

Prevalence and economic significance of goat pox virus disease in semi-arid provinces of Iran

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Abstract:

BACKGROUND: Caprine pox virus disease play an important role in major constraints to small ruminants production in Iran. **OBJECTIVES:** This study was conducted in different districts of Iran to determine the prevalence of goats pox virus disease in different age groups, sex and seasons in Black goats of Iran. **METHODS:** In this study skin lesions of male and female goats were collected randomly from different provinces during (January, 2007 to November, 2010). A total of 318 samples were examined, of which 66 were found positive. **RESULTS:** The overall prevalence rate was 20.75%. Pox virus disease was observed significantly higher in older (58.33%) female goats (36.79%) and in rainy seasons (26.16%). The estimated economic losses due to condemnation of skin deficiency were 5.59% which cost US\$115.44 per thousand skin of slaughtered goats. The prevalence was significantly different ($p \leq 0.05$) in different age groups and sex of the animals. **CONCLUSIONS:** The present study indicates that pox virus disease infection in goats is associated with age, sex of animal and seasons of the year. To control the disease in infected provinces, appropriate preventive control strategies have to be designed to reduce the impact of the disease on goat production in Iran.

Introduction

There are about eighty million small ruminants (sheep and goat) in Iran (FAO, 2005), which plays an important role in the rural economy and earns a substantial amount of foreign currency via exporting skins and other by-products (Soad et al., 1996) Among infectious diseases, pox virus disease (PVD) in particular constitutes a serious health problem and limitation to the productivity of small ruminants throughout the involved provinces of Iran due to the associated morbidity, mortality, cost of treatment and control measures (Ramyar, 1965).

In Iran, viral diseases have been considered one of the major constraints of livestock production. Among the viral diseases, goat pox disease is an economically important livestock disease particularly in sheep and goats. The prevalence of goat pox disease among

small ruminants is rampant and the economic loss from this disease is considerably high. Soad et al. (1996) have reported that pox virus disease is the most prevalent and economically important in sheep and goat. Infection with goat pox virus is regarded as one of the most common infection of ruminants in Asia and Africa (OIE, 2008). This disease causes enormous economic losses all over the Middle East, including Iran; these losses are due to reduction in trade, export, and the development of extensive livestock production such as milk and meat, condemnation of skin, loss of draught power, reproductive failure and mortality and may also prevent the import of new breeds. Ramprambhu et al., 2002 estimated the economic losses (Rao et al., 2000) due to condemnation of skin at 7.54%, which cost US\$28.86 per thousand skins of slaughtered goats. Despite the wide prevalence of the malady and the huge loss sustained from it, no epidemiological study

on this disease in goats has so far been undertaken in semi-arid provinces of this country. Therefore, in this study an attempt was made to record the prevalence of goat pox disease in Iranian Black goats associated with the influence of age and sex on prevalence and to correlate between goat pox infection, temperature and seasonal changes.

Goat pox was first reported in 1879 in Norway and later observed in Macedonia during the first world war. Goat pox was likely present in Asia and Europe as early as the second century AD and its infectious nature was recognized in the mid 18th century. Today sheep and goat pox are found in central and north Africa, central Asia, the Middle East and parts of the Indian subcontinent. A mild pox-like disease has been reported in California but is unlikely to be a goat pox virus. Routine laboratory procedures for the diagnosis of goat pox include characteristic histopathologic lesions and cell culture technique, as there are cross reactions between different strains of goat pox virus species so, the first method is selected.

Materials and Methods

1- Study area and experimental animal: This study was conducted in Razi Institute on 318 suspected samples, received from different semi-arid provinces of Iran including Kerman, Zabol, Hormazgan, Khuzestan, Khorasan, Fars, and Azarbayjan, which are located mostly in the south, central and south-eastern parts of Iran and between 24° 32' north latitude and 91° 52' east longitude. The average maximum and minimum temperature are 23°C and 7°C, respectively (IMO, 2010). The annual average rainfall is 3.334 mm and humidity is 70% (IMO, 2010). In this study, skin lesions of male and female goats of different age groups were examined at the virology department during a period from January 2007 to November 2010. All animals of this study belong to Iranian Black goats which were raised in different areas of provinces of Iran and were maintained under rural and urban animal husbandries. The age of the animal was determined by dentition. The sex of the animals was recorded by examining the presence of penis or uterus.

2- Sampling and processing: A total of 318 skin lesions were received from the involved provinces and examined for lesions manifestations. The gross

lesions of the skin like cyst, abscesses, necrosis, white spots, hemorrhages were investigated and recorded by immediate transfer to the laboratory and then debris tissues were removed and homogenized (Homogenizer type R 16.56 APM, 1200 RPM motor) at 1000 g in 15 minutes, and injected by two methods, sub-cutaneous and scratching. After injection, control measure was carried out as body temperature, secretion and apparent status, nasal and eye discharge were recorded for 10 days.

3- Examination of inoculation goats: Five days after injection, goats were observed for typical clinical signs such as fever, pox vesicles lesions. In some cases vesicles were generalized while in others they were localized, there seems to be a difference in the protection levels of goats (Davis and Otema, 1978). It should be noted that all injected goats were kept for one month until complete recovery and some of them were then transferred to be destroyed.

4- Statistical analysis: Collected data were transferred to STATA version 8.0 (STATA co-operation, Texas, USA, 2002) for analysis by chi-square test. Variation in the prevalence of goat pox disease among sex, age and season were analyzed. The year was divided into three seasons, i.e. Summer (June to September), Rainy (March to May) and Winter (November to February). A value of $p \leq 0.05$ or less was considered significant at 95% confidence interval. X² is used to find differences in age, sex and seasons groups prevalence rates.

Results

Age-wise prevalence rates of goat pox disease: Out of 318 suspected skin lesions 66 (20.75%) samples were found positive. This study reported a relatively low prevalence rate of pox in goats and a higher rate in older animals over two years of age (Table 1). The high infection rates in older animals was associated with age and consequently longer exposure time.

Sex and season-wise prevalence: Female goats (36.79%) were affected more with pox virus disease than males (12.73%). Prevalence of pox virus disease in slaughtered goat was found to be higher (26.16%) during rainy season compared with summer and winter (Table 2). The proportion of animals passing pox lesion gradually increased from the early dry

Table 1. Age-wise prevalence rates of goat pox disease in the south-eastern provinces of Iran. Figures in parenthesis indicate percentages. A significant difference between various age groups was recorded ($\chi^2=16.917$, $p<0.002$).

Age of animals (Years)	Number of skin lesion examined	positive cases (%)
Up to 1	35	(2.85) n= 1
1-1.5	86	(16.27) n= 14
1.6-2	168	(20.83) n=35
2.1-2.5	24	(58.33) n=14
2.6-3	5	(40.00) n= 2

Table 2. Economic losses due to condemnation of pox virus disease affected skin lesions. Figures in parenthesis indicate the percentage. A non significant difference between various seasons was observed ($\chi^2=2.450$, $p=0.294$).

Seasons involved	Number of samples examined	Positive (%) cases
Summer (June to Sept.)	106	(17.9) n=19
Rainy (March to May)	107	(26.16) n=28
Winter (November to February)	105	(16.2) n=17

season and peaked at the end of the dry season and the early rainy and moisture season.

Economic losses: The total weight of 318 affected skin was approximately 143 kg and the weight of condemned mass from affected skin was 8 kg, this was nearly 5.59% of the total weight. The monetary value of 143 kg affected skin was calculated to be US\$619.04 and the monetary value of 66 kg condemned was US\$34.63. Based on these figures, the expected monetary loss due to condemnation of affected skin per slaughtered goat in the population was US\$0.16. Expected monetary losses per 1000 slaughtered goat in the population would be US\$ 115.44. According to the present study, the prevalence of skin condemnation due to pox disease decreased from 4.41% to 2.80% in goats.

Discussion

This study reported a relatively low prevalence rate of pox in goats. Environmental temperature can be the main cause of different prevalence rates of disease in the different regions of the provinces where this study was carried out.

Age-wise prevalence: goat Pox disease was observed significantly ($\chi^2=16.917$, $p<0.002$) higher in older animals over two years of age (Table 1), which is in agreement with the results of other researchers (Soad et al., 1996, Plowright et al., 1959). The higher infection rate in older animals could be due to long-term exposure to direct contact and survival of virus in nature. Similarly, Murry et al. (1973) reported the high infection rates in older animals associated with age and consequently longer exposure time. The prevalence of pox disease started to decrease with the increase of age (>2.5 years) in the present study. Similar observation was reported by Kitching et al. (1986) where the prevalence was high (35.71%) in the 2 years age group and low (18.18%) in the greater than 3 years age group. The probable explanation for the lower prevalence in the higher age group compared to the younger age group could be due to the so-called self-cure phenomenon (Davies .F.G.1976) and /or high acquired immunity, which increase with age. It has been reported that the host may recover from infection with increasing age and hence become resistant (Davies, 1978).

Sex and season-wise prevalence: Female goats were affected more ($\chi^2=15.384$, $p<0.001$) with pox virus disease than the males, which could probably be due to the fact that the female goats in this country are slaughtered at older age. The change of physiologic condition during lactation (productive activity) and /or lack of proper nutrition for production and due to long term exposure of the animals to disease entity and their heavy grazing in submerged areas might be the cause of the greater prevalence rate in female. In adult female goat pox disease was recorded higher (44.20%) and this was probably the reason for the higher survival rate of this age group of animals to this disease (Davies, 1976).

Prevalence of pox disease in slaughtered goat was found to be high during rainy season, however, the difference with other seasons was found non

significant ($\chi^2=2,450$: $p= 0.294$). This observation appears to be in agreement with the earlier reports (Rao et al., 2000). Climate conditions, particularly warm weather, were frequently associated with differences in the prevalence of goat pox virus infection because it was suitable for intermediate hosts mechanical carriers (arthropods) to reproduce and to survive longer under moist and warm conditions (Murry et al., 1973). Moreover, Iran has a warm and moist season for some months and pox virus survive in such an environment. From this and previous studies (Jubb et al., 2004), the prevalence of pox virus infection was found to be significantly higher during the rainy seasons than that of dry season. Reports on the duration and period during which animals are exposed to infection with pox virus vary between habits and the rate of infection is not constant throughout the year but concentrated over a relatively few months (Davies et al., 1985). The proportion of animals passing pox lesion are in agreement with Kitching et al. (1989), there is a peak at the end of the dry season and early rainy and moisture season.

Economic losses: The 5.59% loss of skin tissue with a monetary value of US\$619.04 due to condemnation for skin deficiency should not be underestimated in the context of a developing country like Iran.

Pox infections in goats are endemic and widespread in different provinces of Iran (Fars, Isfahan, Kerman). So control measures should be taken by eradication of mechanical carriers (ticks and mosquito population) in raising goat pastures and avoiding direct and indirect contact of infected goats, as mass vaccination would be carried out before an occurrence happens. Hence supportive treatment should be given to get the maximum benefits from goats.

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بررسی میزان شیوع و اهمیت اقتصادی بیماری ویروسی آبله بزی در استان‌های نیمه خشک ایران

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چکیده

زمینه مطالعه: بیماری ویروسی آبله بزی دارای نقش مهم و اساسی در میزان تولید نشخوارکنندگان کوچک می‌باشد. هدف: این مطالعه جهت تعیین میزان شیوع و اهمیت اقتصادی بیماری در گروه‌های سنی، جنسی و فصول مختلف در بزهای نژادسیاه ایرانی در نواحی مختلف استان‌های نیمه خشک ایران صورت گرفت. روش کار: در این بررسی از لژیون‌های جلدی بزهای نر و ماده بشکل تصادفی در طی یک دوره (از ژانویه ۲۰۰۷ الی نوامبر ۲۰۱۰) جمع‌آوری شده بود از تعداد کل ۳۱۸ نمونه آزمایش شده تعداد ۶۶ مورد مثبت مشاهده و تأیید گردید. نتایج: میزان شیوع بیماری ۲۰/۷۵٪ تعیین شد. میزان بیماری در سنین بالاتر ۵۸/۳۳٪ و در جنس ماده ۳۶/۷۹٪ و در طول فصول گرم و مرطوب ۲۶/۱۶٪ می‌باشد. خسارات اقتصادی تخمین زده ناشی از اختلالات پوستی در حدود ۵/۵۹٪ به ارزش ۱۱۵ دلار امریکائی در هر ۱۰۰۰ بز کشتار شده می‌باشد. میزان شیوع در گروه‌های سنی و جنسی مختلف بطور قابل توجهی ($p \leq 0.05$) متفاوت بود. نتیجه‌گیری نهائی: نتایج این مطالعه موید آنست که بیماری عفونی ویروسی آبله ارتباط مستقیمی با سن، جنس و فصول سال دارد لذا برای کنترل بیماری در استان‌های درگیر به منظور کاهش اثر بیماری بر روی تولیدات بزها در ایران، بایستی استراتژی پیشگیری و کنترل صحیح طراحی شود.

واژه‌های کلیدی: آبله بز، اهمیت اقتصادی، شیوع.

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