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OCCURRENCE AND SEASONAL ABUNDANCE OF ASTIGMATIC MITE, *Tyrophagus putrescentiae* (Shrank, 1781) (Acari: Acaridae) IN POULTRY DUST SAMPLES OF PUNJAB (INDIA)

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Abstract: **A survey was made to observe the occurrence and seasonal abundance of astigmatic mite, *Tyrophagus putrescentiae* (Shrank, 1781) present in the dust samples of poultry farms of Punjab. A total 252 dust samples were subjected to acarological examination and only 225 (89.29%) samples were infested with mites found in poultry dust. Out of these 225 infested samples, only 193 (85.78%) poultry dust samples were infested with mite *Tyrophagus putrescentiae*. During the study, samples were collected three times in a year, in CCLI (Climate class I) from March to June, in CCLII (Climate class II), from July to October and in CCLIII (Climate class III), from November to February. A total 1271 mites were extracted, from which 607 (47.76%) mites were found in samples collected during CCLII, whereas only 406 (31.94%) during CCLI and 258 (20.30%) in CCLIII. Majority of mite *Tyrophagus putrescentiae* (47.76%) was found in dust samples collected during CCLII.**

***Keywords*: dust; poultry; astigmata; mites.**

1. INTRODUCTION

The poultry industry is characterized for its constant search for productivity and profitability. A poultry unit includes dried faecal matter and urine, flakes, ammonia, carbon dioxide, pollens, feed and litter particles, feathers, mites, fungal spores, bacteria, viruses and their constituents. Poultry dust can be a complex mixture of organic and inorganic materials derived from soil, bedding, feed and feed components, faeces, feathers as well as microbiological and invertebrate contaminants (Ngajilo, 2014).

Poultry dust provides reservoir of dust and storage mites. The term storage mites include a variety of mites, but especially certain astigmatic species from the families Acaridae, Glycyphagidae and Chortoglyphidae (Arlian, 2002). These mites are known as storage mites because they are often found in facilities such as barns, silos, and other agricultural facilities (Solarz *et al.* 2004). Among the species that are considered storage mites is the genus *Suidasia* (family Suidasiidae) are also commonly found in dust and stored food products in warmer climates (Krantz and Walter, 2009).

The mite *Tyrophagus putrescentiae* also called mould mite, is commonly present in food industry, agricultural soils, laboratory facilities, animal farms, and in nests of birds and small mammals (Franz *et al.*, 1997, Duek *et al.*, 2001 and Solarz *et al.*, 2004). The mites belonged to genus *Tyrophagus* is best known as fungivorous pests of stored foods, but

some of them live in farming habitats where they may feed on invertebrate eggs and immatures, and living on higher plant material (Hughes 1976; Gerson *et al.*, 2003).

Many species of mites are the major sources of indoor inhalant allergens facilitating both the sensitization of atopic subjects and asthmatic attacks in patients. They release clinically important allergens which cause an occupational allergy among farmers, grain-storage workers and other agricultural workers (Tee, 1994, Tsai *et al.*, 2000). Similarly, the airborne dust in poultry barns causes respiratory dysfunction in poultry workers (Solarz *et al.*, 2004).

The composition of the acarofauna and the abundance of the acaridid mites were strongly affected by the average humidity of the substrate, temperature, relative humidity, number of inhabitants and weight of samples (Palyvos and Emmanouel, 2006). They live in temperatures ranging from -18˚ C to +50˚ C, with optimal temperature of 25˚ C and high relative humidity ranges from 60% to 80% (Feng *et al.*, 2009).

The aim of the present study was to determine the occurrence and seasonal abundance of astigmatic mite *Tyrophagus putrescentiae* in the *Tyrophagus putrescentiae* dust samples collected from various poultry farms of Punjab.

2. MATERIALS AND METHODS

In the present study, dust samples were collected from various poultry farms of Punjab, during the year 2014-2017. Total 225 (89.29%) samples of dust were collected three times in a year, in CCLI, CCLII and in CCLIII respectively. The samples were brought to laboratory in zip locked polythene bags for further study. Mites were extracted by using the Flotation method (Hart and Fain, 1986) and preserved in 70% ethanol. After extraction, mites were cleared in 60% lactic acid for 48 hours at 37˚C. The cleared mites were mounted in Hoyer's medium. The mounted mite specimens were observed under microscope and identified with the help of keys and literature. Photography of the specimens has been done by using Leica microscope at magnification of 100X and 200X in DRS laboratory of Department of Zoology and Environmental Sciences, Punjabi University Patiala.

3. RESULTS AND DISCUSSION

The mite *Tyrophagus putrescentiae* was present in 193 (85.78%) poultry dust samples. A total 1271 mite specimen were isolated from the dust samples during the year 2014-2017. The occurrence and abundance of the mite *Tyrophagus putrescentiae* found in the samples examined is given in Table 1, Fig. 1

Mites belonging to the superfamily Acaroidea have been referred as "storage mites". These mites and other true mites collectively referred as "domestic mites" (Colloff, 1998). The mite *Tyrophagus putrescentiae* is related to family Acaridae, was a fungivorus mite which was abundant in the collected dust samples of poultry farms. It is a non-predatory mite which infests stored foods and other organic debris such as grain, flour, cereals, pet foods, and mould (Rodriguez and Rodriguez, 1987; Chambers, 2002).

A total 1271 mite specimen of *T. putrescentiae* were extracted, from which 607 (47.76%) mites were found in samples collected in CCLII, whereas only 406 (31.94%) in CCLI and 258 (20.30%) in CCLIII. Majority of mites (47.76%) were found during CCLII (July to October) (Table 2, Fig 2). During CCLI (March to June), the relative humidity declines and absolute temperature increases which causes desiccation and ultimately the mite number decreases, but the mite numbers reached maximum in CCLII (July to October) when relative humidity at its peak and optimum temperature is there and heavy decline in mite numbers occurred in CCLIII (December to February) due to the absence of optimum temperature. The astigmatic mites were found all year round (Arlian, 1992). The variation in their numbers is depending on the change in absolute temperature and relative humidity. Because the body temperature of mites follows the environment and they are dependent on the relative air humidity for survival. The combination of optimum temperature with high relative humidity could be favourable for the reproduction of dust and storage mites (Korsgaard, 1998; Sass and Hoback, 2006). The seasonal occurrence and abundance of mite *Tyrophagus putrescentiae* showed positive correlation with increase in absolute temperature and relative humidity throughout the year.

The occurrence of mite *T. putrescentiae* in poultry farms is due to the fulfilment of their needs for their survival and reproduction. Under optimum conditions of temperature and humidity, the life cycle of this mite is completed into 8-21 days which greatly extended if one of the conditions is missing. This is the main reason why poultry farms act as reservoir of these non- predatory, stored product pest mites (Rodriguez and Rodriguez, 1997; Feng *et al.*, 2009).

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Table 1: Showing Classwise distribution of number and percentage of infested dust samples during 2014-2017

Sr. No.	Type of Climate Class (2014-2017)	No. of Infested Samples	% of Infested Samples
1.	CCLI	67	34.72
2.	CCLII	78	40.41
3.	CCLIII	48	24.87
	Total=225	193	85.78

Table 2: Showing yearly distribution of number and percentage of mite specimen (*Tyrophagus putrescentiae*) during three climate classes

Sr. No.	No. of Mite Specimen (*Tyrophagus putrescentiae*)			
		2014-15	**2015-16**	**2016-17**
1.	**CCLI**	152 (34.23%)	125 (30.49%)	129 (30.94%)
2.	**CCLII**	221 (49.77%)	199 (48.54%)	187 (44.84%)
3.	**CCLIII**	71 (15.99%)	86 (20.98%)	101 (24.22%)
	Total=1271	**444 (34.93%)**	**410 (32.26%)**	**417 (32.81%)**

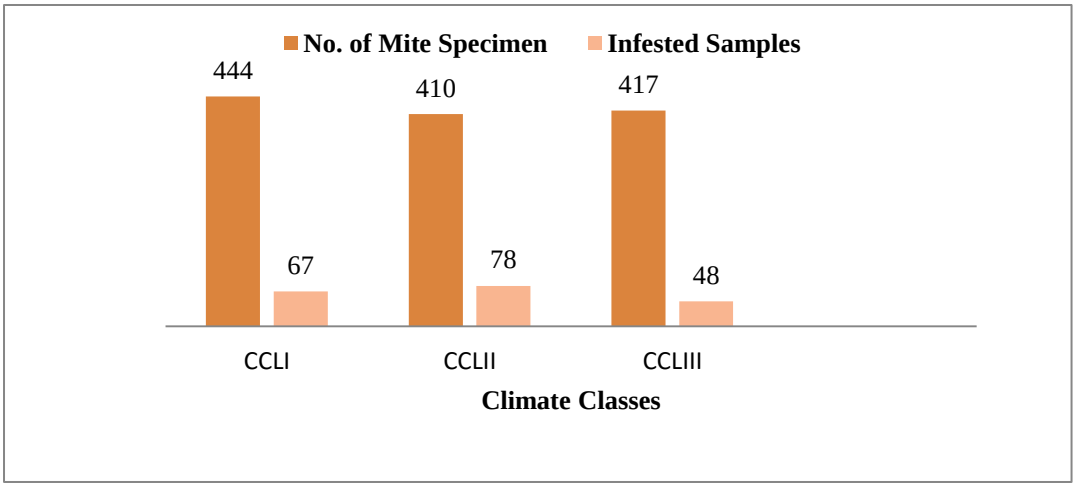

Fig 1: Showing Classwise distribution of total mite population (*Tyrophagus putrescentiae*) and number of infested samples

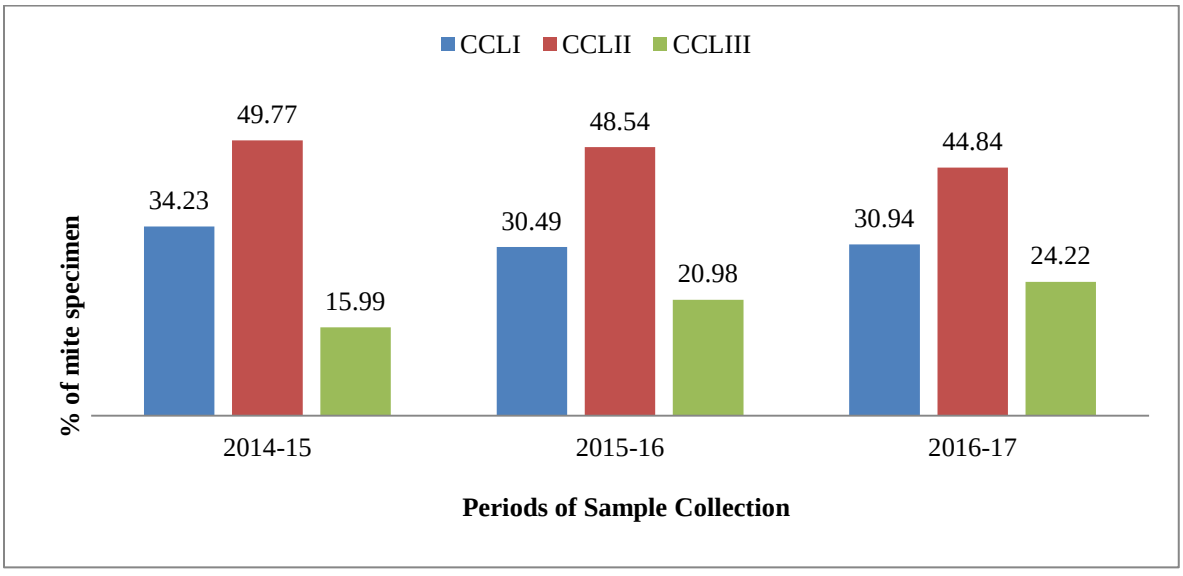

Fig 2: Showing yearly distribution of percentage of mite population (*Tyrophagus putrescentiae*) during different climate classes

4. CONCLUSION

The data presented emphasized on the variations in the frequency of occurrence and abundance of astigmatic mite, *Tyrophagus putrescentiae* present in dust samples of poultry farms of Punjab. The mites were found all year round and variations in their population depending on climatic conditions of the poultry farms. During CCLII (July to October) , maximum number (47.76%) of mites were found in poultry farms, when the temperature ranges from 28˚ C to 35˚ C and the relative humidity ranges from 60% to 80%. Moreover, the mite-fungal relationship enhances the rates of mite population. Ectoparasites and ectoparasites-borne diseases lead to major impact on husbandry, productivity, animal walfare as well as micro and macroeconomics especially in the farming community. So, it is major current problem of poultry farms, people must be aware of preventive measures to eliminate the impact of these microscopic mite pests and parasites who deteriorates the quality of eggs and meat.

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