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Capsaicin effects on consumption of food by Cedar Waxwings and House Finches.—Capsaicinoids (e.g., N-vanillyl-n-nonamide, norcapsaicin, nordihydrocapsaicin, capsaicin, dihydrocapsaicin, homocapsaicin, homodihydrocapsaicin; Hoffman 1983) are aromatic amides and the pungent principles in Capsicum peppers. Although these substances are strong chemical irritants for most mammals (e.g., Rozin et al. 1979), the available data suggest that they are inoffensive to some birds. For example, European Starlings (*Sturnus vulgaris*) and Rock Doves (*Columba livia*) are unresponsive to these compounds, even when concentrations greatly exceed those which mammals avoid (Szolcsanyi et al. 1986; Mason et al., in press).

The present studies were designed to explore further the apparent taxonomic specificity of capsaicin. We also measured the capsaicin levels present in wild fruits and used that concentration in our behavioral tests.

Materials and methods.—To determine an ecologically valid concentration of capsaicin to use in behavioral tests, we determined the average amount of capsaicin present in wild peppers (*Capsicum annuum*). Fruits were collected during the summers of 1990 and 1991 at the Audubon Sabal Palm Sanctuary, Cameron County, Texas. Fresh specimens were frozen immediately and shipped to the Monell Chemical Senses Center, Philadelphia, Pennsylvania. Upon arrival, capsaicin concentrations were determined according to the method of Hoffman et al. (1983). Fruits were weighed, ground to a paste, and extracted with 95% ethanol at 65–75°C for five h. Suspended material was allowed to settle, and the supernatant was transferred to Teflon-lined screw-capped vials. Samples of fluid (50 μl) were injected into a Waters Associates ALC/GPC high performance liquid chromatograph (HPLC) system with a 10 μl Bondapak C_{18} column and a guard column of Bondapak C_{18}/Corasil (Waters Associates) with detection at 280 nm (Hoffman et al. 1983).

Five male Cedar Waxwings (*Bombycilla cedrorum*) were mist-netted near Gainesville, Florida, and shipped by air to the Monell Center. Five male House Finches (*Carpodacus mexicanus*) were funnel trapped in the Philadelphia area. All birds were caged individually (dimensions: 61 cm × 36 cm × 41 cm) under a 12:12 light-dark cycle (lights on 07:00–19:00 h EST).

During a two-week period of adaptation to captivity, canary-finch feed (AVN®, Purina Mills, Inc., St. Louis, Mo.; hereafter referred to as feed) and tapwater were provided ad libitum. Because waxwings are frugivorous, their diet was supplemented with mashed bananas and blueberries every third day.

A five day pretreatment period immediately followed adaptation. On each pretreatment day, birds were food deprived overnight (18:00–08:00 h). Between 08:30 and 09:00 h, one cup containing 20 g of control feed was placed in each cage. Control feed samples were prepared by spraying plain feed with diethyl ether 24 h before testing, and then placing the feed under a fume hood to evaporate the ether (Jakubas et al. 1991). Consumption, spillage, body mass, and dry feces mass for each bird were measured at the end of each test. After testing and until lights out, all birds were provided free access to plain feed and tapwater.

A five-day treatment period immediately followed pretreatment. During treatment, birds were given feed containing 1000 ppm capsaicin in three h tests. To prepare the capsaicin-treated feed, samples were sprayed with reagent grade synthetic capsaicin (Aldrich Chemical Company, St. Louis, Mo.) dissolved in diethyl ether (Aldrich Chemical Company, St. Louis, Mo.). As in pretreatment, the treated feed samples were placed under a fume hood for 24 h to evaporate the ether prior to testing. Consumption, spillage, body masses, and feces dry masses were recorded, as described above. Body masses and dry feces masses were recorded as gross measures of health during the experiment.

Consumption, body masses, and dry feces masses were evaluated separately in three factor analyses of variance (ANOVAs) with repeated measures over periods and days. The independent factor in these analyses was species. Tukey post-hoc tests (Winer 1971:198) were used to isolate significant differences among means ($P < 0.05$).

Results.—Chromatography showed that the average capsaicin concentration in wild fruits was 1000 ppm (SE = 10.5 ppm). Consumption of treated feed by Cedar Waxwings was greater than that of House Finches, although it was slightly, albeit significantly, depressed on treatment day 1 ($F = 28.3$; df = 1,4; $P < 0.007$). Consumption by House Finches remained constant between periods.

When body masses were examined, there were no biologically significant treatment effects. Cedar Waxwings were heavier than House Finches ($F = 50.0$; df = 1,4; $P < 0.003$). Analysis of feces dry mass showed that the mean mass of Cedar Waxwing feces was greater than the mean mass of House Finch feces ($F = 256.8$; df = 1,4; $P < 0.0005$). Otherwise, there were no biologically significant treatment effects.

Discussion.—Wild capsicum peppers contain approximately 1000 ppm of capsaicin. This concentration is repellent to house mice (*Mus musculus*), deer mice (*Peromyscus maniculatus*), and Norway rats (*Rattus norvegicus*) (J. R. Mason, unpubl. data), but does not substantially affect feeding by Cedar Waxwings (present experiment), House Finches (present experiment), Rock Doves (Szolcsanyi et al. 1986), or European Starlings (Mason et al., in press). Although the reasons underlying the apparent taxon-specific aversiveness of capsaicin remain obscure, anecdotal evidence suggests one intriguing possibility. We speculate that the differential sensory effects of capsaicin on mammals and birds may reflect a selected response related to the reproductive strategy of Capsicum plants. Specifically, capsaicinoids may exploit the separately evolved sensory systems of the two taxa (Mason et al., in press) and selectively repel mammalian seed predators but not avian seed dispersers. These irritant chemicals are present only in the red, upright fruit, and occur nowhere else in Capsicum plants. The fruits themselves are high in vitamins, protein, and lipids (Herrera 1987), traits which are correlated with avian dispersal (Willson and Thompson 1982, Willson and Hoppes 1986). Birds are commonly seen feeding on wild capsicum fruits, colloquially known as 'bird peppers' (R. Smith, pers. comm.). Rodents have not been observed eating these fruits, although they will readily consume Capsicum seeds in the absence of capsaicinoids (D. Norman, unpubl. obs.). Whether or not the function of capsaicin is similar to that which we propose remains to be determined, but the hypothesis is readily testable.

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First description of the nest and eggs of the Black Solitaire.—The Black Solitaire (*Entomodestes coracinus*), a little-known species whose nesting has not heretofore been described, occurs only in upper tropical and subtropical forests along the Pacific slope from the headwaters of the Río San Juan in W-C Colombia to NW Ecuador (Meyer de Schauensee 1970, Hilty and Brown 1986). It is fairly common at La Planada Natural Reserve, Dpto. de Nariño, Colombia (1°15′N, 78°15′W), where I discovered two active nests, each of which held two eggs.

I found the first nest on 19 July 1990, along the crest of a ridge at ca 1900 m when an adult was flushed from the nest and reappeared less than 5 min later. The open cup nest was anchored to several vertical stems of an aroid (*Monstera*) attached to the trunk of a melastome tree (*Conostegia* sp., ca 16 cm dbh and 6 m in height), leaning out from the trunk 1.7 m above the ground. Canopy height in the nest-site was ca 20 m. The nest was comprised mostly of fresh moss, with an inner lining of brownish rootlets. The nest cup was 48 mm deep and 90 mm wide (inside diameter). The subelliptical eggs were light glossy green with fine, brown, randomly distributed spots. Two days later, I again flushed an adult from the nest; this bird reappeared nearby on at least four occasions in the next 25 min. Voucher photographs of this nest with eggs and its habitat have been deposited in VIREO (V06-8-001, V06-8-002).