Use of Lucitrap® by groups of woolgrowers to control flystrike

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Summary

Lucitrap® — a novel blowfly trapping system based on synthetic kairomones that preferentially attract Lucilia cuprina — was assessed for effectiveness using a field trial conducted in southern Queensland and field use by four groups of woolgrowers located near Stanthorpe (Traprock Wool group), Goondiwindi, Bollon and Cunnamulla (Noorama group). The trial consisted of paired (treatment, control) groups of sheep on two properties. A total of 2149 sheep were enrolled in the trial. Trap use resulted in up to a 46% reduction in flystrike.

Lucitrap® group members were responsible for planning and implementing how the traps were used and for collecting information to assess the usefulness of the traps under commercial sheep and wool production conditions. The Stanthorpe and Cunnamulla groups were formed in 1998 and the Goondiwindi and Bollon groups were formed in 1999. Approximately 203 000 sheep (representing >2% of the Queensland sheep population) were grazed within these groups. The group approach has provided valuable feedback on trap design and strategies for using traps. Support for the four groups ended in June 2001.

Keywords

Lucitrap®, blowfly, blowfly strike, trap, trapping

Introduction

Blowfly strike causes substantial economic loss to the Australian sheep industry. The annual cost to industry has been estimated at $161 million (McLeod, 1995). The use of pesticides to control and prevent blowfly strike is cost effective. However there is increasing concern regarding pesticide residue on wool and environmental and occupational health and safety issues. This has prompted the need to minimise pesticide use. The development of integrated parasite management programs is seen as a method of meeting this objective (Tellam and Bowles, 1997; Karlsson, 1999). These programs rely on the use of more than one and preferably several methods acting synergistically to control parasite populations to effectively reduce the total amount of pesticide used.

Controlling blowfly strike relies on suppressing the blowfly population and reducing the susceptibility of sheep to blowfly strike. Traditional management practices, for example crutching, mulesing, tail docking, strategic shearing and internal parasite control and, more recently, breeding for resistance are used to reduce sheep susceptibility to blowfly strike (Watts *et al.*, 1979). In addition, the development of vaccines against blowfly strike and fleece rot have been attempted (Tellam and Bowles, 1997). Attempts have also been made to forecast the occurrence of flystrike in sheep flocks based on climatic parameters in order to assist woolgrowers to make better decisions with respect to flystrike control options (Ward, 2000; Ward, 2001).

Suppression of blowfly populations has focussed on flytraps and genetic control. Liver/sodium sulphide combinations (bait bins) have been used in the Australian sheep industry for many years (Mackerras *et al.*, 1936; Anderson *et al.*, 1990). These may reduce flystrike but servicing the traps is labour intensive. A synthetic lure consisting of kairomones was developed in the early 1990s (Urech *et al.*, 1993) and a trap using this lure was released commercially in 1994 as Lucitrap®. (The manufacturer is Bioglobal Pty Ltd. Level 1, 417 Collins St, Melbourne Victoria 3000, formerly Miazma Pty Ltd, Queensland.) Unlike bait bins the Lucitrap® system requires minimal ongoing labour input. The lures are more attractive and specific for *Lucilia cuprina*.

The effectiveness of the Lucitrap® system in reducing blowfly populations has been demonstrated (Urech *et al.*, 1993) however its effectiveness in reducing blowfly strike has not. A three-year project to evaluate the use of Lucitrap® by woolgrower groups to reduce pesticide use commenced in May 1998. A component of the project is to determine whether Lucitrap® use reduces the incidence of blowfly strike. Results of field studies and grower groups are reported in this paper.

Materials and methods

Two properties (A and B) located in southern Queensland were selected as study sites. The study properties are situated 15 km apart and are managed by members of a group of woolgrowers (Traprock Wool) that have been using Lucitrap® since 1994. On both properties treatment paddocks were identified in which traps (Lucitrap®) were operated and that adjoined other paddocks (either the same property or a neighbouring property) in which traps were also operated. Control paddocks were identified in which traps were not operated and adjoined a neighbouring paddock (either the same property or a neighbouring property) in which traps were also not operated. Treatment and control paddocks were stocked with Merino-cross sheep at a stocking rate of approximately 2.5 per hectare. Sheep (in July 1999, weaner ewes aged approximately 10 months on property A and wethers aged two to three years on property B; in July 2000, mixed sex hoggets on property A and four year old wethers on property B) were randomly allocated to paddocks from the same mob.

Traps were operated following manufacturer's recommendations (i.e. one or more traps per 100 sheep) and traps were recharged with lure every three months during the trial. Between August 1999 and May 2000 and August 2000 and May 2001, sheep on both properties were mustered and inspected at monthly intervals. Incidence of flystrike in treatment and control groups on each property was compared by estimating relative risk and 95% confidence intervals (CI). The number and species of blowflies caught in the traps was not recorded because predation by ants prevents accurate counts being made (Horton *et al.*, 1999).

During 1999 to 2000, a total of 950 sheep were enrolled; 550 on Property A and 400 on Property B. On property A treatment and control groups consisted of 350 and 200 sheep respectively and on property B treatment and control groups consisted of 200 sheep each. In 2000 to 2001, a total of 1199 sheep were enrolled, 765 on property A and 434 on property B. On property A, treatment and control groups consisted of 402 and 363 sheep respectively and on property B, treatment and control groups consisted of 222 and 212 sheep respectively.

A survey of woolgrowers in the Stanthorpe and Inglewood shires of southern Queensland was conducted in June 1999 and June 2000. A questionnaire was used to collect information on flystrike occurrence, flock and property characteristics, and the use of pesticides for flystrike control. Information was collected on month, number, and type of flystrike cases that occurred during the period August 1998 to May 1999 and August 1999 to May 2000. Woolgrowers were requested to indicate if they had ever used flytraps; used flytraps during the 1998–1999 and 1999–2000 seasons; and, if they indicated using traps, the number of traps used. From information provided by the questionnaire respondents, incidence density rates of flystrike were estimated. Type of flystrike reported was classified as body (including head and foot) or breech strike. The association between use of flytraps and flystrike was assessed by estimating relative risk. A similar survey was used in 1999 to assess the effectiveness of Lucitrap® used in a group of woolgrowers at Noorama, south western Queensland, and in 2000 in groups of woolgrowers using Lucitrap® at Traprock, Goondiwindi, Bollon and Noorama.

Results

1999–2000 trial

Seventy-seven (14%) cases of flystrike were observed within the study groups on property A between August and November 1999. Cases were predominantly shoulder strike and were overt. The trial on Property A was suspended in November 1999 because of preset animal welfare criteria and all sheep were treated with a cyromazine product (ie Vetrazin® from Novartis). The trial

recommenced in February 2000 after the persistency of affect of cyromazine ended (Bowen *et al.*, 1999). During the observation period (August to November 1999 and February to May 2000), a total of 18 613 and 37 368 sheep days at-risk were accumulated in control and treatment groups, respectively, and 37 and 40 cases of flystrike were detected. The risk of flystrike in the control group was 1.86 times (95% CI, 1.19–2.90) greater than in the treatment group. Between August 1999 and May 2000, two cases of flystrike were detected in the control group on Property B, but no cases were detected in the treatment group. A total of 56 816 and 57 200 sheep days at-risk was accumulated in control and treatment groups, respectively, during the period of observation. Results of the 2000–2001 trial were not available at the time of drafting this manuscript.

1999 surveys

Within the Stanthorpe and Inglewood shires a total of 93 woolgrowers were identified from the sampling frame and sent the questionnaire. Sixty-three questionnaires (68%) were returned and 21 had used flytraps for some of the study period or did not provide information on trap use. The average property size (hectares), flock size, stocking rate (sheep per hectare) and total rainfall (mm) recorded between August 1998 and May 1999 are shown in Table 1. Control properties tended to be larger in size with larger sheep populations at a lower stocking density than the treatment properties. However there was no significant difference between the two groups with respect to property and flock characteristics measured. The average rainfall recorded at all property sites (treatment and control) during the period August 1998 to May 1999 (615 mm) was similar to the historical average of 604 mm for the period August to May in the study area.

Table 1. Characteristics of properties and flocks in a survey in southern Queensland to evaluate the use of fly traps (treatment group) to reduce the incidence of blowfly strike.

	Treatment group			Control group		
	Average	95% CI		Average	95% CI	
Total size (ha)	1818	1042	2595	3171	1931	4411
Flock size	2813	1330	4296	3498	2375	4731
Stocking rate (ha-1)	1.74	1.48	2.01	1.51	1.27	1.75
Rainfall * (mm)	642	579	705	608	555	661

*August 1998 to May 1999

A total of 1070 pesticide treatments were applied for pesticide control on properties on which traps were used, an application rate of 77 per 1000 sheep. On control properties a total of 42 698 treatments were applied, an application rate of 369 per 1000 sheep. The most common pesticide used in the period was cyromazine (i.e. Vetrazin® from Novartis). Incidences of body and breech strike were 24 and 13 respectively per 1000 sheep years at risk. Incidence rates of body and breech strike in control and treatment flocks are shown in Table 2. The relative risk of body strike and breech strike associated with not using the traps during the period August 1998 to May 1999 was estimated to be 1.73 (95% CI, 1.41 to 2.13) and 0.87 (95% CI, 0.46 to 1.64) respectively. The use of flytraps was estimated to reduce body strike by about 42%.

Table 2. Incidence of blowfly strike in flocks in southern Queensland in which fly traps were (treatment) and were not (control) used between August 1998 and May 1999.

	Treatment		Control	
	Body strike	Breech strike	Body strike	Breech strike
Cases	104	12	650	45
Sheep-years at-risk	5517	3019	19933	13039
Incidence*	18.9	3.97	32.6	3.45
Relative risk 95% CI	…	…	1.73 (1.41, 2.13)	0.87 (0.46, 1.64)

*per 1000 sheep-years at risk

Within the southern portion of the Paroo shire a total of 35 woolgrowers were identified from the sampling frame and sent the questionnaire survey. Eighteen questionnaires (51%) were returned and provided useable information. During the study period, 8 and 10 woolgrowers had and had not used flytraps, respectively. The average property size (hectares), flock size, stocking rate (sheep per hectare) and total rainfall (mm) recorded between August 1998 and May 1999 for these two groups

of properties is shown in Table 3. Properties on which traps had been used during the 1998/1999 season tended to be larger in area, contain more sheep at lower stocking densities and received more rainfall than control properties. However, except for property size, the two groups were not significantly different with respect to these characteristics.

Table 3. Characteristics of properties and flocks included in a study in south western Queensland to evaluate the use of fly traps (treatment group) to reduce flystrike incidence.

	Treatment group			Control group		
	Average	95% CI		Average	95% CI	
Total size (ha)	25 992	18 471	33 513	15 582	12 726	18 438
Flock size	10 680	6 977	14 382	5 544	4 288	6 799
Stocking Rate (ha^{-1})	2.3	1.9	2.8	2.9	2.3	3.4
Rainfall * (mm)	389	299	480	293	241	345

*August 1998 to May 1999

A total of 67 598 pesticide treatments were applied for flystrike control on properties which had traps operating, an application rate of 636 per 1000 sheep. On control properties a total of 25 530 treatments were applied, an application rate of 576 per 1000 sheep. The most common pesticide used was cyromazine (i.e. Vetrazin® from Novartis). The reported incidence rates of body and breech strike were 56 and 157 per 1000 sheep years at risk respectively. The risk of body strike on properties on which traps were not operated during the 1998–1999 season was 1.35 times (95% CI 1.07 to 1.70) that of treatment properties (Table 4). The risk of breech strike on properties on which traps were not operated during the 1998–1999 season was 3.43 times (95% CI 3.02 to 3.90) that of treatment properties. The use of traps was estimated to reduce body strike and breech strike by 26% and 71% respectively.

Table 4. Incidence of blowfly strike in flocks located in south western Queensland in which fly traps were (treatment) and were not (control) used between August 1998 and May 1999.

	Treatment		Control	
	Body strike	Breech strike	Body strike	Breech strike
Cases	223	400	103	566
Sheep years at risk	4349	4344	1493	1792
Incidence*	51.3	92.1	70.0	316
Relative risk 95% CI	…	…	1.35 (1.07, 1.70)	3.43 (3.02, 3.90)

*per 1000 sheep years at risk

Goondiwindi Lucitrap®-users group, 2000

In the Goondiwindi group, information on flystrike was recorded on 15 131 sheep grazed in paddocks containing Lucitrap®. The overall incidence of flystrike was 0.48%. Seventy-two strikes were observed: 25 breech, 45 poll and 2 pizzle. These rates of flystrike are also substantially less than estimates (1.1 and 0.5%, respectively) made in a previous survey of woolgrowers located in the Stanthorpe and Inglewood districts. The incidence of flystrike was inflated by the occurrence of poll strike in all rams in a group grazed in the same paddock. The pesticide application rate for flystrike prevention in the monitored sheep was 12 per 100 sheep. This is less than the pesticide application rate for flystrike prevention of 37 per 100 sheep in the district in 1998–1999. Diflubezuron (i.e. Fleececare®) was used for most treatments.

Traprock Lucitrap®-users group, 2000

In the Traprock group, information on flystrike was recorded on 36 647 sheep grazed in paddocks containing Lucitrap®. The overall incidence of flystrike was 0.06%. A total of 19 (0.05%) body strikes and 3 (0.01%) breech strikes were observed. These rates of flystrike are substantially less than estimates (1.1 and 0.5%, respectively) made in a previous survey of woolgrowers located in the Stanthorpe and Inglewood districts. Consistent with this survey, strike predominantly occurred in lambs and weaners (8 cases, 0.25%), with strike rare in wethers (11 cases, 0.03%) and ewes (3 cases, 0.03%). No cases were recorded in rams. None of the sheep in these study paddocks were treated with pesticides to prevent flystrike. This compares with a pesticide application rate for flystrike

prevention of 37 per 100 sheep in the district in 1998–1999, and 8 per 100 sheep for flocks in which Lucitrap® was used.

Table 5. Information recorded on flystrike and pesticide applications from Traprock and Goondiwindi monitor flocks in southern Queensland.

	Traprock	Goondiwindi
Sheep at-risk	36 647	15 131
Breech strikes	3	25
Body strikes	19	45
Pizzle strikes	0	2
Flystrike incidence	0.06%	0.48%
Pesticide application rate*	0	12

*per 100 sheep

Bollon Lucitrap®-users group, 2000

Information on flystrike was recorded on 22 650 sheep grazed in paddocks containing Lucitrap® (Table 6). The overall incidence of flystrike was 2.71%. A total of 403 (1.78%) body strikes and 211 (0.93%) breech strikes were observed. The rate of breech strike was similar to an estimate of 0.64% made from a survey of woolgrowers located in the Noorama district and using traps during 1998–1999, but substantially less than in flocks in which traps were not used (2.19%). However, the rate of body strike observed to date (1.78%) is greater than that estimated in the 1998–1999 survey for either trap-users (0.36%) or non-users (0.48%).

A total of 22 689 pesticide treatments were applied for flystrike control in these Bollon monitor flocks, an application rate of 100 per 100 sheep. This compares with application rates of 64 and 58 per 100 sheep, estimated in the survey of Noorama flocks using and not using Lucitrap®, respectively. Cyromazine (i.e. Vetrazin® from Novartis) was used almost exclusively for flystrike prevention.

Noorama Lucitrap®-users group, 2000

Information on flystrike was recorded on 32 475 sheep grazed in paddocks containing Lucitrap® (Table 6). The overall incidence of flystrike was 9.95%. This estimate was inflated by the reported occurrence of a large outbreak of body strike (3100 cases) in a flock of 9000. In most years, we expect to observe <1% of sheep affected with body strike in this district. A total of 60 (0.18%) breech strikes were observed. This rate is substantially less than the rate of breech strike (0.64%) observed previously in Noorama flocks in which traps were used.

A total of 67 917 pesticide treatments were applied for flystrike control in these Noorama monitor flocks, an application rate of 207 per 100 sheep. This compares with an application rate of 64 per 100 sheep, estimated in the 1998–1999 survey of Noorama flocks using Lucitrap®. The most common pesticides used for flystrike control were cyromazine (i.e. Vetrazin®), 28 878 applications (43%) and diflubenzuron (Fleececare®), 17 000 applications (25%).

Table 6. Information recorded on flystrike and pesticide applications from Noorama and Bollon monitor flocks in south western Queensland.

	Noorama	Bollon
Sheep at-risk	32 475	22 689
Breech	60	211
Body	3100	403
Pizzle	0	0
Incidence	9.95%	2.71%
Pesticide application rate*	207	100

*per 100 sheep

Discussion

Trial

Trial results suggest that Lucitrap® use was associated with a reduction in flystrike of 46% on property A. Insufficient blowfly strike occurred on Property B to test the effectiveness of Lucitrap®. These results demonstrate the variability that may be observed in flystrike occurrence. Results indicate that trial sheep (weaner ewes aged approximately 10 month) on Property A were susceptible to flystrike, whereas trial sheep (wethers aged two to three years) on Property B were resistant. This variability is a feature of sheep production in Australia (Vogt and Woodburn, 1979). The reduction (46%) in flystrike observed on Property A in this trial may not be sufficient to control flystrike in sheep flocks, and does not compare with the magnitude of reduction that can be achieved using new generation pesticides, such as dicyclanil (Schmid *et al.*, 1999). However, if trap use is integrated with other management procedures effective control of flystrike may be possible without the need to use pesticides. This would be of major benefit to the Australian wool industry, which is attempting to reduce pesticide use (Williams and Brightling, 1999).

Groups

In general, woolgrower groups found traps easy to operate. It was clear that woolgrowers required a period of at least three years to gain confidence in withholding pesticide treatments whilst using Lucitrap®. Also, woolgrowers in districts where sheep could be mustered and treated in the face of a flywave appeared to have more confidence in the ability of traps to adequately suppress the blowfly population. Use of Lucitrap® by groups of woolgrowers — already formed for other purposes, such as Bestprac — was an efficient method of introducing this new technology. Woolgrowers appeared to be more prepared to trial the technology over a prolonged period (i.e. three years) when they were part of a group.

Based on study results, long-term use of Lucitrap® may reduce pesticide use. Although most pesticide applications for blowfly control probably do not result in unacceptable pesticide residues on wool, a substantial proportion of woolgrowers apply pesticides (for a variety of reasons) too close to wool harvesting, resulting in unacceptable residue levels on wool (Ward and Armstrong, 1998). Use of Lucitrap® will be most effective in reducing pesticide residue levels in Australian wool if these late season applications can be avoided.

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