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Pesticide toxicity on Arachnida and Myriapoda group of soil micro arthropods in cotton fields of Narsampet mandal, Warangal district

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Abstract
The selected study area is located in Warangal rural district, Narsampet mandal of Telangana State. The study includes normal field where the maize, coriander& onions will be cropped and in these field the pesticides are not used and another one is pesticide treated field where cotton crop is cultivated. The study period is one year i.e. June 2015-May 2016. In this area most of the farmers are used monocrotophos, chlorpyrifos, imidacloprid, pesticides in their cotton fields. July, August and September months (South west monsoon) highest number of soil micro arthropods were recorded and in the months of November, December and January (North East monsoon) lowest number of soil micro arthropods were recorded. The highest number of soil micro arthropods in south west monsoon is due to less amount of pesticide usage and the lowest number in north east monsoon is high amount of pesticide application. There are Eight number of soil micro arthropods were identified belongs to two major groups these are Arachnida and Myriapoda. Among the two groups Arachnida group of micro arthropods were dominated. In this group especially Cryptostigmata, Mesostigmata and Prostigmata species were dominated. Pseudoscorpionida and Chilopoda were observed in lowest number.

Keywords: arachnida, myriapoda, cotton, mean and standard deviation

Introduction
Soil is a complete system full of life and activity for improving of soil sustainability. We need to understand its soil biotic component as a whole and its relation to soil quality. Pesticides and Fungicides are effect on beneficial soil biota. Agricultural system in India has been subjected to a wide range of both natural and anthropogenic forms of soil disturbances. The process of decomposition are controlled largely by soil micro arthropods is attached with soil invertebrates like protozoa and worms which also contribute to the soil community by mixing, loosening and aerating the soil. Pesticides have now become an integral part of our modern life and are used to protect agricultural land stored grain, flower gardens as well as to eradicate the pests transmitting dangerous infectious diseases. Pesticides entering in to the environment after that in the environment some of the pesticides are rapidly degraded or converted into non toxic products. But some other pesticides may remain and changed and retain toxicity for a more or less prolonged period.
Cotton is the most common commercial crop in Warangal district. Most of the farmers are cultivating the cotton crop in this area. Almost all the cotton farmers are used different local available pesticides to control the pests in their crop fields. This study has an attempt to observe the effect of different pesticides on soil micro arthropods in cotton fields of narsampet mandal of Warangal district.

Materials and Methods
In this study soil samples were collected with iron core soil sampler from 5 cm diameter an depth of 15 cm. this sampler was similar to the one used by Edwards and Lofty (1971) [7]. The soil samples were collected on monthly basis for the period of one year. The soil samples those collected were brought to the laboratory and transfer in to the Tullgren funnel within one hour of collection. The Berlese Tullgren funnel (1918) extractor is best for extracting soil micro arthropods with efficiency of about 90% (Hopkins, 1997) [11]. Extraction methods were designed to suit, behaviours and body structures of the organisms (Wallwork, 1970) [17]. The micro arthropods which passed through 2x2 mm sieve of the sample holder were collected separately in the phials containing 70% alcohol fixed to the lower end of funnel these phials were periodically checked to keep the alcohol to desired level. After the extraction of organisms they were collected and immediately they were removed from the lot by using a sucking pipette. A stereo binocular dissecting microscope was used for the quantitative analysis of soil micro arthropods. The number in each group was identified and recorded (Borrer & Delong 1964) [3] Burger & Raw 1967 [4], Esenbeis & Wichard 1959.

Statistical Analysis
Statistical analysis of the selected data like mean, standard deviation is by using Microsoft Excel worksheet.

Results and Discussion
Insecticides applied for the control of pests may also affect beneficial species. For example, one surface application of insecticide was found to reduce predator populations by 60% for as long as six weeks (Cockfield and Potter 1983) [5]. In another experiment, natural predation on sod webworm eggs was greatly reduced by and insecticide application (Cockfield and Potter 1984) [6]. Mites, spring tails and ants are some important microarthropods used to assess environmental impacts (Joy and Chakravorty, 1991) [13]. Pesticides are indispensable tools of the modern cotton crop manager and

there are many situations for which use of a pesticide will be required in order to maintain quality of cotton. During the study period a total number of five species from Arachnida order and three species from Myriapoda order were observed. The clear results and the statistical analysis of the observed results depicted in the table. Iloba and Ekrakene (2008) [12] reported that abundance of soil microarthropod faunal groups like Collembola, Coleoptera, Acarina, Isoptera, Hymenoptera, Myriapoda, Crustacea and Arachnida was dependent on the concentration of pesticide applied and where application was not indiscriminate, soil microarthropods have high recovery rate which could enhance high productivity in the farm in long run.

Arachnida

Arachnida that occur in agroecosystems are often heavily affected by many pesticide applications. When compare to insecticides and pesticides the herbicides and fungicides are relatively harmless. In the present investigation the Pseudoscorpionidans ranged between 9 to 12 in normal field and 6 to 8 in pesticide treated field in the south west monsoon season. The mean values of the pseudoscorpionidans during this season is 10±1.22 in normal field and 7±0.7 in pesticide treated field. The north east monsoon season pseudoscorpionidans ranged between 12 to 15 species in normal field and 4 to 6 in pesticide treated field and the mean values of the species in this season is 13.75±1.08 in normal field and 5±0.70 in pesticide treated field. In the summer season species values ranged between 8 to 11 species in normal field, 5 to 7 species in pesticide treated field. The mean values of the psuedoscorpionidans in summer season is 9.5±1.11 in normal and 6±0.70 in pesticide treated field. Throughout the study period highest number of psuedoscorpionidans were recorded in October month and lowest were recorded in the month of may in normal field, while the same year highest number of species were recorded in the month of June, lowest were recorded in the month of December in pesticide treated field. During the present investigation the Mesostigmata values ranged between 112 to 126 species in normal field and 93 to 102 species in pesticide treated field in the south west monsoon season. The mean values of the Mesostigmata species during this season is 120.3±5.40 in normal field and 97.75±3.49 in pesticide treated field. The north east monsoon season Mesostigmata values ranged between 128 to 138 species in normal field and 74 to 90 species in pesticide treated field and the mean values of the species in this season is 134±3.74 in normal field and 81.25±6.90 in pesticide treated field. In the summer season species values ranged between 100 to 125 species in normal field, 79 to 89 species in pesticide treated field. The mean values of the Mesostigmata species in summer season is 115±9.50 in normal and 84.5±4.15 in pesticide treated field. Throught the study period highest number of species were recorded in October month and lowest were recorded in the month of May in normal field, while the same year highest number of species were recorded in the month of July, lowest were recorded in the month of January in pesticide treated field. Mesostigmata population relatively high in undisturbed soil, In comparison with other natural systems, the Mesostigmata mean density at the study site was low (Hermosilla *et al*. 1977 [9], Astrid Hulsmann and Volkmar Wolters 1998) [1]. Relatively high numbers of the Mesostigmata were observed quite abundant in natural soils (Hermosilla and Rubio 1974 [10], Norton and Sillman 1985, Koehler 1999). In this study period the Cryptostigmata values ranged between 143 to 159 species in normal field and 128 to 162 species in pesticide treated field in the south west monsoon season. The mean values of the Cryptostigmata species during this season is 151.3 ±6.49 in normal field and 143±12.36 in pesticide treated field. The north east monsoon season Cryptostigmata values ranged between 158 to 170 species in normal field and 110 to 126 species in pesticide treated field and the mean values of the species in this season is 165±4.41 in normal field and 119.5±5.89 in pesticide treated field. In the summer season species values ranged between 130 to 156 species in normal field, 123 to127 species in pesticide treated field. The mean values of the Cryptostigmata species in summer season is 143.75±9.75 in normal and 124.5±1.65 in pesticide treated field. Throughout the study period highest number of species were recorded in October month and lowest were recorded in the month of may in normal field, while the same year peak number of species were recorded in the month of August, lowest were recorded in the month of November in pesticide treated field. Edwards (1969) [8] observed that populations of Collembola, Prostigmata and Cryptostigmata were diminished during the early stage of treatment of several organophosphorus insecticides but the populations of predatory groups like Mesostigmata suffered later from the absence of prey. In the same year investigation the Prostigmata values ranged between 143 to 159 species in normal field and 128 to 162 species in pesticide treated field in the south west monsoon season. The mean values of the Prostigmata species during this season is 145 ±5.91 in normal field and 126.5±3.34 in pesticide treated field. The north east monsoon season Prostigmata values ranged between 158 to 170 species in normal field and 110 to 126 species in pesticide treated field and the mean values of the species in this season is 162.3±3.89 in normal field and 108.5±7.15 in pesticide treated field. In the summer season species values ranged between 130 to 156 species in normal field, 123 to127 species in pesticide treated field. The mean values of the Prostigmata species in summer season is 141±9.97 in normal and 114.25±5.71 in pesticide treated field. Throughout the study period highest number of species were recorded in November month and lowest were recorded in the month of May in normal field, while the same year highest number of species were recorded in the month of July, lowest were recorded in the month of December in pesticide treated field. The Prostigmata comprises a group of mites with heterogeneous life history traits (Kethley 1990) [14].

Myriapoda

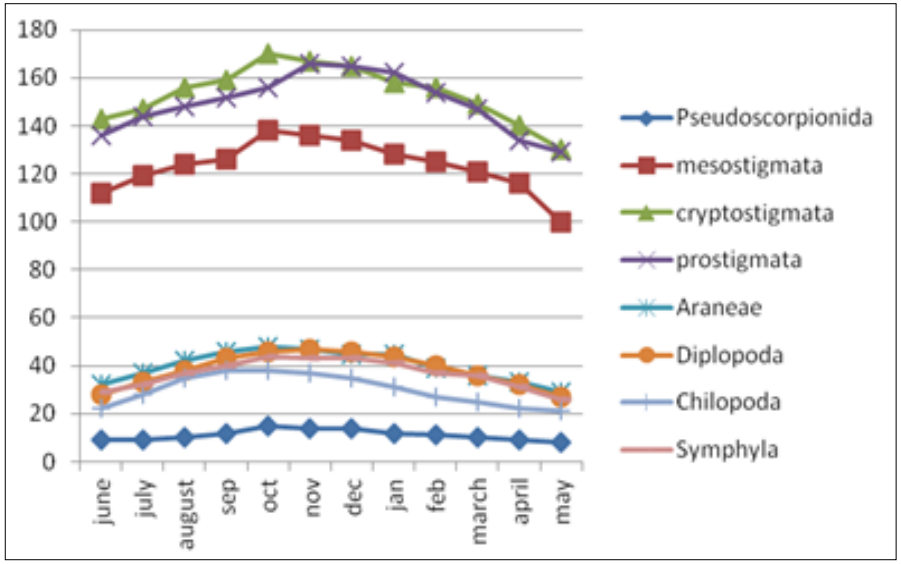
In the present Study period the Araneae values ranged between 32 to 46 species in normal field and 28 to 36 species in pesticide treated field in the south west monsoon season. The mean values of the Araneae species during this season is 39.25 ±5.26 in normal field and 31.5±2.58 in pesticide treated field. The north east monsoon season Araneae values ranged between 45 to 48 species in normal field and 17 to 24 species in pesticide treated field and The mean values of the species in this season is 46.25±1.29 in normal field and 20.5±3.04 in pesticide treated field. In the summer season species values ranged between 29 to 39 species in normal field, 19 to 27 species in pesticide treated field. The mean values of the

Araneae species in summer season is 34.25±3.69 in normal and 23.25±2.86 in pesticide treated field. Throughoutt the study period highest number of species were recorded in October month and lowest were recorded in the month of may in normal field, while the same year highest number of species were recorded in the month of July, lowest were recorded in the month of January in pesticide treated field. In the present study we investige the Diplopoda values ranged between 28 to 43 species in normal field and 25 to 29 species in pesticide treated field in the south west monsoon season. The mean values of the Diplopoda species during this season is 35.5 ±5.59 in normal field and 27.25±1.47 in pesticide treated field. The north east monsoon season Diplopoda values ranged between 44 to 47 species in normal field and 17 to 25 species in pesticide treated field and The mean values of the species in this season is 45.75±1.08 in normal field and 22.25±3.11 in pesticide treated field. In the summer season species values ranged between 27 to 40 species in normal field, 19 to 24 species in pesticide treated field. The mean values of the Diplopoda species in summer season is 33.75±4.81 in normal and 22.25±1.92 in pesticide treated field. Throught the study period highest number of species were recorded in November month and lowest were recorded in the month of may in normal field, while the same year highest number of species were recorded in the month of August, lowest were recorded in the month of January in pesticide treated field. While the same year we observed the Chilopoda values ranged between 22 to 38 species in normal field and 18 to 26 species in pesticide treated field in the south west monsoon season. The mean values of the Chilopoda species during this season is 30.75 ±6.21 in normal field and 22.25±3.03 in pesticide treated field. The north east monsoon season Chilopoda values ranged between 31 to 38 species in normal field and 11 to 25 species in pesticide treated field and The mean values of the species in this season is 35.25±2.68 in normal field and 18±6.51 in pesticide treated field. In the summer season species values ranged between 21 to 27 species in normal field, 13 to 16 species in pesticide treated field. The mean values of the Chilopoda species in summer season is 23.75±2.38 in normal and 14.75±1.08 in pesticide treated field. Throught the study period highest number of species were recorded in September and October months and lowest were recorded in the month of may in normal field, while the same year highest number of species were recorded in the month of August, lowest were recorded in the month of December in pesticide treated field. Significant temporal decreases in the density of most of the microarthropod groups were found in case of Imidacloprid and chlorpyrifos treated field. In the present investigation the Symphyla values ranged between 29 to 40 species in normal field 26 to 32 species in pesticide treated field in the south west monsoon season. The mean values of the Symphyla species during this season is 34.5 ±4.27 in normal field and 29±2.23 in pesticide treated field. The north east monsoon season Symphyla values ranged between 41 to 44 species in normal field and 14 to 24 species in pesticide treated field and The mean values of the species in this season is 42.75±1.08 in normal field and 20.25±3.89 in pesticide treated field. In the summer season species values ranged between 26 to 37 species in normal field, 17 to 22 species in pesticide treated field. The mean values of the Symphyla species in summer season is 32.5±4.38 in normal and 18.50±2.06 in pesticide treated field. Throughout the study period highest number of species were recorded in October month and lowest were recorded in the month of May in normal field, while the same year highest number of species were recorded in the month of August, lowest were recorded in the month of January in pesticide treated field. Pioneer workers in the field of soil ecotoxicology showed that pesticides like aldrin did not affect the predatory mites but killed Myriapoda group and other non-target decomposer groups.

Table 1: Quantitative analysis of Arachnida and Myriapoda soil microarthropod species during the year 2015-2016

	South west monsoon										North east monsoon										Summer									
	Jun		Jul		Aug		Sep		Mean±SD		Oct		Nov		Dec		Jan		Mean±SD		Feb		Mar		Apr		May		Mean±SD	
	N	PT	N	PT	N	PT	N	PT	N	PT	N	PT	N	PT	N	PT	N	PT	N	PT	N	PT	N	PT	N	PT	N	PT	N	PT
Pseudoscorpionida	9	8	9	7	10	7	12	6	10±1.22	7±0.70	15	6	14	5	14	4	12	5	13.75±1.08	5±0.70	11	5	10	6	9	6	8	7	9.5±1.11	6±0.70
Mesostigmata	112	96	119	102	124	100	126	93	120.3±5.40	97.5±3.49	138	90	136	86	134	75	128	74	134±3.74	81.25±6.90	125	79	121	82	116	88	100	89	115±9.50	84.5±4.15
Cryptostigmata	143	138	147	144	156	162	159	128	151.3±6.49	143±12.36	170	126	167	110	165	120	158	122	165±4.41	119.5±5.89	156	123	149	123	140	125	130	127	143.75±9.75	124.5±1.65
Prostigmata	136	127	144	130	148	128	152	121	145±5.91	126.5±3.34	156	117	166	114	165	100	162	103	162.3±3.89	108.5±7.15	154	107	147	111	134	117	129	122	141±9.97	114.25±5.71
Aranae	32	30	37	36	42	32	46	28	39.25±5.26	31.5±2.58	48	24	47	23	45	18	45	17	46.25±1.29	20.5±3.04	39	19	36	23	33	24	29	27	34.25±3.69	23.25±2.86
Diplopoda	28	25	33	27	38	29	43	28	35.5±5.59	27.25±1.47	46	25	47	24	46	23	44	17	45.75±1.08	22.25±3.11	40	19	36	23	32	23	27	24	33.75±4.81	22.25±1.92
Chilopoda	22	18	28	21	35	24	38	26	30.75±6.21	22.25±3.03	38	25	37	24	35	11	31	12	35.25±2.68	18±6.51	27	13	25	15	22	15	21	16	23.75±2.38	14.75±1.08
Symphyla	29	28	32	30	37	32	40	26	34.5±4.27	29±2.23	44	24	43	23	43	20	41	14	42.75±1.08	20.25±3.89	37	17	36	17	31	18	26	22	32.5±4.38	18.50±2.06

N = normal field and PT = pesticide treated field



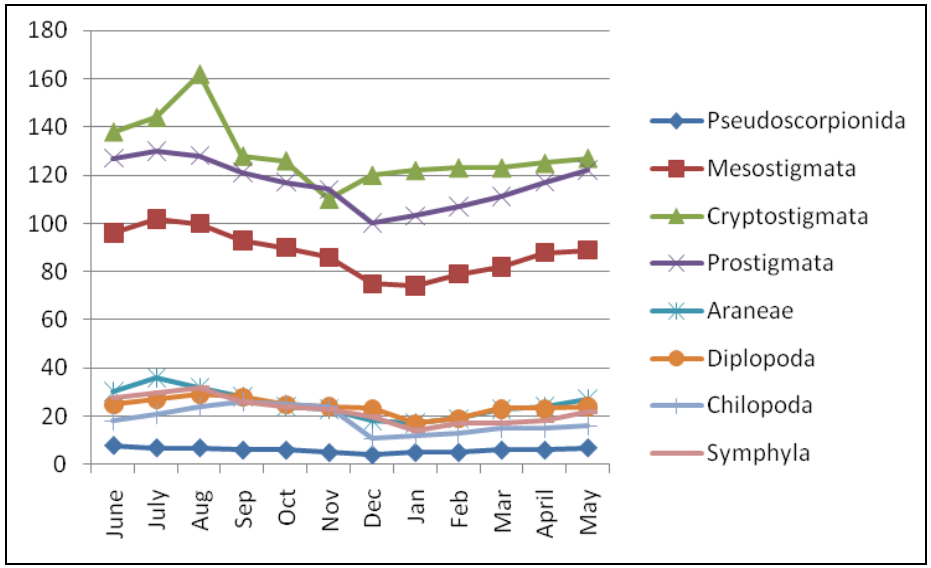


Fig 1&2: Showing the normal field and pesticide treated field soil microarthropod population during the year 2015-2016

Conclusion

The present study reveals that the soil micro arthropod population relatively high in normal field, where no pesticide application, when compared to the field where pesticide application is more.

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