Effects of Lead Acetate on Morphology of *Musca domestica* L. (Muscidae: Dipptera)

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Abstract: Lead is significant environmental pollutant which contaminates food, soil, water, and air. Insects too are influenced easily by such pollutants, therefore present study have been designed to study the influence of lead (as lead acetate) on external morphology of *Musca domestic*a.

The different concentrations of lead acetate, i.e., 0.25 mg., 0.5 mg, and 01 mg per ml in diet of *Musca domestica*, were added ad effects were observed after 48 hours.

Results revealed that in addition to abnormalities and malformation the larvae, morphological changes in adults were observed such as elongated and de-shaped wings and elongated and folded legs.

Some other structural abnormalities of larvae and pupal shape were also observed (tell briefly what were those changes.

Thus the Diptera flies present a useful model for the rapid screening of the environmental hazards due to lead contamination, which exerts a definite physiological and morphological effect on these flies.

Keywords: Heavy metal, lead acetate, *M. domestica.*

INTRODUCTION

Environmental differences among geographically distant housefly populations may also cause genetic differentiation, such as selection, and mutation [1]. This species exhibits great diversity both morphologically [2-4] and genetically [4-6] recognized three forms constituents of a geographic cline of *Musca domestica,* based on the ratio of frons to head width of males and on abdominal coloration [7], on the other hand, rejected Saccà's classification and proposed the subspecific taxon *Musca domestica* for all houseflies outside the Ethiopian region. Gene diversity was surveyed in British, African, and North American housefly populations at 17 allozyme and two mitochondrial loci [8].

MATERIALS AND METHODS

The larval media for *Musca domestica*, was prepared in an open pot by mixing wheat bran with milk and sugar in proper ratio in a uniform mixture and put it in in an open place open allowing house flies freely to visit on there pots were kept for 2 to 3 days for egg hatching. Housefly larvae were reared under aseptic conditions on a basic diet with amended procedure described by [15]. Larvae were grown on these diets for 6 days, removed from the medium and allowed to pupate in covered glass bottles at 29-30 °C. Insects were treated as batches of bottles with 3 grams bananas mixed with lead acetate were used as diet, doses of lead acetate were used as, 0.25 mg, 0.5 mg, and 01 mg. A batch of three bottles was kept as control. 10 larvae were released in each bottle for 48 hours. After that mortality of larvae in each bottle was observed. Survivor larvae were kept in separate bottles on lead free bananas upto formation. During that period pupation and adults effects of lead acetate of different concentration was observed on different flies.

The newly emerged 3rd instar larvae were collected in Petri dishes for the treatments. Batches of three bottles were prepared with 3 grams mangoes and bananas pulp mixed with lead acetate in the desired concentration, as, , 0.25 mg, 0.5 mg, and 01 mg and a batch of three bottles was kept as control. Thereafter, 10 larvae were released in each bottle for 48 hours exposure. At the post 48 hours exposure mortality count was made then the surviving larvae were transferred in separate bottles on pure diet and kept till pupation and adult emergence. At each stage the effect of lead acetate of different concentration was recorded.

RESULTS

Normal Musca domestica larvae were 6$\pm$ 3 mm long in typical whitish cream color. They were in cylindrical cigar shape.

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The head contains one pair of dark hooks. The posterior spiracles are slightly raised and the spiracular openings are sinuous slits which are completely surrounded by an oval black border (Figure **1**).

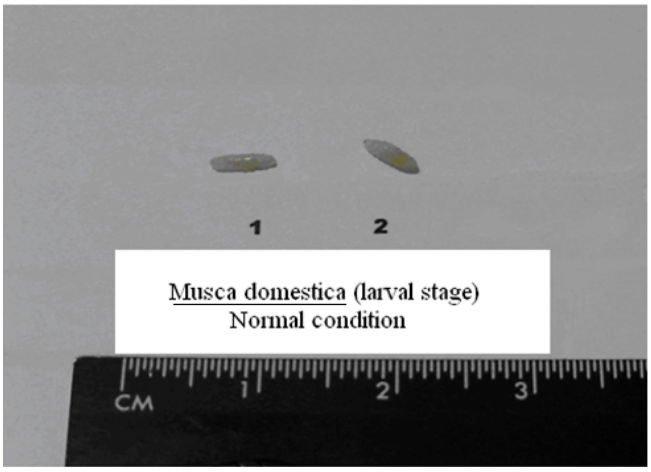


Figure 1: *Musca domestica* (larvalstage) normal in condition, narrow at the mouth end, larvae are 3 to 9 mm. in length.

Musca domestica treated with lead acetate 0.25 mg. at 48 hours. the larvae were thick in at posterior end and tapper from anterior other end, curved at middle portion dull white at anterior end, elongated fusiform in shape, 8 to 9 mm. in length (Figure **2**).

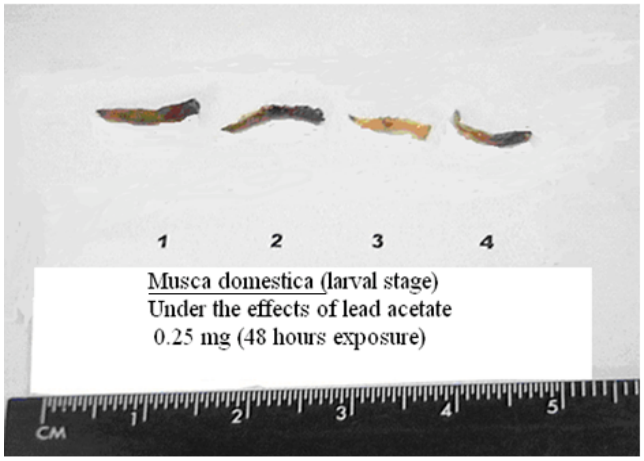


Figure 2: *M. domestica* (larval stage) effected with lead acetate 0.25mg at 48 hours showing abnormalities.

Musca domestica treated with lead acetate 0.5 mg.at 48 hours, elongated body, thick at one end and thin at other end, fusiform in shape, dark brown melanized, were abnormal in shape, curved body and rough surface, 6 to 7 mm. in length, seem morphologically abnormal shape, colour and condition (Figure **3**).

Musca domestica treated with lead acetate 01 mg. at 48 hours,treated larvae were dark brown at the tip of the tapering end, middle portion is yellowish brown, anterior end dark brown about, 6 to 10mm. in length, stuff and curved cylindrical body seemed abnormal condition in shape, size and colour (Figure **4**).

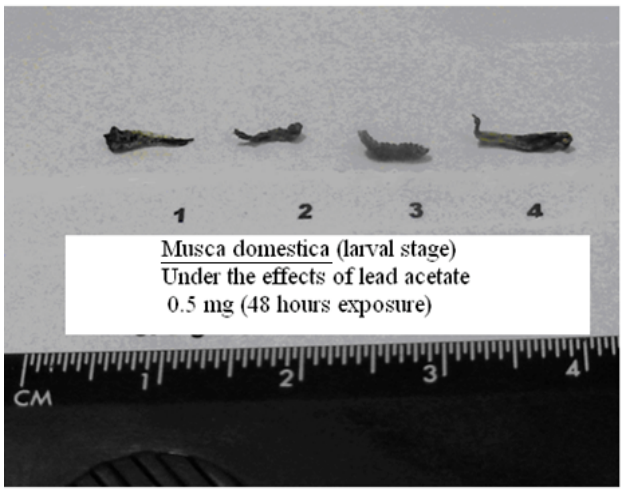


Figure 3: *M. domestica* (larval stage), effected with lead acetate 0.5mg at 48 hours showing abnormalities.

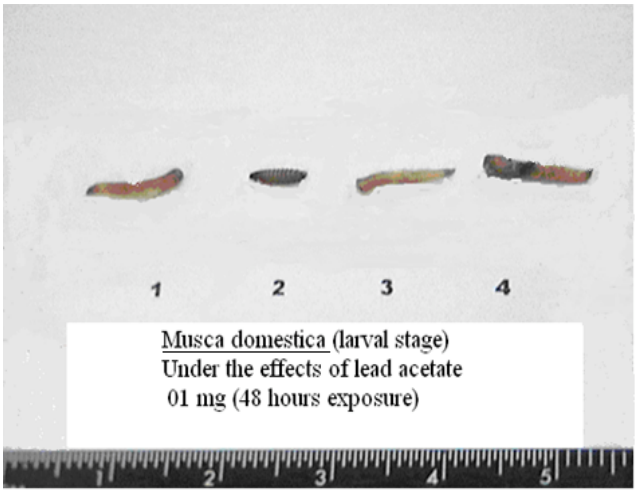


Figure 4: *M. domestica* (larval stage) effected with lead acetate 01mg at 48 hours showing abnormalities.

The pupal of normal *Musca domestica*. was found to be of 8 mm in length, varies in color from dark to yellow, red brown, up to black as per pupa ages. The shape of the pupa was bluntly round at both ends (Figure **5**).

Musca domestica pupae exposed with lead acetate 0.25 mg. for 48 hours,show dark brown melanization, dumble shape and segmented body with 6 to 8 mm in length (Figure **6**).

The *Musca domestica* larvae those were treated with 0.5 mg lead for 48 hours turned into abnormal shaped pupae. These pupae were elongated and

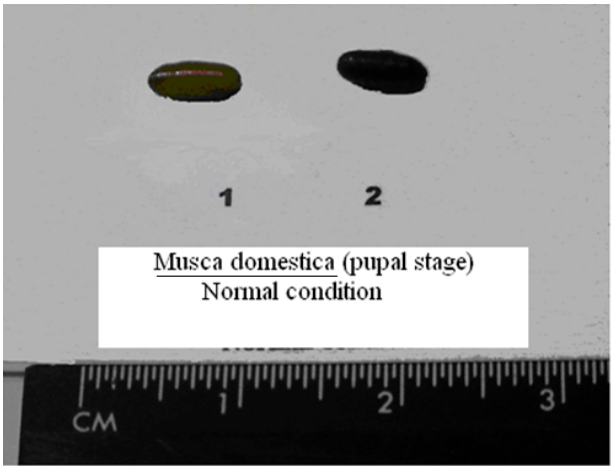


Figure 5: *Musca domestica* (Pupal stage) in normal condition.

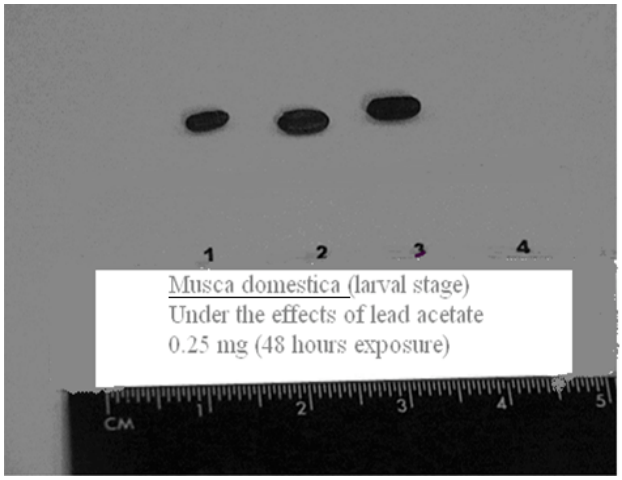


Figure 6: *M. domestica* (Pupal stage) effected with lead acetate 0.25mg at 48 hours showing toxic effect of lead acetate on melanization and structure.

having a pointed projection at the both ends. These pupae were with dark melanization and rough surface melanization dark brown, rough surface, 4 to 5 mm in length, morphologically seemed abnormal structure in shape, size and melanization (Figure **7**).

Affected Pupae, obtained from the treated larvae with the 1.0 mg lead acetate for 48 h, were in dark brown melanization, the were elongated cylindrical. These pupae were around 7 mm in length with spotted marking in cigar shaped appearance. Some time the thin puparium was able to show the abnormal, stunt developed fiy in side the puparium. Full fly emergence was found failed usually, however, if fly was going to emerge it could come out partly.

With the cover of pupal capsule, showing morphologically abnormal structure and melanization (Figure **8**).

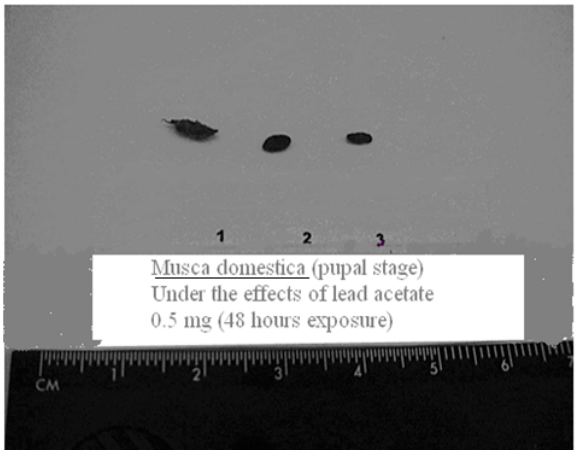


Figure 7: *M. domestica* (Pupal stage) effected with lead acetate 0.5 mg at 48 hours showing hazardous effect on their morphological structure.

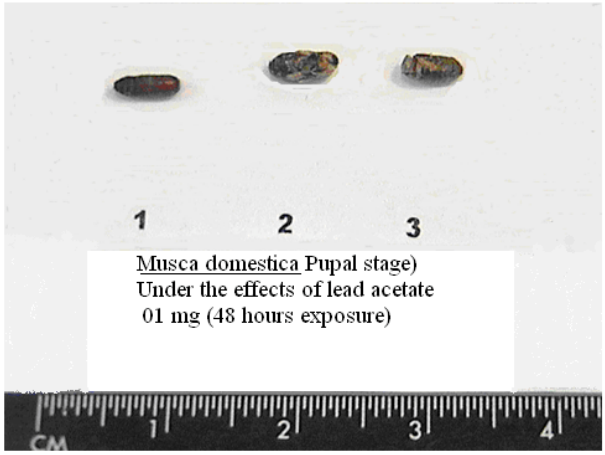


Figure 8: *M. domestica* (Pupal stage) effected with lead acetate 01mg at 48 hours showing abnormalities on their structure and spotted melanization.

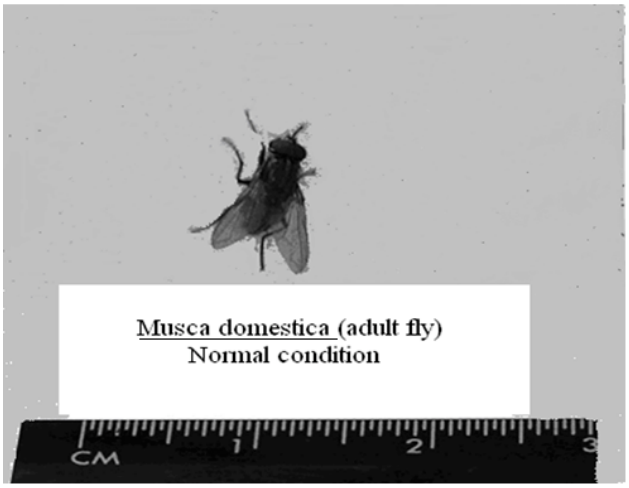


Figure 9: *Musca domestica*, (adult fly) in normal condition.

Musca domestica normal were with brown reddish eyes, sponging mouth part, thorax bears four narrow black strips, the abdomen was with yellow to gray dark

lines and dark marking on the sides, transparant veinlated wings, 7 mm. in length (Figure **9**).

For the for 48 h 0.25 mg lead acetated exposure led the larvae to develop into 7 mm long adults with folded legs and transparent wings with reduced venation. These adults were with three dim longitudinal lines on thorax, their abdomens were dull white and in length,with folded legs, transparent wing with less venation , back of thorax with three dim longitudinal lines, abdomen dull white and 7 mm. in length (Figure **10**).

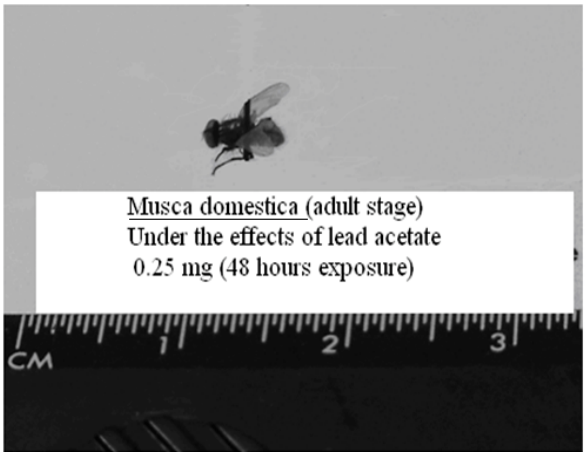


Figure 10: *M. domestica* (Adult stage), effected with lead acetate 0.25mg at 48 hours. Toxic effect of lead showing slightly morphological change in their structure.

Musca domestica Adult emerged from the treated larvae with lead acetate 0.5 mg. at 48 hours exposure. A pair of wide transparent curved wing with venations, legs are folded and thick, reduce dull white yellowish abdomen, thorax is blakish gray with five longitudinal lines, dark red brown eyes, 9 mm. in length.Showing toxic effect on curved wing and legs (Figure **11**).

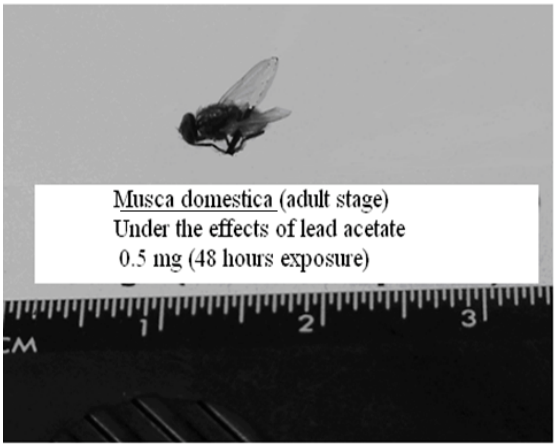


Figure 11: *M. domestica* (Adult stage), effected with lead acetate 0.5mg at 48 hours showing toxic effect of lead on their wings and legs.

Musca domestica adult developed from larvae affected by 01 mg lead acetate up to 48 hours showed a pair of veinleted transparent wings, slightly pointed end posteriorly rounded abdomen with dull white appearence, blakish gray thorax, with 4 longitudinal lines, dark red brown compound eyes, black thick folded legs, 8 mm. body length, morphologically abnormal wing structure (Figure **12**).

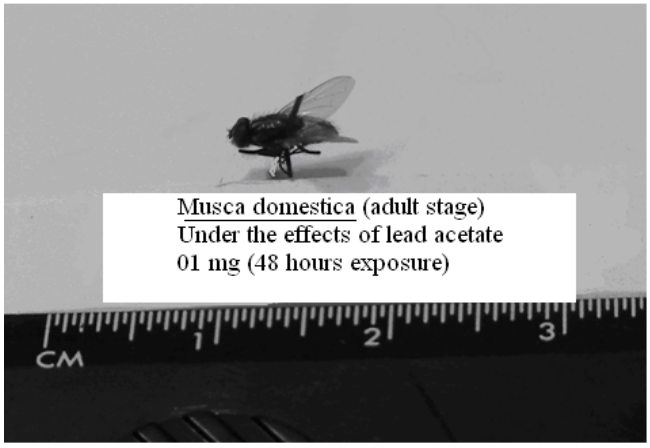


Figure 12. *M. domestica* (Adult stage) effect with lead acetate 01mg at 48 hours showing slightly curve on their wings and folded legs.

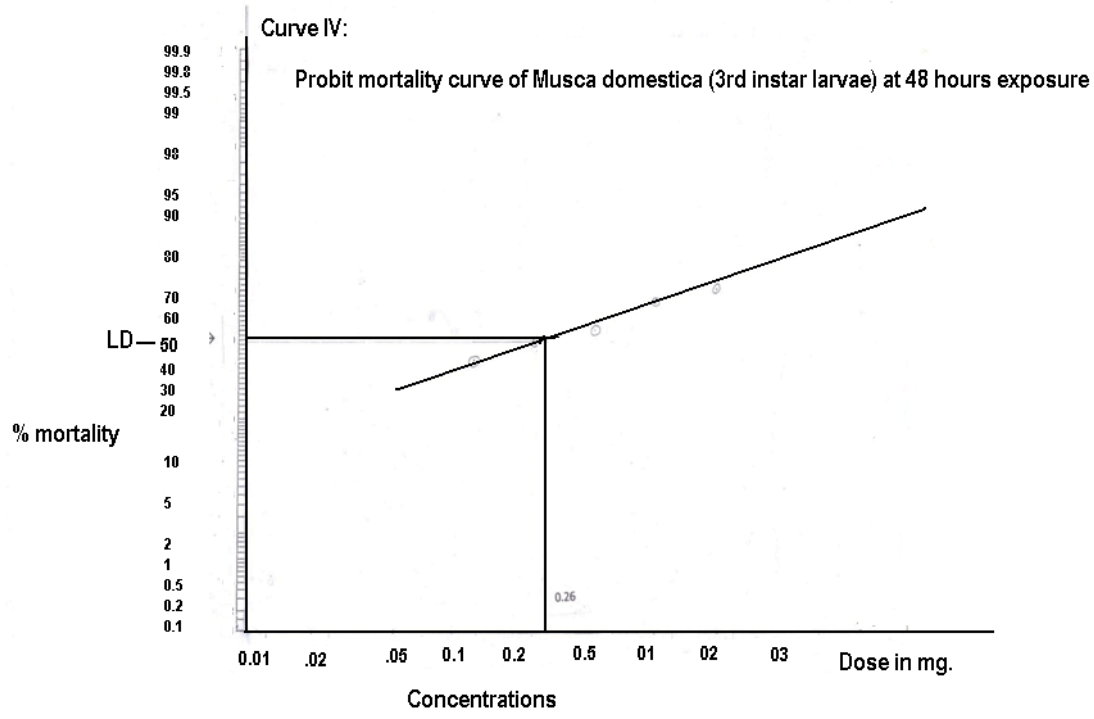
DISCUSSION

Mortality effect of lead acetate on *Musca domestica* (3rd instar larvae) after 48 hours exposure period is indicated in Table **1**.

Table 1: Mortality Effect of Lead Acetate on *Musca domestica* (3rd Instar Larvae) After 48 Hours Exposure

S. No.	Lead acetate in mg	Mortality/ replicate	% Mortality
4	0.25	07	48.88
5		07	
6		08	
7	0.50	08	55.55
8		08	
9		09	
10	1. 00	09	64.44
11		10	
12		10	
16	Control	02	17.77
17		03	
18		03	

Number of larvae exposed in each replicate = 15.



The results of *Musca domestica,* treated with lead acetate 0.125 mg, 0.25 mg, 0.5 mg, 01 mg and 02 mg revealed an increase in mortality rates directly proportional to concentration with a sigmoid-curve (Curve 1) [16]. Have shown that mortality rate increased with the increase in the concentration of lead acetate, these results are in line with the present findings. [9], reported that heavy metal resistance is evidently a widespread phenomenon in invertebrates. Heavy metal resistance specially in Drosophila are the model organisms in exposure to cadmium stated by [11]. Insects Drosophila living in polluted areas have been shown to accumulate heavy metals, in particular Ni and Cu, along with the obvious effects of pollution on growth rate and mortality, reported by [10] Positive relationship was found in *Chironomus* between the copper concentration and the incidence of deformation of the pectin epipharyngis, observed by [12] *Chironomous reparius* and sediment spiked with cadium, zinc and copper,high mortality rates were observed, but no mentum deformities were induced, observed by [13]. The concentration of lead ,cooper, cadmium and zinc in *Chironomus* larvae from several location in the polluted Dyle Basin and Dommel River in Belgium, and compared levels in normal larvae, stated by [14].

The present studies showed that lead acetate caused influence mostly on the morphology and development of the under test insects. However, the differences due to increase in concentration of lead acetate effected the level of these changes as compared to control.

After describing comparison in treated and control flies discuss in the light of relevant references what could be possible mechanisms of lead acetate for these changes.

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