

A REPORT ON THE OCCURRENCE AND ABUNDANCE OF *Acarus siro* L. (Acari: Acaridae) FROM SOME STORED FOOD PRODUCTS IN PUNJAB (INDIA)

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Abstract: A faunistic survey of mites was conducted in many stored food product stores during research work from March 2014 to February 2017 in Punjab. A total of 3240 samples of 12 stored foods i.e. *Almond, Black gram, Cheese, Dalia, Maida, Maize flour, Moong Dal, Rice, Suji, Walnut, Wheat and White gram* were collected and examined for the mite fauna exploration. Thirty samples (each of 25 grams) of each stored food were collected per season, i.e. *Summer i.e. CCL1 (March-June), Rainy i.e. CCL2 (July-October) and Winter i.e. CCL3 (November-February)*. A total of 1220 (37.65 %) samples out of 3240 samples, were mite positive. A total of 30 mite species belonging to 3 orders, 12 families and 21 genera were reported. A total of 14812 mite specimens were obtained. The mite species *Acarus siro* (Linnaeus, 1758) was reported in samples of 11 stored food types. A total of 207 samples (16.97 %) out of the 1220 mite positive samples were positive for *Acarus siro* specimens. A total of 2969 (20.04 %) specimens of *Acarus siro* out of the total 14812 mite specimens were obtained.

Keywords: Stored food products, Mites, *Acarus siro*, Infestation.

1. INTRODUCTION

Mites are most important pest of stored food products especially of grains, cereal products and stored food products. The mites can seriously reduce the quantity and also quality of stored products. In wheat, these mites damage the seeds and make them unsuitable for germination (Solomon, 1946)¹. Some mite genera from family Acaridae are important source of allergens to the worker of farm and stores (Arlian, 1991²; Cuthbert *et al.*, 1979³; Hallas and Iverson, 1996⁴; Hughes, 1976⁵). *Acarus siro* is an important environmental allergen and pest of agricultural pest. *Acarus siro* is shiny and white bodied and 0.2- 0.5 mm in length. The anal setae in this mite are much longer than most dorsal setae. The legs are yellow to brown in colour, depending on what the mite eats. The mite was reported from cereal products, flour, cheese and dried fruit. Some authors report that fungi growing in the feed are also consumed by these mites. On the back of the body there is an incision between the 2nd and 3rd pair of legs, which is characteristics of *A. Siro*. The males possess tarsal and anal suckers as well as a clearly expressed hook-like extension at the thighs of the first leg pair. *A. siro* possesses four long, dragging hairs on his back end. *A. siro*, *A. farris* and *A. immobilis*, these three species are difficult to separate on the basis of morphologically. It was reported from China (Griffiths, 1964a⁶; Li and Fan, 1997⁷), India (Prasad 1974⁸; Putatunda, 2002⁹), Iran (Seiedy *et al.*, 2009)¹⁰, Republic of Korea (Kim *et al.*, 1988)¹¹, Turkey (Emekci & Toros, 2000)¹², USA (Griffiths, 1964a)⁶, Czech Republic (Kucerová and Horák, 2004)¹³, Greece (Athanassiou *et al.*, 2005)¹⁴, Italy (Ottoboni *et al.*, 1993)¹⁵ Canada (Barker, 1993)¹⁶, Czech Republic (Kucerová and Horák, 2004)¹³, Russian Federation (Zatchvatkin, 1941)¹⁷ and Greece (Athanassiou *et al.*, 2005).¹⁴

2. MATERIALS AND METHODS

During the present study, stored food and their products samples from different fields/localities, homes, grocery shops and stores, from the 10 districts of Punjab viz. Barnala, Bathinda, Fatehgarh Sahib, Jalandhar, Ludhiana, Mansa, Muktsar, Patiala, Ropar and Sangrur were collected. From March 2014 to February 2017 research was carried out. Total of 3240

samples were collected. The samples were brought to laboratory in ziplocked polythene bags for further study. A complete record of date, time, locality temperature and relative humidity was also maintained. With “Modified Berlese Funnel” storage mites were extracted (Macfadyen, 1953¹⁸, 1955¹⁹, 1961²⁰). The mites were kept in 70% alcohol. For further identification mites were mounted in Hoyer’s Medium (Fain *et. al.*, 1990)²¹.

3. RESULTS AND DISCUSSION

In the present research work, 30 mite species belonging to 3 orders, 12 families and 21 genera were reported. A total of 14812 mite specimens were obtained. The mite species *Acarus siro* (Linnaeus, 1758) was reported in samples of 11 stored food types. A total of 207 samples (16.97 %) out of the 1220 mite positive samples were positive for *Acarus siro* specimens. A total of 2969 (20.04 %) specimens of *Acarus siro* out of the total 14812 mite specimens were obtained.

The mite *Acarus siro* was present in the 207 samples belonged to 11 different food types investigated during the research work. These food types were –Black gram, Cheese, Dalia, Maida, Maize flour, Dal Moong, Rice, Suji, Walnut, Wheat and White gram. The frequency of occurrence of *Acarus siro* in mite infested samples of Black gram, Cheese, Dal Moong, Dalia, Maida, Maize flour, Rice, Suji, Walnut, Wheat and White gram was 27, 7, 16, 17, 18, 25, 17, 18, 6, 21, 35 respectively. The frequency of abundance of *Acarus siro* in mite specimens found in infested samples of Black gram, Cheese, Dal Moong, Dalia, Maida, Maize flour, Rice, Suji, Walnut, Wheat and White gram was 285, 77, 233, 104, 252, 429, 289, 514, 75, 355, 356, respectively.

The present surveyed work revealed the differential frequency of occurrence and abundance of a mite species *Acarus siro* in response to season to season environmental conditions (i.e., temperature, Relative humidity, etc.) variation, food type. The survey emphasizes the importance of mites in stored food products, further studies like how to prevent their presence in our daily used stored foods and how to control their population build up once are in the stored foods, is highly desirable

Table 1: Seasonal distribution of food samples infested with *Acarus siro*

Name of mite species	Food type found infested with mite	No. of samples found infested	Seasonal distribution of mite infested		
			Summer	Rainy	Winter
<i>Acarus siro</i>	Black gram	27	8	13	6
	Cheese	7	2	4	1
	Dal moong	16	5	8	3
	Dalia	17	4	10	3
	Maida	18	6	9	3
	Maize flour	25	8	13	4
	Rice	17	6	8	3
	Suji	18	5	10	3
	Walnut	6	2	3	1
	Wheat	21	7	10	4
White gram	35	12	15	8	
Total	11	207	65	103	39

Table 2: Yearly distribution of food samples infested with *Acarus siro*

Name of mite species	Food type found infested with mite	No. of samples found infested	Yearly distribution of infested samples		
			2014-15	2015-16	2016-17
<i>Acarus siro</i>	Black Gram	27	9	9	9
	Cheese	7	2	2	3
	Dal moong	16	5	5	6
	Dalia	17	7	6	4
	Maida	18	6	5	7

	Maize flour	25	8	7	10
	Rice	17	6	5	6
	Suji	18	6	5	7
	Walnut	6	2	2	2
	Wheat	21	7	7	7
	White gram	35	11	12	12
Total	11	207	69	65	73

Table 3: Showing the *Acarus siro* present in the food type, total number of mite positive samples obtained in the food type, and number of *Acarus siro* positive samples obtained with their occurrence frequency (%)

S.No.	<i>Acarus siro</i> was present in	No. of mite positive samples	No. of samples with <i>Acarus siro</i>	Occurrence frequency (%) of <i>Acarus siro</i>
1	Almond	55	0	0
2	Black gram	97	27	27.84
3	Cheese	53	7	13.21
4	Dal moong	92	16	17.39
5	Dalia	136	17	12.50
6	Maida	124	18	14.52
7	Maize flour	136	25	18.38
8	Rice	145	17	11.72
9	Suji	81	18	22.22
10	Walnut	39	6	15.38
11	Wheat	162	21	12.96
12	White gram	100	35	35.00
Total	12	1220	207	16.97

Table 4: Showing the *Acarus siro* present in the food type, total no. of mite specimens obtained in the food; and No. of *Acarus siro* specimens obtained with their abundance frequency (%)

S.No.	<i>Acarus siro</i> was present in	No. of total mite specimens obtained	No. of <i>Acarus siro</i> specimens obtained	Abundance frequency (%) of <i>Acarus siro</i>
1	Almond	594	0	0
2	Black gram	750	285	38.00
3	Cheese	688	77	11.19
4	Dal moong	1025	233	22.73
5	Dalia	1176	104	8.84
6	Maida	1540	252	16.36
7	Maize flour	1937	429	22.15
8	Rice	2187	289	13.21
9	Suji	1713	514	30.01
10	Walnut	368	75	20.38
11	Wheat	2022	355	17.56
12	White gram	812	356	43.84
Total	12	14812	2969	20.04

Table 5: Showing the food-wise and overall seasonal distribution of Occurrence of *Acarus siro*

Name of mite species	Food type found infested with mite	No. of specimens found	Seasonal distribution of mite specimens		
			Summer	Rainy	Winter
<i>Acarus siro</i>	Black gram	285	80	169	36
	Cheese	77	20	52	5
	Dal moong	233	65	144	24
	Dalia	104	22	70	12
	Maida	252	78	153	21
	Maize flour	429	120	273	36
	Rice	289	90	160	39
	Suji	514	125	350	39
	Walnut	75	22	45	8
	Wheat	355	105	210	40
White gram	356	120	180	56	
Total	11	2969	847	1806	316

Table 6: Showing the food-wise and overall yearly distribution of Occurrence of *Acarus siro*

Name of mite species	Food type found infested with mite	No. of specimens found	Yearly distribution of mite specimens		
			2014-15	2015-16	2016-17
<i>Acarus siro</i>	Black gram	285	88	93	104
	Cheese	77	18	22	37
	Dal moong	233	65	72	96
	Dalia	104	37	36	31
	Maida	252	79	69	104
	Maize flour	429	119	117	193
	Rice	289	99	85	105
	Suji	514	144	142	228
	Walnut	75	21	24	30
	Wheat	355	111	118	126
White gram	356	110	120	126	
Total	11	2969	891	898	1180

Table 7: Showing the frequency (%) of occurrence of *Acarus siro* within the total infestation and within the total examined samples

Total samples examined	Total samples infested	Total samples infested with <i>A. siro</i>	Frequency (%) within total infestation	Frequency (%) within total examined samples
3240	1220	207	16.97	6.39

Table 8: Showing the frequency (%) of occurrence of *Acarus siro* within the infestation with Acaridae family members

Total samples examined	Total samples infested	Total samples infested with <i>A. siro</i>	Total samples infested with Acaridae members	Frequency (%) within Acaridae family (207 infested samples)
3240	1220	207	563	36.77

Table 9: Showing the frequency (%) of abundance of *Acarus siro* within the total mite specimens (14812) and within the total Acaridae specimens (7825) obtained

Total samples examined	Total mite specimens obtained	Total <i>A. siro</i> specimens obtained	Frequency (%) within total specimens (14812)	Frequency (%) within Acaridae family (7825 specimens)
3240	14812	2969	20.04	37.94

Table 10: Showing the seasonal based independent environmental factor values and frequency (%) of occurrence and abundance dependent factors of *Acarus siro*

Independent factor	Value taken	Season-wise factor value		
		Summer (CCL1)	Rainy (CCL2)	Winter (CCL3)
Environmental abiotic factors				
Temperature (°C)	Monthly Mean	28.36	29.34	15.60
R.H. (%)	Monthly Mean	52.36	73.67	75.49
Dependent factor				
<i>Acarus siro</i>	Occurrence frequency (%)	31.40	49.76	18.84
<i>Acarus siro</i>	Abundance frequency (%)	28.52	60.83	10.65

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