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The losses to livestock from insects are much more subtle than losses from animal diseases such as "Red Nose" or calf scours but real and costly nevertheless. The Federal Extension Service tries each year to get some estimate on the losses from insects on both crops and animals. These data are not too difficult to obtain for crops because the insect damage is quite visible and yield comparisons make it accurate data. The data on livestock losses from insects, however, are much more subject to guesswork. The estimates are that the livestock industry suffers around a 500 million dollar loss annually from insects. If we use this figure, you could divide it evenly and say each state would lose 10 million annually. The Great Plains states, of course, would lose by far more than 10 million because of the numbers of livestock produced in those states.

The major insect pests of livestock are the stable and house flies, cattle lice and grubs, horn and face flies and the aquatic complex of black, deer, horse flies and mosquitoes. It is difficult to obtain accurate information on losses on many of these insects. Our research efforts at Nebraska have been directed primarily at this problem. We started with cattle grubs, then to horn flies, on to stable flies and are now looking at face and house flies.

The difficulty with economic research with cattle grubs is that you have no way of knowing prior to your trials if cattle are infested. This is particularly true if you are using feedlot cattle purchased through a buyer. We traced one group of cattle through five sale barns and finally gave up on determining their origin. We overcame part of this problem by using several trials over a number of years so we would have a large number of cattle from which an average could be obtained. Our other approach was to do our work at ranches in the same region of the state with a prior history of grub infestation. By using these two approaches, we were able to obtain data on the effects of cattle grubs on weight gain performance of cattle on finishing rations in the feedlot, on cattle kept at the ranch and backgrounded or kept on growing rations, and on cattle kept at the ranch but provided only with a maintenance ration.

The treated feedlot cattle showed an average daily gain (ADG) increase of 0.12 lb. per day over the treated cattle in a 100-day trial, the growing ration treated cattle showed an ADG of 0.17 more than untreated cattle in a 120-day trial and there was no significant difference on cattle fed a maintenance ration. We were able to weigh the backgrounded cattle again around 2 months later and found that, after the grubs left the back, compensatory gain occurred and by May 1 there was no difference in weight gain.

Our economic interest in horn flies was directed to weaning weights of calves. There are several studies indicating that horn flies suppress yearling weight gains and one or two showing the effects on mature cows but none on calf weaning weights. We have observed that horn flies are generally not abundant or absent on suckling calves unless very heavy populations are present on cows. Therefore, it would appear that the effects of horn flies on calves would be secondary through an effect on the cow.

We were able to set this research up with one rancher who divided his cow herd for summer grazing purposes. We set up a forced-use dust bag fly program on one group of cows and allowed the flies to reach whatever population level they would on the other group. We then compared the weaning weights in the fall. The calves whose mothers were protected from flies weighed an average of about 13 lb. per calf more than those whose mothers had no fly control.

Our third endeavor on the economics of livestock insects, and the one probably of the most interest to this group, was to determine the effects of the stable fly on feedlot cattle. The stable fly is a blood sucking fly like the horn fly but is about twice as big.

The stable fly feeds primarily on the lower half of the front legs and cattle respond to the flies' painful feeding bites by bunching, with each animal trying to get its front legs into the circle of animals for protection.

The question is, how much do stable flies depress weight gain performance of feedlot cattle. It was not possible to simply compare cattle in two feedlots or even cattle in two pens with fly control at one lot or one pen because of the mobility of the flies between pens or different management practices at the lots.

We solved this problem by putting up a steel building with the sides, back and front open. We built four screened in feedlot pens in the building. Each pen held 10 animals. We could then release flies in the pens or keep them fly free.

In our first trial, we maintained a fly population of 50 flies per calf on calves being fed a growing ration. This fly population level is what we see in about 50% of our lots in Nebraska. At the end of this 100-day trial, the calves which had been kept fly free had gained 0.2 lb. per calf per day more than those that were fed on by flies. Feed efficiency was also depressed by 13% on the fly-infested calves.

In our second trial, we maintained a population of 100 flies per animal, a population we see in about 25% of our lots. These calves were fed a finishing ration. At the end of this 100-day trial, we found a 0.48 lb. per day per calf difference in weight gain and an 11% difference in feed efficiency. We also ran a blood profile. We were looking at some blood constituents that would indicate stress. We were unable to show any significant difference in any of the more than 20 blood properties we compared. We also looked for pathological signs at slaughter but again found no significant differences in such things as liver damage, allergy reactions, etc. As might be expected because of the weight difference, there was a difference in grade between the calf groups. Those that were fly infested graded 0.42 lower than the noninfested calves. In this case, it did not affect the price but could have, had the average been a little lower.

The economic data, plus our experience in research on fly control methods in feedlots, set the stage for applying for and receiving a grant for a pilot study on pest management at feedlots. We found that generally, when we set up research at a feedlot, the manager learned as much or more than we did and the following year that particular lot had been modified to the point that it was no longer usable as a research site. This convinced us that a pest management program would work at feedlots.

There are, or have been, some 40 or more insect pest management pilot projects in the United States. All of them have been on crops, vegetables or fruit with the exception of ours. Needless to say, we had a little problem with communications when we suggested this as a feasible project.

Our project is now in its second year and I think the system might be of interest to you cattle feeders in South Dakota. We started the first year with 27 feedlots and have expanded that number to 36 this year. Our study area is primarily in Dawson County, an area that grows excellent corn and alfalfa, has a large number of feedlots and, probably most important to us, has an excellent County Extension program with Harold Stevens, one of the premier agent chairman in the United States, and Dave Stenberg, a bright young second agent, helping us tremendously in the organizational aspects of this project. We also have a few feedlots in Lincoln County, where we can do research easier because of the distance factor from our research station.

We start the program each year by training scouts to find fly breeding areas, know flies, to understand our fly counting system and to understand our data processing system. I have been very fortunate in being able to hire Dave McNeal, a Purdue graduate student, as a Scout Supervisor for this project. He will utilize the project for his Ph.D. thesis.

Our next step is to go to the feedlots, set up our fly traps, map the fly breeding areas, discuss our reporting system with the manager and then start monitoring the fly population. A scout visits each feedlot each week to determine the fly population levels, check the breeding areas and evaluate the control program. The data from each feedlot are placed in a computer. The computer returns show what progress or decline is being made at the feedlot. The Scout Supervisor then makes a weekly recommendation to the feedlot operator. These recommendations would include such things as where the fly breeding is occurring, whether the fly population is going up or down, the effectiveness of the control program and whether it needs to be increased or decreased or how it might be made more effective.

We feel that many of the feedlot managers have benefited from this program in terms of making their fly control system more effective, thus cutting costs and increasing weight gains and feed efficiency. We have also benefited by learning the many different lot management systems that were unknown to use and that could be useful to other operators. For example, we have one feedlot operator in this study who uses no insecticide and has probably the least flies of any in the program. His system is to get the lots in good shape to start with and then by utilizing a scraper and drag keeping the lots dry through the fly season.

We have found absolutely no correlation between the amount of money spent on insecticides for fly control and the number of flies at the lot. Some who spent little had few flies and some who spent a lot had many flies and vice versa.

Our program has one more year to go. We believe that we will have obtained enough knowledge at the end of this project to put together a very useful and practical management system for fly control at feedlots for use by most feedlot managers. I think one other benefit will be derived from this project and that is to make feedlot design engineers and the EPA aware that some of their water pollution control designs actually cause fly breeding problems. Debris settling basins in particular, if designed with too slight a grade, will allow water to puddle in spots along the drain area and these become fly breeding areas. We are now working with these people in Nebraska to change some of these designs in order to avoid this problem.

One other project we are working on that might be of interest to some of you is the relationship between the face fly and "pink eye." It has been pretty well confirmed that face flies can transmit Moraxella bovis, a bacterial agent, generally considered as the "pink eye" causitive agent. Research also indicates that unless an animal is susceptible to "pink eye" the presence of the bacterium does not necessarily cause infection. We think that mechanical damage caused by face fly feeding may cause an animal to become susceptible to infection. Jack Shugart, a graduate student working with me, has shown the effect of face fly feeding on eye weeping and on eye tissue damage. He is also working on transmission of the bacterium and IBR virus by face flies to animals that have been fed on by face flies prior to exposure to these disease organisms.

In terms of economics, Shugart's data indicate that the economic threshold for face flies might be less than 1 fly per animal. This really gives veterinary entomologists something to do because presently we are unable to reduce face fly numbers much more than 50 to 75% regardless of the control program we employ.

I mentioned the economics of house flies. The house fly is recognized as a public and animal health problem because of its capability of transmitting several diseases. Thus, if a feedlot is close to town and house flies come to the attention of the public, they very quickly become economic. In terms of animal performance, however, the effect of the house fly is unknown. In a preliminary 50-day trial (less than 50 flies per animal), we saw no significant difference. We will do more with this next year with higher numbers of flies.

In summary, I would say that livestock insects and their control are very costly to the livestock industry. I think we are making progress with control measures and in making the producers aware of the problem. As is so often true, once the problem is identified, management changes brought about by the producer will reduce the impact of the problem.