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AN EVALUATION OF HAND-HELD INFRARED THERMOGRAPHY FOR DETERMINING VELVET ANTLER GROWTH RATES IN RED DEER STAGS

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Background. Growing velvet antler is a very dynamic tissue that can abruptly differentiate into cartilagenous tissue and then calcify to essentially form bone - typically referred to as hard antler. While hard-antlered bucks are a marketable product (i.e., hunter-harvest), the growing velvet antler represents a renewable resource from farmed deer which is also a marketable product that can be processed and sold as part of the multi-million dollar "Nutraceutical" industry. A Nutraceutical is defined as any class of dietary supplements, vitamins, minerals, herbs, and healing foods that have medical or pharmaceutical effects on the body. The marketable aspects of growing velvet antler are found in its use as a medicinal agent in traditional Eastern cultures, where it has been used for centuries as a remedy for conditions ranging from infertility to the prevention of general ill health. While holistic medicine is often viewed with skepticism by Western societies, evidence exists which supports the use of velvet antler extracts for the natural performance enhancement of athletes, anti-ulcer treatments, the healing of epidermal wounds, the inhibition of senescence in male and other effects. However, to understand how bio-active agents in velvet antler may be utilized, we must first understand the growth characteristics of antler from farmed deer (e.g., red deer), as well as develop methods for determining the optimal harvest time to maximize antler quality. Therefore, the objectives of this study were to monitor rates of velvet antler growth in red deer stags, and to determine whether hand-held infrared thermography (IRT), a non-invasive means for monitoring physiological changes in body temperature, would be useful to determine when peak antler growth occurs. The use of IRT was suggested since highly proliferative tissue like that of velvet antler should produce a characteristic thermal (heat) signature which may change with growth and development of the tissue.

Research Findings. Length of the antler main beams was positively correlated to body weight in yearling ($R = 0.61$, $P<.001$) and mature ($R = 0.79$, $P<.001$) red deer stags. However, no differences ($P > .10$) in velvet antler growth rates between the right and left antlers were observed (see Figure 1: Yearling – Left Panel; Mature – Right Panel); therefore data were pooled within age class for further analysis. Yearling velvet antler growth rates increased from 0.16 ± 0.03 cm/d between eruption and d 14, to 0.34 ± 0.04 cm/d between d 42 and 56 of growth. Mature stag velvet antler growth peaked at 1.3 ± 0.03 cm/d between d 28 and 42, and declined thereafter.

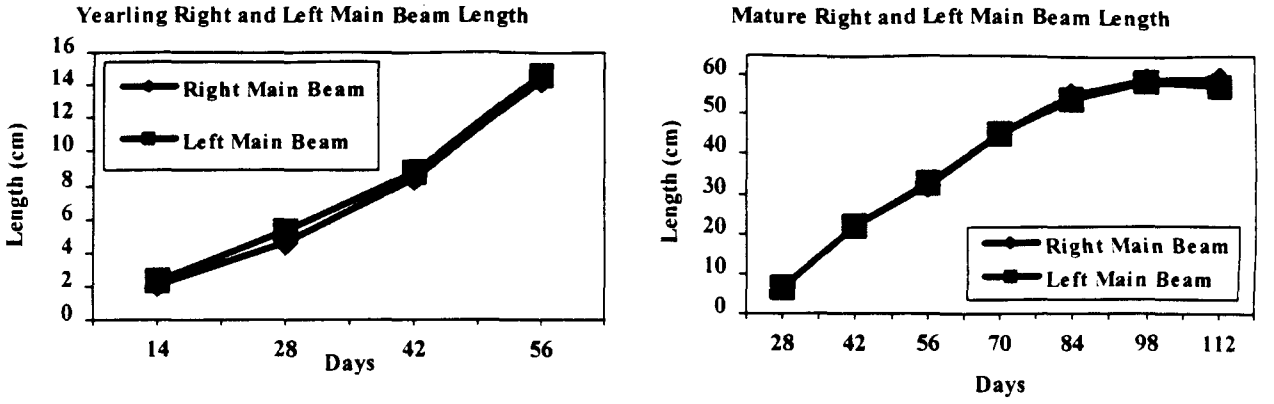

Figure 1. Velvet Antler Main Beam Measurements in Yearling (Left Panel) and Mature (Right Panel) Red Deer Stags.

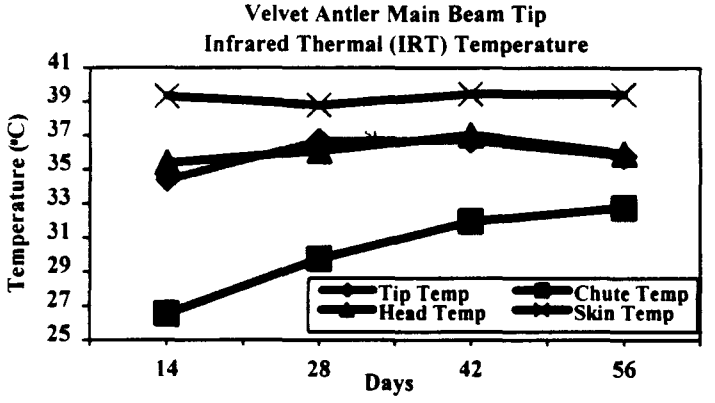

Figure 2. Velvet Antler Main Beam Tip Infrared Thermal (IRT) Temperature Measurements from Yearling Red Deer Stags.

Yearling stag base and tip velvet antler IRT were positively correlated with one another ($R = 0.43$; $P < .01$) as were mature stag base and tip measurements ($R = 0.49$; $P < .05$). However, both measurements were also positively correlated to background IRT ($R = 0.37$ to 0.65; $P < .05$). In mature stags, base antler IRT patterned ($P < .05$) background IRT measurements, while tip IRT did not change ($P > .10$) between day 56 through 112. Note in Figure 2 for yearling stags that surface head temperature (a background measure) and antler tip IRT were essentially the same (i.e., both lines lie on top of one another).

Application. While some anomalies in velvet antler IRT were noted during antler growth, these data seem to indicate that hand-held IRT does not have the sensitivity to reliably monitor antler growth rates. This conclusion has been reached since IRT thermal signatures could not be separated from the background ambient environment. Physical measurement and visual appraisal of velvet antler is the only means available to assess antler growth rates and quality.