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EFFECT OF DIFFERENT DIETS ON THE CONCENTRATION OF INORGANIC CATIONS CONTENT IN THE HAEMOLYMPH OF *Lucilia sericata* (Meigen) and *Chrysomya albiceps* (Wied.) PREPUPAE (DIPTERA-CALLIPHORIDAE)

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SUMMARY

The effect of different nutritional diets, bovine (b.) meat, bovine (b.) liver, chicken and fish on the concentration of inorganic cations, Na^+, K^+, Ca^+, Mg^{++}, and Fe^{++} in the haemolymph of the prepupae of both flies *Lucilia sericata* and *Chrysomya albiceps* were studied. The cation Na+ increased in haemolymph of prepupae of *L. sericata* when its larvae were fed on all four diets especially in case of bovine liver. However K+ increased in haemolymph of prepupae when larvae were fed on bovine meat. Ca^{++} was higher than Mg^{++} and Fe^{++} in case of larvae fed bovine liver. Similar results were obtained in case of *C. albiceps*. The cations Na+ and K+ increased in concentration after feeding on bovine liver diet. Also Na^+ was higher in larvae fed on other diets. In all cases K+ was always lower than Na^+. The cations Mg^{++} and Fe^{++} were the least. Ca^{++} was higher in Larvae fed on bovine meat and bovine liver than in case of larvae fed on fish and chicken.

INTRODUCTION

Various mineral salts are nutritionally and physiologically essential for insects. There is a general agreement that the ash of insects contains, Na+, K^+, Ca^{++}, Mg^+, Zn^{++}, Al^{++}, Si^{++}, Pb^{++}, S^{++}, Mn^{++}, $Fe^{++}$and Fe^{+++}. Some of these are found in trace quantities. Na^+, K^+, Ca^{++} and $Mg^{++}$are always present and act to maintain the ion balance necessary for the control of permeability of tissue membranes, (Pattan, 1963 and Chapman, 1988).

This study was undertaken to investigate the effect of feeding different diets (bovine meat, bovine liver, chicken and fish) on the concentration of cations, Na+, K+, Ca+, Mg++, and Fe++ in the haemolymph of the prepupae of both flies *Lucilia sericata* and *Chrysomya albiceps*.

MATERIAL AND METHODS

Laboratory colony and experiments of both *Lucilia sericata* and *Chrysomya albiceps* was carried out according to Adham *et al.* (2001). The ionic contents (Na+, K+, Ca+, Mg++ and Fe++) in the prepupae haemolymph of both flies were estimated according to the method of Abdel Meguid and El - Mashak (1985), using "Atomic Absorption Spectrophotometer, Pyeunicam sp 1900". Three replicates were made for each experiment.

RESULTS

L. sericata

Table (1) showed that the monovalent cation Na+ was high in haemolymph of prepupae of *L. sericata* when its larvae were fed on all four diets (b. meat, b. liver, chicken and fish) especially in case of b. liver (0.295mg/0.1ml) K^+showed an increase in concentration in haemolymph of prepupae when larvae were fed on b meat diet (0.102 mg/0.1ml) than in those fed on chicken, b. liver and fish. K+ was much lower than Na+ in all cases. The divalent ions Ca^{++}, Mg^{++} and Fe^{++} showed an increase in concentration after feeding b. liver. Ca^{++} (0.141 mg/0.1ml) was higher than Mg++ (0.045 mg/0.1ml) and Fe++ (0.045 mg/0.1ml) in case of larvae fed b. liver. Statistical analysis of the concentration of Na+, K+, Mg++ and Fe++ did not show significant differences between the types of food diets ($P>0.05$). The concentration of Ca^{++} after a liver diet showed highly significant value ($P<0.01$) than in case of b. meat, chicken and fish diets.

C. albiceps

Table (2) showed that the concentration of monovalent ions Na^+ and K^+ were significantly increased (0.501 mg/0.1ml and 0.107 mg/0.1ml) after feeding on b. liver diet respectively. Also Na^+ was higher in larvae fed on other diets. In all cases $K^+$was always lower than Na^+. The divalent Mg^{++} and Fe^{++} were the least. $Ca^{++}$was higher

Table (1): Concentration of inorganic cations in the haemolymph of *Lucilia sericata prepupae*.

Diets	Cation (mg/0.1ml)				
	Sodium (Mean±SE)	Potassium (Mean±SE)	Calcium (Mean±SE)	Magnesium (Mean±SE)	Iron (Mean±SE)
Bovine meat	0.211±0.015	0.102±0.057	0.058±0.019[b]	0.025±0.008	0.03±0.002
Bovine liver	0.295±0.09	0.066±0.02	0.141±0.021[a]	0.045±0.01	0.045±0.007
Chicken	0.179±0.036	0.078±0.037	0.045±0.008[b]	0.026±0.003	0.027±0.006
Fish	0.196±0.02	0.051±0.006	0.052±0.007[b]	0.026±0.002	0.024±0.002
F-value	0.91	0.34	8.83**	1.76	3.29
LSD	----	----	----	----	----

The results are mean (±SE) of three replicate experiments.
Same letter do nnot differ significantly.
LSD : Least significant difference
** P<0.01

Table (2): Concentration of inorganic cations in the haemolymph of *Chrysomya albiceps* prepupae

Diets	Cation (mg/0.1ml)				
	Sodium (Mean±SE)	Potassium (Mean±SE)	Calcium (Mean±SE)	Magnesium (Mean±SE)	Iron (Mean±SE)
Bovine meat	0.408±0.007	0.068±0.002	0.147±0.039	0.064±0.002	0.06±0.008
Bovine liver	0.501±0.023	0.107±0.006	0.137±0.013	0.099±0.002	0.066±0.005
Chicken	0.265±0.009	0.056±0.02	0.102±0.035	0.06±0.002	0.042±0.013
Fish	0.432±0.045	0.077±0.001	0.119±0.021	0.072±0.009	0.045±0.003
F-value	3.69	2.94	0.047	2.46	2.16
LSD	----	----	----	----	----

The results are mean (±SE) of three replicate experiments.
LSD : Least significant difference

in larvae fed on b. meat (0.147 mg/0.1ml) and b. liver (0.137 mg/0.1ml) than in case of larvae fed on fish and chicken. Statistical analysis revealed that there was no significant variation between the concentration of cation ions and type of diets ($P>0.05$).

DISCUSSION

In the majority of insects, haemolymph ionic composition under normal circumstances is regulated principally by modification of the malpighian tubule fluid and by secretion and differential re-absorption in rectum (Stobbart and Shaw, 1974). Although the cation concentration are regulated in insect haemolymph, the content of inorganic bases in the food may cause a departure from normal conditions and insects may deviate in varying degrees (Pattan, 1963).

The basic diet of feeding larval stages of the blowflies *L. sericata* and *C. albice*ps is protein (b. meat, fish, b. liver or poultry source). During the present study the different type of diet used seemed to have an effect on the concentration of the inorganic content in the haemolymph of both larvae. In case of *L. sericata* prepupae whose larvae were fed on b. meat, b. liver, chicken and fish, the monovalent cation $Na^+$was significantly high especially in case of b. liver. Meanwhile K^+ was much lower proportionally to Na+. Similar results were obtained in case of *C. albiceps*. These results indicated that there was an increase in the active transport of metabolites which might affect the behaviour of the inse since neuro-muscular junctions are directly e posed to the haemolymph (Chapman, 1988). might also be suggested that excess of Na^+ cou be sequestered in the tissues of the prepupae, be later mobilized when the adult was able drink (Wall, 1970). The low concentration of K raises the muscle resting potential and changes haemolymph concentration are also known cause the release of neurosecretion from neur haemal organs (Bone, 1945). Results obtained i dicated that the potassium pump continued to o erate for a time after the cessation of larv feeding (prepupal stage) and if there were n equilibration across the midgut wall, the accum lated K^+ could be retained in the alimentary ca nal throughout the prepupal and pupal stag (Haskell *et al.* 1968). However Florkin and Je niaux (1964), suggested that the haemolymp composition of endopterygote insects may b linked with the quiescent behaviour of their la vae, only the sedentary larvae have the specia ized cationic pattern of high K^+ & Mg^{++} ar low Na^+.

The divalent ions Mg^{++} and Fe^{++} were the lea and Ca^{++} was higher in larvae fed on b. liver ar b. meat than in case of *C. albiceps* larvae fed fish and chicken. Also, in case of *L. sericat* Ca^{++} was higher than Mg++ and Fe++ in case larvae fed b. liver. These results were not agreement with those reported by Abdel Megu and El-Gindi (1994) when studying the effect different nutritional diets as meat, fish and b. li

er on the concentration of the inorganic cations, Na^+, K^+, Mgv, Mn^{++}, Pb^+, and Ca^{++} in the haemolymph of the larvae of *Parasarcophaga argyrostoma*. They reported that the cations Na^+ and K+ increased in larvae fed on fish and b. liver. However Mg^{++}, Mn^{++} and Pb^{++} decreased in larvae fed on fish and b. liver, $Ca^{++}$was not found even in traces. They showed that the meat diet increased the concentration of Mg^{++} in haemolymph of larvae than the other two diets, (fish and b. liver), Mg^{++} may partially replace Ca^{++} as a divalent ion in insects. The Mg^{++} ion does not exert the anesthetic effect on insects, as in case of many other invertebrates, indicating an intrinsic difference in the permeability relations of the insect nerve sheaths (Pattan, 1963).

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