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File: ■ Cocoa (*Theobroma cacao*)
■ Flavanols
■ Taste Preference

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RE: Tolerance for High-flavanol Cocoa Powder May Be Similar for Subjects that Prefer Dark Chocolate or Milk Chocolate

Harwood ML, Ziegler GR, Hayes JE. Tolerance for high flavanol cocoa powder in semisweet chocolate. *Nutrients*. 2013;5(6):2258-2267.

Cacao (*Theobroma cacao*) beans consist of polyphenolic compounds that provide health benefits, as well as the less desirable effects of bitterness and astringency. Polyphenolic content is reduced by some of the processing methods (e.g., fermentation and roasting) used to produce chocolate, which generally results in a more palatable product, but with potentially lowered health benefits. Therefore, the goal of this study was to estimate group rejection thresholds for the increased content of cocoa powder produced from underfermented cocoa beans, in semisweet-like chocolate samples.

There were 99 subjects recruited for this study which took place at Penn State University's Sensory Evaluation Center (University Park, Pennsylvania). The subjects were healthy (age range: 18-45 years) and were non-smokers. Within this group, 53 preferred milk chocolate, and 46 preferred dark chocolate. During 1 tasting session, demographic information and rejection thresholds were obtained. Semisweet chocolate samples were presented as 5 pairs with 1 control sample (100% "NI natural cocoa powder," with 10-12% fat content; Blommer Chocolate Company; Chicago, Illinois) and 1 sample that was spiked (35%, 50%, 65%, 80%, or 100%) with high cocoa flavanol (CF) natural cocoa powder (Mars, Inc.; Elizabethtown, Pennsylvania) produced from underfermented cocoa beans (10-12% fat content).

The semisweet chocolate samples were made by combining cocoa butter and sugar with liquors made from the 2 different cocoa powders. The sample formulation consisted of non-fat cocoa solids (44%), cocoa butter (29%), canola (*Brassica* spp.) oil (3%), sugar (23.5%), and lecithin (0.5%). These contents were mixed, conched (65°C for 4 hours), tempered, and molded to produce 2.5 g samples. Samples were presented in order of increasing high CF natural cocoa powder content and the order within the pairs was randomized. Subjects were instructed to consume the entire sample and rinse with water between samples. Total phenolic content was also measured from the freeze-dried extracts of the 2 different cocoa powders.

The total phenolic content of NI natural cocoa powder and high CF natural cocoa powder was 3.4% per weight (g phenolic per 100 g of cocoa powder) and 7.9% per weight, respectively. A significant association was found for gender and chocolate preference (P=0.0126). More women than men preferred dark chocolate (women: n=35; men: n=11), although similar preferences were found for men and women for milk chocolate (women: n=27; men: n=26); however, the results of this study did not indicate any significant differences in rejection thresholds between men and women (P=0.803). Overall, the group rejection threshold for the high CF natural cocoa powder was 80.7%, which was nearly the same value as the second to highest percentage of high CF natural cocoa powder in the semisweet chocolate samples. In addition, it was found that there were no significant differences in rejection thresholds between the group that preferred milk chocolate and the group that preferred dark chocolate (P=0.6235).

The authors conclude that the rejection threshold for high CF natural cocoa powder was equivalent to a sample with 80.7% of high CF natural cocoa powder and that the tolerance of these subjects was similar despite their preference for dark chocolate or milk chocolate; however, other studies have shown that subjects with different preferences (milk vs. dark) had different rejection thresholds for chocolates spiked with a bitter compound.[1,2] Moreover, the total phenolic content of the final products was not measured, and the specific types of polyphenolics were not identified or quantified in each of the cocoa powders. Future studies should include more descriptive profiles of the chocolate samples by subjects, as well as provide more detailed information about the polyphenolic content or other compounds that might influence taste preferences and tolerance.

—Laura M. Bystrom, PhD

References

[1]Harwood ML, Ziegler GR, Hayes JE. Rejection thresholds in chocolate milk: Evidence for segmentation. *Food Qual Prefer*. 2012;26(1):128-133.

[2]Harwood ML, Ziegler GR, Hayes JE. Rejection thresholds in solid chocolate-flavored compound coating. *J Food Sci*. 2012;77(10):S390-S393.

Referenced article can be found at www.mdpi.com/2072-6643/5/6/2258.