Feed Depredation by European Starlings

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Introduction

European starlings (*Sturnus vulgaris*) were first introduced to the United States in the late 1800s. It is believed that the starlings were imported from Europe and released in New York City's Central Park so that all of the birds mentioned in Shakespeare's works would inhabit the new country. For the next 50 years, the starling population grew exponentially; by 1942, starlings had spread to the West Coast. Starlings are not considered migratory and remain in the same general area year round; however, some may migrate several hundred miles. During much of the year, the inconspicuous starlings disperse into small flocks and feed on seeds, fruits, and insects. During winter months, starlings form flocks of several hundred up to 750,000 birds that share feeding and roosting sites. These large flocks prefer to roost in coniferous trees, which provide protection from wind and adverse weather conditions. Previous research has documented that a 3-oz starling consumes nearly 2 lb of feed in a 30-day period. Commercial feedlots have been infested with large populations of starlings during winter months. The attraction to feedlots is due to open feed bunks that provide a convenient source of feed. Currently, there are limited means for controlling starlings in feedlots. The objective of our experiment was to compare susceptibility of different rations to depredation by starlings.

Experimental Procedures

Finishing diets used in this study were formulated with commonly used feed ingredients (Table 1). Four different mixtures of meal-type rations were compared with an extruded ration (Table 2). The first diet was a dry-rolled corn diet with 6% alfalfa hay. The next two diets were based on steam-flaked corn; one contained 6% alfalfa hay, and the other contained 12% corn silage. The remaining meal-type diet was based on steam-flaked corn and 6% alfalfa hay but also contained 25% (dry-matter basis) dried corn distillers grains with solubles. The extruded diet was the exact same mixture as the steam-flaked corn and 6% alfalfa hay diet. Dry-rolled corn was processed to a mean geometric particle size of 4.1 mm (n = 23) by using a single stack roller mill, and steam-flaked corn was processed to a flake density of 28 lb/bu with a mean geometric particle size of 5.7 mm (n = 159). The pelleted diet was processed through a corotating, fully intermeshing, twin-screw extruder (Model BCTG-62, Bühler AG, Uzwil, Switzerland). All ingredients, including the corn and alfalfa hay, were processed by using the extruder and forced through a die to form pieces that were 0.75-in. in diameter and approximately 2 to 3 in. long.

Thirty individual feeding sites were constructed by partitioning concrete fence-line feed bunks into 30-in. sections. Each feeding site (i.e., 30 different feeding sites; 6 feeding sites/ration) received 30 lb of a ration prior to arrival of starlings. A wire mesh panel was secured on the pen side of the feed bunk to prevent disturbance of feed by cattle. Feeding sites were accessible to starlings for the entire day. After starlings left the feedlot and returned to their evening roost, unconsumed feed was weighed and sampled. Samples of fresh and unconsumed feed were analyzed for crude protein, crude fat, starch, and crude fiber.

Results and Discussion

Table 3 shows amount of feed delivered, unconsumed feed recovered, and percentage of feed consumed by starlings over a 9-hour period. The steam-flaked corn/alfalfa hay ration was most subject to depredation by starlings (86%; P=0.01), whereas 79% of the steam-flaked corn/dried distillers grain ration and 76% of the steam-flaked corn/corn silage ration were consumed by starlings during the same period of time. The dry-rolled corn/alfalfa hay ration was less affected (66%, P=0.01) by starlings. Starlings did not consume any of the extruded ration. Figure 1 is a representative photograph of the feeding sites before and during a feeding episode. No starlings were perched in the third feeding site containing the extruded ration; however, the other feeding sites contained large numbers of starlings. Distribution and density of starlings remained fairly constant throughout the day.

Nutrient analyses of fresh and unconsumed feeds are summarized in Table 4. Concentrations of starch were lower (P≤0.02) in residual samples of all meal-type rations, suggesting that starlings preferentially eat grain. Protein and fiber both were higher in residual samples of the steam-flaked corn/alfalfa hay diet, suggesting that ingredients contributing to these nutrients (Table 1) were not consumed by the starlings. Concentrations of crude protein were greater (P≤0.04) in residual samples of the steam-flaked corn/alfalfa hay ration and the steam-flaked corn/dried distillers grain ration. Crude fat levels were higher (P=0.001) in residual samples of the steam-flaked corn/dried distillers grain ration, suggesting that birds eat grain rather than distillers grains. Crude fiber was greater (P≤0.06) in all of the residual samples collected from the meal-type rations compared with original concentrations. Crude protein, crude fat, starch, and crude fiber were similar (P≥0.57) for fresh and residual samples of the pelleted ration.

Figure 3 illustrates daily feed deliveries of the meal-type and extruded rations over a 142-day period. For the first 79 days, feed deliveries mirrored each other, with cattle fed meal-type ration consuming 25.4 lb/day of feed. However, on January 8, 2007, feed deliveries started to diverge. From January 8, 2007, to February 23, 2007, feed delivery of meal-type ration linearly increased by 33% from 25.4 to 37.9 lb/day of feed, whereas feed deliveries of the extruded pellet remained fairly stable. This divergence corresponds closely to the arrival (early January) and dispersal (early March) of wintering starlings. Interestingly, delivery of the meal-type ration linearly decreased from February 23, 2007, to pre-starling levels on March 11, 2007, after the wintering flock dispersed.

Implications

Feed depredation by starlings not only results in an economic loss for commercial feedlots but may also negatively affect animal performance because of alteration of the nutrient composition of the ration. Extruding feedlot rations may be a possible means of preventing bird predation.

Table 1. Nutrient content of individual feed ingredients (%, dry-matter basis)

Ingredient	Crude protein	Crude fat	Crude fiber
Steam-flaked corn	9.7	4.3[1]	9.0[1]
Dry-rolled corn	10.1	4.3[1]	9.0[1]
Alfalfa hay	14.5	2.4[1]	59.4
Corn silage	8.8	2.6[1]	49.7
Dried corn distillers grains	29.6	10.0	31.8
Corn steep liquor	32.0	–	–
Urea	291.0[1]	–	–
Soybean meal, dehulled	54.0[1]	1.6[1]	7.8[1]
Supplement	–	–	–

[1] Nutrient content based on 1996 Nutrient Requirements of Beef Cattle (National Research Council).

Table 2. Composition of total mixed rations (%, dry-matter basis)

Ingredient	DRC[1] with alfalfa hay	SFC[2] with alfalfa hay	SFC with corn silage	SFC with dried distillers grains	Extruded[3]
Steam-flaked corn		81.7	77.8	65.7	–
Dry-rolled corn	84.7	–	–	–	81.7
Alfalfa hay	6.0	6.0	–	6.0	6.0
Corn silage	–	–	12.0	–	–
Corn dried distillers grains	–	–	–	25.0	–
Corn steep liquor	6.0	6.6	–	–	6.6
Urea	0.4	1.2	1.1	0.4	1.2
Soybean meal	–	–	4.6	–	–
Supplement	2.9	4.5	4.5	2.9	4.5

1 DRC = Dry-rolled corn.
2 SFC = Steam-flaked corn.
3 Composition identical to the SFC diet. Ingredients were agglomerated together to form a pellet via extrusion processing.

Table 3. Feed delivered, residual feed recovered, and percentage of feed consumed by European starlings during a 9-hour exposure period (i.e., 7:30 a.m. to 4:30 p.m.)

Item	DRC[1] with alfalfa hay	SFC[2] with alfalfa hay	SFC with corn silage	SFC with distillers grains	Extruded[3]	SEM[4]	P-value
Feed delivered, lb	30.0	30.0	30.0	30.0	30.0	–	–
Residual feed, lb	10.4[a]	4.2[b]	7.3[c]	6.4[c]	30.0[d]	1.3	0.01
Feed disappearance, %	65.5[a]	86.0[b]	76.2[c]	78.7[c]	0[d]	4.3	0.01

1 DRC = Dry-rolled corn.
2 SFC = Steam-flaked corn.
3 Composition identical to the SFC diet. Ingredients were agglomerated together to form a pellet via extrusion processing.
4 SEM = Standard error of the mean.
[abcd]Within a row, means without a common superscript letter differ ($P<0.05$).

Table 4. Nutrient contents (%, dry-matter basis) of total mixed rations before (fresh) and after (residual) a 9-hour exposure (7:30 a.m. to 4:30 p.m.) to European starlings

Treatment	Crude protein	Crude fat	Starch	Crude fiber
Dry-rolled corn with alfalfa hay				
Fresh (n = 2)	12.9 ± 2.3[1]	4.4 ± 1.0	69.6 ± 12.7	15.1 ± 8.1
Residual (n = 7)	15.9 ± 2.4	3.6 ± 1.1	43.5 ± 12.7	27.3 ± 7.9
P-value (Fresh vs. Residual)	0.10	0.32	0.02	0.06
Steam-flaked corn with alfalfa hay				
Fresh (n = 2)	15.7 ± 2.3	3.7 ± 1.0	69.3 ± 12.7	14.7 ± 8.1
Residual (n = 7)	19.5 ± 2.4	3.4 ± 1.1	29.6 ± 12.7	37.0 ± 7.9
P-value (Fresh vs. Residual)	0.04	0.66	0.001	0.001
Steam-flaked corn with corn silage				
Fresh (n = 2)	13.9 ± 2.3	5.1 ± 1.0	67.2 ± 12.7	18.9 ± 8.1
Residual (n = 7)	16.0 ± 2.4	4.4 ± 1.1	28.3 ± 12.7	41.3 ± 7.9
P-value (Fresh vs. Residual)	0.24	0.43	0.001	0.001
Steam-flaked corn with dried distillers grains				
Fresh (n = 2)	16.0 ± 2.3	5.3 ± 1.0	61.0 ± 12.7	21.8 ± 8.1
Residual (n = 7)	21.9 ± 2.4	7.3 ± 1.1	21.8 ± 12.7	36.4 ± 7.9
P-value (Fresh vs. Residual)	0.001	0.01	0.001	0.03
Extruded pellets[2]				
Fresh (n = 2)	15.2 ± 2.3	2.2 ± 1.0	72.6 ± 12.7	14.0 ± 8.1
Residual (n = 7)	15.0 ± 2.4	2.5 ± 1.1	66.7 ± 12.7	13.0 ± 7.9
P-value (Fresh vs. Residual)	0.90	0.78	0.57	0.87

[1] Standard deviation.
[2] Composition identical to the SFC diet. Ingredients were agglomerated together to form a pellet via extrusion processing.

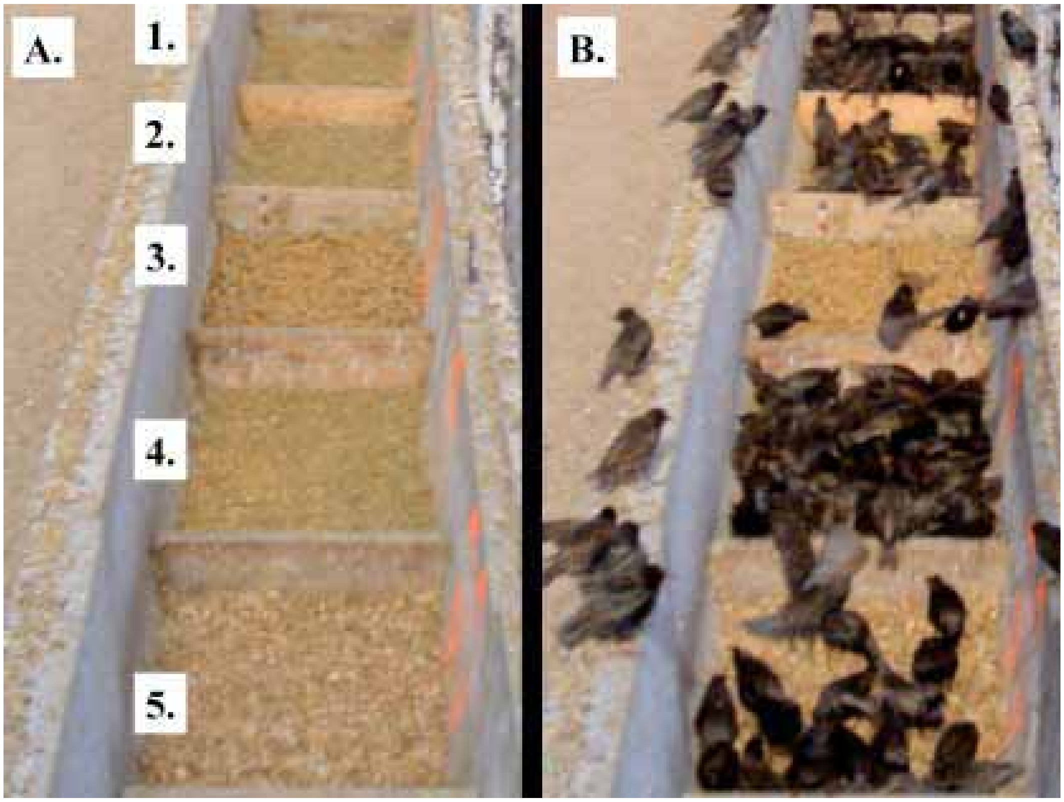

Figure 1. (A) feeding sites before arrival of European starlings and (B) preference exhibited by European starlings at the identical feeding locations.
1. Steam-flaked corn, alfalfa hay, and dried distillers grains.
2. Steam-flaked corn and alfalfa hay.
3. Extruded pellets.
4. Dry-rolled corn and alfalfa hay.
5. Steam-flaked corn and corn silage.

Figure 2. Steam-flaked corn and alfalfa hay diet before and after a 9-hour exposure period (i.e., 7:30 a.m. to 4:30 p.m.) to European starlings.

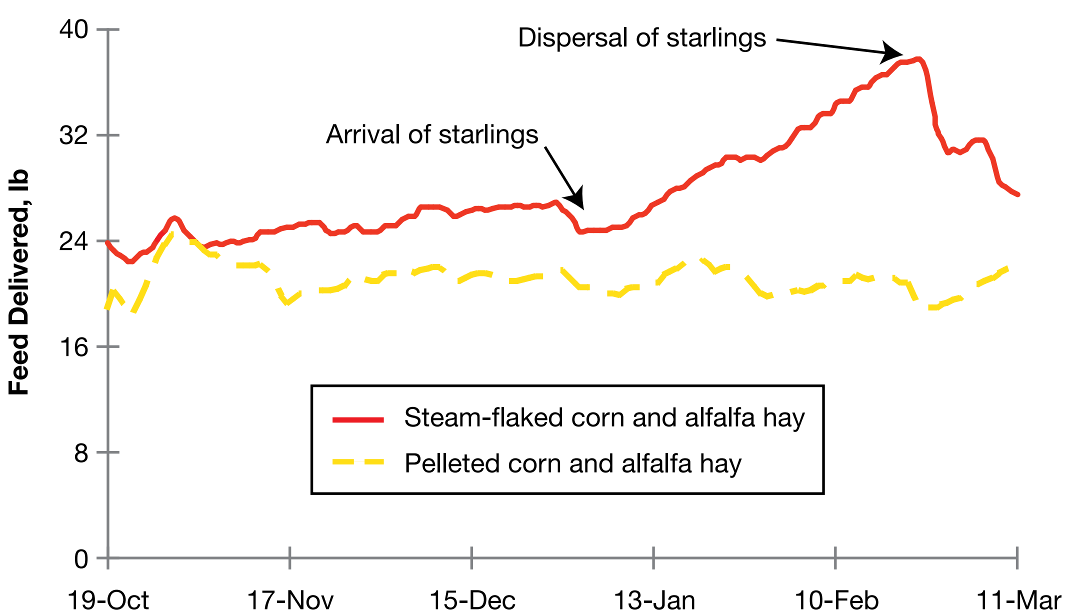

Figure 3. Differences in feed delivered to pens of cattle fed between October and March. The sharp increase starting after January 1 is attributed to the arrival of large numbers of European starlings. The birds dispersed by March 1.