Taste changes in patients undergoing chemotherapy are common and can be of long duration, are associated with poor nutrition, and can reduce quality of life. A pilot study of the fruit *Synsepalum dulcificum*—known as “miracle fruit”—as a novel supportive intervention was conducted with eight patients with cancer who were being treated with chemotherapy and reporting taste changes. Miraculin, a naturally occurring protein in miracle fruit, has the unusual ability to transduce a sweet signal in an acidic environment, profoundly changing food taste profiles for a short duration, masking unpleasant tastes, and increasing the palatability of certain foods. This pilot study was designed to determine whether consumption of the Miracle Fruit™ supplement would improve chemotherapy-associated taste changes, thereby improving the taste of food and ultimately leading to better nutrition. Four of the participants were given a two-week supply of the supplement and the other four were given a two-week supply of a placebo. After two weeks, the supplement group received a two-week supply of the placebo and the placebo group received a two-week supply of the supplement. Participants recorded food and drink intake in daily food diaries and rated taste changes with each food as better, worse, or no change. All study participants reported positive taste changes with the supplement.