THE STUDY OF SOME QUANTITATIVE CHARACTERS TO GROUNDNUTS (*ARACHIS HYPOGAEA* L.) IN THE M2 MUTAGEN GENERATION

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Abstract

Arachis hypogaea L. belongs the *Fabaceae* family, native to South America origine and has 2n=40 chromosomes genom (Marin Ș., 2011). The seeds from three varieties (Tâmburești, Jelud și Braziliene negre) and lines L9184 of peanuts were treated with three chemical mutagens agents, like: ethyl methane sulfonate, dimethyl sulfate and sodium azide. Ethyl methane sulfonate and dimethyl sulfate concentration were 0.2%, 0.4%, 0.6% and 0.8% and sodium azide concentration was 0.02%, 0.04%, 0.06% and 0.08%, each concentration having six hours for action time. The harvested plants were M_1 generation each plants seeds being sown in the following year, resulting the M_2 generation. We made biometric measurements for all the lines regarding the characters: the number of pods/plant, the number of grains from pods and the weight of grains/plant.

By selection, in M_2 generation can be identified and selected those useful mutans and plants with valuable traits, mutations being found in homozygous state. In the selection and plant breeding of economically important crops, the first step is to obtain a highly diverse biological material and to induce large individual variability amplitude. In the M2 generation was made a selection based on biometric determinations in all work variants. A special attention has been paid to the criteria selection based on the phenotypic aspects and productivity of the plants from working variants, for this purpose were made observations in the field, in several phenophases. In the M_2 generation, for the treated variants, the number of pods per plant was reduced following the mutagen treatments. Excepting the Tâmburești variety, for the other varieties the average weight of beans per plant recorded positive differences compared to the untreated control for all the three mutagens.

Key words: Arachis hypogaea L., number of pods/plant, number of grains from pods, weight of grains/plant.

The plant are native to South America origine. In Europe peanuts were brought by portuguese sailors in the sixteenth century (Pop L. *et al*., 1986). In culture is found only one species of *Arachis hypogaea* L., which in turn comprises two subspecies: *Arachis hypogaea fastigiata* Walder, with erect stem, with flowers grouped at the base of main stems, shorter vegetation period (3-5 months) and *Arachis hypogaea procumbens* Walder, with a spread stem over the earth, with a longer vegetation period (4-5 months) (Roman Gh. V. *et al*., 2011).

Peanuts are particularly important because of high seed protein content (25-34%) and fat (45-60%) (Marin, 2011). The oil world production, peanuts ranked third (over 3 million tons annually), being as soybean, sunflower and before cotton (Marin Ș., 2011).

In peanuts, mutations were spontaneously or induced by physical or chemical mutagens for certain characters such as survival, number of days to flowering, number of days to maturity, plant height, number of main branches, number of pods / plant, number of grains / plant, number of immature grains / plant and oil content.

MATERIAL AND METHOD

The biological material was represented by plants of *Arachis hypogaea* L. from generation M2. The M2 generation plants were obtained through the sowing of the M1 generation seeds. The M1 generation plants were obtained from seeds treated with 3 types of chemical mutagen agents, like: ethyl methane sulfonate, dimethyl sulfate and sodium azide. Ethyl methane sulfonate and dimethyl sulfate concentration were 0.2%, 0.4%, 0.6% and 0.8% and sodium azide concentration was 0.02%, 0.04%, 0.06% and 0.08%, each concentration having six hours for action time.

Observations on the three quantitative characters (the number of pods/plant, the number of grains from pods and the weight of grains/plant) were made in the experimental field of the farm Ezăreni belonging to Science Teaching Station of Iasi city, in 2014. The results were processed using

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mathematical and statistical methods: analysis of variance and differences limit.

RESULTS AND DISCUSSION

In the case of the *Tâmbureşti* variety, the lower values of the control sample in terms of the number of mature pods per plant were found to the treatment with ethyl methanesulfonate at concentrations of 0.2% (3.93), 0.4% (6.6) and 0.6% (11.26) (very significant differences). A decrease in the number of mature pods per plant was also recorded in the dimethyl sulphate treatments, the difference from the control sample being distinctly significant at concentrations of 0.2% (4.6) and 0.4% (5.6) and very significant at concentrations of 0.6% (11.27) and 0.8% (13.6). In sodium azide treatments, there were also a decrease in the number of mature pods per plant at concentrations of 0.04% (6.26) and 0.06% (11.93), the differences being very significant. For the *Jelud* variety in the case of dimethyl sulphate treatment, the number of mature pods per plant recording decreases, the differences were very significant at concentrations of 0.6% (4.6) and 0.8% (7.93) compared to the untreated control sample (*figure 1*).

The *Braziliene negre* variety at treatment with ethyl methanesulfonate at concentrations of 0.4% (4.27) and 0.6% (7.6) caused a very significant decrease in the number of mature pods per plant compared to the untreated control sample. Regarding to the number of mature pods per plant on dimethyl sulphate treatment, at concentrations of 0.6% (6.27) and 0.8% (8.6) showed very significant negative differences from the control sample. In the case of sodium azide treatment, the differences from the control were negative, distinctly significant, at concentration of 0.02% (3.26) and very significant at concentrations of 0.04% (6.6) and 0.06% (10.6) (*figure 1*).

The line *L 9184*, treatment with ethyl methanesulfonate caused a decrease in the number of mature pods per plant, the differences being distinctly significant at concentration of 0.2% (1.97) and very significant at concentration of 0.4% (3.63) and 0.6% (4.97) compared to the untreated control sample. Treatments with dimethyl sulphate had a decrease in the number of mature pods per plant at concentrations of 0.4% (3.63), 0.6% (6.3) and 0.8% (7.96), the difference from the control sample being very significant. Following the treatment with sodium azide, the differences were negative, distinctly significant at concentration of 0.04% (2.3) and very significant at concentration of 0.06% (5.63) (*figure 1*).

Treatments with the three mutagens have reduced the number of grains from pods. Dimethyl sulfate determined significant differences from the control sample at concentration of 0.2% (0.2) and distinctly significant differences at concentrations of 0.6% (0.32) and 0.8% (0, 34) (*figure 2*).

Sodium azide treatments at concentrations of 0.04% (0.31) and 0.06% (0.5) determined differences from the control sample very significant compared to the untreated control. The *Jelud* variety, etil methanesulfonate treatments had an increase effect the number of grains from pods at concentration of 0.4% (0.55). The control sample had an average 2.21. An increase in the number of grains from pods was also achieved in the treatment with dimethyl sulphate at concentrations of 0.4% (0.29) and 0.6% (0.58), the differences being distinctly significant and very significant compared to the control sample. The stimulatory effect on the number of grains from pods in the use of sodium azide showed a very significant differences at concentration of 0.02% (0.45) and 0.04% (0.22) compared to the control sample (*figure 2*).

In the *Braziliene negre* variety at concentrations of 0.2% (0.33), 0.6% (0.36) and 0.8% (0.33) in the case of dimethyl sulphate treatments resulted a stimulating effect on the number of grains from pods, with significant differences compared to the control sample. The stimulative effect on the number of grains from pods after using sodium azide showed distinctly significant differences in concentration of 0.06% (0.43) compared to the control sample (*figure 2*)

In the case of the number of grains from pods, the control sample of line *L9184* recorded an average of 2.63. The effects of reducing the number of grains from pods were evident after treatment with ethyl methanesulfonate at concentration of 0.4% (0.46) and 0.6% (0.62) compared to the control sample. Dimethyl sulphate at concentration of 0.6% (0.43) and 0.8% (0.43) results a decrease in the number of grains from pods, with distinctly significant differences (*figure 2*).

The treatments with the three mutagenic substances in the *Tâmbureşti* variety determined a decreased of the weight of the grains per plant compared to the control sample. Differences in treatment with sodium azide at concentrations of 0.06% (4.94) was negative, very significant compared with the control sample. Dimethyl sulfate had an effect of reducing the average weight of the grains per plant, the differences being very significant at concentrations of 0.6% (1.49) and 0.8% (2.44) compared to the control sample(*figure3*).

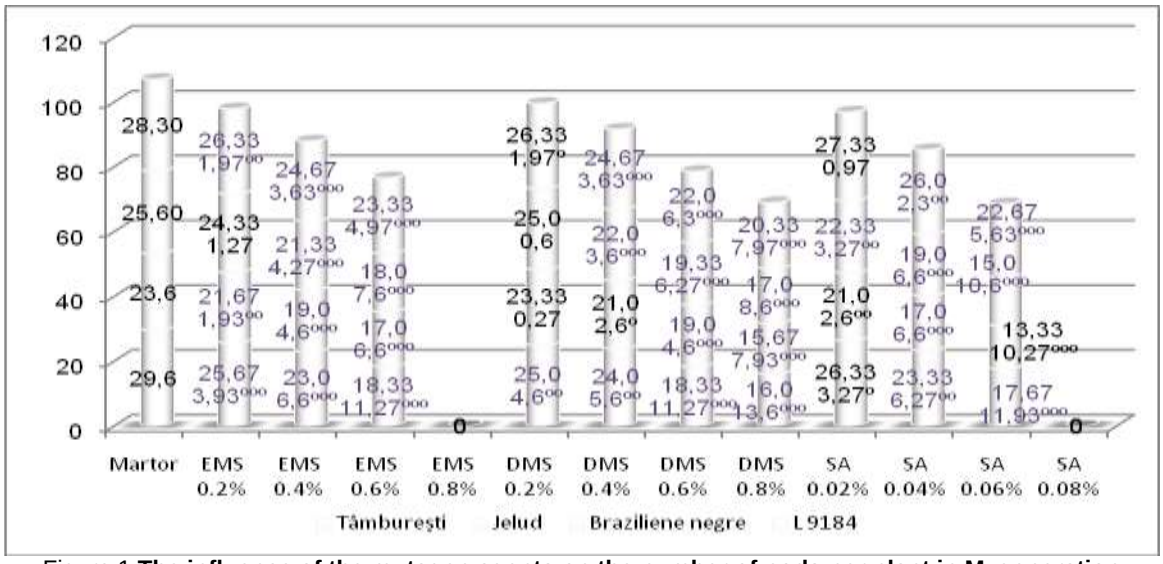

Figure 1 **The influence of the mutagen agents on the number of pods per plant in M_2 generation**

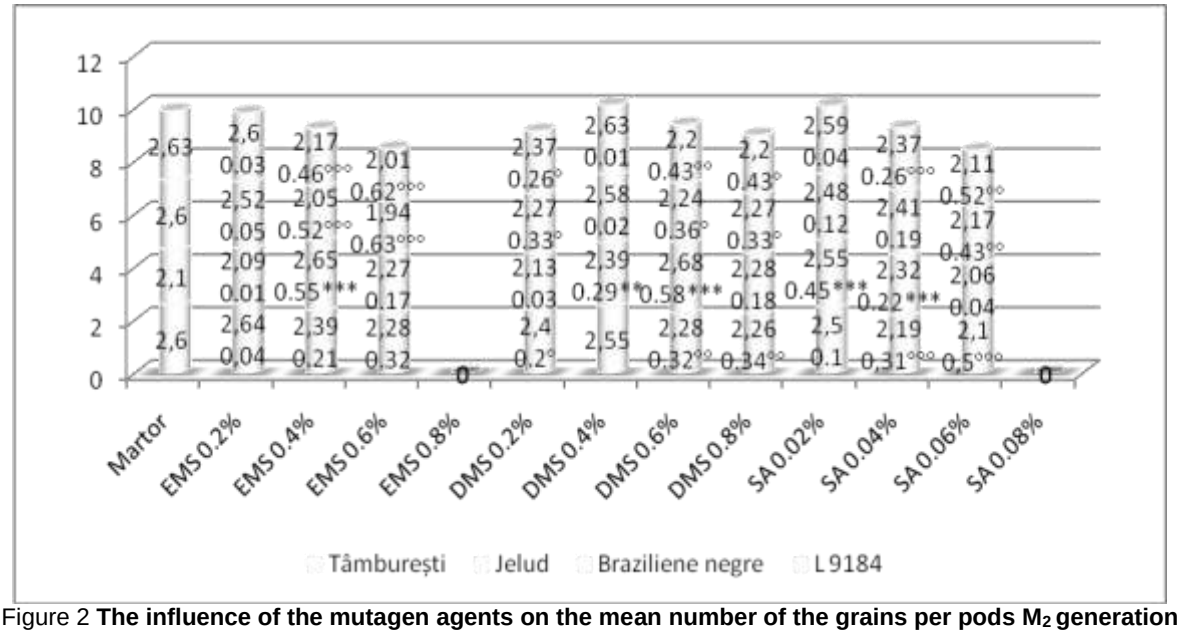

Figure 2 **The influence of the mutagen agents on the mean number of the grains per pods M_2 generation**

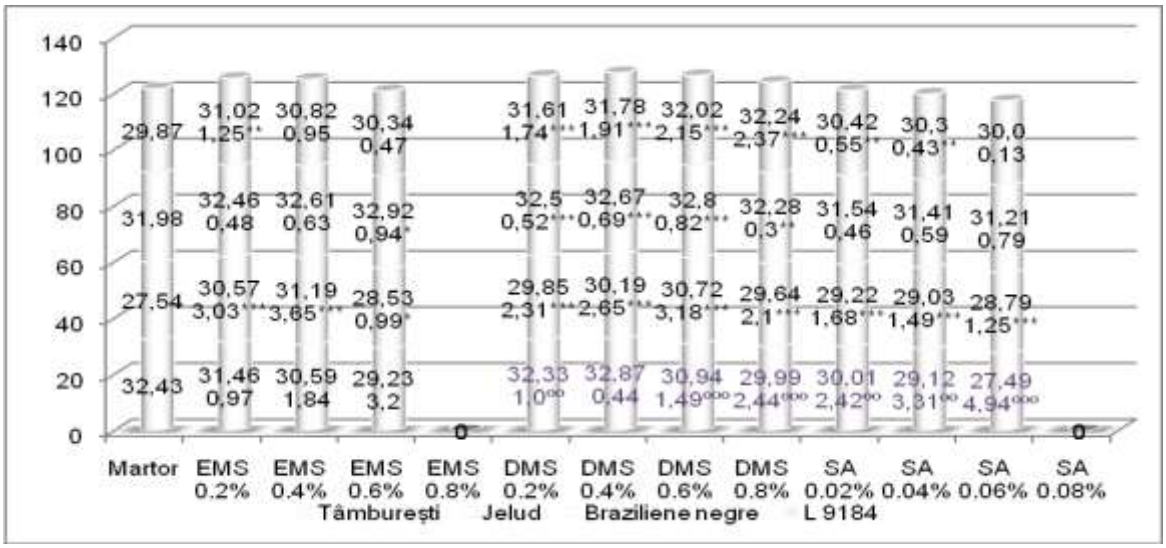

Figure 3 **The influence of the mutagen agents on the mean weight of the grains per plant (g) in the M_2 generation**

In the Jelud variety, the untreated control saple had a mean grain weights per plant of 27.54g. Mutagenic treatments affected the weight of the grains per plant. Thus, in the case of ethyl methanesulfonate at concentration of 0.2% (3.03) and 0.4% (3.65), the differences from the control sample were positive, very significant. Dimethyl sulphate and sodium azide at all concentrations also produced positive, very significant differences from the control sample. The *Braziliene negre* variety control sample had an average grain weight per plant of 31.98g. Dimethyl sulfate at concentrations of 0.2% (0.52), 0.4% (0.69) and 0.6% (0.82) produced differences very significant from control sample (*figure 3*).

At line *L 9184*, dimethyl sulphate treatment at all 4 concentrations showed an increase in the weight of the grains per plant, with positive, very significant differences compared to the control sample. An effect of increasing the average weight of the grains per plant was also achieved by treatment with ethyl methanesulfonate at concentrations of 0.2% (1.25) and 0.4% (0.95), the differences being positive, distinctly significant compared to the untreated control (*figure 3*).

CONCLUSIONS

In the M_2 generation, for the treated variants, the number of pods per plant was reduced following the mutagen treatments, the differences compared to the control being significant, distinctly significant and very significant.

Compared to other varieties, for the *Jelud* variety the number of grains per pod recorded a positive increase, for the ethyl methanesulphonate treatments, with 0,4% concentration, dimethyl sulphate with 0,4% and 0,6% concentrations and sodium azyde with 0,02% and 0,04% concentrations.

Excepting the *Târburești* variety, for the other varieties the average weight of beans per plant recorded positive differences compared to the untreated control for all the three mutagens.

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