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TIMING BIRD CONTROL APPLICATIONS IN RIPENING CORN

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INTRODUCTION

There is much debate among people in bird control about whether the various methods so far developed to control bird damage are really ever cost effective (Headley, 1972; Murton and Jones, 1973; Jackson, 1976; Dyer and Ward, 1978). One thing is clear, however. The likelihood of efficacy is increased if certain conditions are met when applying a control measure. Of these conditions for control application, the most obvious one that needs to be considered, after the decision to apply some control measure is made, is "*when* should the application be made?"

It should be clear that the control application must relate somehow to the occurrence, or expected occurrence, of bird damage in a particular field. Indeed, the usual instructions accompanying any control method include emphasis on early application presumably before birds develop a pattern of feeding in the field. But how does a farmer know when is early? Is it when he sees birds in his field? In New York, we at Cornell have observed numerous large flocks of redwings in cornfields two or three weeks before any corn damage actually occurs, so the mere presence of birds is a poor indication of damage occurrence. And, if the farmer waits until he happens to see actual damage, it may be too late for effective control.

Turning to the technical literature, one can find many reports of damage occurring primarily during the milk or soft dough stage of corn development (Giltz and Stockdale, 1960; Hintz and Dyer, 1970; Stone and Mott, 1973; National Audubon Soc., undated); and many farmers are aware of this. But how can this information help a grower time his bird control application? More specific information is needed about how to recognize when corn is entering its susceptible stage and when during this stage damage is most likely to occur. In this paper, I intend to provide this type of information from my research in central New York, and propose some recommendations for its use.

METHODS

During the summer and fall of 1978, 25 cornfields were chosen within an area six to eight miles from a large blackbird roost in central New York (Cayuga Co.). Fields were chosen to minimize varietal differences of ear characteristics and to represent the range of field maturation times found in the area. None of the fields had bird control measures used in them.

Each of these fields was intensively sampled for bird damage at three- to seven-day intervals beginning at early milk stage and continuing until harvest. Bird-damaged ears were placed into one of five damage classes (after Granett et al., 1974) based on the percent of the ear lost. Knowing the total number of ears sampled allowed an estimation of the percent of the total crop that was damaged. For some types of analyses this percentage figure was transformed into bushels of corn based on an average yield of 80 bushels per acre over the last few years in Cayuga Co. (N.Y. Crop Reporting Serv., 1977).

In the summer of 1979, I conducted a study which entailed monitoring 24 corn fields for bird damage in a way similar to 1978. These fields were in the same study area as the previous year but were selected according to different criteria and, therefore, not representative of the study area with respect to the range of field maturity times. Damage was recorded using the same five damage classes as before, but fewer ears were sampled per visit to a field. Each field was visited every three to four days beginning before milk stage and continuing through the first week in September, when most corn was dented.

Based on observations made during these two years in a total of 49 fields, I would like to first explain a way of measuring corn development and then show how that measurement relates to bird damage and bird control.

A SIMPLE MEASURE OF CORN DEVELOPMENT

In order to identify specific fields for intensive sampling well before any bird damage began, it was necessary to develop a way to establish relative maturity of the various fields in mid-July. The method had to be simple, more reliable than just comparing planting dates, and would ideally relate consistently with the onset of milk stage. The concept of "half silk" (HS), which is used by corn breeders as a measure of a field's development, satisfies these conditions. HS is defined as the time when a field has 50% of all its developing ears with some visible silk emergence. The day of HS can be quickly and reliably determined with one field check and occurs 18-21 days before the onset of milk stage. For the sake of simplicity, I am defining the milk date (MD), or that day when approximately 50% of all the ears in a field have reached early milk stage, as HS plus 20 days.

I would like to emphasize that the determination of HS, and therefore MD, is a simple and reliable way to gauge corn development well before the onset of milk stage. It is in this way that the development of all the fields referred to in this paper was measured.

RESULTS AND DISCUSSION

The majority of the bird damage in 1978 occurred in the first three weeks of August (Figure 1-A), with about 93% of all damage occurring by the second week of September. (Data from 1979 is exlcuded here because the sampled fields were not representative of the area with respect to the range of field maturation times.) There was some significant damage in October in an unusually late maturing field that still had some soft corn when large migrating flocks moved into the area.

Curve B in Figure 1 represents the number of fields entering milk stage on a given day out of 84 fields within the study area; the 25 fields sampled intensively for bird damage are included. It is apparent that the birds' feeding activity is related in some way to the overall availability of corn in the milk stage.

Part A of Figure 1 represents damage that occurred in all 25 fields, including a wide range of field milk dates. To demonstrate the relationship between corn development and bird damage more specifically, damage curves for each field in relation to its MD may be examined. When this is done, a remarkable consistency is revealed. Of the 14 fields that sustained substantial (less than 1% yield) bird damage, 11 incurred the first significant portion of that damage within two days of MD.

Another striking characteristic of most of these field damage curves is their steep slopes, which indicate a large portion of the season's damage occurring in a short time. For all fields, an average of 70.8% (s equals 17.5) of the season's total damage occurred in one six day period, and this was fairly consistent in low and high damage fields (Table 1).

In a composite curve for the 14 high damage fields, damage accumulates rapidly after MD to the extent that approximately 70% of the season's total damage had occurred by seven days past MD and over 90% by MD plus 14 days. This is illustrated in Figure 2, which includes graphs of the damage chronology with respect to MD, totalled for all fields with greater than 1% yield loss in each year.

These data may be summarized as illustrating two important aspects of bird damage patterns: 1) The onset of damage is consistently related to an easily recognizable stage of corn development, and 2) most of the damage occurs in a relatively short period of time, usually immediately after the onset.

These two points are directly relevant to the questions implicit in timing bird controls, i.e., when to begin controls and when to end them. I can now propose a practical answer to the farmer's question of how to determine when "early application" of a control measure is in time to plan and implement that application. That is, simply establish the MD of the field in question by checking for HS around tasseling time and adding 20 days; then plan to implement control 2 or 3 days before MD to insure affecting the first large flocks attempting to feed.

The answer to the question of when to end control measures is somewhat more conditional. There may be situations in which significant damage occurs in fields well beyond the milk stage, e.g., fields adjacent to large roosts or regions with small corn acreage relative to the blackbird population. However, I believe that when corn is abundant and there is a reasonable diversity of habitat to provide alternate food sources for the birds, the significant feeding pressure will occur during the period of susceptibility as shown by this study. Therefore, when these conditions seem to be met, I would recommend discontinuing control measures around MD plus 12 days. Referring to Figure 2, this is when over 80% of all damage had occurred.

Another implication of the short duration of damage occurrence becomes important to the farmer who did not plan on using bird control in a field but has just discovered serious damage there. That is, unless birds are still present and some control can be quickly applied, that field might well have already sustained the major portion of the season's damage; and it may not be worthwhile to spend time and money on trying to save corn that probably will not be damaged anyway.

SUMMARY

In the course of my field work in New York, I have observed on at least one occasion an Avitrol application to a large field in which the bulk of the season's damage had already, I believe, occurred. In several other fields, I have seen the continuous use of automatic propane cannons for more than a month. I hope that the type of information presented in this paper can be used to help avoid such practices, which I believe are unnecessarily wasteful in what is often a marginal economic situation from the start. Pest control researchers and operators can still go a long way toward "fine tuning" the timing of bird control measures, so they more closely align with the period of high susceptibility of a crop to bird damage.

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DISCUSSION

Q: You have a little bump way out on the end of your damage graph. What was that?

A: That represented a particular field that was very, very late in its maturity. It was planted so late that the farmer never really got it harvested. It was a small field. What I've shown is that the birds are very selective and like to eat corn in soft stages. This particular field was still soft very late in the year. When migration begins in our area, birds from the north influx into the area; and populations go way up--they more than double over the summer population. This field was still soft at that time, and so a large amount of damage occurred in that field. But it was an unusual occurrence. Basically 93% of the damage occurred by the first week of September.

Table 1.

The average greatest percent damage in one 6 day period for fields in various categories. Values indicate % of total season's damage.

	Damage ≥1%	Damage <1%	ALL
1978	69.9	62.3	65.0
1979	68.9	82.7	73.0
AVG.	69.5	68.8	67.6

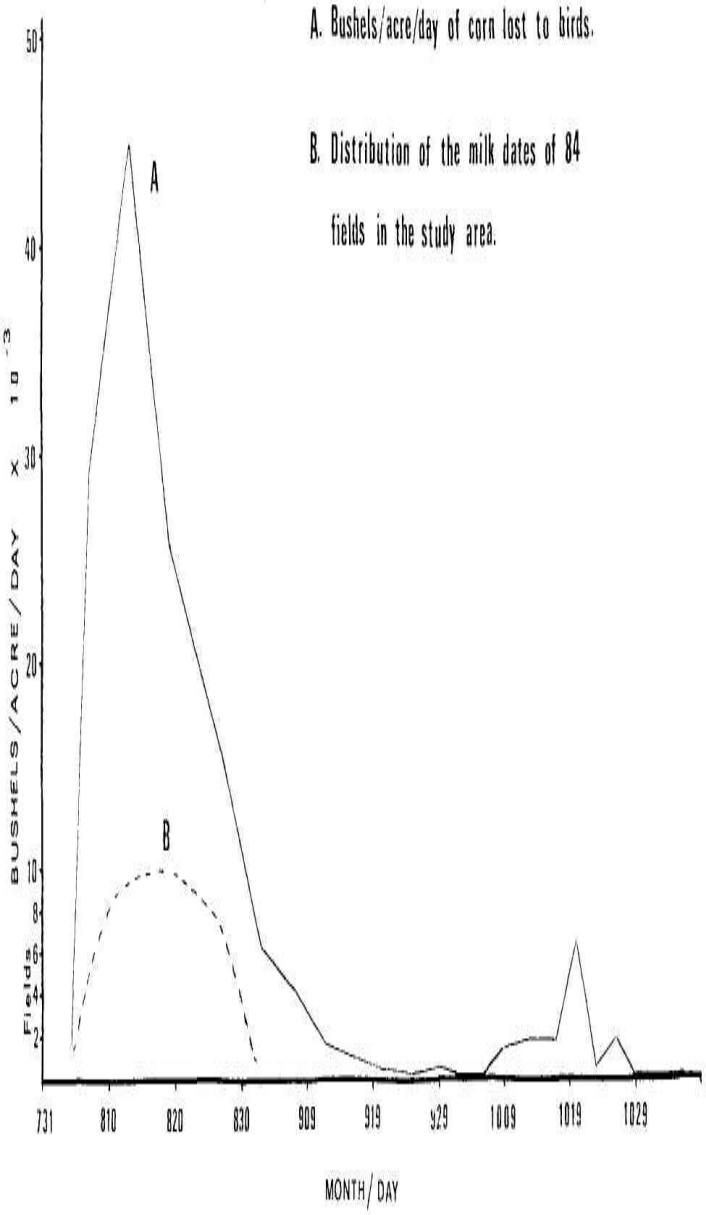
A. Bushels/acre/day of corn lost to birds.
B. Distribution of the milk dates of 84 fields in the study area.
A
B
BUSHELS/ACRE/DAY X 10^-3
Fields
50
40
30
20
10
8
6
4
2
731
810
820
830
909
919
929
1009
1019
1029
MONTH/DAY

Figure 1.

Cumulative damage as % of total on selected days from milk date.

	-1	2	5	8	11	14	17
1978	3.6	28.5	57.3	75.1	84.5	88.8	92.2
1979	13.7	26.8	33.2	71.5	92.7	95.4	95.8
Avg.	8.6	27.6	45.2	73.3	88.6	92.1	94.0

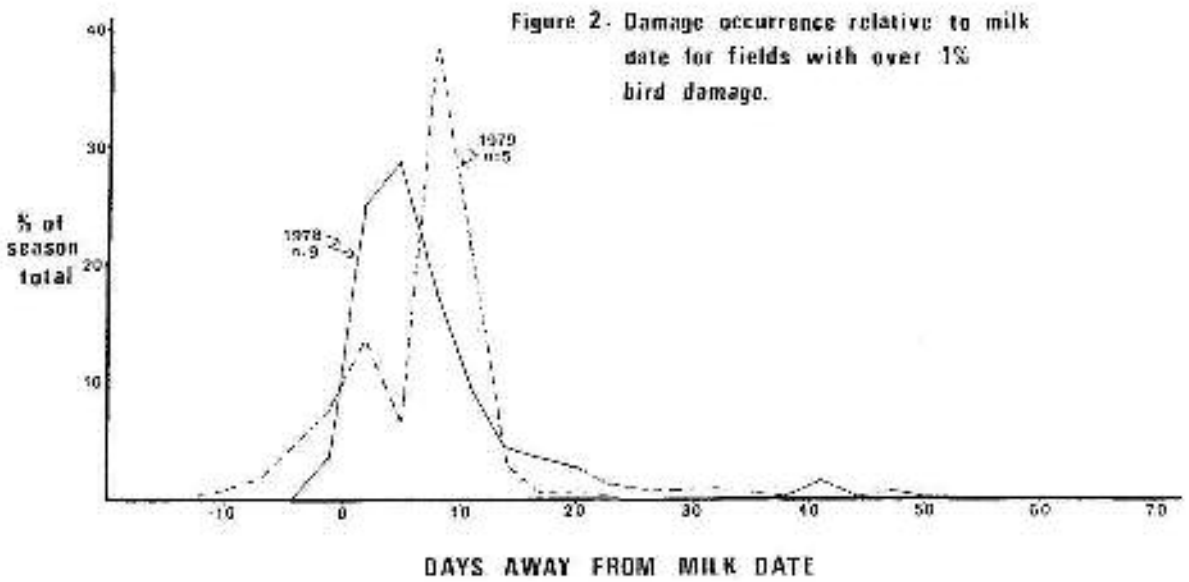

Figure 2. Damage occurrence relative to milk date for fields with over 1% bird damage.