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GENETIC PARAMETERS FOR SCABIES DISEASE AND RELATION WITH INTERLEUKIN 12 CONCENTRATION IN SHEEP

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Abstract

The research carried out to study relationship between scabies with immune response through the level of interleukin 12 (IL-12) in serum. Moreover, genetic variance for infection and some factors related to animals . Overall mean for incidence rate was o.70%, age affected by this disease for adults which infected with percentage rate 0.78% among ages 4 - 6 years, whereas reduced to 0.59% in older animal, however, there are no significant difference with offspring age and lower rate was 0.56% for lamb less than one year then increased to 0.80% for ages between 1-3 years after that declined to 0.73% for more than 4 years, there is no impact of sex on infection, on the same side, this study noticed significant differences (P>0.05) between single and twin were 0.74% and 0.54%, respectively. On the same hand, season has an important role in parasitic incidence, Spring and Autumn witnessed higher rates reached to 1.00% and 0.75% sequentially, while decreased to 0.53% in winter and 0.50% in summer. Higher significant response (P>0.05) for IL-12 level for infected received to 0.28ng/ml while reduced to 0.08ng/ml for healthy animals . Heritability for each of incidence rate of scabies and level of IL-12 were 0.51 and 0.24 respectively whereas repeatability for this disease was 0.46. There is a high significant correlation between infection and IL-12 concentration was 0.344 and negative (P>0.05) with dam age -0.225 and birth type -0.250 while insignificantly with offspring age reached to 0.147. This research concludes that animal resistance to scabies disease result from interaction between genetic and immune activation which depended firstly in selecting healthy animals with less incidence of this disease.

Key words : Scabies, IL-12, genetic, immunity, sheep.

Introduction

Scabies is a popular disease wide spreading at many countries and more concerned problem around the world, all kinds of animals infected with this disease especially in sheep which disposing to parasites as mite or tick, the type of *Psoroptes ovis* and *Sarcoptes scabiere* that infest cutaneous, symptoms appeared after period causing dermatic damages include itching, rubbing perform to cutaneous injuries which considered a mean to enter the bacterial pathogens to the body result sever infections. Furthermore , increasing thickness of skin then developing infection to cover all the body when still parasites for a long time 2-3 months without any care or treatment so, chronic incidence perform to cardiac and kidney disease (Chhabra and Pathake, 2011). Parasites translated to animals throughout surrounding environment or from infected to healthy animals resulted weakness, weight loss, reduction performance and production, drugs costs and mortality at bad management (Nasir *et al*., 2017). Infection varied in different regions, which reached to 16.46% and 12.8% in Alnuaymy and Araby sheep in south of Iraq (Shamsa *et al*., 2006). Mostly different ages infested and infections recorded among females and males with rates 5.26% and 4.02% respectively in Ethiopian cattle (Nuru and Mhatbu, 2017). Host immune response against parasitic pathogens in inflammable skin, which produce langerhane cells that associated with symptoms. After immune stimulation by presence of parasite, cytokines produced in host cutaneous and circumstances, however, pro immflamatory cytokines secreted auto immune cells against *P. ovis* through T helper cells after 24 hours of dermatic sensitive induction also kinds of interleukins secreted as a reaction for infection, moreover, highly sensitive presence after 72 hours, in the same side, immune cells attack parasites resulting cutaneous tissue damage then releasing interferon gamma from microphages and natural killer cells (Sarre *et al*., 2015), in other hand, genetic variation in skin physiology is responsible on different changes in skin among animals (Burges *et al*., 2011). This research highlights on interfer

between scabies and immune response reflected by concentration of interleukin 12 in serum for Iraqi sheep because, there is a little papers quest about this pointe.

Materials and Methods

This study reported in animal field at College of Agriculture, University of Baghdad for periods from first of September – 31 December 2017 on local Awassi sheep, which placed in open barns, births induce in April and October while normal suckling had been followed, animals glupped down against endo parasites also scattered with anti ecto parasites to prevent spreading of pathogens. However, veterinarian records as well as subjective observations considered to ensure occur of infections with Scabies among animals.

Serological analysis

Blood samples collected in sterile tubs contains of EDTA then let to clot for 20 minutes after that extracted at r.p.m. for five minutes and stored for -20^{O}C until estimation of IL – 12 concentration by using kit provided from Shanghai Yokua Biological Technology, China.

Statistical analysis

General Linear Model in Statistical Analysis System (SAS, 2012) was used to account mean squares for incidence rate of Scabies and association with dam age, offspring age, birth type, sex and season as next model:

$$Y_{ijklmn} = \mu + D_i + O_j + B_k + S_l + F_m + e_{ijklmn}$$

Where, μ : General mean, D_i : dam age, O_j : offspring age, B_k : birth type, S_l : sex, F_m : season, e_{ijklmn} : standard error.

The same model was conducted again to estimate of IL – 12 concentration for infected and healthy animals as following:

$$Y_{ij} = \mu + I_l$$

Where, I_l : infected or healthy status

Breeding records depended to estimate the variance by Type 1 method for parents, which have more than five offsprings for determining the genetic parameters in addition to correlation coefficient between studied factors (Paterson and Thompson, 1971).

Results and Discussion

Recent study demonstrated that overall mean for incidence rate of scabies received to 0.70% (table 1). This percentage came less than those for Salifou *et al*. (2013), which was 4.2% in west African dwarf sheep in Senegal also ranged from 46.66% to 24.22% for Banner sheep in India in findings for each of Sawale *et al*. (2012) and Soundararajan *et al*. (2016), respectively, while decreased to 3.14% among Ethiopian sheep (Nura and Mhatbu, 2017) and they membered that infection depending on animal body condition, which increased to 60.53% for weakened animals and declined to 39.47% for those of moderate body score whereas, there is no infection in good mass body and with presence of predisposing factors also keeped animals inside barns all the time without grazing.

Dam age

Study suggested that dam infection influenced by their ages significantly ($p>0.05$), animals have higher incidence rate was 0.78% for 4-6 years and declined to 0.59% for older ages more than 6 years (table 1). These percentages tend to down grade compared with infected adult ewes which reached to 4.61% in Ethiopia (Nuru and Mhatbu, 2017) also in Bannur sheep was 12.29% (Sawale *et al*., 2012). The reason of reduction incidence rate in aged animals may be due to these subjects infested previously several times and this make their bodies more persistence to parasites and enabled their bodies to recognition these pathogens early leads to control on this disease.

Offspring ages

Age has no impact on offspring infestation with scabies and higher incidence rate among animals between 1-3 years and 4 years, which reached to 0.80% and 0.73% respectively whereas less incidence was 0.56% for those under 1 year age (table 1). Contrary to this result incidence percentage raised to 36.71% for those above one year (Sawale *et al*., 2012) whom indicated that younger infection back to crowded, insufficient food and stress.

Sex

There is no effect of sex on scabies infection, which occurred between males and females with rates 0.58% and 0.79%, respectively (table 1). Current result agree with findings of Nuru and Mhatbu (2017) while contrast to Soundaravajan *et al*. (2017), which recorded high positive effect for sex on induction of scabies, the percentage was 35.14% for males higher than those received to 22.37in females while were 10% and 5.9% among males and females in Karakul sheep in Pakistan (Aatish *et al*., 2007).

Birth type

A significant effect ($p>0.05$) found for birth type in scabies induction, infection tend to up grade for single and lower for twins were 0.74% and 0.54% correspondingly (table 1).

Table 1 : Mean square ± standard error for factors effect on scabies disease.

Mean square ± standard error	Numbers	S.O.V
0.70 ± 0.05	58	Overall mean
(P>0.05)		Dam age (year)
0.78 ± 0.11 a	36	>4-<6
0.59 ± 0.12 b	22	> 6
NS		Off spring age (year)
0.56 ± 0.16 a	18	< 1
0.80 ± 0.23 a	25	1 - < 3
0.73 ± 0.14 a	15	3 - < 4
NS		Sex
0.58 ± 0.12 a	24	Male
0.79 ± 0.09 a	34	Female
(P>0.05)		Birth type
0.74 ± 0.08 a	47	Single
0.54 ± 0.14 b	11	Twine
(P>0.05)		Season
0.53 ± 0.17 b	17	Winter
1.00 ± 0.18 a	9	Spring
0.50 ± 0.23 b	4	Summer
0.75 ± 0.17 ab	28	Autumn

Mean with same letters not different within the variable (p>0.05) * NS : not significant.

Table 2 : IL-12 levels for infected and healthy animals.

Healthy± standard error n = 12	Infected ±standard error n =45	
(p > 0.01)		IL–12(ng/ml)
0.08 ± 0.06 b	0.28 ± 0.03 a	

(P>0.01) :**

with scabies and that due to cold which provides a suitable environment to developing and increasing parasites while in Summer rising of sun light for a long period, which reduced humidity and sterilised barns. In this study, the cause of increasing infection in Spring and Autumn may be due to rains and high humidity leads to reproductive insects and their eggs on the skin, further more fleece covered skin and let them not viewed and this develop the infection, according to summer, animals scattering with anti-parasites and this contribute to decline spreading of the disease.

Interleukin 12

Infection has a high significant in the concentration of 1L–12, which reduced to 0.08 NG/ML in healthy animals while rised to 0.28 ng/ml for infestation (table 2) increasing of IL-12 level may be refer to that ecto parasite feeding on tissues, blood also epidermal proteins to survival, these pathogens face a threating of host extra and intra cellular response that produce cytokines in the same time of antigen recognition from white blood cells which directed to immflamable site through signals that help to inter cellular estimation, which recipient these signals as a reaction for infection that caused by parasites faces and resulted sensitivity which perform to skin damage in addition, T cells have an important role in activating and regulating of immune response by yielding immune cytokines like IL - 12 (Walton, 2010). T cells and CD+4 dominantly available in infected skin with scabies in vessels walls for upper dermis layer, which produce phagocytes and natural killer cells which release INF-c that eradicate pro T cells toward T helper 1 after that produce IL-12 in addition T helper 2 cells in cutaneous, which stimulate phagocytes to attack parasites and result dermatic damage, this finally caused symptoms of scabies.

Table 3 : Genetic markers for Scabies and IL-12 with some factors.

Birth type	Sex	Offspring age	Dam age	IL – 12	Correlation coefficient
-0.250 (p > 0.05)	0.224 NS	o.147 NS	- 0.225 (p > 0.05)	0.344 (p > 0.01)	Infection
			Repeatability	Heritability	
			0.46	0.51	Scabies
			0.24	IL - 12	

(P>0.01) :** (P:0.05) : * NS: not significant.

Season

Infection affected significantly (p>0.05) by season, higher incidence rate was 1.00% in Spring and 0.75% in Autumn son the same side, infection tend to down grade in cold and hot condition with similar rates were 0.53% and 0.30%, respectively (table 1). Nuru and Mhatbu (2017) said that winter and spring witness more infections

Genetic parameters

Repeatability of infection with scabies was 0.64, heritability for infection and 1L–12 concentration were 0.51 and 0.12 respectively correlation between scabies and each of dam age, birth type were -0.225 and 0.250

negative (P>0.05) respectively while association not important between infection with offspring age 0.147 and sex 0.224. In the same side, relation between infection and IL – 12 level was 0.344 (table 3). Recent study demonstrated that genetic variance for scabies with medium value (0.51) and this indicate that genetic has partly role in resistance against this disease, which repeated with value o.46 that enabled to predict about infection depending on times of incidence also selection healthy animals with high resistance to pathogens. Correlation between infection and damage and birth type was negative and weakend, this indicate the contrast interaction with infection. Genetic variance for immunity was 0.24, this redaction estimation may be due to sufficient of body immunity and response to parasites which persistence the materials of anti parasitic that used for treatment (Powell *et al.*, 2012), so that genetic effect correlated with T helper 1 cells response in chronic status or interaction INF-c with the cells response that control on parasite in cutaneous (Walton, 2010). Genetic variation contributes in developing the infection through animals ability to deposing to causes of disease and response to them, so symptoms appeared delayed this may be inhibits pre immune response throughout secreting cytokines (Bhat *et al*., 2017).

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