

Studies on the biology, chemotherapy and distribution of warble fly in Pakistan

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Summary

This paper presents data on the prevalence, biology and control of warble fly infestation (WFI) in cattle and goats in Pakistan. A questionnaire for obtaining information on biology and prevalence was circulated amongst field veterinary staff and livestock farmers in all five provinces (Punjab, Sindh, Balochistan, Khyber Pakhtunkhwa [KPK] and Gilgit-Baltistan) and in the Federally Administered Tribal Areas of the country. A total of 1,019 questionnaires were received (Punjab = 296, Sindh = 246, KPK = 318, Balochistan = 151, Gilgit-Baltistan = 8). Warble fly infestation was reported from each province and from the federally administered tribal areas, particularly from hilly, semi-hilly and sandy desert areas (the Cholistan desert, which adjoins the Rehim Yar Khan, Bahawalpur and Bahawalnagar districts, and the Nara area of Sanghar district). Warbles (nodules) started appearing on the backs of the infested animals from September through December and disappeared from October through March. The prevalence of WFI varied from 5% to 75%. It was highest in hilly areas and gradually decreased towards the plains. A map was developed of warble fly-infested areas. Four field trials were conducted to study the efficacy of different drugs indicated for the control of warble fly infestation. A total of 2,094 cattle and 3,876 goats were given five different injectables (avermectins); namely, Ivomec, Endectin, Euvectin, Dectomax and Promectin (ivermectin) during the first three weeks of September. A control group was given normal saline. All the medicines were found to be effective in controlling infestation.

Keywords

Avermectin – Biology – Cattle – Control – Goat – Pakistan – Prevalence – Warble fly.

Introduction

Pakistan lies between latitudes 23°N and 37°N and longitudes 60°E and 80°E. It covers an area of 796,095 km². It has coastal beaches, lagoons and mangrove swamps in the south, sandy deserts, desolate plateaux, fertile plains and dissected highlands in the centre, and valleys and snow-covered peaks and glaciers in the north. For administrative purposes, the country is divided into five provinces – the Punjab, Sindh, Khyber Pakhtunkhwa (KPK), Balochistan and Gilgit-Baltistan – and three federally administered tribal areas.

Pakistan has been divided into ten agro-ecological zones (Table I): the Indus delta, southern irrigated plains, sandy desert, northern irrigated plains, barani (rain-fed) areas, western mountains, northern dry mountains, western dry mountains, dry western plateau and the Sulaiman piedmont (24).

Warble fly is an economically important pest of cattle (*Hypoderma lineatum*) and goats (*Przhevalskiana silenus*) in hilly, semi-hilly and sandy areas of Pakistan. The major economic loss inflicted on the livestock and leather industry by this fly is caused by perforation of hides and

Table I
Agro-ecological zones in Pakistan

Zone	Climate	Temperature (°C)		Rainfall (mm)		Major crops	Animal grazing
		Summer	Winter	Summer	Winter		
Indus delta	Arid tropical	34 to 45	5 to 20	75	5	Rice, pulses, sugar cane, berseem, banana	Summer is the best grazing season, autumn the poorest
Southern irrigated plain	Arid sub-tropical continental	30 to 50	0 to 12	55	0	Cotton, wheat, sugar cane, rice, sorghum, berseem	Summer is the best grazing season
Sandy desert	Arid sub-tropical	39 to 45	2 to 7	46	0	Guar, millet, wheat	Land use: mainly grazing
	Arid to semi-arid, sub-tropical continental	49 to 46	1 to 5	71	18	Gram, wheat, cotton, sugar cane, guar	Land use: mainly grazing
Northern irrigated plains	Semi-arid (eastern part) to arid (south-west) and sub-tropical continental	39 to 46	2 to 6	100	22	Wheat, sugar cane, melons, oilseeds, cotton, maize, berseem, citrus, mango	Grazing available
	Semi-arid and subtropical continental	36 to 44	1 to 6	32	29	Sugarcane, maize, tobacco, wheat, berseem, sugar beet, gram, groundnut	Grazing available
Barani (rain-fed) areas	Humid, hot summers and cold winters (in foothills), semi-arid (south-west)	28 to 45	0 to 6	200	36	Wheat, millet, maize, rice, oilseeds, pulses, fodder	Good grazing in summer, poor in winter
Western mountains	Humid, mild summers and cold winters (east), sub-humid Mediterranean	35 to 44	0 to 4	236	116	Maize, rice, wheat, apples, fodder	Land use: mostly forest or grazing
Northern dry mountains	Snow-covered high mountains, mild summers and very cold winters	30 to 35	-13.1	20	75	Maize, wheat, rice, fruit orchards	Land use: mainly pasture, alpine pastures in summer
Western dry mountains	Semi-arid highland	30 to 44	-10.8	95	35	Wheat, maize, fruit orchards	Land use: mostly grazing, alpine pasture in summer in same district
Dry western plateau	Arid desert	33 to 44	-4 to 15	4	37	Wheat, sorghum, millet, melons, fruit orchards	Land use: mainly pasture, low carrying capacity
Sulaiman piedmont	Arid and hot, sub-tropical continental	40 to 48	1 to 7	38	1.3	Wheat, sorghum, millet, gram	Land use: mainly grazing, low carrying capacity pasture

skins. Degradation in meat quality and lowered milk production in lactating animals lead to other economic losses resulting from this infestation (5). Poor weight gains have been reported in growing calves and kids (19). A general immunosuppression has also been documented (7, 23), which favours invasion by bacterial, viral and other parasitic pathogens.

The national cost of these losses is a serious problem in countries such as Pakistan where the livestock industry forms a significant part of the economy. In 2008/2009, leather and its products ranked third in the items exported from Pakistan (constituting 5.6% of total exports) (11). Leather damaged by warble fly larvae cannot be exported. Even in the local markets, perforated hides and skins fetch a nominal price. Economic losses attributable to warble fly infestation (WFI) of US\$0.24 million and

US\$0.026 million have been estimated in cattle and buffaloes in the Dera Ghazi Khan and Rajan Pur districts of Punjab Province, respectively (14).

Information about the occurrence of warble fly in Pakistan is patchy. Isolated studies, mostly on prevalence, have been conducted in different parts of the country (3, 4, 12, 14, 17, 18, 29). Few reports are available on drug efficacy trials (16, 17). Despite the widespread problems caused by warble fly, no systematic study has ever been conducted to ascertain the exact magnitude of this problem at national level. The present study was, therefore, designed to determine the biology of the parasite and to map the warble fly-infested areas in all four provinces of Pakistan. Four field trials were also conducted to determine the efficacy of different drugs indicated for the control of WFI.

Materials and methods

To sensitise and motivate field veterinary staff and farmers, six seminars highlighting the occurrence of warble fly, its pathogenesis and the economic losses inflicted by this parasite were held in the endemic areas of each province. At the end of each seminar a questionnaire was circulated amongst the participants and they were asked to fill in information on WFI prevalence, the species infested and the biology of the fly. The questionnaire was also sent to district livestock officers for circulation amongst field staff, who also completed and returned the questionnaires. The estimation of prevalence (in %) was obtained from the values (ranges) reported by the field staff on the basis of their observations. The presence of warbles (nodules) was also confirmed by the project staff during the season of warble appearance, August to March. The map coordinates (longitude, latitude and elevation) of the infested areas were recorded using a global positioning system (GPS) for the development of a map.

The efficacy of Ivomec (Ivermectin, Merial), Dectomax (Doramectin, Pfizer), Endectin (Ivermectin, ICI), Euvectin (Ivermectin, LG Life Science) and Promectin (Ivermectin, Invesa International S.A., Spain) in the control of WFI was determined by involving 2,094 cattle and 3,876 goats in four field trials. One trial was conducted in each province. The animals in each trial were divided into six groups. Animals in groups I to V were given one of the drugs, administered in accordance with the manufacturer's instructions, while Group VI served as the control and was given normal saline. The drugs and the placebo, which were administered subcutaneously, were given in the quantities recommended by the manufacturers (1 ml per 50 kg of body weight). The number of animals in each group in each trial is presented in Tables II and III (see 'Results', below). Animals in the districts Jhelum (Punjab Province) and Nowshera (KPK) were treated during the first three weeks of September 2006 while animals in the districts Ziarat (Balochistan Province) and Sanghar (Sindh Province) were treated during September 2007.

Table II
Efficacy of different drugs against warbles in goats

Name of medicine*	Name of district (province)							
	Jhelum (Punjab)		Nowshera (KPK)		Sanghar (Sindh)		Ziarat (Balochistan)	
	No. of animals		No. of animals		No. of animals		No. of animals	
	Examined	Infested	Examined	Infested	Examined	Infested	Examined	Infested
Ivomec	212	0	0	0	260	0	407	0
Endectin	177	0	0	0	130	0	358	0
Dectomax	210	0	0	0	235	0	226	0
Promectin	209	0	0	0	80	0	357	0
Euvectin	205	0	0	0	47	0	224	0
Control	187	73 (39.03%)	0	0	66	0	286	91 (31.81%)
Total	1200	73			818		1858	91

*Ivomec (Ivermectin, Merial), Dectomax (Doramectin, Pfizer), Endectin (Ivermectin, ICI) and Promectin (Ivermectin Invesa International S.A., Spain)
KPK: Khyber Pakhtunkhwa

Table III
Efficacy of different drugs against warbles in cattle

Name of medicine*	Name of district (province)							
	Jhelum (Punjab)		Nowshera (KPK)		Sanghar (Sindh)		Ziarat (Balochistan)	
	No. of animals		No. of animals		No. of animals		No. of animals	
	Examined	Infested	Examined	Infested	Examined	Infested	Examined	Infested
Ivomec	59	0	0	0	222	0	75	0
Endectin	53	0	157	0	115	0	36	0
Dectomax	29	0	145	0	130	0	26	0
Promectin	59	0	0	0	261	0	31	0
Euvectin	252	0	0	0	169	0	13	0
Control	129	40 (31%)	29	8 (27.58%)	94	39 (41.49%)	10	5 (50%)
Total	581	40	331	8	991	39	191	5

*Ivomec (Ivermectin, Merial), Dectomax (Doramectin, Pfizer), Endectin (Ivermectin, ICI) and Promectin (Ivermectin Invesa International S.A., Spain)
KPK: Khyber Pakhtunkhwa

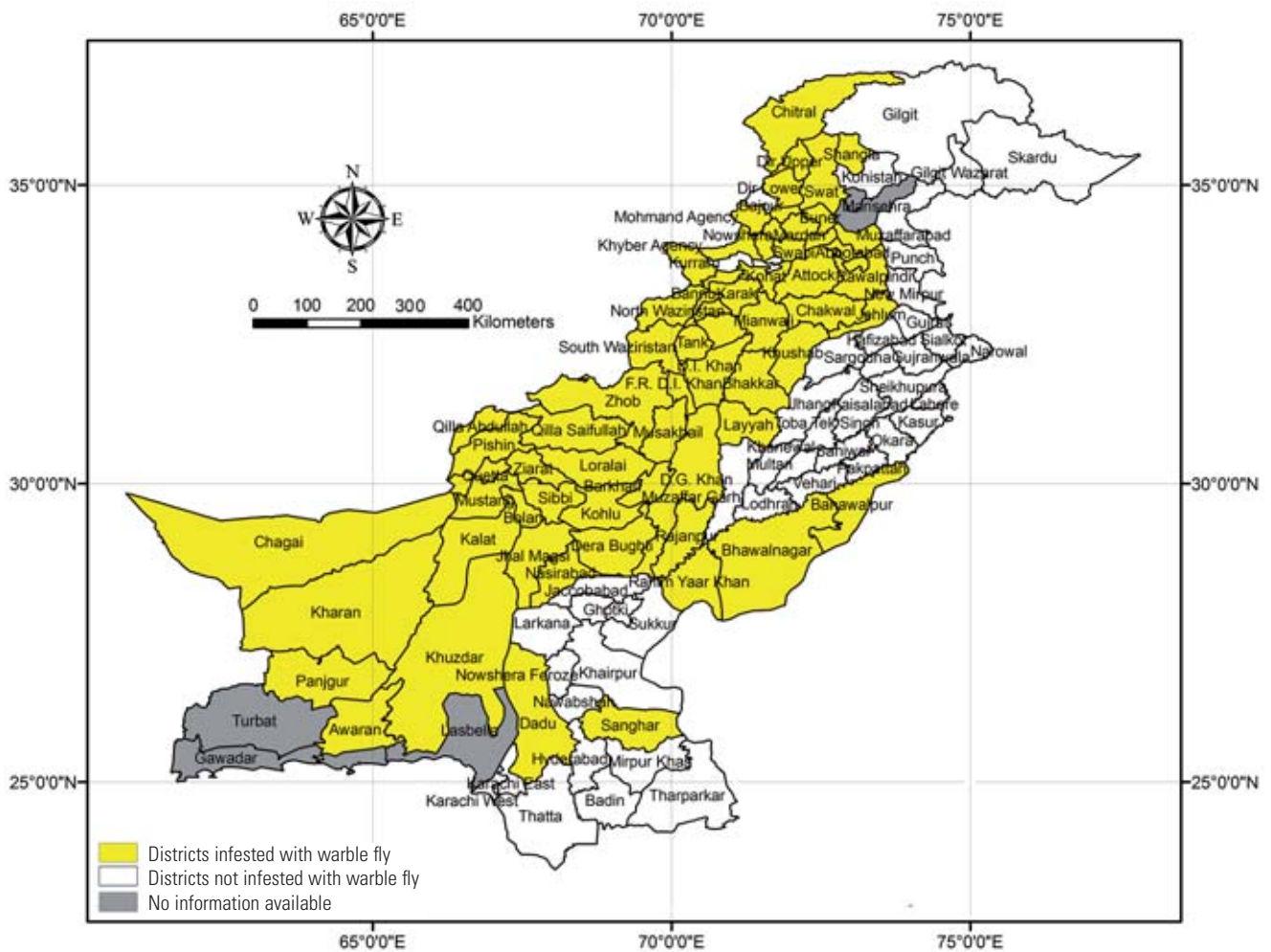


Fig. 1
Districts containing animals infested with warble fly in Pakistan

After treatment, the experimental animals were examined for the appearance of warbles, first on a monthly basis for two months and then on a fortnightly basis, until the last week of January. Side effects of the drugs, if any, were also recorded.

Results

A total of 1,019 questionnaires were received (Punjab = 296, Sindh = 246, KPK = 318, Balochistan = 151, Gilgit-Baltistan = 8). Warble fly infestation was seen in hilly, semi-hilly and desert areas of Pakistan. The prevalence in each district within each province is presented in Table IV (Punjab), Table V (Sindh), Table VI (KPK), Table VII (Balochistan) and Table VIII (Gilgit-Baltistan). Warble fly infestation was reported from all the provinces, particularly from hilly, semi-hilly and sandy desert areas in Cholistan and

Nara (Sanghar district) of Pakistan. The warbles (nodules) on the backs of the infested animals appeared from September through December and disappeared from October through March. The prevalence of WFI varied from 5% to 75%. It was found to be higher in interior regions of the hilly areas and it decreased gradually towards the plains. The WFI was reported and confirmed in cattle and goats only.

A map of the districts in which WFI was reported in Pakistan is presented in Figure 1.

All five treatments were found to be 100% effective in the control of WFI in goats and cattle, as presented in Tables II and III, respectively. None of the treated animals developed warbles in any of the four trials; however, control cattle were found to be infested with warble flies at all four trial sites. Control goats were found to be infested in Punjab and Balochistan only.

Table IV
Prevalence of warble fly infestation by district in Punjab Province

Dashes indicate that no information was available

Name of district	No. of questionnaires received	Species infested	Prevalence %	Cattle		Goats	
				Warbles start appearing	Warbles start disappearing	Warbles start appearing	Warbles start disappearing
Bhakkar	3	Cattle	26 to 50	Sep.	Oct.	–	–
Dera Ghazi Khan	38	Cattle, goats	26 to 50	Oct.	Jan.	Oct.	Jan.
Khushab	35	Cattle, goats	11 to 25	Nov.	Dec.	Nov.	Dec.
Mianwali	44	Cattle, goats	26 to 50	Oct.	Feb.	Oct.	Feb.
Rajanpur	1	Cattle, goats	51 to 75	Oct.	Dec.	Oct.	Dec.
Attock	17	Cattle, goats	11 to 25	Nov.	Feb.	Oct.	Feb.
Chakwal	16	Cattle, goats	5 to 10	Sep.	Feb.	Sep.	Feb.
Jehlum	20	Cattle, goats	5 to 10	Oct.	Dec.	Nov.	Jan.
Layyah	16	Cattle, goats	Less than 5	Nov.	Mar.	Nov.	Mar.
Muzaffargarh	14	No disease	0	–	–	–	–
Rawalpindi	10	Cattle, goats	11 to 25	Oct.	Nov.	Oct.	Nov.
Bahawalnagr	2	No disease	0	–	–	–	–
Rahim Yar Khan	2	No disease	0	–	–	–	–
Vehari	1	No disease	0	–	–	–	–
Toba Tek Singh	1	No disease	0	–	–	–	–
Faisalabad	1	No disease	5	–	–	–	–
Gujranwala	1	No disease	0	–	–	–	–
Gujrat	1	No disease	0	–	–	–	–
Hafizabad	5	No disease	0	–	–	–	–
Jhang	1	No disease	0	–	–	–	–
Kasur	1	No disease	0	–	–	–	–
Lahore	15	No disease	0	–	–	–	–
Lodhran	5	No disease	0	–	–	–	–
Multan	10	No disease	0	–	–	–	–
Nankana Sahib	9	No disease	0	–	–	–	–
Narowal	1	No disease	0	–	–	–	–
Okara	4	No disease	0	–	–	–	–
Pak Patan	1	No disease	0	–	–	–	–
Sahiwal	6	No disease	0	–	–	–	–
Sargodha	1	No disease	0	–	–	–	–
Sheikhupura	1	No disease	0	–	–	–	–
Sialkot	12	No disease	0	–	–	–	–
Bahawalpur	1	No disease	0	–	–	–	–

Discussion

Warble fly infestation is an economically important infestation of cattle and goats in Pakistan. Investigations conducted over many years have indicated that it is mainly prevalent in hilly and semi-hilly areas. The findings of the present study of its prevalence are in agreement with earlier reports (12, 13, 14, 15, 16, 17, 18, 29), and WFI was mostly seen in hilly and desert areas. Only two species, cattle and goats, were reported to be infested in this study, whereas in three earlier studies (4, 13, 14) WFI was also

reported in buffaloes, but its incidence was very low. Soft skins have been reported to facilitate the penetration of the first instar of the warble fly (21, 22, 28). No WFI was reported in sheep in any part of Pakistan, which confirms earlier reports (13, 14, 29).

Warble fly infestation has been recorded in hilly, semi-hilly and sandy desert areas. Its occurrence seems to have no correlation with temperature and altitude because it has been recorded from high mountains (in KPK, Upper Punjab and Balochistan) where the temperature drops to -4°C and

Table V
Prevalence of warble fly infestation by district in Sindh Province

Dashes indicate that no information was available

Name of district	No. of questionnaires received	Species infested	Prevalence %	Cattle		Goats	
				Warbles start appearing	Warbles start disappearing	Warbles start appearing	Warbles start disappearing
Badin	10	No disease	0	–	–	–	–
Mirpur Khas	26	No disease	0	–	–	–	–
Sanghar	35	Cattle	5 to 10	Nov.	Dec.	–	–
Thatta	8	Cattle, goats	0	–	–	–	–
Dadu	22	Goats	5 to 10	–	–	Nov.	Dec.
Larkana	1	No disease	0	–	–	–	–
Naushero Firoz	13	No disease	0	–	–	–	–
Shikarpur	15	No disease	0	–	–	–	–
Tharparkar	27	No disease	0	–	–	–	–
Tando Allayar	3	No disease	0	–	–	–	–
Sukkar	8	No disease	0	–	–	–	–
Mithi	14	No disease	0	–	–	–	–
Karachi	12	No disease	0	–	–	–	–
Jamshoroo	13	No disease	0	–	–	–	–
Nawab Shah	7	No disease	0	–	–	–	–
Hyderabad	11	No disease	0	–	–	–	–
Kumbar Shah Kot	21	No disease	0	–	–	–	–

Table VI
Prevalence of warble fly infestation by district in Khyber Pakhtunkhwa Province

Dashes indicate that no information was available

Name of district	No. of questionnaires received	Species infested	Prevalence %	Cattle		Goats	
				Warbles start appearing	Warbles start disappearing	Warbles start appearing	Warbles start disappearing
Bajour Agency	7	Goats	76 to 100	–	–	–	–
Dera Ismail Khan	4	Cattle, goats	5 to 10	Oct.	Dec.	Oct.	–
Karak	1	Cattle, goats	5 to 10	Oct.	Nov.	Nov.	Jan.
Lower Dir	5	Cattle	Less than 5	–	–	–	–
Nowshera	20	Cattle, goats	5 to 10	Nov.	Feb.	Nov.	Feb.
South Waziristan	73	Cattle, goats	26 to 50	Oct.	Dec.	Oct.	Dec.
Swat	4	Cattle, goats	5 to 10	–	Dec.	Nov.	Dec.
Upper Dir	8	Cattle, goats	5 to 10	Sep.	Oct.	Nov.	Mar.
Chitral	3	Cattle, goats	26 to 50	Oct.	Mar.	Nov.	Mar.
Hangu	15	Cattle, goats	11 to 25	Nov.	Dec.	–	–
Kohat	35	Cattle, goats	5 to 10	Nov.	Dec.	–	–
Mardan	4	Cattle, goats	5 to 10	Nov.	Jan.	Nov.	Jan.
Shangala	3	Cattle, goats	5 to 10	Nov.	Dec.	Nov.	Dec.
Tank	27	Cattle, goats	5 to 10	Oct.	Dec.	Oct.	Dec.
Parachinar	1	Cattle, goats	5 to 10	Oct.	Nov.	Oct.	Nov.
Bat Khela Malakand	10	Cattle, goats	11 to 25	Nov.	–	–	–
Haripur	27	Cattle, goats	Less than 5	–	–	–	–
Lucky Marwat	12	Cattle, goats	11 to 25	Nov.	–	Nov.	–
Mansehra	4	No disease	0	–	–	–	–
Peshawar	41	No disease	0	–	–	–	–
Khyber Agency	1	Cattle, goats	5 to 10	Dec.	–	Nov.	Dec.
FR Tank	8	Cattle, goats	26 to 50	–	–	–	–
FR Dera Ismail Khan	5	Cattle, goats	26 to 50	Oct.	Dec.	Oct.	Dec.

FR: Frontier Region

Table VII
Prevalence of warble fly infestation by district in Balochistan Province

Dashes indicate that no information was available

Name of district	No. of questionnaires received	Species infested	Prevalence %	Cattle		Goats	
				Warbles start appearing	Warbles start disappearing	Warbles start appearing	Warbles start disappearing
Barkhan	7	Cattle, goats	51 to 75	Nov.	Feb.	Nov.	Feb.
Dera Bugti	8	Cattle, goats	11 to 25	Oct.	Nov.	Oct.	Nov.
Kharan	26	Cattle, goats	5 to 10	Oct.	Dec.	Oct.	Dec.
Loralai	3	Cattle, goats	11 to 25	Dec.	Jan.	–	–
Musakhel	8	Cattle, goats	51 to 75	Nov.	Jan.	Nov.	Dec.
Nushki	2	Goats	11 to 25	–	–	Nov.	Dec.
Pishin	13	Cattle, goats	51 to 75	–	–	–	–
Jafarabad	4	Cattle, goats	11 to 25	Sep.	Oct.	Sep.	Oct.
Mastung	21	Goats	11 to 25	–	–	Sep.	Oct.
Panjgur	9	Cattle, goats	5 to 10	Oct.	–	Oct.	–
Sibi	25	Cattle, goats	26 to 50	Sep.	Dec.	Sep.	Dec.
Quetta	5	Cattle, goats	51 to 75	–	–	–	–
Awaran	2	Goats	26 to 50	–	–	–	–
Khuzdar	1	Cattle, goats	11 to 25	Nov.	Dec.	Oct.	Dec.
Bolan	6	Cattle, goats	26 to 50	Sep.	–	Sep.	–
Nasirabad	4	Cattle, goats	11 to 25	–	–	–	–
Ziarat	1	Goats	26 to 50	–	–	Nov.	Jan.
Zhob	2	Cattle, goats	26 to 50	Oct.	–	Oct.	–
Chagai	1	Goats	51 to 75	Nov.	Dec.	Oct.	Dec.
Washuk	1	Cattle, goats	11 to 25	Nov.	Dec.	Nov.	Dec.
Qila Saifullah	1	Cattle, goats	–	–	–	–	–
Muslim Bah	–	–	–	–	–	–	–

Table VIII
Prevalence of warble fly infestation by district in Gilgit-Baltistan Province

Dashes indicate that no information was available

Name of district	No. of questionnaires received	Species infested	Prevalence %	Cattle		Goats	
				Warbles start appearing	Warbles start disappearing	Warbles start appearing	Warbles start disappearing
Astore	1	Cattle, goats	26 to 50	Dec.	Mar.	Nov.	Feb.
Gilgit	3	Cattle, goats	26 to 50	Nov.	Mar.	Nov.	Dec.
Ganchae	1	Goats	5 to 10	Nov.	Mar.	Nov.	–
Ghizer	1	Cattle, goats	26 to 50	Nov.	Mar.	Nov.	–
Chilas	1	Cattle, goats	51 to 75	Sep.	Mar.	Nov.	Mar.
Skardu	1	Goats	11 to 25	Nov.	Mar.	Sep.	Mar.

also from sandy deserts (in Cholistan and Tharr) where the temperature rises to 50°C. It appears that the warble fly persists in habitats where land disturbance is infrequent and the fly can find space and time for completion of its pupation period in the soil. Perhaps it is for this reason that WFI has been recorded mainly in areas where agricultural activities such as ploughing and cultivation are not practised very often.

The absence of WFI from Mansehra district in KPK needs further investigation, because the infestation has been reported from neighbouring districts, including Abbotabad and Haripur. Warble fly infestation is also absent from the Peshawar district; this may be because this district mainly consists of urban areas and adjoining lush green agricultural areas where the fly may not find an appropriate place/sufficient space for completion of its pupal period.

The appearance of warbles was found to start in September and continue through December, with the highest number in November. This finding is in agreement with earlier work (1, 15, 26). The finding of the highest prevalence during December, as reported in other studies (14, 27), might be due to differences in the geo-climatic conditions of the study areas.

The avermectins are a series of closely related macrocyclic lactone derivatives produced as fermentation metabolites of *Actinomycetes* of the genus *Streptomyces*. These molecules have a wide spectrum of activity against nematodes and arthropods parasitic to humans and domestic animals (6).

Ivermectin has been shown to be highly effective against the first stage larvae of *H. lineatum* and *H. bovis*. In the United Kingdom, reasons for the success of the warble fly eradication campaign probably include the widespread adoption of ivermectin treatments in the mid-1980s (30). In 1984, Drummond (10) demonstrated that a dose of 0.2 g/kg bodyweight (1/1,000 of the recommended dose) was able to kill all first instar larvae. In the same year, Argente and Hillion (2) demonstrated that the administration of 0.1 ml of ivermectin injectable (Ivomec®), irrespective of body weight (corresponding to 1/60 to 1/1,000 of the recommended dosage), was highly effective. The drug could be given subcutaneously or intradermally (automatic dermojet). Only one out of 705 treated animals was found to be infested, and this was probably due to errors in the handling of the very small dose of drug. This early report was largely confirmed thereafter by different authors working under different field conditions (5, 8, 9, 20). In the present study, the drugs used were highly effective against WFI in cattle and goats, and this confirms the earlier findings (10, 25, 30).

From the findings of the present study, it may be concluded that ivermectin and doramectin are highly effective and safe for the control of grubs in cattle and goats when given during the first three weeks of September. Further studies are suggested for establishing a sero-surveillance system aimed at its timely diagnosis and effective control.

Conclusions

The warble fly is prevalent in all four provinces of Pakistan. Its intensity is higher in hilly areas than in the plains. The formation of warbles on the backs of infested animals starts in September and continues to the last week of December. The shedding of the larvae commences in the first week of December and continues to the first week of February.

The five medicines used in the drug efficacy trials, namely Ivomec (Ivermectin, Merial), Dectomax (Doramectin, Pfizer), Endectin (Ivermectin, ICI) and Promectin (Ivermectin, Invesa International S.A., Spain), were found to be 100% effective in the control of warble fly. Administration of these medicines during the first three weeks of September was found to be safe and the drugs did not cause any side effects in the treated animals.

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Études de la biologie, la chimiothérapie et la distribution du varron au Pakistan

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Résumé

Les auteurs présentent les résultats d'études conduites sur la prévalence, la biologie et le contrôle de l'infestation par le varron chez les bovins et les caprins au Pakistan. Un questionnaire préparé à l'avance afin de recueillir des informations sur la biologie et la prévalence du varron a été diffusé parmi les personnels vétérinaires de terrain et les éleveurs dans les cinq provinces du pays (Pendjab, Sind, Baloutchistan, Khyber Pakhtunkhwa et les Gilgit-Baltistan)

ainsi que dans les Régions tribales fédéralement administrées. Au total, 1 019 questionnaires ont été recueillis (Pendjab = 296, Sind = 246, Khyber Pakhtunkhwa = 318, Baloutchistan = 151, Gilgit-Baltistan = 8). Des cas d'infestation par le varron ont été signalés dans chaque province ainsi que dans les Régions tribales fédéralement administrées, particulièrement dans les zones vallonnées et semi vallonnées ainsi que dans les régions désertiques (le désert du Cholistan, qui longe les districts de Rahim Yar Khan, de Bahawalpur et de Bahawalnagar, et la zone de Nara dans le district de Sanghar). Les nodules du varron faisaient leur apparition sur le dos des animaux infestés à partir du mois de septembre jusqu'en décembre, pour disparaître progressivement d'octobre à mars. La prévalence des infestations par le varron variait de 5 % à 75 %. Le taux le plus élevé a été constaté dans les régions vallonnées, et diminuait à mesure que l'on se rapprochait des vallées. L'étude a permis de réaliser une carte des zones infestées par le varron. Quatre essais ont été conduits sur le terrain afin d'évaluer l'efficacité des différents médicaments utilisés pour venir à bout des infestations. Au total, 2 094 bovins et 3 876 caprins ont reçu pendant les trois premières semaines de septembre les cinq médicaments suivants, administrés par injection (avermectines): Ivomec, Endectin, Euvectin, Dectomax et Promectin (ivermectine). Un groupe de contrôle a reçu une solution saline. Tous les médicaments cités ont été efficaces pour traiter l'infestation.

Mots-clés

Avermectine – Biologie – Bovin – Caprin – Contrôle des maladies – Pakistan – Prévalence – Varron.



Estudios sobre la biología, la farmacoterapia y la distribución del rezo en Pakistán

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Resumen

Los autores presentan datos sobre la prevalencia, la biología y el control de la infestación por el rezo (género *Hypoderma*) de bovinos y caprinos en Pakistán. A fin de obtener información sobre la biología y prevalencia de ese díptero se repartió un cuestionario predefinido entre el personal veterinario y los ganaderos de las cinco provincias del país (Punjab, Sindh, Baluchistán, Khyber Pakhtunkhwa y Gilgit-Baltistan) y de las Áreas tribales bajo administración federal. Se recibieron en total 1.019 cuestionarios cumplimentados (Punjab = 296, Sindh = 246, Khyber Pakhtunkhwa = 318, Baluchistán = 151, Gilgit-Baltistan = 8). En todas las zonas, y sobre todo en las regiones de desierto arenoso y de alta y media montaña (el desierto de Cholistán, que linda con la ciudad de Rehim Yar Khan, los distritos de Bahawalpur y Bahawalnagar y la zona de Nara del distrito de Sanghar), se comunicó la presencia de infestaciones por el rezo. Desde septiembre hasta diciembre aparecían en el dorso de los animales infestados una serie de nódulos, que desaparecían entre octubre y marzo. La prevalencia del rezo oscilaba entre el 5% y el 75%. Las zonas montañosas presentaban los valores más elevados, que iban decreciendo a medida que el terreno se hacía más llano. Tras elaborar una cartografía de las zonas infestadas por el rezo, se llevaron a cabo cuatro ensayos sobre el terreno para estudiar la eficacia de distintos fármacos indicados para combatir la

infestación. En las primeras tres semanas de septiembre se administraron cinco inyecciones distintas de avermectinas a un total de 2.094 bovinos y 3.876 caprinos: Ivomec, Eudectin, Euvectin, Dectomax y Promectin (ivermectina), y se administró suero fisiológico a un grupo de control. Todos los fármacos resultaron eficaces para luchar contra la infestación.

Palabras clave

Avermectina – Biología – Bovinos – Control – Caprinos – Pakistán – Prevalencia – Rezno.

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