COMPARISON BETWEEN TWO METHODS FOR MEASURING PIGMENTATION OF FROG'S SKIN

Andrea Brenes Soto, MSc[1] and Ellen S. Dierenfeld, PhD[2]

[1]*Zoo and Wild Animal Nutrition and Management Program, Animal Science Department, University of Costa Rica, San José, Costa Rica*

[2] *Novus International, Inc., St. Charles, MO 63304 USA*

Abstract

Tomato frogs belong to the family Mycrohylidae with three recognized species: *D. antongilli, D. guineti* and *D. insularis*. All are endemic to Madagascar, and only found in the northern part of the island. These reddish-colored frogs earned their name due their appearance, being similar to tomatoes, especially when they inflate. True colors, however, can vary a great deal, presenting with many shades of orange, red and yellow, even brown. Because of these characteristics, tomato frogs are common in the pet trade; at least one species has a conservation status "near threatened".

In addition to meeting vitamin A nutritional needs, dietary carotenoids are directly linked to skin pigmentation in a variety of species, including amphibians. Alteration of pigmentation may affect potential recognition of breeding partners, perception of fitness, and could have a physiologic effect on health and reproductive output. This study provides a model for similar research with other colorful amphibian species that may be applied globally.

Twenty-four false tomato frogs (*Dyscophus guineti*) were obtained and maintained in individual aquaria at the Saint Louis Zoo between September and November, 2009. Young (n=19) and adult (n=5) frogs were fed either small (108 mg) or adult (357 mg) crickets for an 8-week trial period. Feeder crickets were injected with known concentrations of beta carotene and/or mixed carotenoids treatments versus control (no carotenoid supplements, 8 frogs per treatment).

Back skin colors were quantified using both a hand-held spectrophotometer (Konica Minolta® CM-700d, Konica Minolta Sensing Americas Inc., New Jersey), as well as qualitatively using visual colors charts (Pantone Color Guide, Pantone® Inc., Carlstadt, New Jersey). The hand-held spectrophotometer registers data from a+ (red), b+ (yellow) and L (lightness) axes on a chromaticity diagram.
Visual color charts observations showed some changes after the intake of carotenoids; 62.5% of the animals fed with beta carotene changed to browner and yellower colors, and 87.5% of the animals fed with mixed carotenoids changed to redder and oranger colors. When colors were classified in a four level scale: yellow, orange, red and brown, significant changes were observed only in mixed carotenoids diet ($p>0.05$); these animals appeared to be oranger.

On the other hand, colorimeter measurements showed more specific data, with mathematical values in the a+ and b+ axis, lightness, and hue differences between colors

and chromaticity as well. Frog color changes were observed and evolution of the color could be measured. For example, +a average value changes (from 15.40 to 16.51) signify that the animals tended to be redder; +b average value changes (from 25.43 to 30.40) signify that the animals tended to be yellower. When values are plotted in a chromaticity diagram, the final color (combined +a and +b values) changed from ocher-colored to more orange. Colorimeter data demonstrated a more precise method for measurement of color compared to visual color scoring, and the equipment was validated with frog´s skin. Resulting data can be better analyzed, and results and variations can be detected and interpreted more scientifically.