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SURVEY FOR THE KEY PESTS OF CHILLI (*CAPSICUM ANNUUM* L.) IN DIFFERENT AGRO-CLIMATIC ZONE OF WEST BENGAL

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Abstract
A survey was conducted to find out the key pests infesting chilli in major chilli growing districts under three different agro-climatic zones of West Bengal *viz*., *New alluvial zone*, *Old alluvial zone* and *Coastal saline zone*. The survey revealed the incidence and occurrence of chilli thrips (*Scirtothrips dorsalis* Hood), Yellow mite or Broad mite (*Polyphagotarsonemus latus* Banks) and *Helicoverpa armigera* Hubner as key pests causing appreciable damage in all the three agro-climatic zones with sporadic populations of other sucking pests like aphids, jassids and whiteflies.

Introduction
West Bengal is broadly divided into six Agro-climatic Zones, which fall within three Agro-climatic Regions *viz.,* Eastern Himalayan Region, Lower Gangetic Plain Region and Eastern Plateau & Hill Region among the 15 regions in India, as classified by the Planning Commission, Government of India. Farmers of West Bengal have been growing chilli in highly diverse agro-climatic situations from Hilly and Terai soils of Himalayan foot hills in the North, Red lateritic and gravelly soils in the West, coastal saline soils in the South to rich alluvial soils in the Central region (Paul *et al*., 2013).

Chilli belongs to the family Solanaceae and includes 31 known species (Moscone *et al.*, 2007). Among the 31 species included in the *Capsicum* genus, only five - *C. annuum*, *C. baccatum, C. chinense*, *C. frutescens* and *C. pubescens* have been domesticated and cultivated (Heiser and Pickersgill, 1969; IBPGR, 1983). The Indian germplasm is mainly represented by two species, *C. annuum* and *C. frutescens* with a number of varieties (Thul *et al.,* 2009). In India, chilli is cultivated in an area of 7.67 lakh hectares and the production is estimated at 12.34 lakh tonnes (Priyadarshini *et al.*, 2018). Chilli accounts for 40 percent of the total spices exported from India and 23 percent in terms of value. Chilli is known to be affected by 57 insect and non-insect pests of which the Tarsonemid mite, *Polyphagotarsonemus latus* (Banks) (Acari:Tarsonemidae) and thrips, *Scirtothrips dorsalis* are most destructive sucking pests and are considered as major pests (Berke *et al.*, 2000; Reddy and Puttaswamy, 1984). The productivity of the crop is decreasing sharply day by day mainly due to leaf curl complex associated with the infestation of *Scirtothrips dorsalis* Hood and *Polyphagotarsonemus latus* Banks (Mondal and Mondal, 2012). The objective of this study is to ascertain the incidence of key pests of chilli in three different agro-climatic zones of West Bengal under the farmer's agronomic practices and crop protection strategies.

Materials and Methods
Fixed plot survey was conducted during rabi season of 2013-14 in major chilli growing districts under three different agro-climatic zones of West Bengal to find out the key pests infesting chilli. The agro-climatic zones considered for the survey were the *New alluvial zone*, *Old alluvial zone* and *Coastal saline zone*. Farmer's field were considered for observation under the survey in each of the agro-

climatic zones selected. In each zone, 1,000 meter square area of chilli field was selected and divided into four quadrates. Then, 10 plants were randomly selected and tagged for observations in each quadrate. The observations were taken at fortnightly intervals on the key pests of chilli under farmer's chemical interventions.

Both adults and nymphs of thrips were counted in situ from half to fully opened top three leaves with the help of 10 X hand lens. For observation of mites, one leaf each from upper, middle and lower position of the selected plants were collected in perforated zip lock polythene bag (16 x 18 cm) and the samples were brought to laboratory and examined under 20 x magnification stereo zoom binocular microscope. The data were then subjected to ANOVA following necessary transformations.

Details of the experiment were as follows:

Agro-climatic zones (NARP)	Old alluvial zone	New alluvial zone	Coastal saline zone
District	Murshidabad	Nadia	South 24-Parganas
Block	Jiaganj	Chakdah	Kakdwip
Village	Chandipur	Simurali	Kakdwip
Crop	Chilli	Chilli	Chilli
Season	October-February	November-March	November-March
Variety	Beldanga lanka	Bullet lanka	Krishnachura lanka
Total area	2 bigha approx.	3 bigha approx.	2 bigha approx.
Fertilizers used	Urea, SSP, MOP	Urea, SSP, MOP	Urea, SSP, MOP
Pesticides used	fipronil (Regent) spinosad (Tracer)	imidacloprid (Confidor) emamectin benzoate (Missile)	acephate (Asataf) imidacloprid (Hilmida)

Results and discussion

The survey revealed the incidence and occurrence of chilli thrips (*Scirtothrips dorsalis* Hood), Yellow mite or Broad mite (*Polyphagotarsonemus latus* Banks) and *Helicoverpa armigera* Hubner as key pests causing appreciable damage in all the three agro-climatic zones. Further, small and sporadic populations of other sucking pests like aphids, jassids and whiteflies were also observed but their population being negligible, were not considered for study in this experiment.

a) Key pests of chilli in Old alluvial zone of West Bengal.

Table 1 represents the population of key pests of chilli recorded at **Old alluvial zone of West Bengal**. From the table, it is clear that the population of pests in chilli was very low during the month of December which may be due to the fact that the ambient temperature in this region was low and unfavourable for the growth and development of the crop plant as well as the pests concerned. However, when the environmental conditions turned optimum, the highest number of mites (19.30/ 3 leaves) and % leaf curl (65.84 %) was recorded during second fortnight of February. Similarly, the highest number of thrips (7.84/ 3 leaves) and % leaf curl (32.61 %) was as well recorded during second fortnight of February whereas the highest number of defoliator, *Helicoverpa armigera* (1.95/ plant) and % defoliation (28.41 %) was recorded during second fortnight of January when the crop had entered the reproductive phase.

b) Key pests of chilli in New alluvial zone of West Bengal.

The population of key pests of chilli recorded at **New alluvial zone of West Bengal** has been depicted in Table 2. The population of mites increased gradually throughout the month of January

and February to reach the peak population (15.74/ 3 leaves) causing highest % leaf curl (51.22 %) during first fortnight of February while the highest population of thrips (6.60/ 3 leaves) and the subsequent leaf curl damage (30.08 %) was recorded during second fortnight of February. On the other hand, the number of defoliator, *Helicoverpa armigera* (1.83/ plant) and % defoliation (26.41%) was highest during second fortnight of January when the crop was in the reproductive phase.

c) Key pests of chilli in Coastal saline zone of West Bengal.

Table 3 represents the population of key pests of chilli recorded at **Coastal saline zone of West Bengal**. In the table, it can be seen clearly that the population of the chilli mites started to increase gradually to reach the peak population (25.71/ 3 leaves) and their subsequent leaf curl (76.71 %) during second fortnight of January whereas the number of thrips (9.08/ 3 leaves) and % leaf curl (36.71 %) reached the peak during second fortnight of February. Further, the number of defoliator, *Helicoverpa armigera* (2.37/ plant) and % defoliation (32.28 %) touched its peak during first fortnight of February.

Numerous scientists have conducted experiments throughout the year for assessing the occurrence of key pests of chilli in different seasons in India. The findings of this experiment was in conformity with the findings of Sunitha *et al.* (2007), Kumar *et al.* (2007), Nandini *et al.* (2010), Reddy *et al.* (2011), Kumar and Gupta (2014), Chintkuntlawar *et al.* (2015), Sarkar *et al.* (2015) and Priyadarshini *et al.* (2018) who reported that the mite, *Polyphagotarsonemus latus* Banks; thrips, *Scirtothrips dorsalis* Hood; *Spodoptera litura*, whitefly, jassids, aphids, *Helicoverpa armigera* Hubner and *Spodoptera exigua* were the major pests infesting chilli in India. The findings of the present author were also supported by the findings of Karmakar (2016) who reported that *Polyphagotarsonemus latus* Banks was the most widely distributed mite in West Bengal, while Mondal and Mondal (2012) reported that the yellow mite, *Polyphagotarsonemus latus* Banks and chilli thrips, *Scirtothrips dorsalis* Hood are considered the most devastating pests in West Bengal.

Table 1. Key pests of chilli in Old alluvial zone of West Bengal during Rabi season, 2013-14

Month		Mean no. of mite/ 3 leaves	% leaf curl (mites)	Mean no. of thrips/ 3 leaves	% leaf curl (thrips)	Mean no. of defoliator*/ plant	% defoliation (Fruit borer)
December 2013	1st FN*	0.97	13.18	0.66	10.21	0.87	15.21
	2nd FN	2.02	17.36	1.34	11.25	1.24	21.36
January 2014	1st FN	5.93	23.24	3.05	16.02	1.16	18.66
	2nd FN	8.66	34.98	3.98	20.87	1.95	28.41
February 2014	1st FN	14.31	50.71	4.82	23.92	1.38	21.69
	2nd FN	19.30	65.84	7.84	32.61	1.10	20.72
Mean		8.53	34.22	3.62	19.14	1.28	21.01
S.Em (±)		7.15	20.59	2.59	8.47	0.36	4.34

***FN: Fortnight,* *defoliator encountered was *Helicoverpa armigera* Hubn**

Table 2. Key pests of chilli in New alluvial zone of West Bengal during Rabi season, 2013-14

Month		Mean no. of mite/ 3 leaves	% leaf curl (mites)	Mean no. of thrips/ 3 leaves	% leaf curl (thrips)	Mean no. of defoliator */ plant	% defoliation (Fruit borer)
December 2013	1st FN*	1.03	12.34	0.93	11.05	0.76	15.85
	2nd FN	1.65	18.31	1.47	12.58	0.67	15.28
January 2014	1st FN	6.82	27.90	1.98	16.36	1.37	22.75
	2nd FN	9.57	34.37	3.11	18.74	1.83	26.41
February 2014	1st FN	15.74	51.22	3.93	25.22	1.12	21.50
	2nd FN	12.67	48.65	6.60	30.08	0.87	16.07
Mean		7.91	32.12	3.00	19.00	1.10	19.64
S.Em (±)		5.90	15.76	2.07	7.38	0.43	4.58

**FN: Fortnight,* *defoliator encountered was *Helicoverpa armigera* Hubn

Table 3. Key pests of chilli in Coastal Saline Zone of West Bengal during Rabi season, 2013-14

Month		Mean no. of mite/ 3 leaves	% leaf curl (mites)	Mean no. of thrips/ 3 leaves	% leaf curl (thrips)	Mean no. of defoliator */ plant	% defoliation (Fruit borer)
December 2013	1st FN*	1.36	14.13	0.86	12.44	0.60	14.71
	2nd FN	3.23	19.68	0.65	9.81	0.81	17.24
January 2014	1st FN	7.97	32.94	1.87	16.57	1.88	28.10
	2nd FN	25.71	76.71	2.49	24.83	2.06	30.13
February 2014	1st FN	17.47	54.40	6.46	28.65	2.37	32.28
	2nd FN	19.08	68.78	9.08	36.71	0.75	14.80
Mean		12.47	44.44	3.56	21.50	1.41	22.87
S.Em (±)		9.72	26.06	3.42	10.35	0.77	8.14

**FN: Fortnight,* *defoliator encountered was *Helicoverpa armigera* Hubn

Conclusion

The infestation of *Scirtothrips dorsalis* Hood and *Polyphagotarsonemus latus* Banks is associated with the devastating leaf curl complex of chilli which is one of the prime limiting factor causing extensive yield loss especially in southern districts of West Bengal. It is therefore advisable to adopt proper prophylactic measures or detect the early infestation by the pest and initiate proper management because the disease spreads quickly arresting the growth and development of the crop ultimately leading to poor yield.

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