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# Distribution of Fly Pests in a Farm in Plateau State, Nigeria

**[1]Oke, P. O., [2]Dayong, F. S., [2]Ogbu, I. K. and [1*]Ogbaje, I. C.**

[1]Department of Veterinary Parasitology & Entomology, College of Veterinary Medicine, Federal University of Agriculture, Makurdi
[2]Department of Animal Health, Federal College of Animal Health and Production. National Veterinary Research Institute, Vom.

[*] *Author for Correspondence: igochechriso@yahoo.co.uk*

## ABSTRACT

An evaluation of fly pests of cattle was conducted in Federal College of Animal Health and Production Technology (FCAH&PT) Farm, Chaha Village, Jos South Local Government Area, Plateau State, Nigeria between August and October, 2020. Samples were collected from the farm weekly for three months. A total of nine hundred and nineteen (919) adult dipterous flies comprising fifteen species in eight genera across the three sub-orders were caught and identified using aerial sweeping hand net, light trapping and aerial insecticide spray. *Phlebotomus papaltasi* (44.18%) was the most prevalent while *Simulium damnosum* (0.22%) was the least. Others were *Musca domestica* (17.73%), *Stomoxys calcitrans* (11.43%), *Culicoides* species (10.99%), *Musca autumnalis* (10.23%), mosquitoes – *Anopheles gambiae/Culex quequinfasciatus* (4.89%) and *Tabanus* species (0.33%). The haematophagous flies (72.04%) out-numbered the non-haematophagous flies (27.96%) and the number of females collected/caught 780 (84.87%) were higher than the males 139 (15.13%). The highest collections were made in October (353 representing 38.41%) while September had the lowest (263 /28.62%). The study established the presence of fly pests in the farm and recommends that appropriate control measures should be put in place to forestall any disease outbreak.

**Keywords**: Cattle; Disease; Farm; Fly pest, Cattle; Vector

## INTRODUCTION

Most of the dipterous flies are both human and animal pests globally and their effects on livestock are enormous; however, prominent among these is nuisance due to their presence and feeding attempts (Berry *et al*., 1983; Wieman *et al*., 1992; Dougherty et al., 1994; Mullens *et al*., 2006; Taylor *et al*., 2012). Other effects of haematophagus flies are blood loss from direct bite during feeding activity and losses incurred on their control (Parihar and Narldkar, 2018). Furthermore, their roles both as vectors of mechanical and biological transmission of pathogens cannot be over-emphasized (Kettle, 1977; Linley *et al*., 1983; Crosskey, 1993; Nelson, 1991; Davies, 1994; Shujuan *et al*., 2001; Fasulo *et al*., 2005; Taylor *et al*., 2012). The level of discomfort to their hosts varies and depends on the species of fly (Campbell *et al*., 2001; Shujuan *et al.,* 2001; Narladkar and Shivpuje, 2014).

Mosquitoes are the most abundant widely distributed and important vectors of human and animal diseases (Shujuan *et al*., 2001). The genus *Anopheles* and most importantly the species *Anopheles gambiae* serve as the sole vector of *Plasmodium* species (malarial parasites) in humans. Blackflies of the genus *Simulium* are small black-flies with a characteristic hump thorax. They are the principal vectors of *Onchocerca volvulus*, the causative agent of River blindness (Myburgh and Nevill, 2003). Sandflies (*Phlebotomus*) are small (2-4mm in length}, pale brown flies covered with delicate hairs. They hold their wings above the body and are active during the day. Despite their small size, they are efficient and strong fliers. They have a widespread distribution in the tropics and subtropics. They are responsible for the transmission of *Leishmania* species (Chagas *et al*., 2018).

The study was conducted to identify the types of fly pests, their population dynamic in the institutional farm and to verify whether they are the already established diseases vector flies.

## MATERIALS AND METHODS

### Sampling

The research was conducted at the Federal College of Animal Health and Production Technology (FCAH&PT) Farm, Chaha, Plateau State. Chaha is a village at the outskirt (Southward) of National Veterinary Research Institute (NVRI) Vom, in Jos South local government area of Plateau State. It accommodates the Federal College of Animal Health and Production Technology (FCAH&PT), Vom. The College farm houses cattle, goats, sheep and poultry in separate pens. Flies were collected at the vicinity of the cattle (Lat.: 9.74912333, Long: 8.77363167). The samples were collected once weekly for a period of three months (August to October, 2020) using Aerial Sweeping hand net.

**Procedure:** Flies were collected at close range using aerial sweeping hand net (Narladkar and Shivpuje, 2014). This was used for collection of large groups of flies. The flies were allowed to gather around the animal on target and in a very fast move, the net was used to scoop the flies for collection. Upon collection, the flies were gently emptied into sample bottles containing 70% ethanol, properly labeled and preserved until analyzed. Large flies were collected through light trapping.

**Light trapping Procedure:** The light traps were attached to poles around the paddocks (about 2 meters above the ground) and allowed to operate from dusk to dawn (Baylis *et al*., 1997; Maryam *et al*., 2014). The flies were made to fall into the liquid mixture containing 200ml of water and 2 drops of liquid detergent (Morning fresh®), in the collecting pots attached to the base of the traps (Oke *et al*., 2016). The sample was then harvested the next morning, washed in distilled water and preserved in sample bottles containing 70% alcohol until when needed. Small flies (Nematocera) were collected through the following methods;

**Insecticides Spray:** Locally mild/ light insecticide was prepared by mixing 1ml of Dichlovos in 1 litre of water. A wide cloth was spread on the ground and flies resting on the poles were sprayed. The flies which fell on the cloth were collected and preserved in sample bottles containing 70% ethanol for identification. This was carried out a day after light trapping so that the residual effect of the insecticide did not in any way affect the light trapping. This method was also used for large flies (Borkent, 2014a and b).

**Identification**

All collected specimens were sorted into three groups (Nematocera, Cyclorrhapha and Brachycera) based on their sizes (small, medium and large). Using stereo-microscope, the groups were separately identified morphologically into species focusing on those characteristic features such as the wing venation, antennal pattern and male genitalia as the case may be (Narladkar and Shivpuje, 2014). Various identification keys were used and digital images of various characteristic features observed were compared with reference materials (Sen and Dasgupa, 1959).

## RESULTS AND DISCUSSION

A total of nine hundred and nineteen (919) flies comprising fifteen (15) species of eight (8) genera were caught during sampling. These dipterous flies of Veterinary importance include *Musca domestica* (house fly), *Musca autumnalis* (face fly)- (non-haematophagous) and *Stomoxys* species (stable fly), *Simulium* species (black fly), *Phlebotomus papaltasi* (sand fly), *Tabanus* species (horse fly), *Culicoides* species (biting midges), *Anopheles gambiae*, *Culex quinquefasciatus* (haematophagous). Incidentally, the number of flies caught in each of the sub-orders varies greatly, which is likely due to the methods of collection adopted. The use of aerial sweeping hand net and insecticide spray may not be as effective in the collection of Nematocera when compared with the UV light trap that was used in its collection. The results of this study are in partial agreement with Ahmed *et al*., (2005), whom work in Southern Kaduna reported the presence of horse and stable flies (*Stomoxys* and *Tabanus*). However, they did not report any of the Nematoceran flies. A similar study which was conducted by Njila *et al*. (2015) at Jos Zoological garden reported the presence of house flies (*Musca* spp; non - biting fly) and stable fly (biting fly) among the flies collected around the wild life. However, the methods of collection differ, but his findings partially agreed with our results in areas of the presence of both house fly and stable fly around the livestock farm. The flies reported in all the cases can cause loss in production either directly or indirectly. Similar observations have also been reported previously by other authors (Daniel and Kingsolver, 1983; Balashov, 1984; Burkot, 1988; McCall and Kelly, 2002), who opined that flies abundance is associated to host preference, feeding habits and habitats. However, no genera of flies in the sub-order Nematocera were reported by these scientists, possibly due to differences in the trapping methods. The current study made use of UV light traps which are specific for small flies while the previous work by those researchers employed the use of biconical traps which are only specific for medium to large flies. The most prevalent of these flies was *Phlebotomus papatasi* (44.18%) whereas *Simulium damnosum* (0.22%) had the least. The high prevalence of biting midges among the collections was in agreement with Dipeolu, (1976) and Oke *et al*. (2016) reports, who observed various species of biting midges in their works. Prevalence of other flies encountered were *Musca domestica* (17.73%), *Musca autumnalis* (10.23%), (non-haematophagous), *Stomoxys calcitrans* (11.43%), *Culicoides* species (10.99%), *Anopheles gambiae* (4.57%), *Culex quinquefasciatus* (0.33%) and *Tabanus* species (0.33%) as shown in Table 1. These aspects of our findings are in agreement with Biu *et al*. (2018) from Borno State where they also recorded *Musca* species, *Tabanus* species and *Stomoxys* species. The study is also in comparism with the report of Narladkar and Shivpuje, (2014), which also encountered *Culicoides* species, *Phlebotomus* species, *Simulium* species, *Tabanus* species and mosquitoes and had their peak between August-September. There was significant difference (P=0.0002) in the monthly distribution of the flies according to genera/species and sex. This implies that some particular period of the year favor the activity of the flies. The highest number of the flies were collected in October – 353 (38.41%) while September and August had 263 (28.62%) and 303 (32.97%) respectively. This shows that the fly activity become higher towards the end of the rainy season. The numbers of females collected were statistically higher than the males (Table 2). This is likely due to the short life span of male flies. In some flies (eg, *Glossina* spp) the males mate once and die off whereas the females can live very long producing up to seven to ten generations of off-springs. Another reason could be that just like in some animals, it is believed that the males are more exposed to dangers than the females. Males go far away from their territory in search of food to provide for the dependents and also fight the enemies in order to defend or protect its territory leading to their premature death. The results revealed that haematophagous flies (72.04%) were far more than the non-haematophagous flies (27.96%), but there was no statistical difference (P=0.3177). All the three sub-orders of Veterinary importance in the order Diptera were represented (Nematocera: 60.28%, Cyclorrhapha: 39.39% and Brachycera: 0.33%), table 2. However, there was no significant difference (P=0.1322) in monthly distribution according to sub-order.

**Table 1**: Monthly distribution, species and sex of fly at FCAH&PT Farm Chaha Village, Plateau State

| **Fly species** | **August** | **September** | **October** | **Male** | **Female** | **Total** (%) | **Chi-Squ** | **df** | **P-value** |
|---|---|---|---|---|---|---|---|---|---|
| *Anopheles gambiae* | 29 | 0 | 13 | 0 | 42 | 42 (4.57) | 30.11 | 8 | 0.0002 |
| *Culex quinquefasciatus* | 1 | 0 | 2 | 0 | 3 | 3 (0.33) | | | |
| *Phlebotomus papatasi* | 59 | 151 | 196 | 87 | 319 | 406 (44.18) | | | |
| *Simulium damnosum* | 1 | 1 | 0 | 0 | 2 | 2 (0.22) | | | |
| *Culicoides* species | 76 | 1 | 24 | 7 | 94 | 101 (10.99) | | | |
| *Musca domestica* | 64 | 48 | 51 | 19 | 144 | 163 (17.73) | | | |
| *Musca autumnalis* | 31 | 27 | 36 | 15 | 79 | 94 (10.23) | | | |
| *Stomoxys calcitrans* | 40 | 35 | 30 | 11 | 94 | 105 (11.43) | | | |
| *Tabanus* species | 2 | 0 | 1 | 0 | 3 | 3 (0.33) | | | |
| **Total catch** (%) | **303**(32.97%) | **263**(28.62%) | **353**(38.41%) | **139(**15.13%) | **780(**84.87%) | **919** | | | |

**Table 2**: Fly distribution according to Sub-order and their feeding habits

| **Sub-order** | **Male** | **Female** | **Total** | **%** | **Chi-sq** | **df** | **P-value** |
|---|---|---|---|---|---|---|---|
| Nematocera | 94 | 460 | 554 | 60.28 | | | |
| Cyclorrhapha | 45 | 317 | 362 | 39.39 | 4.045 | 2 | 0.1322 |
| Brachycera | 0 | 3 | 3 | 0.33 | | | |
| Heamatophagus | 105 | 557 | 662 | 72.03 | 0.999 | 1 | 0.3177 |
| Nonhaematophagus | 34 | 223 | 257 | 27.97 | | | |

All the haematophagous flies encountered in this study have been proven to be potential biological agents of diseases, while *Musca domestica* and *Tabanus* species are mechanical vectors of various pathogens.

**Conclusion**

The study revealed presence of several genera of biting and non-biting flies that can interfere with the performance and productivity of the livestock inhabiting the study area. Adequate farm level control measures should be instituted to reduce exposure of the animals to these pests and prevent possible outbreak of diseases.

**Conflict of Interest**

The authors declare that they have no conflict of interest.

**Authors Contribution**

OPO designed the work, DFS and OIK participated in sampling and laboratory identification of the flies. OCI did data analysis and prepared the draft manuscript. All authors have read and approved the final manuscript.

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