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EFFECT OF FOOD, GROWTH AND BODY LIPID CONTENTS ON THE SUSCEPTIBILITY OF *TRIBOLIUM CASTANEUM* HERBST TO TOXICITY OF INSECTICIDES

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That susceptibility of insects to insecticide toxicity is substantially influenced by variations in their food has been reported by various workers such as Rattan Lal and Nayak (1963). Devaraj Urs and Mukerjee (1966). Rattan Lal and Singh (1966), Devaraj Urs and Mukerjee (1967), Rattan Lal and Attri (1967), Teotia and Gupta (1970), Murthy and Sreevastava (1971) and Bhaskaran and Mukerjee (1971). The tolerance of insects to toxicity of insecticides associated with food of the insects can be expected to be imparted by the vigour of the insects (vigour tolerance). The present paper gives results of studies conducted on the effect of various natural foods on the growth, size and lipid contents of *Tribolium castaneum* on the one hand and their susceptibility to endrin and parathion on the other.

Materials and Methods

Wheat, wheat + 5% yeast, coconut oil cake, groundnut oil cake and gingelly oil cake were the different foods used. These were used in the form of finely ground powders. Growth of *T. castaneum* in the different foods was assessed in terms of growth index (Srivastava. 1959) for which individual rearings were made on the different foods. For the toxicity tests, bulk rearings of the insect were done on the different foods utilising the eggs collected from the same culture. Toxicity of endrin and parathion to adults of T. *castaneum* reared on different foods was assessed in terms of ld-p relations. The insecticides were applied as emulsions under Potter's tower for the ld-p evaluations. The emulsions were prepared from technical material using benzene as solvent and triton X-100 as emulsifier; concentrations of these in the emulsions were maintained at 5 and 0.625 per cent respectively.

The lipid contents of the adults reared on the different food media were estimated following Otr (1964).

Results and Discussion

Table 1 gives the dosage- mortality regressions between the two insecticides and adults of *T. castaneum* and the calculated LD 50 values. It may be seen that based on LD 50 values the insects reared on gingelly oil cake were the most highly susceptible to parathion, followed by those reared on ground nut oil cake, coconut oil cake, wheat + 5% yeast and wheat. In the case of endrin, the insects reared on

Table 1

Toxicity of Endriu and Parathion to adults of *Tribolium castaneum* herbst reared in different food media

Insecticide	Food	Heterogeneity	Regression equation	L. D. 50 Values	Fiducial limit
Parathion	Wheat	X^2 (2) = 2.7581	Y = 3.855X + 0.187389	0.0018	0.001533 0.002047
	Wheat + 5% yeast	X- (2) = 4.35979	Y = 7.5283X — 4.27263	0.00170	0.001588 0.001830
	Coconut oil cake	X^2 (2) = 0.061999	Y = 3.4074X + 1.0060	0.00149	0.001176 0.001879
	Groundnut oil cake	X^2 (2) = 1.24956	Y = 5.28435X — 1.17755	000148	0.001352 0.001611
	Gingelly oil cake	X^2 (2) = 0.014154	Y = 9.7198X — 2.5736	0.00134	0.001207 0.001488
Endrin	Wheat	X (3) = 1.88462	Y = 2.3532X + 0.7269	0.0655	0.05398 0.07936
	Wheat + 5% yeast	X^2 (3) = 8.124278*	Y = 1.33693X + 2.62792	0.0594	0.08279 1.621
	Coconut oil cake	X^2 (3) = 0.659	Y = 1.0484X + 3.0298	0.0757	0.05208 0.01011
	Groundnut oil cake	X^2 (3) = 3.89939	Y = 1.2311X + 1.2367	0.0700	0.06319 0.07766
	Gingelly oil cake	X^2 (3) = 9.89162	Y.= 1.7950X + 1.9870	0.0645	0.02115 0.01790

* Significant at 5% level. In the rest of the cases data were found to be homogenous at P = 0.05
X = *Los* dose x 10^4 Y = Probit kill

Table 2

Susceptibility of *T. castaneum* adults to toxicity of endrin and parathion in relation to food, growth, weight and lipid contents

Insecticides	Food	L. D. 50 Value	Growth Index	Weight of 100 insects	Fat contents (%)
Parathion	Gingelly oil cake	0.00134	1.39	165 mg	14.75
	Groundnut oil cake	0.00148	2 30	195 ,,	14.16
	Coconut oil cake	0.00149	1.19	150 ,,	
	Wheat + 5% Yeast	0 0017	2.69	198 ,,	19.00
	Wheat	0 0018	1.50	185 ,,	24.12
Endrin	Wheat + 5% Yeast	0.0594	2.69	198 ,,	19.00
	Gingelly oil cake	0.0645	1.39	165 ,,	14.75
	Wheat	0.0655	1.50	185 ,,	24.12
	Groundnut oil cake	0.0700	2.30	195 ,,	14.16
	Cocount oil cake	0.0757	1.19	150 ,,	

wheat-fyeast were the most highly susceptible followed by those reared on gingelly oil cake, wheat, groundnut oil cake and cocount oil cake It is seen thus, that there is no uniformity in the order of relative susceptibility of the insects reared on different food materials to toxicity of the two insecticides.

Table 2 gives the data on growth index, weight of adults and fat contents of T. *castaneum* reared on the different food media in relation to the LD 50 values of parathion and endrin. It is observed that the growth index of the insect varied considerably when reared on the different food materials. Thus wheat + 5% yeast gave the highest growth index (2.60) closely followed by groundnut oil cake (2.30). Wheat and gingelly oil cake gave much lower growth indices (1.5 & 1.39 respectively) and coconut oil cake gave the least growth index (1.19). The weights of insects reared on the different foods also showed similar relationship as those of growth iadices. As regards lipid contents, however, insects reared on wheat had the highest fat contents of 24.12 percent followed by those reared on wheat-fyeast (19 per cent), gingelly oil cake (14.75 per cent) and groundnut oil cake (14.16 per cent). In the case of both parathion and endrin there was no correlation between the LD 50 values on the one hand and growth indices and weights of insects on the other. In the case of parathion there is a general correlation between LD 50 and fat

contents of the insects reared on different food materials; thus the insects with fat contents of 24.12 per cent were more resistant to parathion than the other insects with lower fat contents. This observation is in agreement with those of Mer and Furmansha (1953), Mc Govern (1949), Fisk (1958) and Bridges and Cox (1959). Such a correlation was, however, lacking in the case of endrin.

In general, it appears that the vigour factors such as high growth index and increased weight of insects contributed by the food materials do not have any influence on the susceptibility of *T. castaneum* adults to parathion and endrin. It is probable that the factors contributing to vigour tolerance of this insect to toxicity of insecticides may be other than a vigorous growth and a heavy built.

Summary

The growth index and weight of *Tribolium castaneum* were the highest when reared on wheat + 5% yeast followed in the descending order by those of insects reared on groundnut oil cake. gingelly oil cake, wheat and coconut oil cake. There was no correlation between the LD 50 values of parathion and endrin on the adults T *castaneum* on the one hand and the growth index and weight of the insects on (he other. There was positive correlation between the LD 50 values of parathion and the body lipid contents of *T.* castaneum while there was no such correlations in the case of endrin.

സംഗ്രഹം

ടൈബോളിയം കാസ്റ്റേനിയം എന്ന കലവറകീടത്തെ വിവിധ തരത്തിലുള്ള ഭക്ഷ്യ പദാർത്ഥങ്ങൾ കൊടുത്തു് വളർത്തിയതിൽ ഗോതമ്പുമാവും 5 ശതമാനം ഈസ്റ്റും ചേർത്തുള്ള ഭക്ഷണം കീടങ്ങൾക്കു് ഏറ്റവും നല്ല വളർച്ചകൊടുത്തതായി കാണപ്പെട്ടു. ഇതിൽനിന്നും പടിപടിയായി കുറഞ്ഞവളർച്ചകൊടുത്ത ഭക്ഷ്യപദാർത്ഥങ്ങൾ നിലക്കടലപ്പിണ്ണാക്കു്, എള്ളംപിണ്ണാക്കു്, ഗോതമ്പുമാവു്, തേങ്ങാപ്പിണ്ണാക്കു് എന്നിവയാണു്. പാരത്തയോൺ, എൻഡ്രിൻ എന്ന കീടനാശിനികളുടെ ഈ കീടത്തിന്മേലുള്ള LD 50 യും വിവിധ ഭക്ഷണങ്ങൾ കൊണ്ടു് കീടത്തിനുള്ള വളർച്ചയുമായി സഹസംബന്ധം ഇല്ല എന്നതെളിഞ്ഞു. പാരാത്തയോൺന്റെ **LD** 50 യും കീടദേഹത്തിലെ കൊഴുപ്പിന്റെതോതും തമ്മിൽ ധനാത്മക സഹസംബന്ധം ഉള്ളതായികണ്ടു. എന്നാൽ എൻഡ്രിന്റെ കാര്യത്തിൽ ഇങ്ങനെ ഒരു സഹസംബന്ധം കാണപ്പെട്ടില്ല.

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