



Preferences of three blackbird species for sunflower meats, cracked corn and brown rice

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We offered sunflower meats, cracked corn and brown rice to individuals and small groups ($n = 4-5$) of red-winged blackbirds (*Agelaius phoeniceus*), yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) and common grackles (*Quiscalus quiscula*) to determine their food preference. Common grackles (sexes combined) preferred cracked corn over sunflower meats and brown rice. Male and female yellow-headed blackbirds preferred brown rice or a combination of brown rice and cracked corn or sunflower meats. Female red-winged blackbirds chose brown rice; whereas, male red-winged blackbirds did not show a consistent food preference. Either brown rice or a brown rice and cracked corn combination should be used to bait blackbirds.

Keywords: *Agelaius phoeniceus*; bait preference; blackbirds; common grackle; North Dakota; *Quiscalus quiscula*; red-winged blackbird; *Xanthocephalus xanthocephalus*; yellow-headed blackbird

Sunflower plantings in the northern Great Plains have increased from a few thousand hectares in the early 1960s to about 1 312 000 ha in 1994 (Helgeson *et al.*, 1977; Kleingartner, 1994). Ripening sunflower can be severely damaged (Hothem, DeHaven and Fairaizl, 1988) by both sexes of three species of blackbirds (red-winged blackbirds (*Agelaius phoeniceus*), yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), and common grackles (*Quiscalus quiscula*) (Linz *et al.*, 1984; Twedt, Bleier and Linz, 1991; Homan, Linz and Bleier, 1994). Bird damage control techniques (e.g. scare devices, habitat manipulation and repellents) are available to reduce sunflower damage but all of these methods have limitations of costs, logistics and effectiveness (Linz *et al.*, 1993). Thus, growers are seeking the development of new environmentally safe and effective avicides, repellents and chemosterilants (Kleingartner, 1989).

Chemical formulations applied to various grains are often used to control blackbird populations (Knittle *et al.*, 1988; Glahn and Wilson, 1992). Currently, sunflower meats, cracked corn and brown rice are the recommended baits for controlling blackbirds with DRC-1339 avicide (active ingredient: 3-chloro-4-methylbenzenamine hydrochloride) in the northern Great Plains (US Department of Agriculture, Animal and Plant Health Inspection Service, 1993). However, quantitative data comparing preferences of red-winged blackbirds, yellow-headed blackbirds and common grackles for these baits are not available. Rapid consumption of the baits by blackbirds may increase the efficacy of the avicide and reduce the risk of exposing nontarget animals to toxic chemicals. Thus, knowledge of the food preferences of blackbirds is needed before effective damage management strategies using DRC-1339 avicide

can be implemented. The objective of this experiment was to determine the food preferences of captive male and female red-winged blackbirds, yellow-headed blackbirds, and common grackles (sexes combined) when presented with cracked corn, sunflower meats and brown rice.

Materials and methods

Blackbirds were mist-netted in late July and August 1992 in a wetland located within 10 km of Fargo, North Dakota and transported to 4.9 (length) \times 1.2 (width) \times 2.4 (height) m outdoor holding pens in Fargo. Birds were separated by species and sex and were provided Layena CrumblesTM (Purina Mills, Inc., St. Louis, MO, USA), millet, grit and fresh water.

We conducted feeding trials with individually caged blackbirds (individual trials) and groups of four or five birds (group trials) of the same sex and species from 14 August to 15 September 1992. The sunflower meats, cracked corn and brown rice were prepared for the trials by screening through a No. 5 (4.0 mm) U.S. standard sieve and catching the food on a No. 7 sieve (2.8 mm) to remove food fragments (U.S. Department of Agriculture, Animal and Plant Inspection Service, 1993). The mean mass of 30 randomly selected sunflower meats, cracked corn and brown rice was 0.02 ± 0.008 (SD) g, 0.06 ± 0.019 (SD) g, and 0.02 ± 0.004 (SD) g, respectively. We determined the percentage of dry matter, acid detergent fiber, ash, fat content, crude protein and gross energy (cal g⁻¹) of the three food items (Goering and Van Soest, 1970; AOAC, 1990).

For the individual trials, common grackles (sexes

combined) [$n = 28$, \bar{x} mass = 101.0 ± 2.7 (SE) g], male red-winged blackbirds [$n = 15$, \bar{x} mass = 65.5 ± 1.9 (SE) g], female red-winged blackbirds [$n = 16$, \bar{x} mass = 42.5 ± 1.2 (SE) g], male yellow-headed blackbirds [$n = 16$, \bar{x} mass = 90.3 ± 3.2 (SE) g] and female yellow-headed blackbirds [$n = 14$, \bar{x} mass = 56.9 ± 2.0 (SE) g] were randomly selected, weighed, and placed in 61.0 cm (length) \times 35.6 cm (width) \times 40.6 cm (height) screened cages for 8 days. Male and female grackles were combined because they were difficult to separate by sex during the post-breeding season due to their similar size and plumage.

In the individual trials, all food was removed from the cages at sunset and at sunrise, the water was removed and 20 g of each food item (sunflower meats, cracked corn and brown rice) was placed in separate 8.9-cm-diameter culture cups and positioned in a 14-cm-diameter Petri dish to catch spilled grain. After 1 h, the test foods were removed and the maintenance diet and water placed in the cages. Foods remaining in the food containers and spilled grain (including food found on cage floor) were dried at room temperature (about 22°C) for at least 24 h and weighed to the nearest 0.01 g.

For the group trials, four or five common grackles [$n = 14$, \bar{x} mass = 101.8 ± 4.3 (SE) g], male red-winged blackbirds [$n = 14$, \bar{x} mass = 61.1 ± 2.2 (SE) g], female red-winged blackbirds [$n = 15$, \bar{x} mass = 42.7 ± 1.8 (SE) g], male yellow-headed blackbirds [$n = 15$, \bar{x} mass = 90.0 ± 2.0 (SE) g], or female yellow-headed blackbirds [$n = 14$, \bar{x} mass = 48.9 ± 2.0 (SE) g] were randomly selected from a pool of birds used previously in the individual trials and placed in separate 4.9 m (length) \times 1.2 m (width) \times 2.4 m (height) outdoor pens. We placed 100 g of each food type in a 41.9-cm-diameter hard rubber tray and then placed the tray in separate 20.3-cm-diameter pans to catch spillage. Test procedures were the same as described for the individual trials. The average amount of food consumed by an individual bird in a group was obtained by dividing the total amount of food consumed during a feeding trial by the number of individuals in that group.

Statistical analysis

Data from individual and group feeding trials were analyzed separately. The null hypotheses that sunflower meats, cracked corn and brown rice were consumed equally within each species-sex class were tested with a comprehensive Repeated Measures Multivariate Analysis of Variance (RMANOVA) (Cody and Smith, 1991). Specific contrasts were made as part of this RMANOVA. *F*-statistics refer to simultaneous comparisons of all food categories; $p < 0.05$ was accepted as significant for all statistical tests.

Results

Food characteristics

Sunflower meats, cracked corn and brown rice had approximately the same percentage of dry matter (Table 1). Brown rice had two–three times more ash (3.6%) and two–three times less acid detergent fiber (2.1%) than sunflower meats and cracked corn. Sun-

flower contained 65–70% more gross energy and nearly three times more crude protein than rice and corn.

Common grackles

Individually caged common grackles ate significantly different amounts of sunflower meats, cracked corn and brown rice ($p < 0.0001$) (Figure 1A). They ate more cracked corn than either sunflower meats ($p < 0.0001$) or brown rice ($p < 0.0001$). Birds fed in groups also ate different ($p = 0.0006$) amounts of each food item, again eating more cracked corn than sunflower meats ($p = 0.0004$) or brown rice ($p = 0.0182$) (Figure 1B).

Table 1. Results of chemical analyses on three foods fed to caged blackbirds"

Nutritional analysis	Food item		
	Sunflower meats	Cracked corn	Brown rice
Dry matter (%)	94.1	90.6	90.6
Ash (%)	1.5	1.2	3.6
Gross energy (cal g ⁻¹)	7.3	4.4	4.3
Crude protein (%)	28.6	10.6	9.4
Acid detergent fibre (%)	5.9	5.4	2.1

"Values represent mean percentages of duplicate samples. Variance was negligible (i.e. <0.1%)

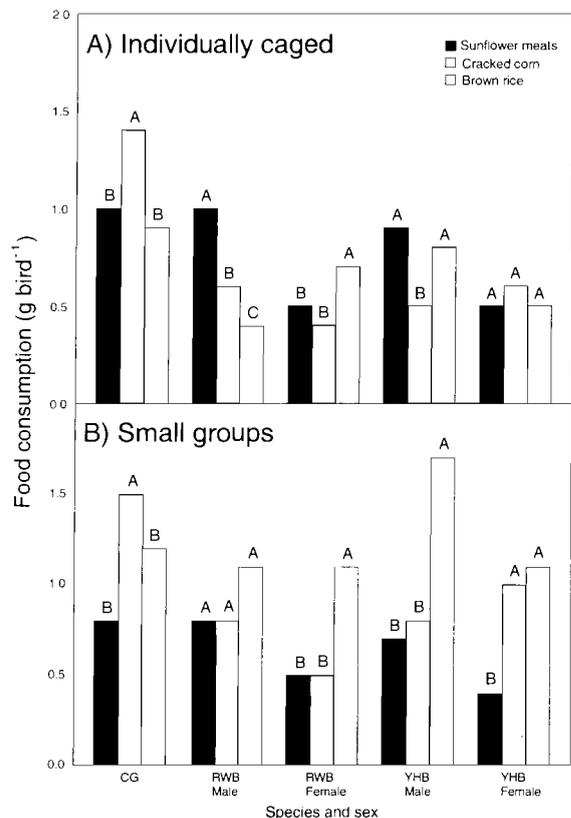


Figure 1. Average amount of sunflower meats, cracked corn, and brown rice consumed by (A) individually caged birds or (B) by individual birds fed in small groups of four or five birds. Test birds were common grackles (CG, sexes combined), male red-winged blackbirds (RWB), female red-winged blackbirds, male yellow-headed blackbirds (YHB) and female yellow-headed blackbirds

Red-winged blackbirds – males

Individually caged male red-winged blackbirds ate different ($p < 0.0001$) amounts of each food item (Figure 1A), preferring sunflower meats over cracked corn ($p < 0.0001$) and cracked corn over brown rice ($p = 0.0472$). Birds fed in groups consumed equal amounts of sunflower meats, cracked corn, and brown rice ($p = 0.6531$) (Figure 1B).

Red-winged blackbirds – females

Individually caged female red-winged blackbirds ate significantly different ($p = 0.0027$) amounts of the three food items (Figure 1A). They preferred brown rice over sunflower meats ($p = 0.0441$) and cracked corn ($p = 0.0025$). Birds fed in groups ate disproportionate amounts of the three food items ($p = 0.0017$), again preferring rice over sunflower ($p = 0.0107$) and cracked corn ($p = 0.0117$) (Figure 1B).

Yellow-headed blackbirds – males

Individual male yellow-headed blackbirds ate significantly different amounts of the three food items ($p = 0.0058$), preferring both sunflower meats ($p < 0.0001$) and brown rice over cracked corn ($p = 0.0108$) (Figure 1A). Birds fed in groups ate different amounts of the three foods ($p = 0.0054$), clearly preferring brown rice over sunflower meats ($p = 0.0148$) and cracked corn ($p = 0.0376$) (Figure 1B).

Yellow-headed blackbirds – females

Individually caged female yellow-headed blackbirds ate the same amounts of each food ($p = 0.0811$) (Figure 1A). Birds fed in groups ate significantly different amounts of each food item ($p = 0.0167$), preferring brown rice ($p = 0.0041$) and cracked corn over sunflower meats ($p = 0.0042$) (Figure 1B).

Discussion

Average consumption of brown rice, cracked corn and sunflower meats per bird was 22% higher when the birds fed in groups than when they fed individually. Food consumption by blackbirds, which normally feed in flocks in late-summer, may have been enhanced by the presence of other birds during the group trials (Mason and Reidinger, 1981).

We expected (*a priori*) that sunflower would be consistently selected over corn and rice because (i) sunflower is a high energy and high protein food and (ii) sunflower is a preferred food for migrating blackbirds in North Dakota (Linz *et al.*, 1984; Twedt *et al.*, 1991; Homan *et al.*, 1994). However, only individually caged male red-winged blackbirds preferred sunflower over the other two foods. Common grackles, which have larger bills than red-winged and yellow-headed blackbirds (Beecher, 1951), probably maximized their energetic benefit by selecting the largest food item (i.e. cracked corn). On the other hand, brown rice may have been relatively easy for the smaller billed birds (e.g. female red-winged blackbirds) to handle (Avery,

Goocher and Cone, 1993). Overall, food preference was probably dependent on several factors including color, size, taste and calorific content (Beecher, 1951; Mason *et al.*, 1984, 1989).

Our results indicate that all three foods are acceptable to blackbirds and could be used as bait carriers. However, if a certain species and sex of blackbird is targeted, wildlife managers may choose to use a particular bait. For example, brown rice should be used if the target bird is the female red-winged blackbird; whereas, cracked corn should be used to bait common grackles. Mixed blackbird flocks could be baited with a combination of brown rice and cracked corn in the northern Great Plains. We suggest that sunflower meats should be used sparingly because they were not consistently preferred by any test group. Moreover, sunflower meats placed on the ground tend to decompose more rapidly than cracked corn and brown rice, further decreasing their usefulness as a bait.

We suggest that additional bait preference research should be conducted with groups of blackbirds housed in large enclosures. To further simulate field conditions, trials with mixed flocks of blackbirds should be considered. Finally, the relative attractiveness of cracked corn, sunflower meats, and brown rice to non-target birds found in sunflower growing areas should be investigated.

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References

- American Organization Analytical Chemist (1990) *Official Methods of Analysis*. 15th ed. Association Official Analytical chemists, Washington, DC, 1298 pp
- Avery, M. L., Goocher, K. L. and Cone, M. A. (1993) Handling efficiency and berry size preferences of cedar waxwings. *Wilson Bull.* **105**, 604–611
- Beecher, W. J. (1951) Adaptations for food-getting in the American blackbirds. *Auk* **68**, 411–440
- Cody, R. P. and Smith, J. K. (1991) *Applied Statistics and the SAS Programming Language*, North-Holland, New York, 403 pp
- Glahn, J. F. and Wilson, E. A. (1992) Effectiveness of DRC-1339 baiting for reducing blackbird damage to sprouting rice. *Proc. East. Wildl. Damage Contr. Conf.* **5**, 117–123
- Goering, H. K. and Van Soest, P. J. (1970) *Forage Fiber Forage Analysis (Apparatus, Reagent, Procedures and Some Applications)*. U.S. Department of Agriculture, Agriculture Research Service Handbook **379**, 20 pp
- Helgeson, D. L., Cobia, D. W., Coon, R. C., Hardie, W. C.,

- Schaffner, L. W. and Scott, D. F.** (1977) *The Economic Feasibility of Establishing Sunflower Oil Processing Plants in North Dakota*. ND State Agr. Exp. Station and U.S. Depart. Commerce. Bull. **503**, 98 pp
- Homan, J. H., Linz, G. M. and Bleier, W. J.** (1994) Effect of crop phenology and habitat on the diet of common grackles (*Quiscalus quiscula*). *Am. Midl. Nat.* **131**, 381–385
- Hothem, R. L., DeHaven, R. W. and Fairazi, S. D.** (1988) *Bird Damage to Sunflower in North Dakota, South Dakota and Minnesota*. 1979–1981. US Fish Wildl. Serv., Fish Wildl. Tech. Rep. **15**, 11 pp
- Kleingartner, L.** (1989) Blackbird controls still on front burner. *The Sunflower* **15**, 32–33
- Kleingartner, L.** (1994) Sunflower briefs. *The Sunflower* **20**, 4
- Knittle, C. E., Cummings, J. L., Linz, G. M. and Besser, J. F.** (1988) An evaluation of modified 4-aminopyridine baits for protecting sunflower from blackbird damage. *Proc. Vertebr. Pest Conf.* **13**, 248–253
- Linz, G. M., Dolbeer, R. A., Hanzel, J. J. and Huffman, L. E.** (1993) *Controlling Blackbird Damage to Sunflower and Small Grain Crops in the Northern Great Plains*. US Department of Agriculture Bull. **679**, 15 pp
- Linz, G. M., Vakoich, D. L., Cassel, J. F. and Carlson, R. B.** (1984) Food of red-winged blackbirds (*Agelaius phoeniceus*) in sunflower fields and corn fields. *Can. Field-Nat.* **98**, 38–44
- Mason, J. R. and Reidinger, R. F.** (1981) Effects of social facilitation and observational learning on feeding behavior of the red-winged blackbird (*Agelaius phoeniceus*). *Auk* **98**, 778–784
- Mason, J. R., Dolbeer, R. A., Arzt, A. H., Reidinger, R. F. and Woronecki, P. P.** (1984) Taste preferences of male red-winged blackbirds among dried samples of ten corn hybrids. *J. Wildl. Manage.* **48**, 611–616
- Mason, J. R., Dolbeer, R. A., Woronecki, P. and Bullard, R. W.** (1989) Maturational and varietal influences on sunflower consumption by red-winged blackbirds. *J. Wildl. Manage.* **53**, 841–846
- Twedt, D. J., Bleier, W. J. and Linz, G. M.** (1991) Geographic and temporal variation in the diet of yellow-headed blackbirds. *Condor* **93**, 975–986
- United States Department of Agriculture, Animal and Plant Health Inspection Service** (1993) *Compound DRC-1339 Concentrate – North Dakota (Use Label)*. US Department of Agriculture, Animal Plant Health Inspection Service, Hyattsville, Maryland

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