and St. John’s Wort on Body Fat Loss, Lipid levels, and Mood States in Overweight Healthy adults,” and our con study: “The Effect of Commercial Thermogenic Weight Loss Supplement on Body Composition and Energy Expenditure in Obese Adults”, argued that bitter orange supplementation is overall ineffective and may have some negative side effects. Both studies were double blind, randomized, placebo-controlled clinical trials and had close to the same sample sizes. The lengths of the studies were similar as well. Also, they both had extensive exclusion criteria. However, both studies were not long enough to determine whether bitter orange supplementation was effective in the long run or whether or not it was safe. Although both studies were strong, our pro article had advantages over our con article. The con study had a treatment and placebo group; however, the pro study had a treatment, placebo and a control group as well. The con

study also did not have great control over diet analysis nor did it measure appetite. The pro study, which supports bitter orange as an effective weight loss agent was a stronger study, however more research needs to be done before recommending this.

Our pro study: “Effects of Citrus aurantium Extract, Caffeine, and St. John’s Wort on Body Fat Loss, Lipid Levels, and Mood States in Overweight Healthy Adults”, supports bitter orange supplementation, when combined with caffeine and St. John’s Wort, as being effective and safe for individuals trying to lose weight. The study design used was a double-masked, randomized, placebo-controlled study, with 3 groups including: treatment (group A), placebo (group B), and control (group C). 23 subjects were selected for this study and 20 completed the entire six weeks of the trial.

“Exclusion criteria included history of thyroid or heart disease, cancer, human immunodeficiency virus, acquired immunodeficiency syndrome, pregnancy, lactation, hypertension, use of monoamine oxidase inhibitors, and current use of a restricted calorie diet or anorectic medication.” Participants also had to have a history of physical activity and were not allowed to consume alcohol during this study. Inclusion criteria included adults that were over 21 years of age and healthy individuals with a BMI greater than 25 kg/m². Written consent was also required among participants. Group A, which included 9 subjects, was given Citrus aurantium extract (975 mg), caffeine (528 mg), and St. John’s Wort (900 mg). Group B, which included 7 subjects, was given a maltodextrin placebo. Group C, which included 4 subjects, received nothing.

Each group was evaluated at weeks 1, 3 and 6. A medical scale was used to weigh the participants and they were weighed after fasting for four hours and emptying their bladders, while wearing only “essential clothing”. Bioelectrical impedance was

used to measure body composition. Each participant in this study exercised in a training program for three days per week, which included a combination of weight training and step aerobics. A registered dietician instructed subjects to be on an 1800 kcal/day diet. Each week, patients were called and every two weeks they sat down to review their diets with the dietician using a 24-hour dietary recall. A Profile of Mood States questionnaire was used to keep track of any changes in their mood. Biochemical measures were also taken by blood draws, electrocardiographic procedures, and urine analysis. Significance was measured at $P < 0.05$ and paired t tests were used to look at changes over time in the groups. Analysis of variance was used to test time/group interactions in order to look at any changes that occurred in groups over time.

At week 1, there were no differences between the three groups. By week 6, group A had significant weight loss (1.4 kg, $P < 0.05$) and also had significant fat loss (3.1 kg, $P = 0.01$). The treatment group also had an increase in their basal metabolic rate (2026 to 2069 kcal/d, $P < 0.05$). The placebo group did not have significant amounts of weight loss ($P = 0.10$), although there were some body fat and total weight loss. The control group had a tendency towards fat loss, but this value was not significant ($P = 0.10$). There was no threat or significant changes among any of the three groups biochemically. There were also no changes in electrocardiograms or the urine analysis. Total cholesterol and serum triglycerides decreased in the treatment group, but this did not occur in the placebo or control. The researchers of this study concluded that bitter orange supplementation when combined with caffeine and St. John's Wort is effective in weight loss. They argue that this supplement is more effective than simply by diet and exercise alone and is able to reduce body fat in healthy adults that are obese.

The study design used, which was a double-blind, randomized clinical control trial, is a strong study because it is very high on the evidence pyramid. The exclusion and inclusion criteria helped to eliminate any confounding factors. The dietary guidelines established and keeping in contact with the registered dietician made this study much stronger. The many tests used to measure the overall health and progression of the participant's results was beneficial to the study. On the other hand, this study was very short and contained very few subjects. This limits the studies long-term results. One thing that may have weakened this study is that they didn't account for whether patients were already using a weight loss supplement previously like our other study did. This may have had an effect on the amount of weight that patients lost. This study was overall very strong, with few weaknesses. With this, we support the author's conclusion that bitter orange supplementation may be an effective weight loss agent and safe when used correctly. However, a longer study on side effects and long-term effectiveness would need to be done before we recommended using this supplement to obese individuals trying to lose weight.

Our con article, "The Effect of Commercial Thermogenic Weight Loss Supplement on Body Composition and Energy Expenditure in Obese Adults", argues that bitter orange supplementation is not effective in weight loss and may have serious side effects associated with its use. The purpose of this study was to look at the effects of bitter orange, ma huang, and guarana combined on resting energy expenditure, body composition and blood chemistry in healthy obese adults. The study design used was a randomized, double-blind clinical control trial. 26 subjects were selected for this study, but only 20 participants completed the entire trial. There were two groups, including a

treatment and a placebo group. The treatment group included 12 subjects and the placebo included 8 subjects. Inclusion criteria included ages 18-40 years, >20% fat in males and >30% fat in females, <3 days a week physical activity, and informed consent was required. Exclusion criteria included pregnant or trying to get pregnant, lactating females, orthopedic problems, great amount of weight loss in past three months (>30 lbs.), weight loss supplement use in past three months, hypertension, and a history of heart, liver, thyroid, psychiatric disease, diabetes, anemia, nervousness, anxiety, depression, seizure disorder or stroke.

In the first two days, participants took one capsule in the morning and one capsule in the afternoon. After the first two days, two capsules were taken in the morning and two were taken in the afternoon. In the morning, many tests were measured including the measurement of expired gases for 5 minutes and REE was tested using open-circuit spirometry. Heart rate, blood pressure, and electrocardiogram were simply included for safety measures and were not included in the actual study results. Blood was taken to measure glucose, cholesterol, triglycerides, and high-density lipoprotein cholesterol. Low-density lipoprotein was measured using the blood results of the previous assays using a calculation. In the afternoon body composition was measured using total body mass, percent fat, fat mass, and fat-free mass. A 3-day dietary recall was taken on a weekly basis by the patient and only 14 out of the 20 subjects completed the dietary recall (9 in treatment group, 5 in placebo group). Participants engaged in aerobic exercise three days per week, starting by walking 1.5 miles and increased to 2.0 miles and they were able to choose whether to run or walk. Statistical significance was set to 0.05 and t-tests were used to compare the differences among groups in age, body mass, height and

percent fat. Effect sizes were also measured for the dependent variables and were calculated based on mean and standard deviations from the pre and post treatments.

Results showed that the groups did not differ significantly at the beginning of the study, nor at the end of the study. The only significant difference was the fat mass ($P=0.033$). Patient's diets did not differ significantly when using the supplement. There were also no significant differences between participant's blood chemistries combined including: glucose, cholesterol, triglycerides, HDL or LDL. The author's concluded that bitter orange, when combined in a supplement with ma huang and guarana may result in a loss in fat mass, percent fat, and body mass, but had a very small effect on diet, blood chemistries or energy expenditure.

The study design of this study is very high on the evidence pyramid, making it a very strong study. This study had extensive exclusion and inclusion criteria to avoid confounding factors. Although researcher's measured the side effects, they did not directly include them into the study. Long-term effects were not measured due to the short length of the study, which could cause adverse effects to individuals taking this supplement. The sample size was also small in this study. Dietary recall was measured by the participants without supervision from a qualified source, and not every participant included a dietary recall, which weakens the study further. Due to more weaknesses in this study in comparison to the pro-article, we do not support the author's conclusion. We believe that a long-term study with a larger sample size and a dietary recall that is monitored by a registered dietitian is needed to support the evidence.

Obese individuals often use bitter orange supplementation to help aid in weight loss; however, there is often a concern of safety and long-term effectiveness. We

overviewed two studies, both of which looked at the effectiveness of bitter orange on weight loss, and strengths and weaknesses supporting their conclusions. The pro article concluded that bitter orange supplementation is effective and safe in helping obese individuals to lose weight, whereas the con article argued that bitter orange supplementation is overall ineffective in helping individuals to lose weight. We conclude that bitter orange supplementation is effective in short term weight loss and few short-term side effects have been shown; however, a long-term study may show adverse events and possible relapse of weight gain. Therefore, we would not suggest bitter orange as a weight loss supplement until more research has been done regarding its long-term safety and effectiveness.

References:

Colker, Carlon M.; Kalman, Douglas S.; Perlis, Theresa; Street, Chris; Torina, Georgeann C. (1999). Effect of Citrus aurantium Extract, Caffeine, and St. John's Wort on Body Fat Loss, Lipid Levels, and Mood States in Overweight Healthy Adults. Current Therapeutic Research. 60: 145-153.

Armstrong, Jeffery W.; Duhme, Simone; Johnson, Patrick (2001). The Effect of Commercial Thermogenic Weight Loss Supplement on Body Composition and Energy Expenditure in Obese Adults. Journal of Exercise Physiology. 4: 28-35.