INFLUENCE OF METEOROLOGICAL FACTORS ON THE OCCURRENCE OF FOOT AND MOUTH DISEASE IN KARNATAKA STATE*

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ABSTRACT

During the period of nine years (January, 1995 to December, 2003) the influence of meteorological parameters on the foot and mouth disease (FMD) outbreaks in cattle, buffaloes and bovines (cattle and buffaloes together) of Karnataka were analyzed. The results of the retrospective study indicated that the minimum temperature with buffaloes and bovines; and rainfall with cattle, buffaloes and bovines, were negatively correlated with outbreaks. Further analysis of data into various subgroups indicated significantly (P<0.01) higher outbreaks in up to 100 mm rainfall range areas along with this comparatively higher outbreaks were recorded in maximum temperature of 27.1-31.0°C, minimum temperature of 17.6-21.5°C and morning humidity of 79.1-92.0%. Probably these factors may be acting as predisposing factors responsible for the occurrence of FMD in Karnataka state.

INTRODUCTION

Foot and mouth disease (FMD) is one of the most economically important disease of cloven-footed animals of the world and is endemic in India and now has occupied the first place among the top five diseases of our country. Ellis and James (1976) estimated the economic losses due to FMD in bovine population of India as Rs. 420 crores per year. However, the National Dairy Development Board (NDDB) has updated the estimate as Rs. 1,000 crores (Saxena, 1995). To curtail the economic losses effective preventive and control measures have to be formulated for which the predisposing/precipitating factors have to be identified. However, the precipitating or predisposing factors for the occurrence of FMD in bovines are not clearly defined even though few parameters have been incriminated. Hence, the present study was undertaken to know the influence of various meteorological parameters.

MATERIAL AND METHODS

In the present study, data of 9 years (January, 1995 to December, 2003) pertaining to the number of outbreaks of FMD in cattle, buffaloes and bovines (cattle and buffaloes together) of all the 27 districts of Karnataka State were obtained from the Deputy Directors of Department of Animal Husbandry and Veterinary Services (AH&VS), Government of Karnataka as a part of requirement of the National Agricultural Technology Project (NATP) on "Weather based animal disease forecasts (WBADF)". The outbreaks were pooled according to the groups.

To know the influence of meteorological factors on the outbreaks, the data were analyzed by employing Pearson's correlation mentioned by Snedecor and Cochran (1994). Either the positive or negative correlation did not pinpoint the exact level of meteorological parameters influencing the occurrence of the disease. Hence, to know the level of these parameters which may result in higher outbreaks in cattle, buffaloes and bovines, the data were analyzed by frequency distribution of the meteorological parameters to make the class intervals. Since the class intervals were too many, efforts were made to have 5 to 6 class intervals to overcome the voluminous presentation. According to each class interval

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the data were analyzed to know the outbreaks. Then the data of the groups under each species were analyzed by ANOVA (single factor) and critical difference (CD) to signify the variations using the method of Snedecor and Cochran (1994). Thus the class interval wherein higher values of a particular parameter was recorded was considered as precipitating or predisposing factor.

**RESULTS AND DISCUSSION**

The range of each group of maximum and minimum temperature, morning humidity and rainfall along with the average number of outbreaks are given in the Figure-1, where the outbreak values are averages of annual total outbreaks.

During the study period of nine years (January, 1995 to December, 2003), 4677 outbreaks of FMD were recorded in Karnataka State wherein 3374 outbreaks (72.14%) occurred in cattle and 1303 outbreaks (27.86%) occurred in buffaloes.

The maximum temperature did not correlate with outbreak and the minimum temperature was negatively correlated with outbreak of buffaloes and bovines i.e., as the minimum temperature decreases the disease increases. Further analysis of the data indicated that the higher mean outbreaks were recorded with those associated with group-III of maximum temperature (27.1-31.0°C) and minimum temperature (17.6-21.5°C). So this range of temperature may influence the higher occurrence of outbreaks as this range may be suitable for survival and spread of virus. This is similar to the finding of Chowdhury et al. (1986) and Sharma (1998). Without using the present methodology wherein Chowdhury et al. (1986) reported that the ambient temperature was inversely related to outbreaks of FMD and Sharma (1998) reported that aerosol spread depends upon the wind speed and is favoured by low temperature, high humidity and overcast sky.
In the present study, significant correlation between disease occurrence and morning humidity was not noticed. However, higher outbreaks were recorded in group-V where the humidity range was 79.1-92.0%, followed by those of group-IV, III and other groups. Thus, this higher humidity range may influence the survival (Sellers and Parker, 1969) and spread of virus in air droplets from one place to other place. This was substantiated by the report of Sosov and Taranova (1973) from Moscow wherein they concluded that relative humidity was probably a more important climatic factor than air temperature and rainfall and the report of Chowdhury et al. (1986) from West Bengal who have opined that the relative humidity had direct effects on the outbreaks of FMD. In addition, Sharma (1998) also reported that aerosol spread depends upon the wind speed, low temperature, high humidity and overcast sky and concluded that the air-borne spread has been found mainly in temperate climates where there is high humidity.

In the present study, rainfall was negatively correlated with outbreaks of FMD. This was also substantiated by the further analysis of the data which indicated that the mean outbreaks of FMD were significantly (P<0.01) higher in areas coming under the low rainfall areas i.e., group-I (Up to 100 mm/month) followed by those of group-II, III, V and IV (Figure 1). This is contradictory to the findings of several workers. Prasad et al. (1981) reported that high rate of FMD occurred in years in which heavy rains and floods resulted in the movement of large numbers of livestock and personnel. Saxena (1995) opined that climate does play a role in the determination of the FMD incidence rate wherein a high rate of FMD incidence is expected in high rainfall areas. However, Chowdhury et al. (1986) opined that the rainfall had no effect on outbreaks of FMD.

The present study indicated that morning humidity and rainfall influences the occurrence of FMD.

Since preliminary study has been made at this stage, further detailed investigation probably involving a prospective study is the fruitful area of research to be undertaken in future.

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