INTRODUCTION

Livestock plays a pivotal role in Pakistan’s economy by uplifting the socioeconomic conditions of resource-poor farming communities and alleviating poverty. In the financial year 2013-14, the livestock sector contributed 11.8% to the Gross Domestic Product (GDP) of Pakistan; its share in the value of all agricultural commodities was 55.9% (PES, 2013-14). In the livestock sector, water buffaloes and cattle with an estimated population size of 35-40 million are the main milk-producing animals and yielding approximately 18,000–31,000 million tons of milk (PES, 2013-14).

Keeping in mind its great share in economy, it is important to deal efficiently with all challenges to livestock industry. These challenges are in the form of various infectious diseases which adversely affect the economy of the country (Carroll et al., 2008). Among these, parasitic diseases i.e. haemo-protozoan and gastrointestinal parasites are most important which affect milk and meat production of animals (Artis, 2006; Gohil et al., 2013; Khan et al., 2013). Cattle are highly susceptible to most of the diseases and parasites that affect buffaloes. Despite of great genetic potential of cattle in Pakistan, its production is not good due to these parasitic diseases. In Pakistan, parasitic diseases including haemo-protozoan and gastrointestinal parasit-
ism are considered a major obstacle in the health and production performance of cattle. Ticks are important vector for transmission of diseases (Shah et al., 2017) and also it cause physical damage to livestock, thus affecting the quality of hide. Most important tick borne diseases of livestock are Theileriosis, Babesiosis and Anaplasmosis.

Gastrointestinal parasites (Nematodes, Trematodes and cestodes) are important parasites of cattle having a negative impact on both animal health and financial returns from production animals. Parasitic diseases offer a great obstacle to livestock, thus causing direct and indirect losses (Harper and Penzhorn, 1999; Kagira and Kanyari, 2001). Gastrointestinal parasitism lowers the productive capacity of animals and may cause death in some cases (Lebbie et al., 1994). Some of these are zoonotic and therefore a threat to public health.

The current study focus on the prevalence and diversity of parasitism caused by haemo-protozoan and helminthes in Government cattle breeding and dairy farm, Harichand, Charsadda to provide a basis for evolving strategic and tactical control of these parasites.

**MATERIAL AND METHODS**

**STUDY AREA**

This study was conducted in Cattle Breeding and Dairy Farm, Harichand which is located in District Charsadda, having more than 400 heads comprising of different local, exotic and cross bred animals. It is located at 34.8°N Latitude and 71.43°E longitude with an altitude of 276 meters (908 feet) and lies 29 km from the provincial capital, Peshawar.

**Table 1:** Overall prevalence of Haemo-protozoan and Intestinal parasites in cattle in Cattle and breeding farm, Harichand

<table>
<thead>
<tr>
<th>Parasitism</th>
<th>Parasites</th>
<th>N</th>
<th>Prevalence %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemo-protozoan</td>
<td>Theileria</td>
<td>234</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Anaplasma</td>
<td>234</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Mixed infection</td>
<td>234</td>
<td>0.01</td>
</tr>
<tr>
<td>Fecal Examination</td>
<td>Trichostrongylus</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Bonostomum</td>
<td>100</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Moneizia benedeni</td>
<td>100</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Mixed Infection</td>
<td>100</td>
<td>53</td>
</tr>
</tbody>
</table>

**SAMPLE COLLECTION**

During hot months of the year samples were collected from different breeds, age and sex of cattle from Cattle breeding and Dairy Farm Harichand, Charsadda. For studying the haemo-protozoan, a total of 234 blood samples were collected while 100 samples were collected for coprological examination.

**MICROSCOPIC EXAMINATION**

Thin blood smears were prepared and fixed in methanol for 5 min and stained for 30 min in Giemsa stain diluted to 5% with buffer. Slides were then examined for haemo-protozoan i.e. *Anaplasma, Theileria* and *Babesia* spp. at 100× objective magnification (Shah et al., 2017) The parasite identification was done with the help of keys mentioned in the book titles “Veterinary Clinical Parasitology” (Zajac and Conboy, 2012).

**COPROLOGICAL EXAMINATION**

Fecal samples were collected directly from the rectum in sterile bottles and transported to Parasitology Lab, Center of Poultry and Parasitology, Veterinary Research Institute, Peshawar. Fecal sample was dissolved in saturated sugar solution (Soulsby, 1982) and examined for the presence of eggs/oocyst. Parasite eggs were identified on the basis of morphology (Zajac and Conboy, 2012).

**STATISTICAL ANALYSIS**

Data collected was arranged in Ms Office Excel and statistically analyzed by Chi square ($\chi^2$) using Statistical Package for Social Services (SPSS) version 16.0 as described by Snedecor and Cochran (1994).

**RESULTS AND DISCUSSION**

**Prevalence Of Tick-Borne Diseases (TBDs)**

Prevalence of Haemo-protozoan and gastrointestinal parasites were estimated using formula.

$$P = \frac{d}{n} \times 100$$

Where:

- P: Prevalence;
- d: No. of animals found positive;
- n: Total no. of animals sampled (Thrusfield, 1995).

Out of total 234 blood samples 112 (48%) samples were positive for Haemo-protozoan's in which *Theileria* and *Anaplasma* was recorded as 18 and 28%, respectively while mixed infection was recorded as 0.01%. In coprological examination 82 out of 100 samples were positive for intestinal parasites in which *Trichostrongylus, Bonostomum* and *Monezia* were recorded as 12, 8 and 9%, respectively while mixed infection was recorded as 53% (Table 1).

**HAEMO-PARASITES**

Breed wise prevalence of haemo-protozoan was 51, 61, 27, 37 and 46% for Jersy, Fresian, Achai, Jersy Achai cross and Fresian Sahiwal cross, respectively. Table 2 shows that there was significant difference (P<0.05) in the prevalence of haemo-protozoan with...
the respect to breed, whereas no significant difference (P>0.05) was recorded age wise, though prevalence was higher in adult animals. Sex wise prevalence of haemo-protozoan was 20 and 58% for males and females and was found statistically significant (P<0.05).

### Table 2: Prevalence of Haemo-protozoan in different cattle with respect to breed, age and sex

<table>
<thead>
<tr>
<th>Variables</th>
<th>Category</th>
<th>N</th>
<th>Prevalence of Haemo-protozoan %</th>
<th>$\chi^2$ value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breed</td>
<td>Jersy</td>
<td>41</td>
<td>51</td>
<td>27.82</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>Fresian</td>
<td>83</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Achai</td>
<td>33</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jersy × Achai</td>
<td>51</td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fresian × Sahiwal</td>
<td>26</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Adult</td>
<td>193</td>
<td>51</td>
<td>4.66</td>
<td>0.198</td>
</tr>
<tr>
<td></td>
<td>Young</td>
<td>41</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
<td>170</td>
<td>58</td>
<td>21.15</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>64</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Gastrointestinal Parasites

Gastrointestinal parasitism was found to be 87, 71, 100, 89 and 80% for Jersy, Fresian, Achai, Jersy Achai cross and Fresian Sahiwal cross, respectively. Breed wise prevalence was found to be non-significant statistically (P>0.05) through Chi square analysis. Prevalence of intestinal parasitism was statistically significant (P<0.05) with respect to age and sex (Table 3).

In Pakistan, parasitic infections i.e. haemo-parasites and gastrointestinal parasitism poses significant threat to the booming dairy industry of the country. Haemo-parasitic diseases are present throughout the world, but are most devastating in tropical and sub-tropical areas (Sathaporn et al., 2004). Different developmental stages of ticks serve as means of transmission for these haemo-parasitic diseases (Pipano and Shkap, 2006). Many tick borne haemo-parasitic diseases are present in domestic animals in Pakistan, including Babesia, Theileria and Anaplasma (Zahid et al., 2005; Silke, 2009).

In the current study, overall prevalence of haemo-parasitic infections was 47.8%, in which Theileria, Anaplasma and mixed infections were recorded as 18, 28 and 0.01%. Prevalence of Theileria was slightly lower from that of Zahid et al. (2005) who recorded higher (24%) incidence of theileriosis. The difference might be due to the fact that

Table 3: Coprological examination of different cattle with respect to breed, age and sex

<table>
<thead>
<tr>
<th>Variables</th>
<th>Category</th>
<th>N</th>
<th>Prevalence %</th>
<th>$\chi^2$ value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breed</td>
<td>Jersy</td>
<td>23</td>
<td>87</td>
<td>22.09</td>
<td>0.140</td>
</tr>
<tr>
<td></td>
<td>Fresian</td>
<td>38</td>
<td>71</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Achai</td>
<td>11</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jersy × Achai</td>
<td>18</td>
<td>89</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fresian × Sahiwal</td>
<td>10</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Adult</td>
<td>65</td>
<td>72</td>
<td>34.40</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Young</td>
<td>35</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
<td>80</td>
<td>89</td>
<td>14.76</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>20</td>
<td>55</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Though the prevalence of haemo-parasitic diseases was more in adult cattle as compare to young in the present study but statistically it was non-significant. These results were found similar to the findings of Khan et al. (2004) and Atif et al. (2012). Prevalence was found significantly higher in female as compare to male and these findings are in congruent to Rajput et al. (2005) and Durrani (2008) who reported higher prevalence of Theileria annulata and Anaplasma marginale in female animals. Hormonal disturbances and immunosuppression in female animals might be the possible reason for the higher prevalence of haemo-parasitic diseases (Kocan et al., 2003).

Parasitic diseases have strong seasonal correlation as hot and humid weather provide conducive environment for the
propagation of ticks which act as vector for haemo-parasitic diseases. As this study was conducted in a farm where mostly animals are roop-tied which exert stress and thus immunosuppression and eventually higher parasitic diseases. In study area, animal’s movement was limited which predisposed animals to tick infestation.

Coprolological examination of cattle revealed that mixed infection was present in most of the animals followed by Trichostrongylus, Moniezia benedeni and Benostomum. Higher prevalence of helminthes in the current study might be due to the fact that the study area provided a conducive environment for the development of these parasites. These findings are supported by the work carried out by Samanta and Santra (2007), Jyoti et al. (2011) and Singh et al. (2012). Intestinal parasitism was found significantly higher at young age comparatively. Young animals are most susceptible to parasitic diseases as compare to adult due to weak immune status. These results are supported by Singh et al. (2012). Most of the animals in the study area were tethered animal that is why no trematodal infection was recorded in this study.

CONCLUSION

It was concluded from the present study that both parasitic infections i.e. Haemo-parasites and gastrointestinal parasites were prevalent in Cattle and Breeding Farm, Harichand. For the complete eradication of parasitic diseases, control strategy including proper treatment and management should be devised along with periodical screening of animals.

AUTHOR’S CONTRIBUTION

MIK conceived idea of the manuscript. SSAS, MI and AU collected samples. SSAS and HK analyzed the data and wrote draft of the manuscript. All authors reviewed the final version of the manuscript.

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