GENETIC RESISTANCE FOR EPHEMERAL FEVER IN MURRAH BUFFALOES

S.S. TOMAR and V.N. TRIPATHI
Dairy Cattle Genetics Division
National Dairy Research Institute
Karnal-132 001 (Haryana) INDIA

SUMMARY

The present investigation was based on the incidence and inheritance of ephemeral fever, also known as three-day sickness (TDS), in a herd of buffaloes comprising 813 animals at National Dairy Research Institute, Karnal, India. The average incidence in calves (birth to 6 months), heifers (6 month to age at first calving) and adult lactating buffaloes was 8.3, 2.1 and 2.2% for the 3 age groups respectively. The season of birth did not affect the incidence whereas the year of birth had significant effect. The recurrence of TDS from birth to first lactation age indicated that only two animals (0.47%) suffered twice with TDS. The occurrence of TDS was found to be positively associated with diarrhoea, whereas its association with foot and mouth diseases was negative. Quantification of incidence of the TDS based on testing the distribution of sire progeny groups showed normal distribution of the incidence in the population. The heritability estimates based on paternal half-sib method and by regression of daughters on dam method were 0.46±0.196 and 0.232±0.25 respectively.

INTRODUCTION

Ephemeral fever which is also known as three-day sickness (TDS) is caused by viral infection. It is characterised by high temperature (40.6 to 41.1°C) muscular pain and lameness, rapid respiration, anorexia and cessation of rumination. Earlier, it was known that buffalo is rarely affected by ephemeral fever (Carpano, 1937) and that cattle are the only natural hosts (Spradbrow, 1966). Later on, Thuraisinghan (1963) reported the ephemeral fever in both cattle and buffalo at several places in Malaya. Malvia and Prasad (1977) recorded higher incidence of TDS from June to August in crossbred cattle and buffaloes. The present investigation was conducted to study the incidence and inheritance of TDS in buffaloes.
MATERIALS AND METHODS

A herd of Murrah buffaloes maintained at National Dairy Research Institute, Karnal, India were examined for the incidence of ephemeral fever. A total of 813 female animals were examined for the incidence of TDS from their birth till they remained in the herd. The incidence data were classified into age groups viz., calves (birth to 6 months of age), heifers (6 months to age at first calving), and adult lactating buffaloes from first through eighth lactation; into periods (each period comprising 2 years data according to sire distribution); and into seasons of the year (season 1 as winter from December to March, season 2 as summer from April to June, season 3 as rainy from July to September, season 4 as autumn from October to November). The periods and seasons were taken according to the birth of the animal to study the incidence in calves and heifers and according to the calving of the animals to study the incidence in adult lactating buffaloes.

Least squares technique of analysis of data (Harvey, 1966) was conducted to study the effect of period and season of birth in calves and heifers, and to study the effect of periods and season of calving in adult lactating buffaloes. The association of TDS with other diseases like diarrhoea, tympany, respiratory ailments, eye troubles and foot and mouth disease (FMD) was tested by chi-square test as:

$$\chi^2 = \frac{(ad - bc)^2 N}{R_1 R_2 C_1 C_2}$$

Where, n = total number of animals examined
R1 = a+b, R2 = c+d, C1 = a+c, C2 = b+d
a, b, c, d are the number of animals susceptible to both diseases, to only TDS, to only second disease, and resistant to both the diseases under question, respectively.

The heritability estimates were obtained by regression of daughters on dam method (Lush, 1950) and by paternal half-sib method. To conduct the least squares analysis of data and to estimate the heritability by paternal half sib method, the values one and zero were assigned to the animals which showed susceptibility and resistance to TDS, respectively. The data was then transformed into proportions, taking the proportion for zero as 1/4 ni and for one as (ni - 1/4 / ni) with ni as the number of animals in a particular cell developed for each period under each season. These proportions under
each cell were then transformed into angles $Q = \sin^{-1} /P$ with $p$ as the proportion of animals susceptible to TDS (Snedecor and Cochran, 1967). The data on 416 daughters sired by 34 sires were available, to estimate the heritability and to test the normal distribution of the incidence of TDS.

RESULTS AND DISCUSSION

The incidence of TDS in the herd, regardless of age, from birth till first lactation was found to be 7.59% based on the animal which reached to first lactation. The female buffalo calves upto 6 months of age had significantly higher incidence (8.3%) as compared to heifers (2.09%) and lactating buffaloes (2.61%). This indicated that some of the animals suffered with TDS left the herd before reaching maturity. Geoffrey (1976) mentioned that calves are more likely to die than adult cattle due to TDS. The results of the present investigation are in agreement to that of Blood et al. (1979) who indicated that all age groups are susceptible but they further mentioned that the disease is more common in adults and the calves are less affected, those less than 6 months of age showing no clinical signs. Sethi and Balaine (1978) reported higher incidence of TDS (17.5 to 33.3%) in different genetic groups of crossbred cattle. The results of present study did not support the remarks of Carpano (1937) that buffalo is rarely affected with TDS and of Spradrow (1966) that the cattle are the only natural hosts.

The incidence of TDS was higher in calves born during summer and lower in those born during autumn season, though the differences among seasons were not statistically significant. In lactating buffaloes also the incidence was not affected by season of calving. Blood et al. (1979) indicated that the disease occurs in summer months and its spread depends on the force and direction of prevailing winds. The period (year) of birth in calves and period of calving in adults had significant effect on the incidence of the disease.

The incidence of TDS was found to be positively associated with diarrhoea but negatively associated with the incidence of foot and mouth disease. No association of TDS with other diseases like tympany, respiratory ailments and eye troubles was observed in this study. Geoffrey (1976) indicated that the animals suffering with TDS die as a result of gastro-enteritis, pneumonia and heart failure. Blood et al. (1979) indicated that anorexia, constipation and
diarrhoea occur in animals affected with TDS and also there is an increase in respiratory and cardiac rates with an increase in nasal discharge.

The incidence of TDS based on the animals which reached to lactation age was 7.59%. Most of these animals (7.11%) affected only once from birth till first lactation and only two animals (0.47%) suffered twice. This indicated low recurrence of TDS.

To test the normal distribution of the incidence of TDS in the herd, the tests of chi-square, skewness and kurtosis were applied forming the sire-progeny groups. The data of 416 daughters of 34 sires were available. It was observed that 59 daughters of 10 sires suffered with TDS and none of the daughters of 24 sires suffered. The range of incidence among the daughters of these 10 sires ranged from 5.8 to 37.5%. The chi-square test was not significant indicating that the differences between the observed and expected frequencies were not significant, and thus the observed frequencies for the occurrence of TDS in the herd corresponds to normal distribution. The tests of skewness and kurtosis indicated that the calculated values of skewness and kurtosis were lesser than the tabulated values. This indicated that skewness and kurtosis were absent in the distribution. This negative approach indicated that the incidence of TDS in the herd was normally distributed. This supported the findings of Sethi and Balaine (1978) for TDS in cattle.

Genetic variation in resistance for TDS was studied in terms of estimating the heritability by paternal half-sib method and regression of daughters on dam method. The heritability estimates were found to be 0.464±0.169 and 0.232±0.25 based on two methods, respectively. These results indicated reasonable genetic basis for the inheritance of susceptibility to this disease. Thus improvement could be achieved through selection against this disease. Sethi and Balaine (1978) concluded that improvement through selection against this disease is possible in Holstein Friesian and Brown Swiss crossbred groups only and not in pure bred Haryana and Jersey crossbred cattle.
REFERENCES


### TABLE 1. Average incidence of ephemeral fever in different age groups

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Number of animals</th>
<th>% animals affected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Examine</td>
<td>Affected</td>
</tr>
<tr>
<td>Calves</td>
<td>813</td>
<td>68</td>
</tr>
<tr>
<td>Heifers</td>
<td>668</td>
<td>14</td>
</tr>
<tr>
<td>Adults: First lactation</td>
<td>422</td>
<td>11</td>
</tr>
<tr>
<td>Second lactation</td>
<td>386</td>
<td>15</td>
</tr>
<tr>
<td>Third lactation</td>
<td>418</td>
<td>13</td>
</tr>
<tr>
<td>4 - 8 lactation</td>
<td>1117</td>
<td>13</td>
</tr>
</tbody>
</table>

### TABLE 2. Association of TDS with other diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>Number of animals susceptible to TDS &amp; other disease</th>
<th>Resistant to TDS and other disease</th>
<th>X² Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhoea</td>
<td>5</td>
<td>178</td>
<td>27</td>
</tr>
<tr>
<td>Tympnay</td>
<td>0</td>
<td>12</td>
<td>32</td>
</tr>
<tr>
<td>Respiratory ailments</td>
<td>0</td>
<td>23</td>
<td>32</td>
</tr>
<tr>
<td>FMD</td>
<td>0</td>
<td>32</td>
<td>67</td>
</tr>
<tr>
<td>Eye troubles</td>
<td>3</td>
<td>41</td>
<td>29</td>
</tr>
</tbody>
</table>