THE EFFECT OF CHEMICAL MUTAGEN AGENTS ON SOME MORPHOLOGICAL CHARACTERS TO *ARACHIS HYPOGAEA* L.

EFECTUL AGENȚILOR MUTAGENI CHIMICI ASUPRA CARACTERELOR MORFOLOGICE LA ARAHIDE (*ARACHIS HYPOGAEA* L.)

SPÂNU (MÎRZAN) Oana[1], LEONTE C.[1], LUPU Elena-Ancuța[1], POMOHACI T.I.[1]
e-mail: spanuoana@yahoo.com

Abstract. *Arachis hypogaea L. is an annual herb belongs to the Fabaceae family, native to South America origine and has 2n = 40 chromosomes genom (Marin, 2011). In this paper we present some biometrical data obtained during vegetation period of peanuts, for seeing the effect of some mutagen agents on the plants in M_1 generation.. The M_1 generation of plants was obtained from treated seeds with three 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. Thus, it was determined: plant height, number of branches and number of umbels. Thus, the wealth of new biological material can be isolated useful forms for use in the process of creating new varieties.*
Key words: *ethyl methanesulfonate, dimethyl sulfate, sodium azide, Arachis hypogaea L.*

Rezumat. *Arachis hypogaea L. este o plantă anuală, din familia Fabaceae, originară din America de Sud (2n=40) (Marin, 2011). În lucrare sunt prezentate câteva observații biometrice realizate în timpul perioadei de vegetație a arahidelor în scopul determinării acțiunii agenților mutageni asupra plantelor în generația M_1. Această generație a fost obținută din semințe tratate cu trei tipuri de agenți mutageni chimici şi anume etilmetansulfonat, sulfat de dimetil şi azidă de sodiu. Etilmetansulfonatul şi sulfatul de dimetil au fost în doze de 0,2%, 0,4%, 0,6% şi 0,8%, iar azida de sodiu a fost în doze de 0,02%, 0,04%, 0,06% şi 0,08%, fiecare concentrație având ca timp de acțiune de şase ore. În felul acesta, din bogăția de material biologic nou se pot izola formele utile în vederea folosirii acestora în procesul de creare a noi soiuri.*
Cuvinte cheie: *etil metansulfonat, sulfat de dimetil, azidă de sodiu, Arachis hypogaea L.*

INTRODUCTION

Arachis hypogaea L. is an annual herb belongs to the Fabaceae family, having 2n=40 chromosomes genom. The plant are native to South America origine. In Europe peanuts were brought by portuguese sailors in the sixteenth century (Pop et al., 1986).

[1]University of Agricultural Sciences and Veterinary Medicine of Iasi, Romania

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

Savage and Keenan (1994) shows that seeds of peanuts contain between 44-56% fat and 20-30% protein, which are also a rich source of minerals (phosphorus, calcium, magnesium and potassium) and vitamins (group E, K, and B).

MATERIAL AND METHOD

Biological material was represented by plants of *Arachis hypogaea* L. in generation M1, varieties: Tâmbureşti, Jelud, black Brazilian and L 1984 line. The M1 generation of plants was obtained from treated seeds with three types of chemical mutagen agents, like: ethyl methanesulfonate (EMS), dimethyl sulfate (DMS) and sodium azide (SA). EMS and DMS solutions were made in concentration of 0.2%, 0.4%, 0.6% and 0.8%, and the SA solution was in concentration of 0.02%, 0.04%, 0.06% to 0.08%, each concentration having six hours for action time.

Observations on the plant height, number of mature pods and thousand-grain mass were made in the experimental field of the farm Ezăreni in Science Teaching Station in Iasi,in 2012.

The results obtained were processed using mathematical and statistical methods: analysis of variance and differences limit.

RESULTS AND DISCUSSIONS

After treatment with mutagenic agents are obtained numerous mutations that show changes in morphological characters. Under the influence of chemical mutagens, mitotic cell division changes, induces the morphological changes of plants.

The plant height was influenced very significant by applying mutagens and their concentration in M1 generation.

As the plant height, the control had an average value of 24.33 cm to Tâmbureşti variety, 35.66 cm to Jelud variety , 36 cm to L 9184 line and 41 cm to Brazilian black variety (fig. 1).

The Tâmbureşti variety, stimulation effects on plant height were evident after treatment with ethyl methanesulfonate in concentration of 0.2% (4.03) and 0.4% (4.7), the difference was significant and distinct significant compared to the control (fig. 1).

Dimethyl sulfate also produced a growth enhancing of plant height in concentration of 0.2% (7.36) and 0.4% (10.03), the difference from the control were very significant. With increasing concentration of dimethyl sulfate a gap has been found in plant height concentration of 0.6% (2.63) and 0.8% (3.63), the difference was distinct significant compared to the control (fig. 1).

The plant height at the Tâmbureşti variety treated with sodium azide was negative, distinct significant, compared the control in concentration of 0.02% (1.63) and negative, very significant in concentration of 0.04% (2.3) and 0.06% (3.96) (fig. 1).

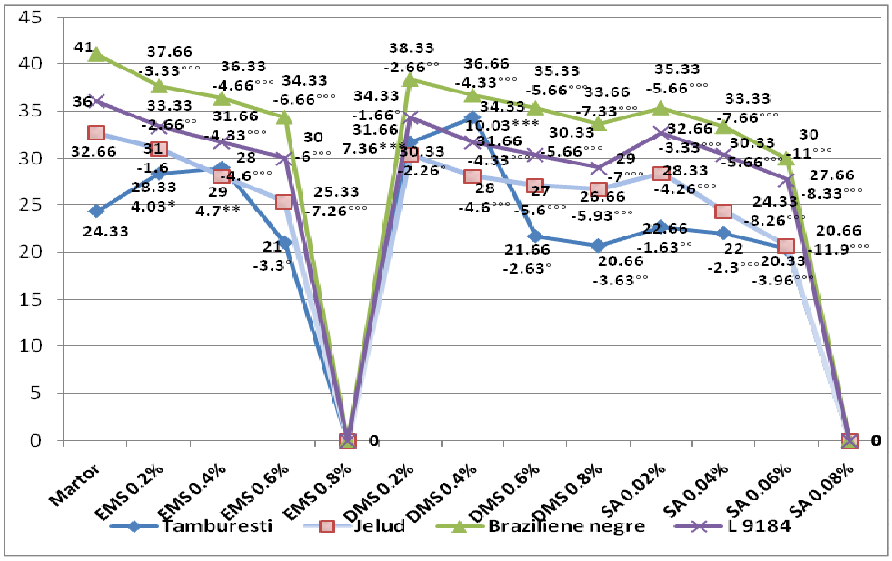

Fig. 1 – Influences of mutagen agents on plant height and its significance in M1 generation

Treatments with three mutagenic at the Jelud variety produced significant decreases and very significant in plant height compared to the untreated control (fig. 1).

Treatments with ethyl methanesulphonate had a reduction effects on the plant height, in the treatment with the solution concentration of 0.4% (4.6) and 0.6% (7.26), the difference was very significant compared to the control (fig. 1).

Treatments with dimethyl sulphate caused a pronounced deficit on the plant height in particular at concentrations of 0.4% (4.6) 0.6% (5.6) and 0.8% (5.96), the difference was very significant compared to the untreated control (fig. 1).

Effect of sodium azide reduction was the most pronounced on the Jelud variety in the plant height, even at concentration of 0.02% (4.26). At concentrations of 0.04% (8.26) and 0.06% (11.9) was a deficit of plant height, the differences was very significant compared to the control (fig. 1).

After treatment with sodium azide, at black Brazilian variety was observed a pronounced decrease in plant height at concentrations of 0.04% (7.66) and 0.06% (11), the difference was very significant compared to the control (fig. 1).

Treatments with EMS at the line L 9184 in concentrations of 0.4% (4.33) and 0.6% (6) had an inhibitory effect on plant height, the difference was very significant compared to the control. A decrease in plant height was recorded at the treatment with sodium azide in concentrations of 0.04% (5.66) and 0.06% (8.33), the difference was very significant compared to the control (fig. 1).

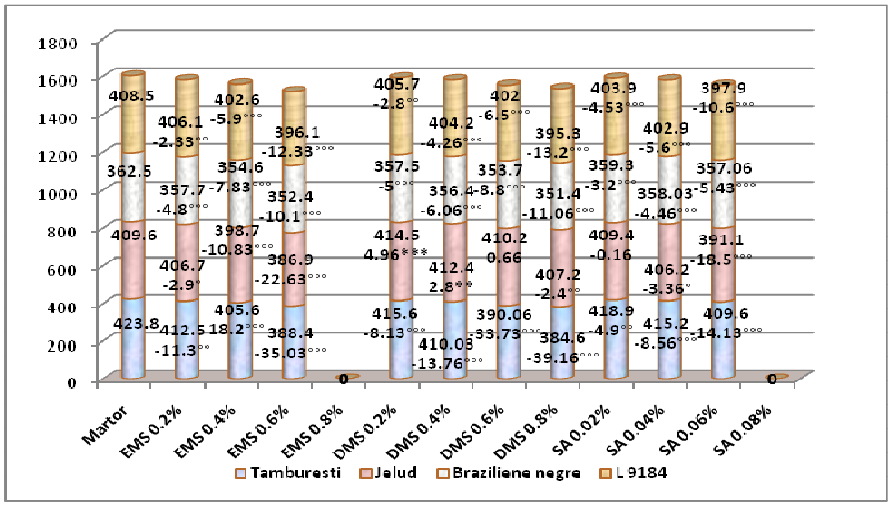

Fig. 2 - Influences of mutagen agents for thousand-grain mass and its significance in M1 generation

The thousand-grain mass at control variants recorded an average value of 362 g to black Brazilian variety, 408.5 g to line L 9184, 409.6 g to Jelud variety and 423.8 g to Tâmbureşti variety (Fig. 2).

The thousand-grain mass, at Tâmbureşti variety, differences from control was negative, very significant for the EMS treatments in concentrations of 0.4% (18.2) and 0.6% (35, 03) (fig. 2).

Treatments with sodium azide recorded a deficit for thousand-grain mass, for the concentration of 0.04% (8.56) and 0.06% (14.13), the difference was very significant compared to the control (fig. 2).

In the case of the Jelud variety it has been found a very significant decrease of the thousand-grain mass after treatment with EMS in concentrations of 0.4% (10.83) and 0.6% (22.63) (fig. 2).

Dimethyl sulfate at Jelud variety had an increasing effect of the thousand-grain mass at variants with concentrations of 0.2% (4.96) and 0.4% (2.8) ,differences was distinct and very significant from the control. The most pronounced effect of sodium azide was observed at the concentration of 0.06% (18.5), the difference from the control was negative, very significant (fig. 2).

The line L 9184 with EMS treatments at concentrations of 0.4 (5.9) and 0.6% (12.33) had an decreasing effect of the thousand-grain mass, the differences was very significant compared to the control. Dimethyl sulfate resulted a decrease in the thousand-grain-mass at a concentration of 0.8% (13.2), the difference compared to the control was considered to be very significant (fig. 2).

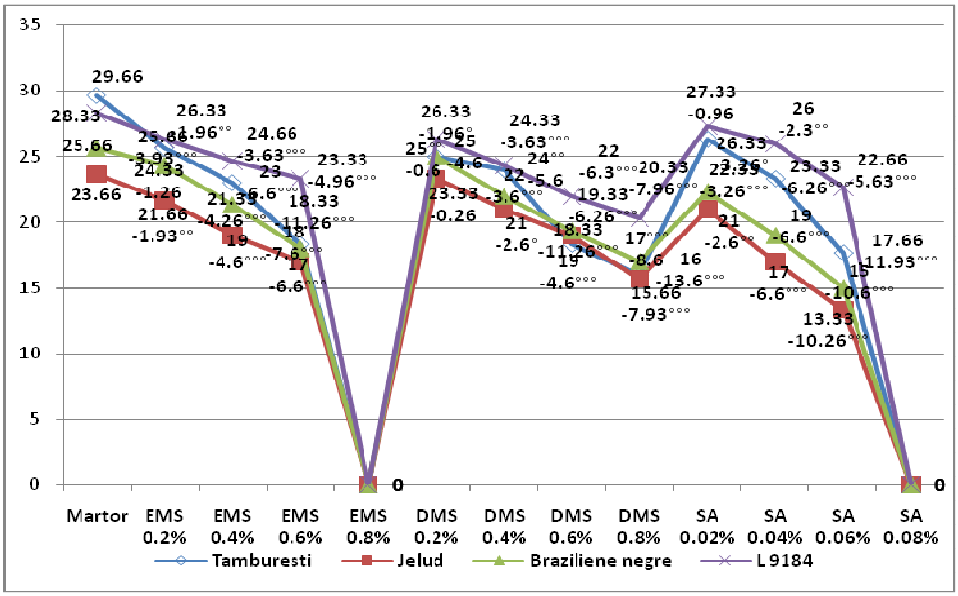

Fig. 3 - Influences of mutagen agents on the number of mature pods and its significance in M1 generation

Regarding the number of mature pods per plant, the control had an average value of 23.66 in Jelud variety, 25,66 to Brazilian black variety, 28,33 to line L 9184 and 29,66 to Tâmbureşti variety (fig. 3).

The variety Tâmbureşti recorded lower values from the control in terms of the number of mature pods per plant at treatment with EMS concentration of 0.4% (6.6) and 0.6% (11.26) (differences very significant) (fig. 3).

A decrease in the number of mature pods per plant was recorded at dimethyl sulfate treatments, the difference from the control was distinct significant at concentrations of 0.2% (4.6) and 0.4% (5.6) and very significant at concentrations of 0.6% (11.26) and 0.8% (13.6). At treatments with sodium azide it has been found a deficit very significant in the number of mature pods per plant in concentration of 0.04% (6.26) and 0.06% (11,93) (fig. 3).

After treatment with EMS the Jelud variety was observed a distinct decrease significant in the number of mature pods per plant in concentration of 0.2% (1.93), followed by decreases very significant in the concentration of 0.4% (4, 6) and 0.6% (6.6) compared with the untreated control. In the case of treatment with dimethyl sulfate, the number of mature pods per plant was a very significant decrease in concentration of 0.6% (4.6) and 0.8% (7.93) from untreated control (fig. 3).

Compared with untreated control, the concentration of 0.04% (6.6) resulted in treatment with sodium azide a reduction in the number of mature pods per plant (significant differences), and with concentration of 0.06% (10.26) and 0.08% (10.26) were recorded only differences very significant from the control (fig. 3).

The black Brazilian variety at treatment with ethyl methanesulfonate, concentration of 0.4% (4.26) and 0.6% (7.6) resulted a very significant reduction in the number of mature pods per plant compared to untreated control. Regarding the number of mature pods per plant treatment with dimethyl sulfate, in concentration of 0.6% (6.26) and 0.8% (8.6) had recorded differences negative , very significant compared to the control. In the case of treatment with sodium azide, the difference from the control was negative, distinct significant , in concentration of 0.02% (3.26) and very significant in concentrations of 0.04% (6.6) and 0.06 % (10.6) (fig. 3).

Treatment with EMS to line L 9184 resulted a decrease distinct significant the number of mature pods per plant in concentration of 0.2% (1.96) and very significant in concentration of 0.4% (3.63) and 0.6% (4.96) compared with the untreated control (fig. 3).

Treatment with dimethyl sulfate had a significant decrease in the number of mature pods per plant at concentration of 0.4% (3.63) 0.6% (6.3) and 0.8% (7.96) the difference were very significant compared to the control. After treatment with sodium azide it has been found a distinct significant decrease in concentration of 0.04% (2.3) and very significant in concentration of 0.06% (5.63) (fig. 3).

CONCLUSIONS

1. After treatment it was found a reducing plant height, thousand-grain mass and the number of mature pods per plant with increasing mutagen concentration used, recording differences distinct significant and very significant compared with untreated control.

2. At treatment with ethyl methanesulphonate the black Brazilian variety, concentrations of 0.4% and 0.6% resulted a reduction very significant in the number of mature pods per plant compared to untreated control.

3. Dimethyl sulfate to Jelud variety has an increase effect of the thousand-grain mass on variants with concentrations of 0.2% and 0.4% the difference was very significant compared to the control.

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