# THE EFFECTS OF SOME CHEMICAL COMPOUNDS ABOUT THE INDIVIDUALS OF *DROSOPHILA MELANOGASTER*

**GHEORGHII V. CIOBOTARI[1], ION I. BĂRA[1]***

**Key words**: *Drosophila melanogaster*, lead acetate, E vitamin, potassium permanganate, caffeine, urea, phenol, nicotine, benefic triangle.

**Abstract**: There were registered different effects of the actions of some chemical substances on *Drosophila melanogaster* individuals. We concluded that low concentrations of substances stimulated the prolification and high concentrations of those substances inhibiting this process. Both the concentration values which had stimulating effects and the substances which had inhibiting effects are specific for each used substances.

## INTRODUCTION

It is agreed that the xenobiotic factors, especially substances of synthesis, have dangerous effects for living systems, inducing a decrease of viability and proliferation, encouraging the appearance of ills, decreasing the longevity etc. Frequently, at certain concentrations, some compounds are inconsistent with life. But there are situations when very dangerous substances, administered in low concentration, have a stimulating effect. We believe that this aspect is very interesting and that the investigations about it may supply very important and interesting theoretical and practical conclusions.

## MATERIAL AND METHODS

The investigations were effectuated with lead acetate, $K_2MnO_4$, caffeine, urea, phenol, nicotine, and E vitamin, administered in different concentrations on *Drosophila melanogaster* individuals, from Suceveni, Kutî, Iaşi, Oneşti, Ungheni and Catranâc populations. The investigations endorsed to estimate the action of mentioned substances, in different concentrations, about *Drosophila melanogaster* individuals from natural populations. For each substance it was established 3-4 concentrations which assured the reasonable individuals number survive. It was assured, for each substance, desired concentration in culture medium. After that, in each tube, were introduced 2 males and 2 females. The descent was analyzed for number of off springs in each tube, during three generations. All data were compared with control and statistical processed.

## RESULTS AND DISCUSSIONS

The obtained results pointed out some effects induced by mentioned compounds, depending of their concentration and duration of treatment. We shall present on a synthesis of obtained results which presents, in our opinion, a great theoretical and practical importance.

After the treatment with mentioned substances we have observed that all compounds, in certain concentrations (small concentrations only) have a stimulating effect about number of *Drosophila melanogaster* resulted individuals. The stimulating effect, in first generation, has appeared for all substances (used in this experiment). In the second generation, under the same treatment, only under urea and E vitamin treatment it was registered an increase of individuals number per tube. In the third generation the individuals number increased only in the case of E vitamin administration.

If, on abscissa (x axis), put the concentrations of substance and on ordinate (y axis) put the numbers of individuals (appeared under substance influence), will obtain a curve with dynamics of individuals number, depending of the substance concentration.

So, if we draw a parallel to x axe through point corresponding to the number of individuals from control variant, on y axe, will see that the obtained line intersect the curve and divide the graphic in two parts – above one and below one. The above zone has the aspect of a triangle

(ABC) for which we propose the name beneficial triangle of substance action, because this part correspond to the bigger values registered for individuals number, in variants of treatment comparative with control variant. So, we may assert that every substance has a beneficial effect upon individual system, when is administered in a low concentration.

Thus, inside of benefic triangle architecture, we found three concentration values named as followed:

a) the concentration which corresponding to CAB angle named **minim concentration with zero effect** - this low value did not generated an effect on population number;

b) the concentration which corresponding to ABC angle named **maxim concentration with stimulator effect** - this value corresponding to the maxim level for stimulator action of chemical substances on population number;

c) the concentration which corresponding to BCA angle named **maxim concentration with zero effect** - this value corresponding to an inhibiting effect of the chemical substances which reducing the population number until the control value. This concentration representing a superior limit of benefic triangle of a chemical substance.

The chemical substances which we investigated, in some specific concentrations, had benefic effects on living cells, individuals and, after that, on population. However, the persistence of this effect, as a consequence of this treatment in the next generations, is specific for each investigated substance. For many times, the benefic effect appearing just in first generation (for example, lead acetate, potassium permanganate, caffeine, phenol and nicotine).

Therefore, we realized a chemical substances classification depending on toxicity degree (the presence and persistence of benefic triangle during many generations).

For the analysis of benefic triangle evolution inside of investigated chemical substances, we observed that during the administration of a same substance quantity in nutritive medium, this is lower from a generation to the next one until disappearance. This facts suggesting us that the chemical substances would be accumulated inside of cells from a generation to the next one. The substance quantity growing up until, after a time, it is breaking the normal biochemical reactions from inside. Therefore, inside of a further generation even a low substance concentration had a noxiousness influence. The persistence of benefic triangle depending on cells needs for this substance, metabolism speed of it, and certainly another features.

The knowledge concerning the benefic triangle properties for those substances at population level is very useful, especially because of manipulation possibilities of populations through growing of individual numbers with a high variety. Because it is very well known that there not exist two similar individuals from genetic point of view, the growing of individual variability generate high efficiency of selection.

Also, those knowledge concerning to substances benefic effects are useful for agriculture (for chemical control of pests). We have to evidencing than some substances, in specific concentrations, could have either a lethal action for some species, or a stimulator effects generating a high growing of individual number for another species.

But, the most useful for us are the laws of benefic triangle of chemical substances action used in ecology domain. Many specialists practice a diminution of polluting substances through their spreading on large surfaces. Therefore, we could do an evaluation on their impact on the environment. After that, we try to establish a correct intervention in critical situation through efficient methods, and we can avoid ecological catastrophes with important consequences.

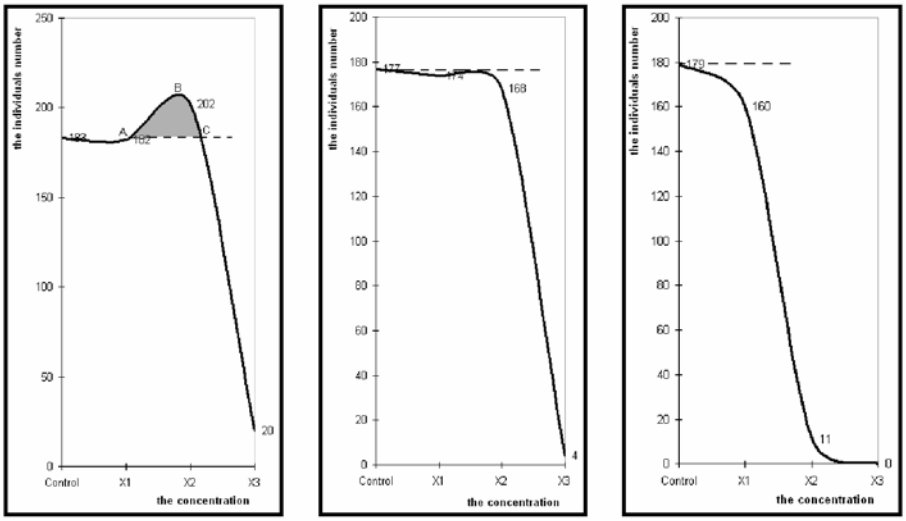


Figure 1. Diagram of individuals number dynamics as result of the lead acetate treatment ($(CH_3COO)_2Pb \cdot 3H_2O$) applied on three successive generations (a – first generation; b - second generation; c - third generation).

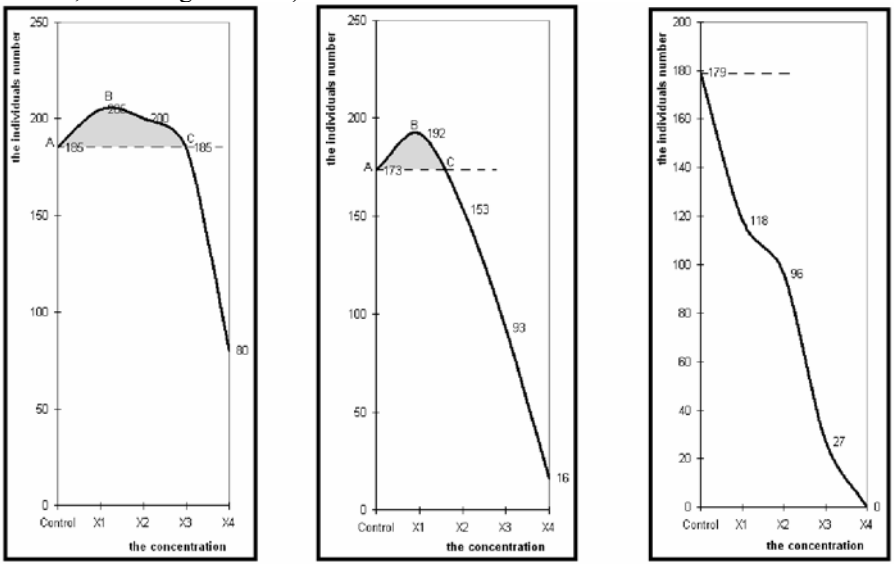


Figure 2. Diagram of individuals number dynamics as result of the urea treatment applied on three successive generations (a – first generation; b - second generation; c - third generation).

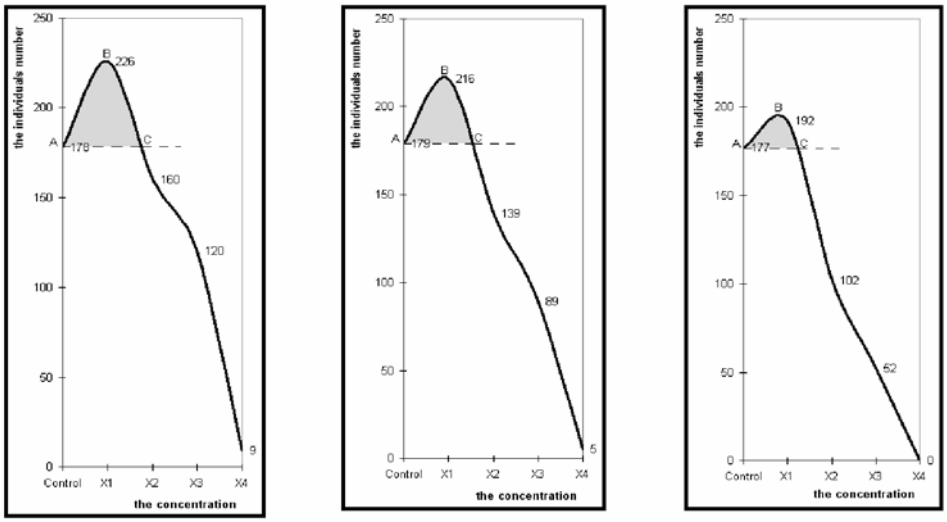


Figure 3. Diagram of individuals number dynamics as result of the E vitamin treatment applied on three successive generations (a – first generation; b - second generation; c – third generation).

## CONCLUSIONS

We was able to pointed out the effect of different compounds about the *Drosophila melanogaster* individuals number dynamics in successive generations.

We concluded that low concentrations of substances stimulated the increase of individuals number and high concentrations induced a decrease of individuals number.

Both the concentration values which had stimulating effects and the substances which had inhibiting effects are specific for each used substances.

## BIBLIOGRAPHY

1. Ashburner, M., and Wright, T. R. F., 1989. *The Genetics and Biology of Drosophila*. Vol. 2b, Academic Press, London, New York, San Francisco. 500-504.
2. Băra, I. I., 1999. *Genetica*. Ed. Corson, Iaşi.
3. Beilharz, R. G., and Nitter, G., 1998. The missing E: the role of the environment in evolution and animal breeding. *Zeitschrift fur Tierzuchtung und Zuchtungsbiologie* 115: 439-453..
4. Chapman, R. F., 1998. *The Insects, Structure and Function*, chapter 22, Vision, Cambridge University Press.
5. Charlesworth, B., Charlesworth, D., and Morgan, M. T., 1990. Genetic loads and estimates of mutation rates in very inbred plant populations. *Nature* 347: 380-382.
6. Crow, J. F., and Simmons, M. J., 1983. The mutation load in *Drosophila*., pp. 1–35 in The Genetics and Biology of *Drosophila*, Vol. 3c, edited by M. Ashburner, H. L. Carson and J. N. Thompson. Academic Press, London.

1) “Alexandru Ioan Cuza” University, Faculty of Biology
*) soveja@uaic.ro