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PROGRESS REPORT -- EXPERIMENTAL COMPARISON OF VOLE CONTROL METHODS

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North Carolina State University

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Don W. Hayne
Professor, Statistics and Zoology
North Carolina State University
Raleigh, North Carolina 27650

At last year's meeting in Beltsville, William T. Sullivan, Jr., read a paper describing an experiment we had set up to compare vole control methods (Sullivan and Hayne 1978). In particular, this investigation attempts to measure the effect of clean orchard culture. This year I am describing some of our experiences with this experiment, with a preliminary appraisal of the different methods of study. Obviously, our observations must be accepted as very tentative, made as they are so early in the experiment.

METHODS: The experiment consists of 8 blocks (orchards) in Henderson County, North Carolina each with 4 plots which represent the 4 different treatments. One plot is observed as the orchardist is managing it (and of course management differed from orchard to orchard and from year to year in the same orchard). One plot is treated with rodenticide post-harvest on a routine basis. One plot is maintained under clean culture (mowing and herbicides). One plot is kept in clean culture with rodenticide applied post-harvest when vole signs were found. These plots are of about 2.5 acres each with a central data area of about 0.9 acres. Last year's paper describes the experiment in greater detail (Sullivan and Hayne 1978).

Three types of data are considered here. Apple sign test data have been recorded once at 24-28 stations per plot. These data are expressed as percentage of possible activity; statistical analysis used the arcsin transformation. Estimates of population density (voles per acre) were made with a crossed line technique; statistical analysis was with a logarithmic transformation. Survival rates were measured by live-trapping, mark and release, with three trapping periods; these results were stated as instantaneous rates of mortality on a daily basis where this was possible, though a nominal survival rate of zero prevented this form of statement at times.

One difficulty with our experiment is that about half of the 8 orchards have very low vole populations. This fact introduces some variability, though the randomized block design takes care of some of the trouble. We would have much better data, however, if more of our cooperators had high vole populations.

One interesting fact is that the general distribution of vole populations seems to persist from year to year, at least in the time span observed here. We seem to be making much the same kind of observation in the interdepartmental pest management project (IPOMS), that is, that the same orchards generally have the high or the low populations over the brief span of our observations.

We have made two mistakes of judgement in carrying out this study. In Fall 1977 we waited for the cooperators to carry out vole control on their plots, with the result that some never did and we never obtained the posttreatment records on several growers' plots. We have now

decided to take the records after some interval, to obtain a complete data set. Our second mistake was not to follow up on blocks where no animals were taken at the first trapping in Spring 1978 (in late April and early May). Again, the data for the second set of observations (June) are scattered and difficult to analyze. In particular, average values for the second trapping, Spring 1978 in Tables 1 and 2 cannot be compared with results from the first trapping which included zero values.

RESULTS: Reviewing first the methods of study, the apple sign test thus far has provided the best-behaved data. This measurement (Table 1) showed the effect of using rodenticide, even though there was considerable variability among the experimental blocks in population levels. The apple sign test data have the added advantage that they are easy to record and to work up.

The population estimation by live trapping (Table 2) using crossed lines provided results roughly parallel to the apple sign test data, but

Table 1. Population estimates in voles per acre with lack of significant difference indicated by common letter; analysis with logarithmic transformation.

	1977 Fall		1978 Spring	
	Pretreat	Posttreat	1st	2nd*
Grower plot	67.7 (a)	--	4.8 (a)	30.0
Toxicants only	94.1 (a)	18.4 (a)	3.4 (a)	48.3
Clean culture only	58.8 (a)	62.3 (a)	8.6 (a)	21.8
Toxicants & clean culture	41.9 (a)	19.5 (a)	2.9 (a)	14.2

* Data incomplete; no evidence of significant differences. Values may not be compared directly with first trapping results.

Table 2. Apple sign test: mean percent with lack of significant difference indicated by common letter; analysis with arcsin transformation.

	1977 Fall		1978 Spring		1978 Fall	
	Pretreat	Posttreat	1st	2nd*	Pretreat	Posttreat
Grower plot	24 (a)	--	23 (ab)	50	18 (a)	26 (ab)
Toxicants only	27 (a)	10 (a)	10 (a)	71	17 (a)	13 (a)
Clean culture only	24 (a)	35 (b)	35 (b)	54	24 (a)	28 (b)
Toxicants & clean culture	20 (a)	9 (a)	18 (ab)	33	10 (a)	11 (a)

* Data incomplete; no evidence of significant differences. Values may not be compared directly with first period results.

relatively more variable in that no differences were statistically significant. The method seems to provide credible data, but because of the small numbers of animals captured, the estimates are variable. In particular, so few animals were taken in common to the two crossed lines that a single added animal would have changed the estimates considerably. Further, the fraction of animals taken in both lines seems to fluctuate considerably from season to season. We don't know yet whether there is any pattern in these changes.

The measurement of survival rate was of little usefulness within the framework of the planned experiment, but this measurement did provide information that is useful elsewhere. For example, after treatment in the fall of 1977, there were 9 of 24 plots where zero survival was recorded (there were also 6 plots of the 24 where no animals were captured pretreatment and thus no estimate of survival). In all these 9 plots the apple sign test recorded activity, some low and some high, and in all but one there was a non-zero population estimate. This observation suggests population movement. Therefore we plan to continue the live trapping with estimation of survival and population size.

Comparing clean culture alone with toxicants alone and the combination of toxicants and clean culture, we may say that the posttreatment populations with clean culture only are higher on the average, and that we have no evidence as yet that clean culture plus rodenticide is any better than rodenticide alone. But any conclusions at this stage must be very tentative.

CONCLUSIONS: Thus far, the apple sign test seems to provide the best data, although it is useful to know survival rate and population size.

The experiment thus far has not demonstrated any superior influence of clean culture in reducing vole populations.

LITERATURE CITED

Sullivan, W. T., Jr. and D. W. Hayne. 1978. An experimental comparison of vole control methods. Proc. Second Eastern Pine and Meadow Vole Symposium, Beltsville, MD:49-51.