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Effect of Tepa, Metepa and Hempa on the Bionomics of *Dacus cucurbitae* Coq. Serajuddin KHAN (Department of Zoology, Muslim University, Aligarh, India) Received August 4, 1975. *Botyu-Kagaku* 41, 20, 1976.

5. ウリミバエ *Dacus cucurbitae* Coq. の生態におよぼす tepa, metepa および hempa の影響

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ウリミバエ *Dacus cucurbitae* の雌雄を tepa, metepa, hempa で処理し，処理された個体と無処理，処理された個体間で交配し，その産卵数，孵化率，不妊率，産卵期間，成虫の生存期間を調べた．得られた結果は次のようである．1) 雄は雌より不妊剤に対する感受性が大きい．2) いずれの不妊剤も雌の産卵数を減少させたが，特に hempa はその作用が強く，0.5%で産卵が全くなかった．3) 産卵期間は不妊剤処理で短かくなった．4) 処理された成虫の寿命は雌では短かく，雄では長くなる傾向があり，これは不妊剤を実用化する場合には有利な条件になるだろう．

Benschoter and Paniagua[1] showed that the longevity of *Anastrepha ludens* was not effected when it was fed on a diet containing 2.0% biotin and similar results were obtained by Haniotakis and Galachtiou[2] who exposed *Dacus oleae* to residual films containing 0.620 to 1.240 ml/m^2 of metepa for 0.5, 1.3 or 5.0 minutes. However, these findings relate to fruit flies other than *D. cucurbitae* and the author is not aware of any such studies concerning *D. cucurbitae*. It was therefore, considered desirable to find out if tepa, metepa or hempa could effect the bionomics of this species.

Method and Materials

Freshly emerged flies were obtained from normal laboratory colonies and were divided in two groups, one of which was allowed to feed on sugar treated with different concentrations of tepa, metepa or hempa for three days while the other was maintained on normal fly food. After 72 hours, the flies living on the treated food were also provided normal diet. Virginity of the females was self insured as copulation invariably starts in this species after about 15 days of emergence. Sexing was done after 7 days and single pair reciprocal crosses were established between treated and untreated males and females as also between treated males and treated females by placing them in small cages, 3 × 3″ in size and constructed of wire frames covered over by mosquito netting. Five pairs of each type were studied to find out the rate of oviposition, fertility of eggs and the longevity of the adults.

Results

The results obtained are presented in tables 1 to 3. All the chemicals tested, reduced the fecundity of the females but such reduction was more pronounced when the flies were treated with different concentrations of hempa. The sterility effects of the chemosterilants on males and females were different but the females were less susceptible to the chemosterilants than the males. This substantiates the earlier observations of Keiser *et al.*[3] who found that the females of *D. dorsalis*, *D. cucurbitae* and *C. capitata* were less susceptible to sterility effects of apholate, tepa, metepa and tretamine. Males treated with 0.0078, 0.0156, 0.03125 and 0.0625% tepa and mated with untreated females induced 25.05, 45.4, 71.9 and 81.48% net sterility as compared to 18.51, 25.46, 65.88 and 72.54% net sterility obtained when treated females were confined with the normal males. A similar pattern was observed in the case of metepa, where a net sterility of

Table 1. Biological effects of tepa.

Concentration (%)	Cross type	Eggs				Adults					
		Number of eggs per female		(%) Sterility	(%) Net Sterility	Duration in days			Longevity in days		
		Oviposited	Hatched (%)			Preoviposition period	Oviposition period	Post oviposition period	Males	Females	
										Oviposited	Not oviposited
0.0078	T♂×N♀	356.25	57.76	42.24	25.05	16.0	78.5	4.25	64.8	98.75	22.0
	N♂×T♀	148.25	63.41	36.59	18.51	18.0	53.5	7.75	65.6	79.25	19.0
	T♂×T♀	202.5	50.37	49.63	35.27	23.5	59.75	14.0	99.8	97.25	137.0
0.0156	T♂×N♀	199.6	42.49	57.51	45.41	20.0	47.2	14.4	78.2	81.6	—
	N♂×T♀	233.33	58.0	42.0	25.46	21.66	53.0	1.66	60.0	76.33	22.0
	T♂×T♀	301.0	28.83	71.17	62.84	24.4	53.7	12.0	75.4	89.6	34.9
0.03125	T♂×N♀	143.33	21.86	78.14	71.9	21.33	41.0	18.33	83.0	60.5	24.0
	N♂×T♀	167.0	26.55	73.45	65.88	27.0	50.66	13.0	62.8	92.66	63.5
	T♂×T♀	117.75	13.59	86.41	82.53	20.0	32.0	23.25	42.5	81.25	—
0.0625	T♂×N♀	101.4	14.41	85.59	81.48	28.8	55.2	9.2	63.2	89.4	—
	N♂×T♀	210.66	21.37	78.63	72.54	16.33	65.66	6.0	68.0	88.0	31.5
	T♂×T♀	104.5	1.92	98.08	97.53	28.0	57.0	20.5	29.2	105.5	52.0
Control		248.6	77.82	22.18	—	24.2	80.4	9.4	50.4	114.0	—

N = Normal, T = Treated

Table 2. Biological effects of metepa.

Concentration (%)	Cross type	Eggs				Adults					
		Number of eggs per female		(%) Sterility	(%) Net sterility	Duration in days			Longevity in days		
		Oviposited	Hatched (%)			Preoviposition period	Oviposition period	Post oviposition period	Males	Females	
										Oviposited	Not oviposited
0.0078	T♂×N♀	215.5	66.46	33.54	14.59	23.5	62.5	9.0	94.4	95.0	29.0
	N♂×T♀	460.0	75.66	24.34	2.77	17.0	63.0	2.0	69.2	82.0	51.25
	T♂×T♀	109.4	63.44	36.56	18.48	27.0	73.2	18.0	53.0	118.1	—
0.0156	T♂×N♀	175.66	58.64	41.36	24.64	32.33	32.25	23.0	53.0	98.33	47.5
	N♂×T♀	128.66	65.29	34.71	16.1	25.66	57.33	30.0	63.6	113.0	28.5
	T♂×T♀	305.2	52.23	47.77	32.88	17.8	46.4	4.0	75.2	69.0	—
0.03125	T♂×N♀	180.75	38.18	61.82	40.96	23.5	74.5	6.0	56.0	104.0	20.0
	N♂+T♀	170.75	51.4	48.6	33.95	23.5	51.75	4.25	71.2	79.5	—
	T♂×T♀	155.0	28.26	71.74	63.68	23.8	52.2	13.0	54.4	89.0	—
0.0625	T♂×N♀	156.66	28.3	71.7	63.63	27.66	40.66	4.33	65.2	72.66	33.0
	N♂×T♀	208.75	29.0	71.0	62.73	24.25	77.25	15.25	102.8	116.75	20.0
	T♂×T♀	232.0	20.0	80.0	74.3	22.6	90.0	10.6	77.0	123.2	—
Control		248.6	77.82	22.18	—	24.0	80.4	9.4	50.4	114.0	—

N = Normal, T = Treated

Table 3. Biological effects of hempa.

Concentration (%)	Cross type	Eggs				Adults					
		Number of eggs per females		(%) Sterility	(%) Net sterility	Duration in days			Longevity in days		
		Oviposited	Hatched (%)			Preoviposition period	Oviposition period	Post oviposition period	Males	Females	
										Oviposited	Not oviposited
0.0625	T♂×N♀	99.5	60.31	39.69	22.5	21.0	43.5	38.5	86.2	103.0	64.0
	N♂×T♀	109.0	70.33	29.67	9.62	30.0	57.33	25.0	82.8	112.33	31.0
	T♂×T♀	101.5	49.76	50.24	36.06	22.25	37.75	36.5	85.4	96.5	27.0
0.125	T♂×N♀	24.0	33.33	66.67	57.14	22.0	29.0	89.0	37.6	140.0	27.75
	N♂×T♀	214.0	36.67	63.33	52.87	20.75	57.5	7.5	76.8	85.75	72.0
	T♂×T♀	60.0	32.5	67.5	58.23	26.5	60.5	28.5	65.0	115.5	34.66
0.25	T♂×N♀	79.0	27.2	72.8	65.04	20.2	40.2	37.6	75.4	122.5	38.0
	N♂×T♀	141.0	30.49	69.51	60.81	23.33	36.33	8.0	60.75	64.33	27.0
	T♂×T♀	45.8	32.29	76.71	70.07	29.2	22.6	30.8	50.6	82.6	—
0.5	T♂×N♀	63.2	0.3	99.7	99.61	27.2	19.0	4.0	35.2	50.2	—
	N♂×T♀	54.5	0.46	99.54	99.4	24.0	37.75	28.25	60.8	90.0	23.0
	T♂×T♀	**	—	—	—	—	—	—	—	—	—
Control		248.6	77.82	22.18	—	24.2	80.4	9.4	50.4	114.0	—

** Flies did not oviposit. N = Normal, T = Treated

99.61, 65.04, 57.14 and 22.5% was obtained when males treated with 0.5, 0.25, 0.125 and 0.0625% hempa were allowed to mate with untreated females as against 99.4, 60.81, 52.87 and 9.62% net sterility when only the females were treated with 0.5, 0.25, 0.125 and 0.0625% hempa.

The different concentrations of tepa and metepa tested did not inhibit oviposition but no eggs could be obtained from adults treated with 0.5% hempa.

Treatment of both sexes with tepa, metepa or hempa enhanced the degree of sterility. Mal-es treated with 0.0625% tepa or metepa and mated with normal females gave a net sterility of 81.48 and 63.63% respectively as compared to 97.53 and 74.3% net sterility obtained when both the sexes were treated. Similarly the net sterility induced was 36.06% when both the sexes were treated with 0.0625% hempa as against 22.5% net sterility when only the males were treated.

The above findings are in agreement with those of Ansari[4] who reported that the degree of sterility increased when both sexes of *Musca domestica nebulo* were treated with apholate, tepa, metepa or hemel. Taking net sterility as the criterion, tepa was more effective than metepa in producing sterility among the adults of *D. cucurbitae* regardless of the sex treated. Hempa was the least effective of the three chemicals tested.

An attempt was also made to find out if the chemosterilants had any effect on the oviposition or the longevity of the flies. The preoviposition or postoviposition periods of the treated flies remained almost unaffected but the oviposition period was reduced when the flies were treated with chemosterilants and such reduction was more pronounced among flies treated with hempa. An oviposition period of 80.4 days of the untreated flies was reduced to 59.75 and 73.2 days when both the sexes were treated with 0.0078% tepa and metepa respectively. Similarly when the flies were treated with 0.0625% hempa the oviposition period was reduced to 37.75 days.

The effects of chemosterilants on the longevity of males and females were variable. In general the longevity of the treated males was increased while that of the treated females decreased. These observations are not supported by the earlier findings of Haniotakis and Galachtiou (1973) who reported that metepa did not effect the longevity of adult *D. oleae*. The increased longevity of the males of *D. cucurbitae* may, however, prove advantageous in sterile release technique as such males would affect the reproductive potential of the normal population in subsequent generations.

Summary

The effects of chemosterilants on the bionomics of *D. cucurbitae* were studied by establishing reciprocal crosses between treated and untreated adults in small cages, 3 × 3″ in size. Males were found to be more susceptible to the chemosterilants than the females. Hempa reduced the fecundity of the females and no eggs were obtained from adults treated with 0.5% hempa. The degree of sterility enhanced when both sexes were treated with a chemosterilant.

The oviposition period of the females treated with tepa, metepa or hempa was reduced and such reduction was more pronounced among the flies treated with hempa. The effect of chemosterilants on the longevity of males and females were variable, while the longevity of the treated males increased that of the treated females was shortened ; a fact which may be advantageously used in planning future control programmes.

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