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THE SOIL-DWELLING MITES OF EASTERN TURKMENISTAN

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The trombidiform mites (*Tarsonemina*, *Prostigmata trombidiformes*) dwelling on wheat fields were studied by many acarologists in various countries [1-4]. A number of publications were devoted to studying the population and vertical location of soil-dwelling mites in various biotopes [4-6]. In Turkmenistan, the soil-dwelling mites *Tarsonemina* and *Prostigmata* remain poorly studied to date [7].

In 1994-1997, we collected soil-dwelling mites on the wheat fields of the Chardzhou, Farab, Deinau, Khodzhabai, and Charshangi districts. We analyzed a total of 370 soil samples each 1 dm³ in volume and 120 samples from the vegetative organs of the wheat. The vertical location of the mites in the soil was studied to a depth of 50 cm by layers using the procedure of soil-ecological studies. The moisture content of the soil was determined by the generally adopted methods of drying the samples in a thermostat. The soil temperature was measured with a set of soil thermometers. The mites were separated from the soil samples with the aid of a thermoeclector. In the period of our investigations, we collected a total of 45,700 mites.

Analysis of the collected material revealed the presence of 38 species from 13 families (Table 1).

Inspection of the table reveals that the population of the mites in meadow irrigated soils is much higher in comparison with other types of soils, which is explained by the abundance in them of organic remnants, especially in the roots, in the wheat straw, and in weeds. By our observations, the abundance of soil mites in various types of soils depends on their content of organic fertilizers and plant remnants. In sand desert and alluvial soils, eurybiont mite species prevail. On fields in use for many years, their population is higher than on newly developed ones. In mountain brown soils, the species composition of the mites is inferior to that in meadow soils, but the number of mites in them remains the same as in other types of soils.

We studied the dependence of the vertical location of the mites, and also the groups of mites accompanying them, on the moisture content and temperature of the soil on the wheat fields in the farmer's cooperative Dzheikhun in the Chardzhou District (Table 2).

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Table 1. Composition and Number of Mites in Various Types of Soils in Eastern Turkmenistan

Family	Number of species	Number of mites per dm ³ by soil types			
		meadow alluvial	alluvial flood plain	sand desert	mountain brown
<i>Pygmephoridae</i>	11	75	22	34	31
<i>Dolichocybidae</i>	1	18	—	—	—
<i>Siteroptidae</i>	4	8	3	5	2
<i>Scutacaridae</i>	8	15	3	7	19
<i>Tarsonemidae</i>	6	17	5	9	13
<i>Cunaxidae</i>	2	2	10	5	13
<i>Bdellidae</i>	1	—	3	—	—
<i>Tydeidae</i>	1	2	—	—	—
<i>Tarsocheylidae</i>	1	2	3	7	5
<i>Anystidae</i>	1	3	—	—	—
<i>Cheyletidae</i>	1	4	—	—	—
<i>Stigmatidae</i>	1	2	—	1	1
Total	38	148	44	68	84

As a result of these studies, we discovered a definite dependence of the number of mites on the moisture content and temperature of the soil. In line with our observations, the optimal moisture content for the normal reproduction of the mites is 5-25% at a soil temperature of 3-25 °C. The vertical location of the mites in the top soil was nonuniform. Apparently, the dynamics of the mite population depends on the set of abiotic and biotic factors such as the structure of the soil, the presence of food substrates and natural enemies. The mites form microboreholes in the soil that improve its aeration. Most likely, at the time of irrigations, the tarsonemins and prostigmats pass over into the inactive state and withstand excessive moistening of the soil, but on flooded sections of the wheat fields their population drops to a minimum.

The species of the tarsonemins and prostigmats which we discovered on the wheat fields are related to three ecological groups: saprobionts, predators, and phytophages.

The saprobionts are represented by 23 species of mites. The dominant among them are the species *B. centriger*, *B. tarsalis*, *B. gracilis*, *B. silvestre*, *P. paucisetosus*, and *Pav. protracta*. The species *B. centriger*, like all the others, reproduces intensely in autumn. In this season, the mites dwell at a soil depth of 30-40 cm. In winter (December, January), the mites have not been found in the soils. They are probably in a state of rest. In February, during the thawing period, this species passes into an active state, and numerous females, males, and larvae are found in the soil. In March and April, the number of specimens of this species gradually increases and reaches a maximum at the end of May. In the spring months, they usually dwell at a soil depth of 10-20 cm.

The predators include eight species of the prostigmats. They are often encountered in the upper layers of the soil and feed on various species of mites, the larvae of insects,

Table 2. Vertical Location and Average Population of Soil-Dwelling Mites on Wheat Fields, 1996-1997

Time of collecting	Depth, cm	Total specimens per dm ³	Distribution by groups, %					Soil moisture content, %	Soil temperature, °C
			tarso-nemins	prostig-mats	oriba-tids	gama-sids	acarids		
November	10	95	92.6	3.1	4.2	—	—	8.8	11.0
	20	71	100	—	—	—	—	13.0	11.2
	30	128	35.1	—	25	10.9	28.9	13.6	12.0
	40	15	100	—	—	—	—	13.6	14.7
February	10	73	54.7	—	—	1.3	43.8	17.0	5.0
	20	46	58.6	2.1	26	2.1	10.8	18.9	4.7
	30	34	100	—	—	—	—	15.5	5.2
	40	18	44.4	5.5	27.7	22	—	17.2	5.5
March	10	139	20.4	—	17.9	13.6	47.4	9.6	13.6
	20	74	27	1.3	8.1	4	59.4	12.8	11.0
	30	47	49	4	40.4	6.3	—	12.9	10.5
	40	23	26	74	—	—	—	14.8	9.8
April	10	81	61.7	—	17.2	9.8	11.1	7.5	17.0
	20	50	30.0	2.0	54	4.0	10.0	9.4	15.2
	30	87	40.2	—	43.6	14.9	1.14	11.8	15.6
	40	64	62.5	56.0	31.2	4.68	—	13.5	14.5
May	10	1008	2.6	0.09	—	0.4	96.8	10.5	27.0
	20	20	80.0	—	—	20.0	—	14.2	26.2
	30	5	80.0	20	—	—	—	14.7	24.2
	40	18	16.6	—	72.2	—	11.1	14.9	23.0
June	10	266	5.2	7.5	36	6.0	45.1	11.8	25.0
	20	22	—	4.5	45.4	40.9	9.0	15.2	24.0
	30	34	—	—	61.7	26.4	11.7	16.1	23.0
	40	76	7.9	2.6	71.8	13.7	3.8	16.2	22.4

and their eggs. On the leaves of wheat plants, we discovered specimens of the active predatory mite *T. placitus*. It apparently feeds on species of microarthropods dwelling on plants.

The group of phytophages includes the following species: *S. tameri*, *S. aegyptiacus*, *T. caucasicus*, *T. waitel*, *T. pauperoseatus*, *S. spirifex*, and *S. dzemilae*. They rise from the upper layers of the soil onto plants and form an important structure in the acarocomplex of wheat. The species of the tarsonemins dwelling on plants feed on their sap and to a definite extent lower the yield of the wheat.

CONCLUSIONS

1. For the first time in the soils of wheat fields, we discovered 38 species of mites; two of them — *T. pauperoseatus* and *T. placitus* are new ones for Turkmenistan's fauna.

2. We studied the presence and population of the mites depending on the types of soils. The largest number of their species were discovered in meadow irrigated soils.

3. We established the dependence of the population of the mites on the temperature and moisture content of the soil. In the soils of wheat fields, the mites are located nonuniformly vertically.

4. Seven species of tarsonemins dwell on wheat plants and feed on their sap.

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