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A vibrating feeder tray improves bullfrog production

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ABSTRACT

Studies have developed techniques for bullfrog feeding in which movement of the food stimulates food intake in the absence of housefly larvae. We analyze a completely randomized design with two treatments (vibrating tray and linear feeder) in triplicate. A total of 1800 bullfrog froglets (*Lithobates catesbeianus*) (7.60 ± 0.59 g) were divided in six pens of 12 m^2 and density 25/m^2. Three fattening pens contained linear cement feeders (3.0 × 0.50 m) with a V-shaped bottom that crossed the pen longitudinally at each side of the pool containing commercial diet (40% crude protein) with added 5% housefly larvae. In the other three pens, six vibrating feeders trays (80 × 34 cm) per pen were arranged linearly, three at each side of the pool with commercial ration without housefly larvae. The productive performance of frogs was assessed by weight gain, feed intake, feed conversion, specific growth rate and survival by 90 days. We observed that bullfrog froglets receiving food in a vibrating feeder tray present better productive performance (weight gain, feed conversion and specific growth rate) than animals fed ration and housefly larvae in a linear feeder. This response can be related to the greater visual stimulus of the food by frogs fed in vibrating feeder trays, in which food had greater movement.

1. Introduction

In bullfrog rearing, movement of the food is an important feed stimulus. In the wild, these animals feed on small insects and invertebrates that actively move in terrestrial and aquatic environments (Hirai, 2004; Silva et al., 2009). Within this context, recent studies have shown that the movement of inert food can increase the food intake of frogs on commercial frog farms, improving live weight gain and feed conversion (Castro et al., 2012). These achievements open new perspectives for frog farming. In this respect, the improvement of feeding techniques is necessary to reduce the cost of frog production in captivity.

The Anfigranja system, the main frog production system in Brazil, was designed to contain shelters, a pool and feeders for supplying ration, as well as housefly larvae that stimulate food intake by the animals (Lima et al., 2003). Other production systems can be adopted on commercial frog farms depending on the financial conditions of each producer. These systems include the vertical system (Rodríguez-Serna et al., 1996) and flooded system (Oliveira et al., 2009), in which the water moves the feed stimulating the food consumption. The absence of housefly larvae minimizes the stigma and may contribute to increase the consumption of frog meat by consumers.

Since bullfrog meat is an important commercial product, the production of these animals in modern and more hygienic systems may render the cost of the end product more feasible for the producer, in addition to increasing meat consumption by consumers. This study analyzed the productive performance of bullfrog froglets fed in vibrating or linear feeder in the Anfigranja system. In this respect, we suggest here the use of vibrating feeder tray for bullfrog feeding in this system. The vibrating feeder tray results in increased movement of feed pellets and may improve feed consumption and growth rate of bullfrog froglets.

2. Material and methods

2.1. Animals

A total of 1800 *Lithobates catesbeianus* froglets (7.60 ± 0.59 g) were divided into six fattening pens (12 m^2) in an experimental facility containing basic equipment (a pool, shelters, and troughs) arranged in a linear manner according to Lima (1997). The frogs were housed at a density of 25 animals/m^2. Water from an artesian well was supplied continuously. During the experimental protocol, the water quality parameters were maintained in the acceptable range for bullfrog growth: temperature (27. 8 °C), pH (7.26 ± 0.12), dissolved O_2 (7.33 ± 0.76 mg L^{-1}), Total Ammonia

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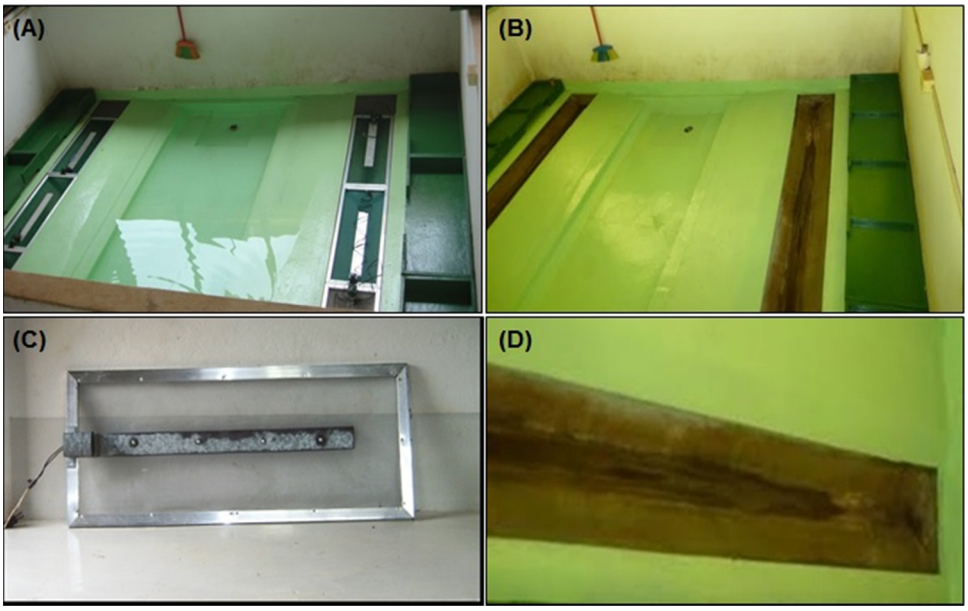

Fig. 1. Fattening pens and feeders for bullfrog froglets rearing in the Anfigranja system. (A) A pen with six shelters and six vibrating feeders each, arranged linearly beside of the pool. (B) A pen with six shelters and two linear feeders each, arranged linearly beside of the pool. (C) A vibrating feeder (80 × 34 cm) consisted of an aluminum frame (2.5 cm wide) and a nylon screen (5 mm) between knots with galvanized sheet (59.4 × 4.5 cm) and a converter connected to a timer in the center of the nylon screen to move the food. (D) A linear cement feeder (3.0 × 0.50 m) with a V-shaped bottom.

Nitrogen (0.21 ± 0.03 mg L^{-1}) and photoperiod (12 h). The parameters measurement was performed using an oximeter and a pH meter YSI 55 and Nessler's reagent for ammonia.

2.2. Study design

Basically, the frogs were submitted to different types of feeding (two treatments). In the first treatment, the animals received ration and housefly larvae in a linear feeder. In the second treatment, the animals received the same ration without larvae in a vibrating feeder tray. Next, total population sampling was performed to determine production parameters of the animals (weight gain, food intake, feed conversion, survival, and specific growth rate) at three different time points (30, 60 and 90 days) in the summer. The feed was been distributed on the feeder tray manually by a producer twice daily according to 5% of total body weight measured monthly. The total biomass value was readjusted following each biometric measurement.

2.3. Specific procedures

2.3.1. Pens with linear feeders

Three fattening pens (Fig. 1B) contained linear cement feeders (3.0 × 0.50 m) with a V-shaped bottom that crossed the pen longitudinally at each side of the pool (Fig. 1D). Commercial diet FRI-AQUA® (40% crude protein, 6–8 mm pellet) with added 5% housefly larvae according to Aleixo et al. (1984) determined by the wet weight to stimulate food intake was supplied until apparent satiety of the animals. Cleaning of the pens, exchange of the pool water and removal of leftovers were performed daily.

2.3.2. Pens with vibrating feeder trays

In the other three pens, six vibrating feeder trays (80 × 34 cm) per pen were arranged linearly, three at each side of the pool (Fig. 1A). Each vibrating feeder tray consisted of an aluminum frame (2.5 cm wide) and a nylon screen (5 mm) between knots. A galvanized sheet (59.4 × 4.5 cm) with a converter connected to a timer was placed in the center of the nylon screen. The galvanized sheet moves the food and stimulates food intake by the animals (Fig. 1C). The same commercial ration containing 40% crude protein was supplied until apparent satiety of the animals, but without the addition of housefly larvae. The vibrating feeders were activated from 7:00 to 19:00 h. The vibrating feeder trays remained 15 min on (each feeding period) and 15 min off. The vibrating feeder tray does not throw the food in the water. It simply vibrates and moves slightly all portion food stimulating the frogs feeding on the vibrating feeder tray. If the feed falls into the water, the frogs do not eat.

2.3.3. Productive performance

The productive performance of the frogs was evaluated at 0–30, 31–60 and 61–90 days by the measurement of weight gain, food intake, feed conversion, survival, and specific growth rate (SGR = ln(final live weight) – ln(initial live weight)/experimental days]. A sample of 20% of the frogs was weighed monthly in each experimental pen. For calculation of the amount of ingested food and feed conversion on a dry matter basis, leftovers (diet and housefly larvae) were removed, stored in a freezer, and subsequently dried in an oven with forced air circulation at 105 °C for 12 h.

2.3.4. Statistical analysis

Data of weight gain, food intake, feed conversion, specific growth rate and survival were analyzed regarding normality and homoscedasticity by the Shapiro–Wilk and Bartlett tests, respectively, and after submitted to analysis of variance. Significant differences between treatments were analyzed by the Duncan test ($\alpha = 0.05$) using the SAS Institute (2008) program.

3. Results

The weight gain and feed conversion of frogs feeding in the vibrating feeder tray was higher than that of animals feeding in the linear feeder after day 60 of the study period. In ninety days of experiment, weight gain (240.48 ± 16.49 g), feed conversion (1.10 ± 0.01) and the specific growth rate (4.85 ± 0.15%/day)