

## EFFECTS OF TREATMENT WITH DIFFERENT CONCENTRATIONS OF NICOTINE SOLUTION, ON A BACK-MUTATED *DROSOPHILA MELANOGASTER* POPULATION

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**Key words:** nicotine solution, *Drosophila melanogaster*, aberrations types

**Abstract:** Our study is focused on monitoring the number of *Drosophila melanogaster* adults (grown on culture medium enriched with nicotine solution) per generation, and those distribution on sexes. The occurrence of new mutations or of back mutations, the differences between wild type and mutants but also the differences of nicotine treatment effects in correlation with solution concentration, was monitored.

### INTRODUCTION

Thousands of chemicals with not well known mutagenic effects could be lately detected in the natural environment, as result of human activity. Statistic studies show that 80% of genetical abnormalities appear due to chemical pollution.

Nicotine is a high level spreaded substance in the atmosphere. Even if many studies were focused on the effects of nicotine on human health, there still are many non elucidated matters. Researches regarding effects of nicotine on *Drosophila melanogaster*, can offer new data about the mutations frequency, natality dynamic, sex ratio in natural populations comparing with experimental populations.

For this work, we monitored the number of *Drosophila melanogaster* adults (grown on culture medium enriched with nicotine solution) per generation, and those distribution on sexes. The occurrence of new mutations or of back mutations, the differences between wild type and mutants but also the differences of nicotine treatment effects in correlation with solution concentration, was monitored.

### MATERIAL AND METHODS

The individuals of *Drosophila melanogaster* were grown in laboratory on standard medium (control variants) and on medium enriched with nicotine solution (with following concentrations: 0,005%; 0,01%; 0,03%) in the case of experimental variants.

For each experimental variant (represented by a specific nicotine solution concentration) were used 3 vials with nicotine enriched medium and 1 vial with standard medium (representing control).

In each vial were placed two *Drosophila melanogaster* females and two males, belonging to „eyeless”, back mutant line. For few days the flies were observed to notice if females were fertilised, and after about one week it is checked adults occurrence, every day at the same time.

Each experimental variant was repeated three times.

### RESULTS AND DISCUSSIONS

Nicotine is an alkaloid found predominantly in tobacco, and in lower quantities in tomato, potato, eggplant, and green pepper. It is a neurotoxin with particular specificity to insects; that is why nicotine was widely used as an insecticide in the past. It is more toxic than many other alkaloids such as cocaine. The currently available literature indicates that nicotine, on its own, does not promote the development of cancer in healthy tissue and has no mutagenic properties. Nicotine is shown to have inhibitory effect on apoptosis, in this way it may create a more favorable environment to cancer to develop.

In the case of our experiment, it was observed that for 0,005% nicotine solution concentration, the average number of individuals were 126,44 per vial, for 0,01% concentration, there were 164,67 flies per vial, and for 0,03% concentration the average number was 40,67 per vial. In the case of control variant, the average number was 117,67 individuals per vial.

Regarding sex ratio, it could be noticed that for 0,005% solution concentration, there were an average number of 64 female to 62,44 male individuals per vial, for 0,01% concentration variant, the average was 84 females to 80,67 males per vial. For treatment with 0,03% solution concentration, there were obtained the average number of 20,56 females and 20,11 males per vial. For the control variant, the average number of females were 63,33 and for males 54,33 per vial.

It is interesting to note that nicotine increase the time period requested for maturation. It was observed that for control variant there were necessary 5 days for adults to occur, for 0,005% and respectively 0,01% nicotine solution concentration there were necessary 7 days and by increasing concentration to 0,03% , there were necessary 3 more days (10 days).

Related to dynamics of adult occurrence reported to numbers of days from eclosion (Fig. 1.), it could be noticed that for all experimental variants (including the controle), the maximum number was reached in the middle time period.

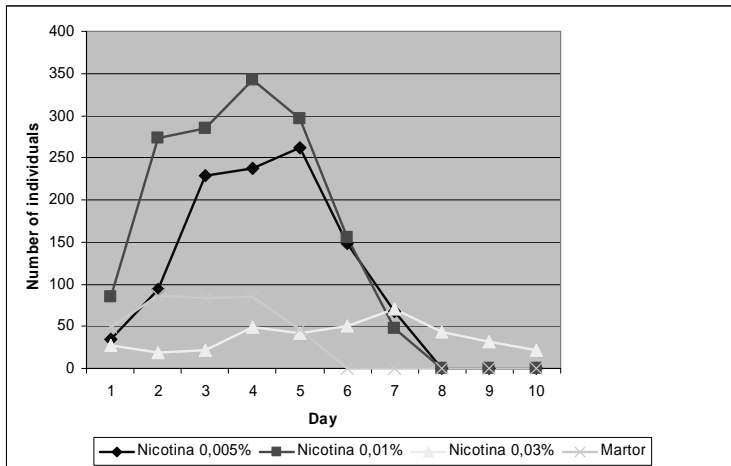


Fig.1. The dynamics of adults number reported to day numbers from eclosion for all experimental variants

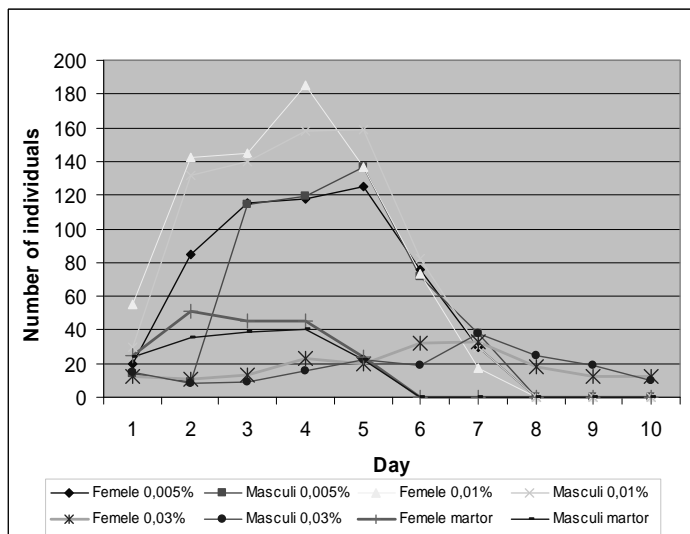


Fig.2. The sex ratio reported to day numbers from eclosion for all experimental variants

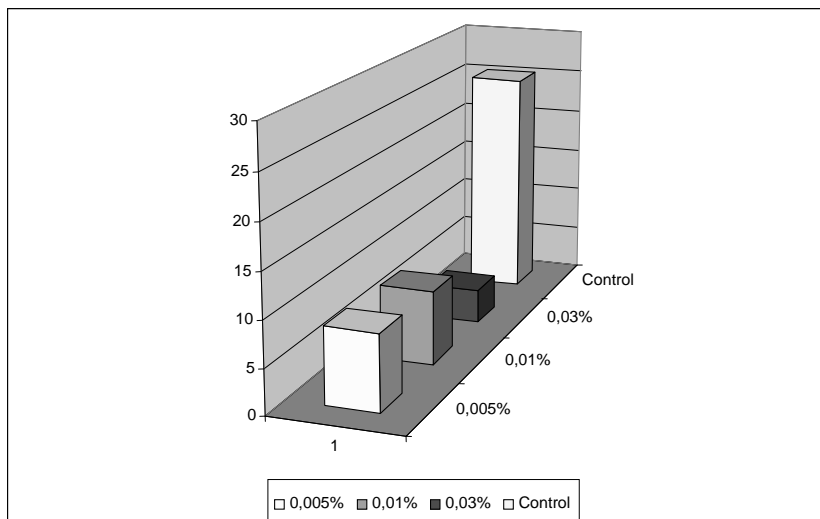


Fig.3. The aberrations frequency for all experimental variants (different nicotine solution concentrations and control)

The treatment with 0,005% nicotine solution concentration, induced a decrease of aberrations frequency comparing with Control (from 5,73% to 5,78%). By increasing nicotine concentration to 0,01% , the aberrations frequency continue to decrease compared also with control variant, also with the lower nicotine concentration experimental variant (3,55%). It can be preliminary conclude that at the tested (low) concentration, nicotine has an stimulatory effect on prolificity of *Drosophila melanogaster*, decrease the aberrations frequency and increase the time period till adults develop after eclosion. By increasing the nicotine concentration to 0,03%, the aberration frequency continue to decrease (2,11%), the maturation time continue to increase (to double comparing with Control, from 5 to 10 days).

Regarding aberrations types, there were found for Control different mutants: without one eye (36 females and 36 males); without one eye and the existing one smaller than normal (5 females and 1 male); vestigial wings (4 females and 3 males); curly wings (1 male and 1 female); individuals with one smaller eye (6 females and 7 males); individuals with combined mutations: vestigial and one smaller eye (1 male); vestigial and one eye less (2 males); one eye less and only one and also vestigial wing (1 female).

The aberrations types variety increased for 0,01% nicotine solution concentration: without one eye; vestigial; one smaller eye; one point – shape eye; eyeless; one vestigial wing; one eye less and the existing one very small; curly wings; lobe eye; small eyes; one distorsioned member; body shape reduced to half. The mostly mutations occure at female (21) comparing to 13 for male.

The less mutations types, occurred for nicotine solution concentration of 0,03% : without one eye; one smaller eye, one curly wing; one eye less and the present one smaller than normal; body shape reduced to half. Similar with the other case, the number of mutated females is higher comparing with the number of affected males (10 females and 5 males).

### CONCLUSIONS

At 0,005% and 0,01% nicotin solution concentration, it could be noticed an positive effect regarding prolificity of *Drosophila melanogaster* individuals.

The treatment with nicotine solution at the three mentioned concentrations, induced a decrease of aberrations frequency comparing with Control.

By increasing nicotine concentration, the aberrations frequency continue to decrease compared also with Contol variant, also with the lower nicotine concentration experimental variants.

Nicotine increase the time period requested for maturation.

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