https://doi.org/10.29321/MAJ.10.A03681

Studies on the Seasonal Incidence of Insect Population in Lucerne and the Effect of Insecticides

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Valuable contributions have been made to investigate the effect of temperature and humidity on the development, growth, metabolism, longevity, fecundity, distribution *etc.* of various insects particularly storage pests, predators and parasites, and relatively fewer crop pests (Cook, 1927; Pruthi and Pradhan, 1945; Pradhan and Vishwanathan, 1959; Narayanan *et al.*, 1962 *etc.*), but very little has been studied to assess the overall population incidence during different seasons, and consequently no estimate of actual losses even on 'guesstimates' are available.

Simultaneously, on the other hand, it becomes imperative to device suitable chemical control for the population reduction, since the loss caused by insect pests, in general, is a function of their population incidence. With this view, therefore, a study was undertaken in lucerne (*Medicago sativa* Lin.) which is an important fodder crop throughout Rajasthan, harbouring a large and varied insect population responsible for substantial tonnage besides considerable nuisance to feeding animals.

For studies on frequency of pest infestation in case of maize borers and lucerne weevil, *vide* Kushwaha and Jain (1963 *a,b*).

I. CORRELATION OF POPULATION WITH TEMPERATURE AND HUMIDITY BASED ON MAJOR INSECT GROUPS

The population of some major insect orders, *viz.*, Orthoptera, Coleoptera, Hemiptera, Diptera, and Hymenoptera in lucerne crop (*vide* Appendix) during the year 1964-65, as correlated with the fluctuating ecological factors mainly the temperature and humidity, was undertaken. Random samples were collected fortnightly, from 10 × 10 metres area from three fields located distantly on the Agronomy Farm of the College. Insects were collected by 40 sweepings of nets, carefully sorted out into respective orders and month-wise population calculated for the months of October, 1964 to July, 1965, except for January when the sampling could not be done under unavoidable circumstances (Text-fig. 1 *b*). The data were subjected to multiple correlation in order to find out whether any of these factors exert cumulative or individual effect significantly on population (*vide* Table 1).

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Received on 20-7-66.

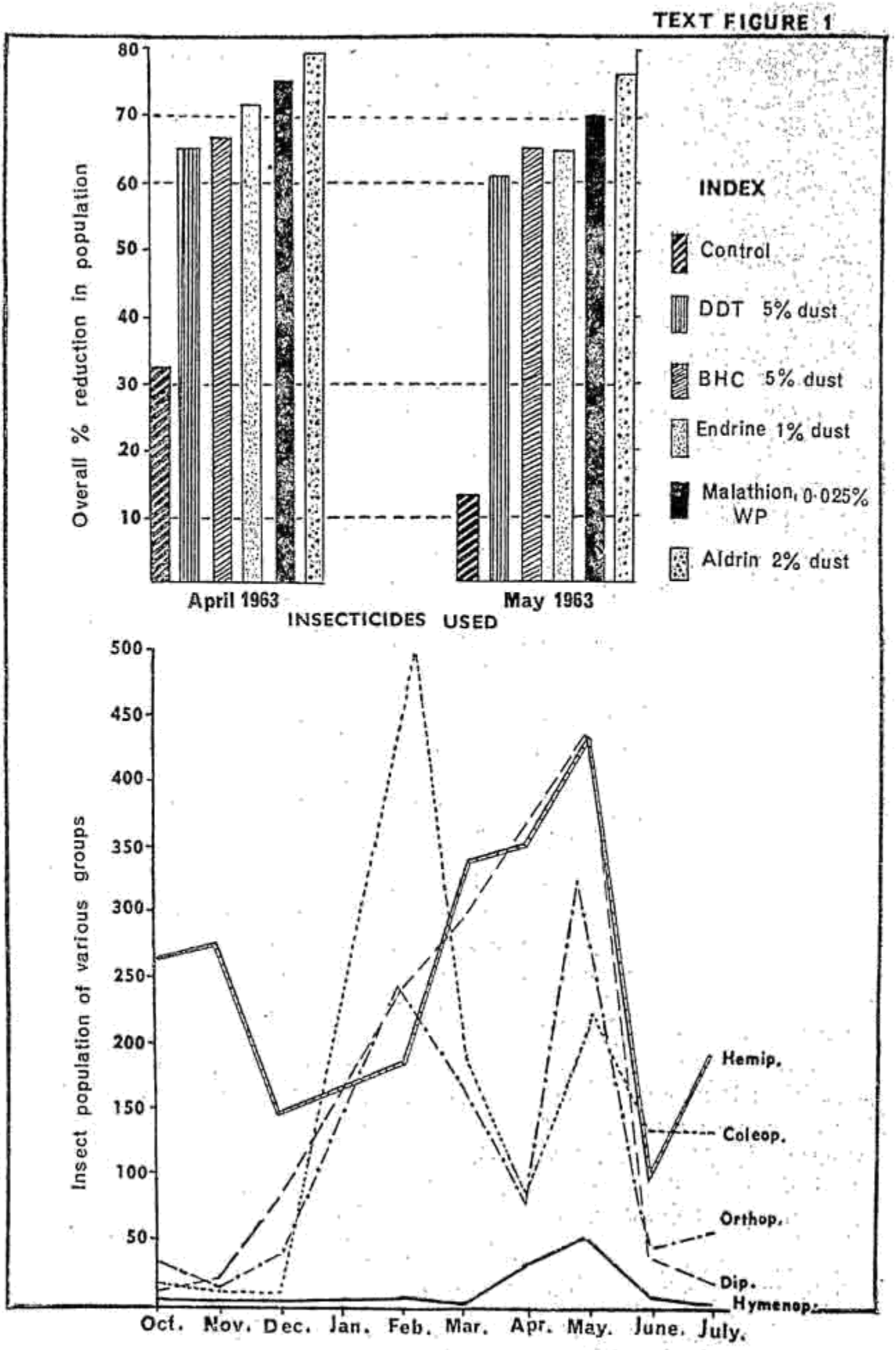

FIG. I. Overall insect population in lucerne.

[a] Histogram showing percentage reduction in different insecticides.

[b] Graph showing seasonal variation of different Orders.

TABLE 1. *Insect Population of some important insect orders in lucerne, as correlated to temperature and humidity (October 1964—July 1965)*

Months	Mean monthly tem. (°C)	Mean monthly humidity(%)	Population counts of various insect orders				
			Ortho-ptera	Coleo-ptera	Diptera	Hemi-ptera	Hymeno-ptera
October	25.7	48.0	32	15	11	266	4
November	19 2	42.0	10	8	20	277	2
December	15.7	45.0	34	8	83	149	3
February	18.7	45.0	241	496	240	183	6
March	22.6	40.0	163	197	298	337	3
April	27.3	39.0	71	89	311	351	32
May	30.7	28.0	319	225	431	429	54
June	31.4	46.0	45	137	31	93	9
July	27.9	70 0	54	136	11	188	1
Correlation co-efficient (r) for temperature			0 028	0.0003	0 0167*	0 23	0.533
Correlation co-efficient (r) for humidity			-0.94	0 3714	0 829*	0.32	-0.656*
Multiple correlation co-efficient (R) for temperature and humidity			0 519	0.92	0 96*	0.85	-0.808*

*Significant at 5% level.

The analysis of data reveal that the dependent variable *viz.*, population is definitely correlated with both the independent variables *i.e.*, temperature and humidity. However, significant effect was observed only in Dipterans and Hymenopterans. In case of Diptera, both temperature and humidity have significant effect individually as well as in combination, while in Hymenoptera, only humidity has significant effect on the population individully as also in combination with temperature. In the remaining orders no significant effect of either temperature or humidity was observed on population individually or in combination.

II. EFFECT OF INSECTICIDES ON POPULATION OF MAJOR INSECT GROUPS

A set of trials in randomised replicated design was laid out during April and May, 1963, in plots of size 31.0 × 38.5 metres of lucerne field for two subsequent cuttings, on the Agronomy Farm, Rajasthan College of Agriculture, Udaipur. There were six treatments including control replicated three times, and each replicated plot measured 10 × 6 metres. The insecticides used were

TABLE 2. *Effect of insecticidal treatments on insect population (Order-wise) in lucerne during April and May, 1963*

Treatments	Pre- and Post- treatment population on different orders																Overall population		Overall percentage reduction	S. E.	C.D. at 5%
	Orthop.		Dermap.		Hemip.		Thysan.		Lepidop.		Diptera		Hymenop.		Coleop.						
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post			
April, 1963																					
Aldrin 2% dust	4	3	2	—	26	4	6	2	2	1	10	5	1	—	40	3	91	18	80.21		
B.H.C. 5% dust	4	2	1	—	38	6	5	5	4	1	11	4	5	3	37	13	104	34	67.31		
D.D.T. 5% dust	6	3	5	4	29	9	10	1	4	—	8	2	2	2	30	11	94	32	65.95		
Endrin 1% dust	9	5	6	2	29	7	18	5	2	2	7	2	4	1	36	7	111	31	72.07	6.12	15.19
Malathion 0.025% Suspension spray	9	4	8	1	26	6	16	1	1	—	12	6	11	4	38	6	121	28	76.85		
Control	8	10	5	6	31	15	16	12	3	—	9	14	11	6	43	22	128	85	32 54		
May, 1963																					
Aldrin 2% dust	14	10	8	1	66	13	12	3	5	3	28	12	19	—	95	16	247	58	76.51		
B.H.C. 5% dust	21	13	8	3	81	20	10	10	1	—	25	11	12	7	94	23	252	87	65.48		
D D.T. 5% dust	18	7	10	8	75	27	14	8	4	—	14	7	14	—	66	27	215	84	60.93		
Endrin 1% dust	15	5	6	3	94	39	21	10	3	—	18	6	16	3	50	12	223	78	65.02		
Malathion 0.025% Suspension spray	17	8	7	2	93	23	9	2	4	1	20	9	31	10	73	17	244	72	70.50		
Control	15	16	6	9	81	73	12	15	4	6	33	24	33	9	87	83	273	236	13.28	14.15	34.78

Aldrin, BHC, DDT, Endrin and Malathion. All the formulations used were dusts except Malathion which was wettable powder (WP). Each treatment was applied twice at an interval of a fortnight by which time the pest population again returned to normal.

In order to estimate the population of various groups, a wooden frame 1′×1′×2′ was used for random sampling. All the plants within 1 sq. ft. area were cut at ground level, collected carefully in muslin bag and Order-wise counts of insects made in the laboratory. Both, pre- and post-treatment (at weekly interval) samples and counts were taken and the data statistically analysed (Table 2)

The data revealed that all the insecticides were significantly superior to control in reducing the overall population of insects in both the trials (Text-fig. 1 *a*). However, amongst the treatments Aldrin was significantly superior to DDT only in the first trial. In order of efficacy, the insecticides may be arranged as Aldrin, Malathion, Endrin, BHC and DDT. Further, in view of high population incidence and proportionate reduction, particularly in case of Coeloptera and Hemiptera, it may be interpreted that Aldrin and Malathion were significantly more effective against Coleopterans and the Hemipterans respectively.

While considering the Order-wise population (*vide* Table 2), it may be observed that Coleopterans and Hemipterans dominate, followed by the Dipterans and Orthopterans.

Acknowledgements : We record our grateful thanks to the Indian Council of Agricultural Research for financing the work under the research Scheme "Investigation on forage insects". Our sincere thanks are also due to the Director, Zoological Survey of India, Calcutta and Commonwealth Institute of Entomology, London, for identification of the specimens; Shri S. C. Bhardwaj, Instructor for assistance and the Dean, Rajasthan College of Agriculture for facilities.

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APPENDIX

List of Identified Insect Species Collected in Lucerne Crop while Sampling During 1964—65

S No.	Species arranged alphabetically under respective Order, Family and Subfamily	Status and period of activity
	ORDER COLEOPTERA	
	Chrysomelidae	
1.	*Aulacophora foveicollis* Lucas	Major; from beginning of March to middle of August.
	Coccinellidae : Coccinellinae	
2.	*Adonia variegata* (Goeze)	Predator; from end of November to middle of August.
3.	*Coccinella septempunctata* Linn.	Predator; April - July and October - January
4.	*Itleis cincta* Fabr.	Predator; October-April
5.	*Menochilus sexmaculatus* Fabr.	Predator; throughout the year except May and June.
6.	*Thea 16-notata* Mukerjee	Predator; November-March.