Protective Seed Coating Aids Turf Establishment

By David R. Marks, Russell D. Japuntich and Robert W. Howe

Planting and establishing turf has never been easy. A variety of natural forces such as wind, rain and heat can cause poor growth rates, bare spots and need for reapplication. Seed predation by birds also can reduce the effectiveness of turf establishment and can increase costs substantially (Beard, 1973).

Studies in native prairies (Howe, 1999) imply that birds and seed-eating rodents may even modify turf composition by preferentially eating certain (perhaps desirable) seeds and avoiding others. Agricultural crop damage by blackbirds, turkeys, waterfowl, sandhill cranes, and other bird species is well-documented by the U.S. Department of Agriculture's (USDA) Wildlife Services Program, but seed losses in turf settings are seldom reported.

A potential solution to the problem of seed loss is to encase the seeds in an unpalatable material that deters animals from eating or recognizing the seeds.

Where are coatings used?

Seed coatings have been used for a variety of applications, including enrichment of pet food, deterring squirrels from backyard bird feeders and improving germination of seeds.

The National Wildlife Research Center has found that a seed coating consisting of various clays is effective in reducing blackbird predation on rice seeds in Louisiana (USDA, 1999). Seeds coated with a bird repellent are available in New Zealand, but these and other specially treated seeds have only recently been developed, and little or no information is available about their effectiveness.

On Aug. 24, 2000, the Encapsulated Seed Co. started production of an "all-in-one" grass seed product called EncapSeed at the company's manufacturing facility in Green Bay, Wis. EncapSeed uses a patented technology that individually encapsulates premium grass seeds in a blanket of mulch containing non-toxic fiber from recycled office paper. The coating also contains soil conditioners, fertilizers and a growth-enhancing agent. By combining fertilizer with seed and mulch, this product is designed to free landscapers, homeowners and superintendents from the tedious and labor-intensive task of finding, buying and applying fertilizer, seeds and straw. It also reduces the effects of wind and erosion by increasing the weight of seeds.

Encapsulation of turf seeds clearly serves as a deterrent to seed predation by birds.

Removal, called seed predation, by birds is a major concern for people purchasing specially treated lawn seeds. Our goal in this study was to discover whether birds are truly less likely to eat treated seeds than untreated seeds. To answer this question, we created a controlled experiment on captive house sparrows, a common species of residential areas and one of the species most likely to consume seeds in turf settings. We tested the following hypothesis: Encapsulating seeds deters seed predation by birds.

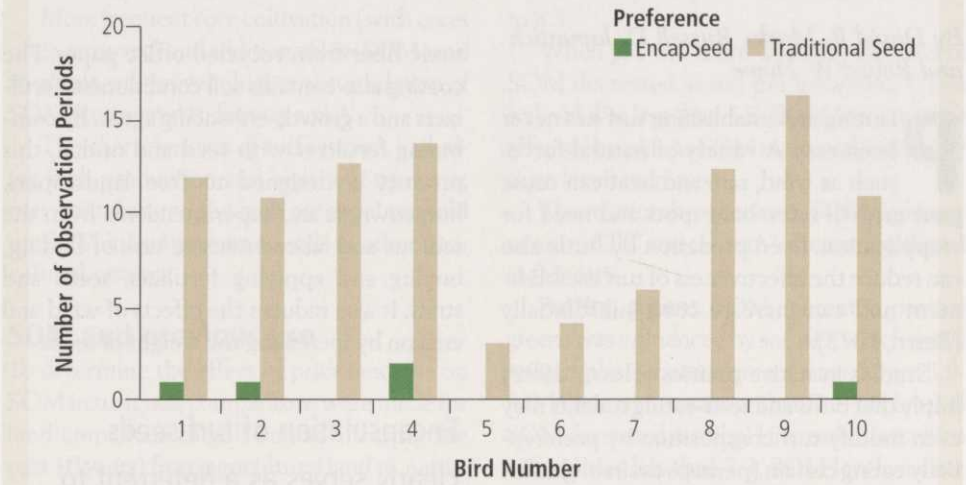
Methods

In North America, European house sparrows are an introduced species that occur in small flocks almost invariably near human habitation (Sibley, 2000, Blair, 1996).

Since their introduction in New York in 1850, populations have exploded and their distribution encompasses North America except for the northern Canadian territories (Sibley, 2000). House sparrows made ideal subjects for our study because they are common seed-eating birds (Elgar, 1987, McGillivray, 1984) and they typically are associated with human residences (Gill, 1995). Because house sparrows are exotic species, we could capture and directly

TABLE 1

Seed Preferences



Feeding preferences of 10 captive house sparrows for trays with EncapSeed vs. trays with unencapsulated traditional grass seeds. Results indicate the preferred tray during separate 10-minute observation periods. Individual birds typically made multiple visits to the trays during each observation period.

observe their feeding behaviors without violating federal or state bird protection laws (U.S. Forest and Wildlife Service, 1999).

We captured house sparrows with standard mist nets placed along a brush-line that was in close proximity to bird feeders. Netting took place on three separate days and took an average time of one hour each day.

Altogether 10 birds were caught, observed and released unharmed. This sample size is large enough to indicate a statistically significant preference by individuals if the preference is strong according to a simple binomial distribution (Zar, 1984). The birds were handled and maintained following standards outlined by Belant et al. (1997). Captive sparrows were placed in separate quarter-inch hardware-cloth, 12-square foot cages. Each cage contained a water dish, perching branches, and only one bird so that individuals would act and feed independently of one another. The cages were raised 2 inches above the ground so that any spilled seed would pass through the cage floor, and only the seeds in the feeding trays were available to the birds.

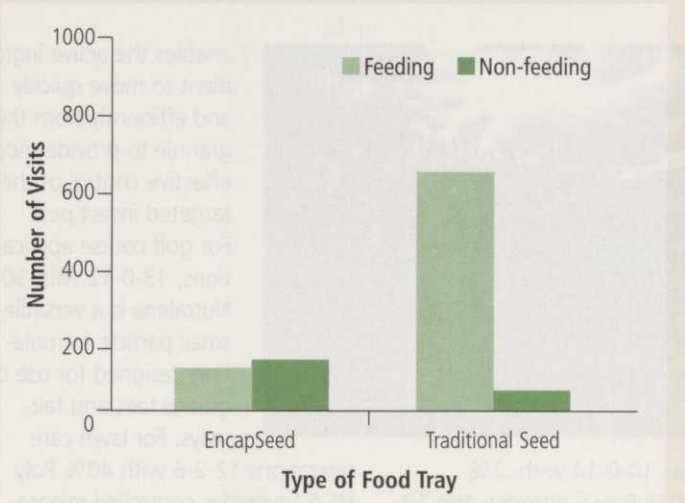
To test the seed preference of the house sparrows, we provided both the encapsulated seed and the unencapsulated or traditional grass seed in two identical feeding trays. Both seeds were comprised of the same all-purpose blend of seeds with the only difference being the encapsulation.

The blend consisted of 20 percent Cannon Kentucky Bluegrass, 20 percent Kenblue Kentucky Bluegrass, 20 percent Silverlawn Creeping Red Fescue, 20 percent Raymond Chewing Fescue and 20 percent SR4010 Perennial Ryegrass. The trays were available to the birds for the duration of 10 minutes, during which we recorded each visit to a tray.

Visits were divided into two categories: food eaten (FE) and no food eaten (NFE). A NFE visit occurred when a bird made contact with the seed but did not eat any, and a FE visit was recorded when the bill of a bird actually made contact with the seed. If a bird continued eating at the same feeding tray, we record the feeding session as only a single visit. A new visit was recorded only after the bird physically left the feeding tray and returned.

TABLE 2

Seed Preference By Visit Frequency



Summary of all visits to seed trays by captive house sparrows. Each visit represents a single decision to visit the tray. During a feeding visit, the bird ate some of the seed. During a non-feeding visit, the birds ate no seeds.

After the 10-minute observation period, we removed the feeding tray for 10 minutes, and the process was repeated. We completed a total of 290 bird observations over 12 observation days. This sample size provides significant power for detecting preferences, but we emphasize the overall preference of individuals to avoid the inflated statistical significance due to pseudoreplication (Hurlbert, 1984). Each bird was released after six days of confinement. Wild birdseed was provided after all observations were completed for the day and on days when no observations took place.

Results were analyzed by applying a simple sign test (Zar, 1984). Each observation period was labeled either positive (+) if the bird made more visits to the EncapSeed or negative (-) if the bird made more visits to the traditional grass seed. The distribution of positive vs. negative outcomes was then compared to a binomial distribution for determination of a probability (p) value. Observation periods with an equal number of visits to the treated and traditional seeds were omitted from the test, as defined by the statistical procedure.

Results

Our results showed a highly significant avoidance of the EncapSeed (Table 1) by the captive house sparrows.

In nearly every observation, the birds were more likely to eat traditional turf seeds than EncapSeeds, and few birds ate the EncapSeeds at all. We recorded a total of 688 cases of birds visiting and feeding on the traditional seeds compared with 145 cases of birds visiting and feeding on the EncapSeeds (Table 2). Length of these visits varied, but the birds almost always spent a longer period of time at the tray with traditional turf seeds.

All of the 10 individual birds showed a preference for the traditional seeds (Table 1). Only one bird favored the EncapSeed tray during two separate observation periods, but this same bird favored the traditional seeds during 14 observation periods. Six birds always favored the traditional seeds, while the remaining three birds favored the EncapSeeds during only one observation period (compared with 35 total observation periods showing preference for the traditional seeds).

Analysis of the NFE visits produced some interesting results. More non-feeding birds visited the EncapSeed than visited the traditional seeds (Table 1). This could be the result of the birds' curiosities about new and strange-looking seed, which may cause them to visit the EncapSeed tray for investigation, but not for consumption.

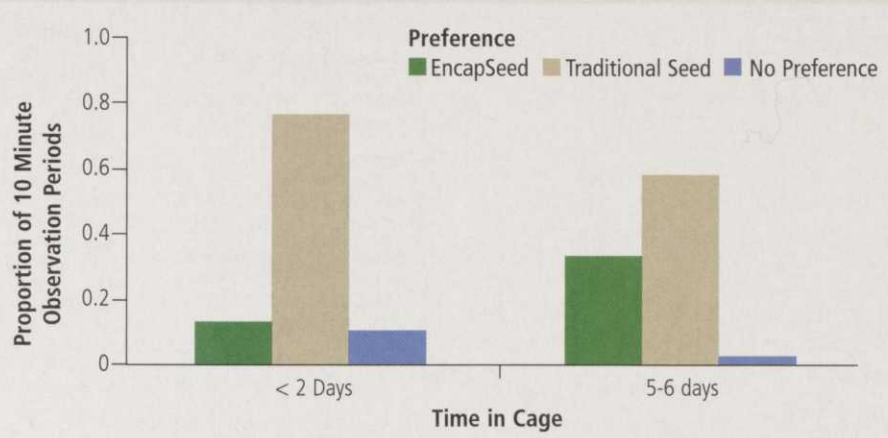
Agricultural crop damage by bird species is well documented but seed losses in turf are seldom reported.

The lower number of NFE visits to the traditional seeds is a result of the fact that visits to the plain seed usually resulted in feeding. When all visits (both FE and NFE) were evaluated together, we found significantly more visits to the traditional seeds.

To find if the birds became accustomed to

TABLE 3

Seed Preferences By Exposure Over Time



Preferences of newly captured (less than two days) vs. longer captured (five to six days) house sparrows for separated trays with two types of turf seeds. Y-axis indicates the proportion of 10-minute observation periods during which the birds favored trays with EncapSeed or unencapsulated traditional grass seeds. Results include both feeding and non-feeding visits.

the EncapSeed over time, we compared the feeding responses of experienced birds (in cage for five to six days) with responses of newly captured birds (in cage for less than one day). Using data from all visits (both FE and NFE), we found that experienced birds showed no significant difference in the number of visits to either the treated or traditional grass seed. As expected, however, these birds showed a highly significant preference for the traditional seed when just the FE visits were included (Table 3).

Inexperienced birds, on the other hand, showed a preference for the traditional turf seed even if we include the NFE visits. Apparently the birds recognized the traditional seeds as preferable without prior experience; later during the experiment they became more curious and visited the EncapSeeds more frequently.

Like the inexperienced birds, however, birds that had been in the cage for five to six days still avoided eating the EncapSeeds.

Discussion

Results from our analysis provide strong evidence that house sparrows avoid eating treated seeds. Because house sparrows are common-seed predators in urban environments, this finding supports the conclusion that seed encapsulation is an effective deterrent to bird damage in newly established turf.

Considering all individual visits made by the birds when feeding occurred, the house sparrows were 4.7 times more likely to choose traditional seeds over the treated seeds. All of the 10 birds tested showed a preference for the traditional seeds. In short, encapsulation of turf seeds by the EncapuLayer process clearly serves as a deterrent to seed predation by birds.

Direct testing in the field would provide additional evidence for this conclusion, but the unequivocal avoidance shown by all of the experimental birds argues that our findings are robust. Use of seeds treated with the EncapSeed process should lead to a more even and effective germination of turfgrasses because fewer seeds will be removed by birds.

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