Changes in management practices and pesticides used by Queensland producers to control blowflies and lice

R. Armstrong[1] and M. Ward[2]
[1]Department of Primary Industries, Locked Bag No 4, Moorooka, QLD, 4105.
[2]Department of Veterinary Pathobiology, School of Veterinary Medicine, Purdue University, West Lafayette, Indiana 47907, USA,
Email: armstrongb@dpi.qld.gov.au

Summary
Surveys of 483 Queensland producers in 1995–1997 and 336 producers in 1998–1999 showed that there was a reduction in the use of OP and SP pesticides; an increase in the use of IGR pesticides; a reduced incidence of application of pesticides in long wool; and a reduction in the frequency of repeat applications.

Keywords
Sheep, wool, pesticides, organophosphorous, synthetic pyrethroid, lice, flystrike

Introduction
Animal health, welfare and production considerations require the use of pesticides in the wool industry to protect sheep flocks from ectoparasites, in particular louse infestation and blowfly strike. However, the use of pesticides can result in residues on wool (Pattinson, 1995). Removal of pesticide residues from wool during the scouring process can lead to pollution of the environment. In addition, there are occupational health issues associated with the use of pesticides and exposure of workers handling treated sheep (Russell, 1995; Shaw, 1997). To ensure continued market access a reduction in residue levels was required. To achieve this reduction producers needed to change practices used for blowfly and lice control to minimise pesticide use and pesticide residues on wool.

Information on pesticide use and wool residues has been reported in various studies (Horton *et al.*, 1995; Horton *et al.*, 1997; Plant, 1995; Ward and Armstrong, 1998; Ward and Armstrong, 2001). The practices that produced low or high residue levels were clearly defined. Those practices that needed to be changed — for example repeated pesticide treatments and treatment in long wool — were identified.

This study describes some of the ectoparasite control practices that changed within the Queensland sheep flock between 1995–1997 and 1998–1999.

Methods
Wool samples collected at random from Queensland wool clips by the Australian Wool Testing Authority Ltd between April 1995 and April 1997 (483 samples) and June 1998 and May 1999 (336 samples) were tested for OP (organophosphorous), SP (synthetic pyrethroid) and IGR (insect growth regulator) residues, either by the Department of Primary Industries Pesticide Residues Laboratory or by the Victorian State Government Chemical Laboratory as described by Ward and Armstrong (1998 and 2001). Samples were tested for diazinon, coumaphos, propetamphos, temephos (1998–1999 only) chlorfenvinphos, cyhalothrin, cypermethrin, alphamethrin and deltamethrin, diflubenzuron, cyromazine and triflumuron. The results of this testing have been reported (Ward and Armstrong, 1998; Ward and Armstrong, 2001) and are not discussed in this paper.

Owners of the lots tested were sent a postal questionnaire seeking information on pesticides used during the wool growing season to control louse infestation and blowfly strike in sheep from which wool had been tested. Specifically, information was sought on whether or not sheep were treated, when and how often they were treated, the methods of application used to treat for louse and blowfly infestation, and whether or not the recommended dose rate was applied. Information was also sought on flock characteristics, in particular the region of Queensland in which the flock was located (Darling Downs, South-, Central- or North-West), flock size (< 1000, 1001–5000, 5001–10 000 or > 10 000), months of wool growth, and shearing time (month and year). This data, which was used to

compare with published statistical information to ensure that the surveys were representative of the Queensland flocks, has been reported (Ward and Armstrong, 1998; Ward and Armstrong, 2001).

Information was collected using closed-type questions. Trace back of wool tested to a particular mob of sheep was achieved by providing producers with the following information: brand, selling centre, agent, sale date, lot description and lot number.

From information provided by producers, variables describing the method, timing and frequency of pesticide applications for the control of both lice and flystrike infestations were created. These variables were categorised so that every category contained >5 responses. Frequency tables described pesticide application practices for the control of lice and flystrike.

Results

A total of 360 producers in 1995–1997 (75% response) and 218 woolgrowers in the 1998–1999 survey (66% response) returned questionnaires. Seventy-one percent of respondents in the 1995–1997 survey and sixty-four percent of respondents in the 1998–1999 survey did not detect infestations of lice in their flocks at shearing, although 91% and 93% of respondents, respectively, applied pesticides for infestations of lice. The distributions of pesticide use variables for louse control are shown in Table 1.

Table 1. The number and percent of producers in Queensland that responded to questionnaire surveys (1995–1997 and 19989–1999) on the use and method of application of pesticides to control infestations of lice.

Variable	Category	Number (%) of respondents 1995/97	Number (%) of respondents 1998/99
Pesticide treatment	Yes	308 (92)	195 (93)
	No	25 (8)	15 (7)
Frequency of treatment	Once	222 (73)	164 (84)
	Twice or more	73 (27)	32 (16)
Method of pesticide application on 1st occasion	Backline	124 (54)	146 (76)
	Dip	76 (33)	30 (15)
	Handjet	19 (8)	8 (4)
	Other[a]	11 (5)	12 (6)
Method of pesticide application on 2nd occasion	Handjet	43 (57)	16 (50)
	Automatic jetting race	17 (23)	6 (19)
	Dip	12 (16)	-
	Other[b]	19 (20)	10 (31)
Interval between shearing and last treatment	≤ 3 months	145 (64)	167 (86)
	> 3 months	81 (36)	28 (14)
Pesticide applied on the 1st occasion	Triflumuron	41 (22)	105 (57)
	Diazinon	52 (27)	37 (20)
	Cyper/alphamethrin	44 (23)	26 (14)
	Deltamethrin	21 (11)	13 (7)
	Diflubenzuron	12 (6)	5 (3)
	Other[c]	21 (10)	10 (5)
Pesticide applied on the 2nd occasion	Diazinon	24 (50)	15 (50)
	Diflubenzuron	8 (16)	7 (23)
	Cyper/alphamethrin	5 (10)	2 (7)
	Other[d]	9 (24)	6 (20)

[a] spray race, automatic jetting race, firefighter spray; [b] backline, dip, spray race, firefighter spray;
[c] propetamphos, cyhalothrin, temephos; [d] cyper/alphamethrin, propetamphos, temephos

The distributions of pesticide use for flystrike control are shown in Table 2. Use of pesticides for flystrike was reported by 291 (81%) of respondents in 1995–1997 and 109 (52%) survey respondents in 1998–1999. Most (61% and 77%, respectively) of the respondents applied pesticides preventively for flystrike. The distributions of pesticide use variables for blowfly control are shown in Table 2.

Table 2. The number and percent of producers in Queensland that responded to questionnaire surveys (1995–1997 and 1998–1999) on the use and method of application of pesticides to control blowfly strike.

Variable	Category	Number (%) of respondents 1995/97	Number (%) of respondents 1998/99
Pesticide treatment	Yes	209 (81)	109 (52)
	No	49 (19)	99 (48)
Frequency of treatment	Once	156 (75)	85 (81)
	Twice or more	53 (25)	20 (19)
Method of pesticide application on 1st occasion	Handjet	72 (37)	64 (66)
	Automatic jetting race	35 (18)	19 (20)
	Backline	-	6 (6)
	Other[a]	96 (45)	8 (8)
Method of pesticide application on 2nd occasion	Handjet	20 (41)	11 (58)
	Automatic jetting race	10 (20)	8 (42)
	Other[a]	19 (39)	-
Interval between shearing and last treatment	≤ 3 months	28 (17)	9 (8)
	> 3 months	136 (83)	96 (92)
Pesticide applied of the 1st occasion	Cyromazine	63 (46)	44 (44)
	Cyromazine/diazinon	23 (17)	18 (18)
	Diazinon	36 (26)	16 (16)
	Diflubenzuron	-	11 (11)
	Other[b]	15 (11)	10 (10)
Pesticide applied of the 2nd occasion	Cyromazine	13 (38)	12 (63)
	Other[c]	21 (62)	7 (37)

[a] dip, spray race, firefighter spray; [b] cyper/alphamethrin, propetamphos, cyromazine/diflubenzuron; [c] diazinon, diflubenzuron, cyromazine/diazinon

Discussion

Changes detected in pesticide application practices for lice control between the two surveys include a decrease in the proportion of producers applying pesticides twice or more during the wool growing season (27 to16%), and an increase in producers using backline applications (54 to 76%) on the first occasion and applying pesticides within three months following shearing (64 to 86%). In addition, there has been an increase (35 to 57%) between 1995–1997 and 1998–1999 in the proportion of producers using IGRs for initial louse treatments, and a decrease in the use of OP (32 to 20%) and SP (33 to 21%) pesticides.

Changes detected in pesticide application practices for flystrike include a decrease in the proportion of producers applying pesticides for flystrike (81 to 52%), applying pesticides twice or more during the wool growing season (25 to 19%) and applying pesticides within three months post shearing (17 to 8%), and an increase proportion of producers using hand jetting applications (37 to 66%) on the first occasion. There has also been an increase (55 to 73%) between 1995–1997 and 1998–1999 in the proportion of producers using IGRs for initial flystrike treatments, and a decrease (45 to 34%) in the use of OP pesticides.

The change in pesticide application practices — in particular reduced frequency of pesticide applications for lice and blowfly control and applications earlier in the wool growing season for lice control — has resulted in a reduction in OP and SP residue levels on wool and an increase in IGR residues (Ward and Armstrong, 2001). However, there is a clear shift occurring in the pesticides used for the control of infestations of lice and blowfly strike. OP and SP use is decreasing and IGRs are currently the dominant class of pesticide used for control.

Both the proportion of producers using pesticides for flystrike control and the timing of these applications during the wool growing season are important determinants of residues on wool. Pesticide treatments late in the wool growing season present a major obstacle to reducing pesticide residues in Queensland wool. In surveys covering the wool growing period 1993–1997, 81% of respondents reported treating for flystrike and 83% of these respondents applied pesticides >3 months after shearing. During the period 1997–1999, about half of the survey respondents reported

treating sheep with pesticides for the control of flystrike, and 92% of these respondents applied pesticides >3 months after shearing. This reduction could be due to greater awareness of the need to reduce long wool application or it could have resulted from a reduction in blowfly activity. There is a continuing need for flystrike protection for sheep in long wool, and effective pesticides that have minimal downstream effects need to be used. In the surveys of Queensland flocks described, there has been an increase in the use of cyromazine for this purpose. However the practice of mixing diazinon with cyromazine continues to be used by some producers.

There is a small proportion of producers who apply pesticides with devices that are not recommended for that purpose, for example firefighters, high concentration low volume spray races, and automatic jetting races for lice control.

Conclusion

There has been a change in pesticide application practices used for the control of sheep blowflies and lice within Queensland sheep flocks, both in terms of the frequency of application and the types of pesticide applied. This has resulted in a reduction in the use of OP and SP pesticides and a reduced frequency of long wool applications — a positive change. On the other hand, the use of IGR pesticides has increased. The impact of this change still needs to be determined.

References

Horton, B.J., Best, D.J., Butler, L.G. and Gregory, G.G. (1997). Organophosphorous residues in wool grease resulting from specified on-farm lice and flystrike control. *Australian Veterinary Journal* **75**: 500–503.

Horton, B.J., Gregory, G.G. and Best, D.J. (1995). Which lice and flystrike control procedures lead to high pesticide residue concentrations in wool? Results of a Tasmanian survey. In: *Proceeding of the Australian Sheep Veterinary Society.* AVA, pp116–118.

Plant, J. (1995). On farm pesticide use and wool residue levels — a national survey. In: *Proceedings of the Australian Sheep Veterinary Society.* AVA, pp119–123.

Pattinson, R.D. (1995). The marketing consequences of pesticide residues in wool and the results of the National Residue Survey. In: *Proceeding of the Australian Sheep Veterinary Society.* AVA, pp102–105.

Russell, I. (1995). Pesticides in wool — occupational health and environmental consequences. In: *Proceeding of the Australian Sheep Veterinary Society.* AVA, pp108–111.

Shaw, T. (1997). Wool as a ‘clean, green’ fibre; the implications of pesticide residues in wool - a challenge for regulatory authorities, drug companies, wool processors, veterinarians and farmers. In: *Proceedings of the Fourth International Congress for Sheep Veterinarians*. Australian Sheep Veterinary Society, pp98–105.

Ward, M.P. and Armstrong, R.T.F. (1998), Pesticide use and residues on Queensland wool. *Australian Veterinary Journal* **76:** 739–742.

Ward, M.P. and Armstrong, R.T.F. (2001). Surveys to assess the amount of pesticide in wool and the use of pesticides by producers in Queensland. *Australian Veterinary Journal* **79**: 37–41.