

A REPORT ON THE OCCURRENCE AND ABUNDANCE OF *TYROPHAGUS PUTRESCENTIAE* (Schrank, 1781) IN WAREHOUSES OF PUNJAB (INDIA)

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Abstract: A faunistic survey of mites was conducted during the period March 2014 to February 2017 from warehouses of twelve districts of Punjab. Wheat dust and rice dust samples were collected from each site seasonally, i.e. Summer (CCL I), Rainy (CCL II) and Winter (CCL III). Mite survey revealed the occurrence of 27 mite species belonging to 3 orders, 15 families. A total of 28701 mite specimens were extracted from the infested samples. The most abundant and most prevalent mite in both types of samples was: *Tyrophagus putrescentiae* (Schrank, 1781). A total of 315 samples (72.92 %) out of the 432 total collected samples were positive for *T. putrescentiae* specimens. Out of 28701 mites obtained from infested samples, 4078 (14.21%) specimens were of *T. putrescentiae*.

Keywords: Faunistic, mite, infested, *Tyrophagus putrescentiae*.

I. INTRODUCTION

After insects, mites are the major arthropod pests that inhabit stored agricultural products worldwide. During storage period, bulk of grain is vulnerable to the attack of mites resulting into the deterioration quantitatively and qualitatively [1]. The degree of deterioration depends on a number of biotic and abiotic factors such as the moisture content of grains being stored, temperature, humidity, light, ventilation, hygiene [2], [3] and quality and quantity of resources [4], [5] and other fauna present within granaries. Several mite species are generally associated with stored grains, cereals, and stored food products. Faunistic surveys have discovered *Acarus siro*, *A. farris*, *Tyrophagus putrescentiae*, and *T. longior*, *Lepidoglyphus destructor* as the most frequent pest species, while *Cheyletus eruditus* (Schrank) and *C. malaccensis* as common predatory mites in stored grains [5], [6], [7], [8].

Mites mostly go unnoticed due to their cryptic appearance and small size. But they overcome the barrier of smaller size with high rate of fecundity and shorter life cycle. Fecundity rate depends on the type of species, food available and other environmental conditions [9].

There are three different types of damages generally associated with mites and other arthropods inhabiting stored grain and their products [10]. Firstly, they contaminate the food directly with allergens which they produce [11], [12]. Secondly, mites spread the spores of fungi throughout the godown, thus, indirectly contribute in contamination of stored grain [13], [14]. Thirdly, mites which feed on germinal part of seed decrease the germinability and cause significant grain weight losses [15], [16].

The main identification features of *Tyrophagus putrescentiae* are: Chelicerae dentate, supracoxal setae broad basally and gradually tapering; setae scc shorter than sci. Tibia of Leg I with a flagellate seta. Supracoxal setae expanded and bearing fairly long pectinations. Genital opening situated between coxae III and IV, with 1 pair of genital setae (g) and 2 pairs of genital papillae covered by genital valves. In adult male aedeagus present; with a pair of anal suckers and tarsus IV have 2 suckers.

Tyrophagus is one of the most important genus of family Acaridae. *T. putrescentiae* colonizes different synanthropic environment and feeds on various post-harvest agricultural products. *T. putrescentiae* is an economically important fungivorous mite species inhabiting stored food and products [17] (Hughes 1976). Under optimal conditions, at temperature 25, 30 and 32.5°C the developmental time (egg to adult) of mite *Tyrophagus putrescentiae* has been found to be 9.4, 7.2 and 8.5 days, respectively [18].

II. MATERIALS AND METHODS

During the present research, dust samples from wheat and rice storage warehouses of 12 districts of Punjab viz. Amritsar, Barnala, Bathinda, Faridkot, Ferozpur, Jalandhar, Ludhiana, Mansa, Hoshiarpur, Patiala, Ropar and Sangrur were collected. From March 2014 to February 2017 research was carried out. Total of 432 samples were collected. The samples were brought to laboratory in zip lock polythene bags for further research work. A complete record of date, time, locality temperature and relative humidity was also maintained. With “Modified Berlese Funnel” and “Floatation method” storage mites were extracted [19]. The mites were kept in 70% alcohol. Mites were cleared in 60% lactic acid and mounted in Hoyer’s medium for identification [20].

III. RESULTS AND DISCUSSION

During present research work, 27 mite species belonging to 3 orders, 15 families were reported. A total of 28701 mite specimens were obtained. The mite species *Tyrophagus putrescentiae* (Schrank) was reported in both type of samples. Out of 432 collected samples, 315 samples (72.92 %) were positive for *T. putrescentiae* specimens. A total of 4078 (14.21 %) specimens of *T. putrescentiae* out of the total 28701 mite specimens were obtained. During CCL II (rainy season) maximum infestation was observed and all wheat dust samples were positive for mites. During CCL I, CCL II and CCL III the number of wheat dust samples infested with mites were 57, 72 and 43 respectively (Table no. 1). During CCL I, CCL II and CCL III the number of rice dust samples infested with mites were 44, 57 and 42 respectively (Table no. 2). The total number of specimens of *T. putrescentiae* observed from wheat dust samples during CCL I, CCL II and CCL III were 741, 1381 and 361 respectively (Table no. 6). The total number of specimens of *T. putrescentiae* observed from rice dust samples during CCL I, CCL II and CCL III were 375, 1048 and 172 respectively (Table no. 7).

Table 1: Number of wheat dust samples infested seasonally as well as yearly.

Time period	No. of Samples Infested			Total (Yearly)
	CCL I	CCL II	CCL III	
March 2014-Feb. 2015	21	24	12	57
March 2015-Feb. 2016	19	24	15	58
March 2016-Feb. 2017	17	24	16	57
Total (Seasonally)	57	72	43	172

Table 2: Number of rice dust samples infested seasonally as well as yearly.

Time period	No. of Samples Infested			Total (Yearly)
	CCL I	CCL II	CCL III	
March 2014-Feb. 2015	14	19	12	45
March 2015-Feb. 2016	17	19	14	50
March 2016-Feb. 2017	13	19	16	48
Total (Seasonally)	44	57	42	143

Table 3: Total number of samples infested with *Tyrophagus putrescentiae* seasonally.

Sample Type	No. of Samples Infested			Total
	CCL I	CCL II	CCL III	
Wheat Dust	57	72	43	172
Rice Dust	44	57	42	143
				315

Table 4: Total number of samples infested with *Tyrophagus putrescentiae* yearly.

Sample Type	No. of Samples Infested			Total
	March 2014-Feb. 2015	March 2015-Feb. 2016	March 2016-Feb. 2017	
Wheat Dust	57	58	57	172
Rice Dust	45	50	48	143
				315

Table 5: Frequency (%) of *Tyrophagus putrescentiae* within the total examined samples.

Total samples examined	Total samples infested with <i>Tyrophagus putrescentiae</i>	Frequency (%) within total examined samples
432	315	72.92

Table 6: Total population of *Tyrophagus putrescentiae* in the wheat dust samples yearly as well as seasonally.

Time period	Seasonal Population (Wheat Dust)			Total (Yearly)
	CCL I	CCL II	CCL III	
March 2014-Feb. 2015	230	459	96	785
March 2015-Feb. 2016	280	492	129	901
March 2016-Feb. 2017	231	430	136	797
Total (Seasonally)	741	1381	361	2483

Table 7: Total population of *Tyrophagus putrescentiae* in the rice dust samples yearly as well as seasonally.

Time period	Seasonal Population (Rice Dust)			Total (Yearly)
	CCL I	CCL II	CCL III	
March 2014-Feb. 2015	126	262	49	437
March 2015-Feb. 2016	149	380	56	585
March 2016-Feb. 2017	100	406	67	573
Total (Seasonally)	375	1048	172	1595

Table 8: Total population of *Tyrophagus putrescentiae* in the infested samples seasonally.

Sample Type	Seasonal Population			Total Mite Population
	CCL1	CCL2	CCL3	
Wheat Dust	741	1381	361	2483
Rice Dust	375	1048	172	1595
				4078

Table 9: Yearly distribution of population of *Tyrophagus putrescentiae* in the dust samples.

Sample Type	Yearly Population			Total Mite Population
	March 2014-Feb. 2015	March 2015-Feb. 2016	March 2016-Feb. 2017	
Wheat Dust	785	901	797	2483
Rice Dust	437	585	573	1595
				4078

Table 10: Frequency (%) of *Tyrophagus putrescentiae* within the total mite specimens.

Total Dust samples examined	Total no. of mite specimens obtained	Total no. of <i>Tyrophagus putrescentiae</i> specimens obtained	Frequency (%) within total specimens (28701)
432	28701	4078	14.21

Tyrophagus putrescentiae Schrank is a serious and frequent pest of stored grains due to its tolerance to low humidity and wide range of temperatures [17]. Damage caused by infestation ranges from loss of germinability and weight reduction to the contamination with their excreta and dead bodies [17],[21], thus, making the grain unfit for consumption. *T. putrescentiae* was considered generally as nuisance pest of low economic importance. This is due to the fact that damage by these mites has always been overshadowed by the major pests, such as beetles.

IV. CONCLUSION

It was clearly observed from the results that mite infestation was most likely to occur during rainy season. This information about the seasonal variation in mite population will help to take the most appropriate mite control measures.

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