NOVEL FOOD ITEM PREFERENCE IN HABITUATED THE EASTERN CHIPMUNK *TAMIAS STRIATUS*

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Keywords- Chipmunk, *Tamias striatus*, foraging, habituated

INTRODUCTION

The Eastern Chipmunk, *Tamias striatus*, is a diurnal forager with a diverse diet including nuts, acorns, seeds, mushrooms, fruits, berries, and occasionally small invertebrates (Nowak, 1991). Chipmunks forage heavily in the summer in order to create food caches that are consumed during winter torpor (Anderson et al, 2002). Home ranges can extend up to .4 ha (Nowak, 1991), but as a central place forager (Lacher, 1996) chipmunks rarely venture more than 45 meters from their burrows (Nowak, 1991) due to limitations imposed by predators, competitive neighbors, and food availability (Yahner, 1978). These ranges often overlap (Dunford, 1970), and chipmunks have been observed foraging in large food patches simultaneously. Chipmunks are known to have mid-morning and mid-afternoon peaks of activity (Snyder, 1982).

A chipmunk's ability to survive through winter is dependent on being able to cache a large amount of food. Past experiments have explored food preference (Pyare,

1993) but dealt only with current food items. By adding a novel food item of high nutrient value it would be expected that chipmunks would have enough plasticity in their diet to quickly add the food item, as that would give it an advantage over chipmunks without the ability. However, we would expect food items of poor value or dangerous due to flavor to be avoided.

In a preliminary observation, chipmunks at the test site were compared with wild chipmunks and those at the test site were determined to be habituated because they did not react to human presence until only a meter away. In contrast wild chipmunks would run away anywhere inside of roughly eight meters.

How quickly a chipmunk would add a novel food item was determined along with the effects of a chili additive (commonly used in sciurid repellents, and a plant defense against herbivores), quinine (a chemical known to be undesirable to avian organisms (Speed, 2000)), and 2-trans-hexenal, an undesirable chemical a certain cockroach will use to deter predators (Farine, 1997). We expected the novel food items to quickly be added to the diet while the undesirables are rejected, but found results to the contrary. As a diurnal mammal we expect chipmunks to be dichromatic (Britannica) and able to differentiate between red, blue, and yellow seeds (due to their differences in wavelength) as distinctive novel food items.

Methods and Materials

The study took place at the University of Michigan Biological Station 45.560^{o} north and longitude 84.675^{o} west (maps.google.com). Two sites, control and experimental, were used that were placed 1m under small cover (low lying plants directly off of a frequently traveled path) to avoid disturbance by foot traffic. The control site was over 40 meters from the experimental site to avoid crossover of chipmunks.

Sunflower seeds were colored red, blue, and yellow using food coloring at a concentration of 30ml water and 2 drops of coloring for 50 seeds for around 12 hours. When used, 10ml of chili additive was added to red seeds, 5ml (low) concentration or 15ml (high) of quinine hemisulfate (94% concentration) was added to blue seeds, and 2 drops (low) or 5 drops (high) of trans-2-hexanal at 98% concentration was added to blue seeds. Yellow seeds were always used as a control.

Data were collected from in the first week of August by counting the number of seeds left on a 50cm*25cm thin wooden board (the control site always had untreated colored seeds). Seeds were set out at a morning time (between 8-10am) and at a late afternoon time (between 4-5pm) and the number taken was recorded an hour after. Initially 7 seeds of all three colors with nothing added were set out at both the experimental and control. To control for edge effect they were laid out in a circle alternating between each color. Once no chipmunk preference for any particular color was found, low concentration quinine was added to blue seeds. After a day high concentration quinine was added to blue seeds in the morning, along with the chili additive in the evening (experimental sites then contained both high concentration quinine and the chili additive). Data were collected for 2 days. In the afternoon a day later, piles of 18 seeds of each color were set out on the low concentration trans-2-hexenal was added to blue seeds and data were collected that afternoon and the following morning. The following day high concentration trans-2-hexenal was added to the blue seeds and data were collected for 2 days. Data were analyzed using a T-test to compare means.

RESULTS

Chipmunks took all seed colors and all concentrations of quinine and chili additive (Fig. 1;Fig. 2). Trans-2-hexenal was only avoided at a high concentration, but most was still taken and a significant difference was not found (t=.923, df=3, P=0.424) (Fig. 3). Data collected on rainy days is excluded.

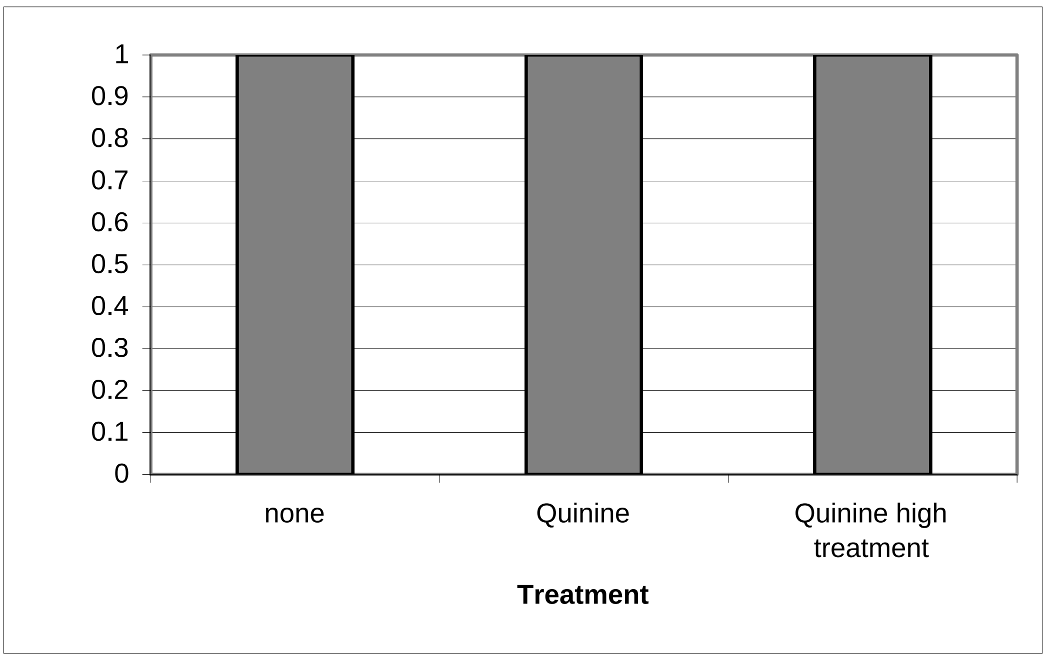

FIGURE 1. Seeds from all treatments were consumed.

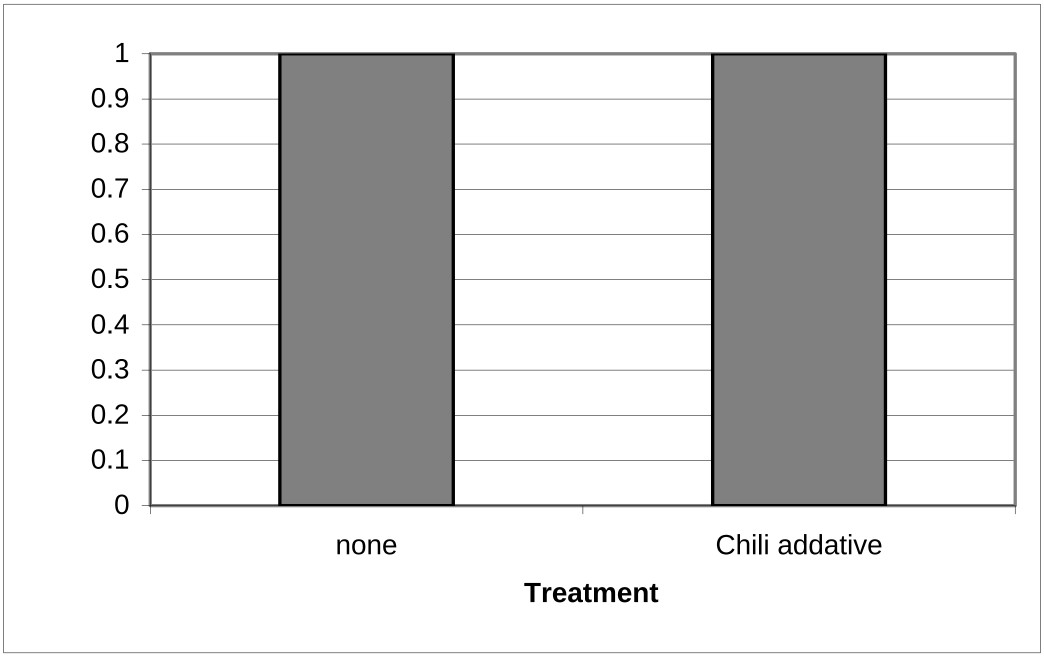

FIGURE 2. Seeds from all treatments were consumed.

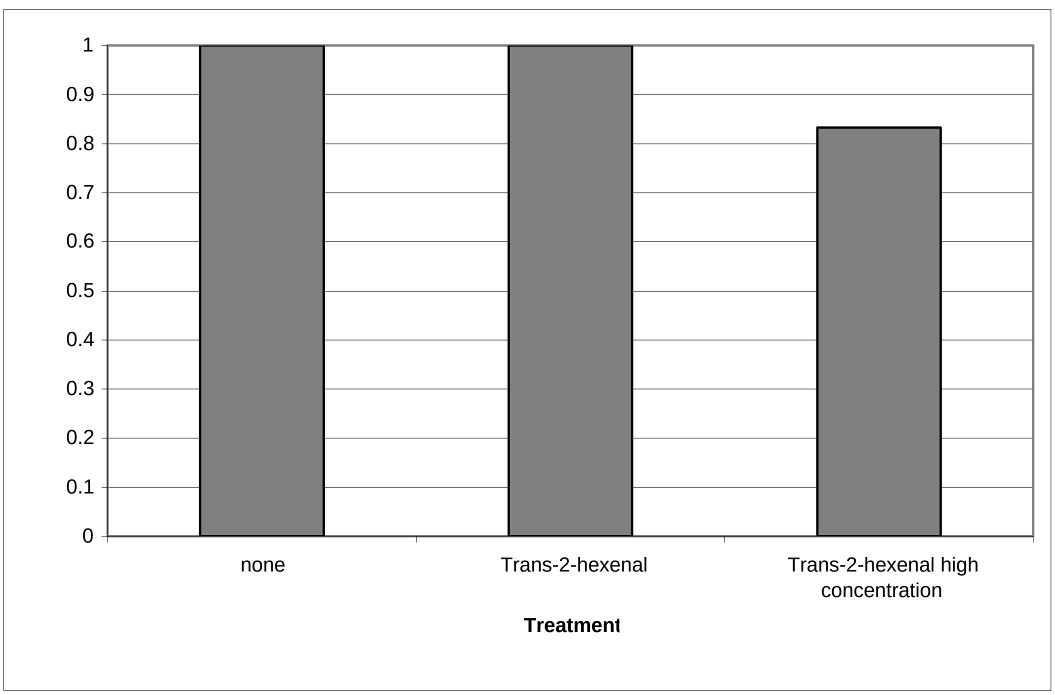

FIGURE 3. A small proportion of seeds from the trans-2-hexenal high concentration were not eaten.

Discussion

Contrary to the belief that chipmunks should avoid bitter chemicals that may hint at a poisonous or dangerous food item, all of our treatments were consumed by the chipmunks. These results raise interesting questions about the effects that habituation to humans has on small mammals. It is not unreasonable to assume that there must be a very high benefit for habituated chipmunks that choose to add nearly any food item that does not kill them to their diet. However, it should not be easily accepted that the chemicals we dispensed to the chipmunks were completely edible. Instead of eating the food we dispensed it is more likely that the chipmunks cached the items and will reevaluate their worth during winter when they use their food stocks. By collecting a large variety of food items, even though some may be less edible than others, the chipmunk may be planning for a winter in which food items are scarce, and eating less edible food is a better option than eating nothing. A large pool of possibly edible foods may be more beneficial than a small pool of definitely edible foods.

This experiment demonstrates the ease of which habituated chipmunk populations could be controlled. If it is assume habituated chipmunks bring nearly any food like item set out back to their caches, it would not be difficult to add a bacteria or poisonous agent with the ability to destroy the cache, in turn reducing a chipmunks chance to survive through the winter.

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