THE EFFECT OF CHEMICAL MUTAGEN AGENTS ON SOME MORPHOLOGICAL CHARACTERS TO *CORIANDRUM SATIVUM* L.

EFECTUL AGENȚILOR MUTAGENI CHIMICI ASUPRA CARACTERELOR MORFOLOGICE LA CORIANDRU (*CORIANDRUM SATIVUM* L.)

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Abstract. *Coriandrum sativum L. is an annual herb of Near East origine, belongs to the Apiaceae family, and has genom 2n = 22 chromosomes (Diederichsen, 1996). In this paper we present some biometrical data obtained during vegetation period of coriander, for seeing the effect of some mutagen agents on the coriander plants. The M_1 generation of plants was obtained from treated seeds with three types of chemical mutagen agents, like: ethidium bromide, colchicine and dimethyl sulfate, in concentration of 0,02%, 0,04%, 0,06%, 0,08%, each concentration having four and 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 (Leonte, 2011).*
Key words: colchicine, ethidium bromide, dimethyl sulfate, *Coriandrum sativum* L.

Rezumat. *Coriandrum sativum L. este o plantă erbacee, anuală, din familia Apiaceae, originară din Orientul Apropiat (2n =22) (Diederichsen A., 1996). În această lucrare sunt prezentate unele observații biometrice realizate în timpul perioadei de vegetație a coriandrului în scopul determinării acțiunii agenților mutageni asupra plantelor de coriandru în generația M_1. Această generație a fost obținută din semințe tratate cu trei tipuri de agenți mutageni chimici şi anume bromură de etidium, colchicină şi sulfat de dimetil, în concentrații de 0,02%, 0,04%, 0,06% şi 0,08%, fiecare concentrație având ca timp de acțiune patru şi şase ore. Astfel s-a determinat: înălțimea plantelor, numărul de ramificații şi numărul de umbele. 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 (Leonte, 2011).*
Cuvinte cheie: colchicină, bromură de etidium, sulfat de dimetil, *Coriandrum sativum* L.

INTRODUCTION

Coriander (*Coriandrum sativum* L.) is an annual herb, belongs to the Umbelliferae family, and has genom 2n=22 chromosomes. The plant's name comes from the Greek word "koris", which means bug, immature plants and seeds having an intense smell of bug (Roman et al., 2008). The plant is originally of the

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Near East, but has spread from the Mediterranean to Central Europe (Rausch Andrea, 2008). In Romania it can be grow with good results in all areas with fertile lands, but the highest yields are obtained in Bărăgan, Dobrogea, Burnazului, Olteniei and Covurlului plains.

The coriander (*Coriandrum sativum* L.) is an aromatic herb that is used either fresh leaves or fruits (seeds) which have a sweet-bitter, with a slight tint of pungency.

Complex chemical composition of fruit, give them the stimulant properties of gastro-intestinal secretions, soothing and carminative, helping the body to eliminate gas (Borcean Eugenia, 2005).

MATERIAL AND METHOD

Biological material was represented by plants of *Coriandrum sativum* L. in generation M_1, varieties: *Sandra* and *Omagiu*. The M_1 generation of plants was obtained from treated seeds with three types of chemical mutagen agents, like: ethidium bromide, colchicine and dimethyl sulfate, in concentration of 0.02%, 0.04%, 0.06%, 0.08%, each concentration having four and six hours for action time.

Observations on the three quantitative characters (plant height, number of umbels and number of branches) were made in the experimental field of the farm Ezăreni in Science Teaching Station in Iasi, in 2011. Biometric analysis was performed by protocols described by Axel Diederichsen in 1996 and Axel Diederichsen and Hammer in 2003.

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 height of the control was between 66,93 and 76,82 cm with an average of 70.30 cm from *Sandra* variety and between 69.82 and 72.94 cm with an average of 71.44 cm from *Omagiu* variety (fig. 1 şi 2). Treatments with colchicine, to both varieties had a pronounced effect on reducing both plant height and number of branches and umbels per plant.

The *Sandra* variety, reduction effects on plant height were evident after treatment with the solution concentration of 0.04% and 0.06%, the values ranging between 62.55 and 55.87 cm at the time of exposure of 4 hours and between 41.09 and 39.82 cm to 6 h of treatment, the difference is very significant from the control (fig. 1).

On *Omagiu* variety the height was reduced at treatment by 6 h at all four concentrations of colchicine: 0.02%, 0.04%, 0.06%, 0.08%, the difference from the control was very significant (fig. 2).

Dimethyl sulfate produced an insignificant reduction of plant to *Sandra* variety but in *Omagiu* variety this treatment produced significant differences compared with the control at concentrations of 0.06% and 0.08% in treatment 4 hours and the concentration of 0.08% at treatment for 6 hours. Thus, at treatment

of 4 hours the average plant height was 69.03 cm at concentration of 0.06% and 68.58 cm at concentration of 0.08% while at treatment of 6 hours the average was 67.89 cm (fig. 2).

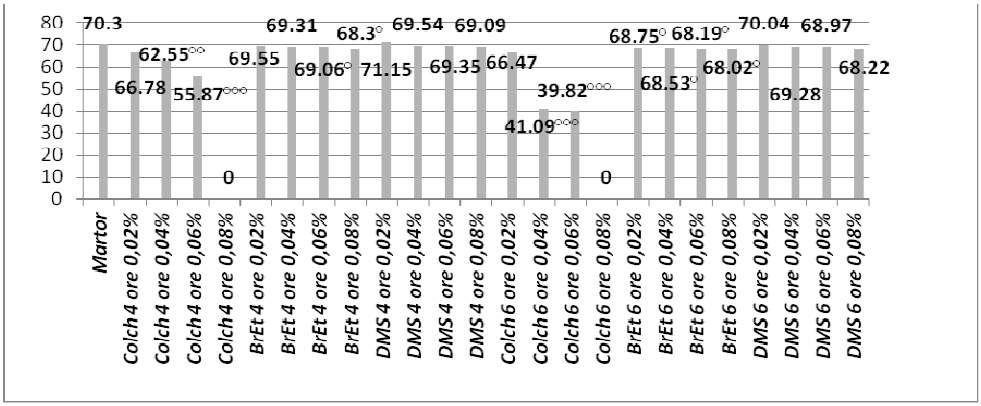

Fig. 1 – Influences of mutagen agents on plant height and its significance in M_1 generation to Sandra variety

On *Sandra* variety the treatment with ethidium bromide, produced significant reductions in plant height compared with control. Thus, significant differences, at treatment the 4 hours occurred at concentrations of 0.06% and 0.08% and at treatment the 6 hours, differences became significant at all four concentrations (fig. 1).

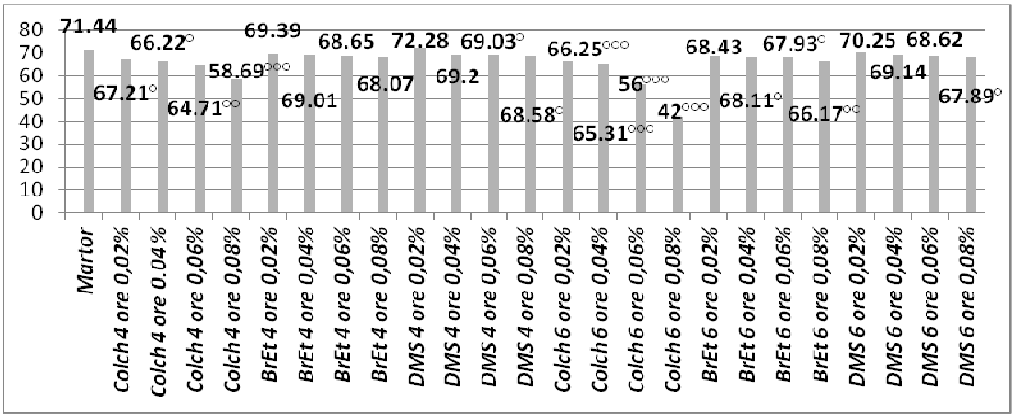

Fig. 2 - Influences of mutagen agents on plant height and its significance in M_1 generation to Omagiu variety

On *Omagiu* variety, ethidium bromide treatment resulted in significant distinct differences from the control concentration of 0.08% with an average height of 66.17 cm (fig. 2).

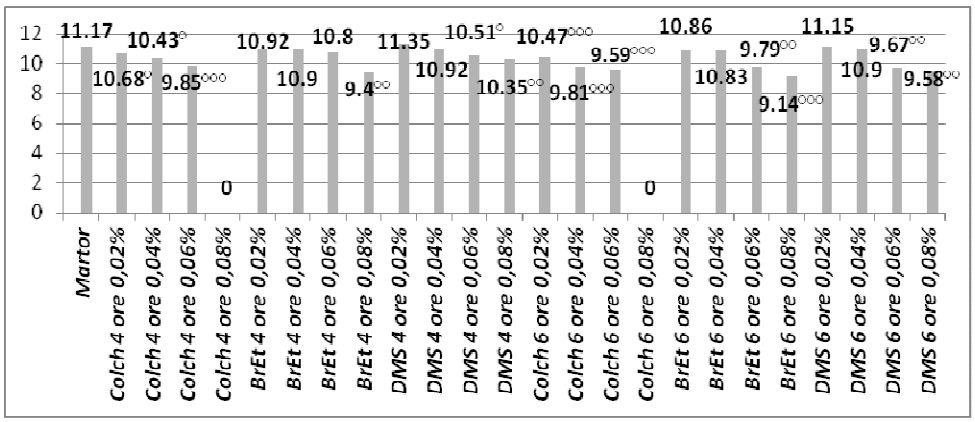

Fig. 3 - Influences of mutagen agents on the number of branches and its significance in M_1 generation to Sandra variety

As the number of branches per plant, control variant had an average value of 11.17 to *Sandra* variety and an average value of 11.23 to *Omagiu* variety (fig. 3 and fig. 4). On *Sandra* variety, colchicine has produced significant differences in concentration of 0.06% in treatment 4 hours (average 9.85) and at concentrations of 0.02% (average 10.47), 0.04% (average 9.81) and 0.06% (average 9.59) to treatment for 6 hours (fig. 3).

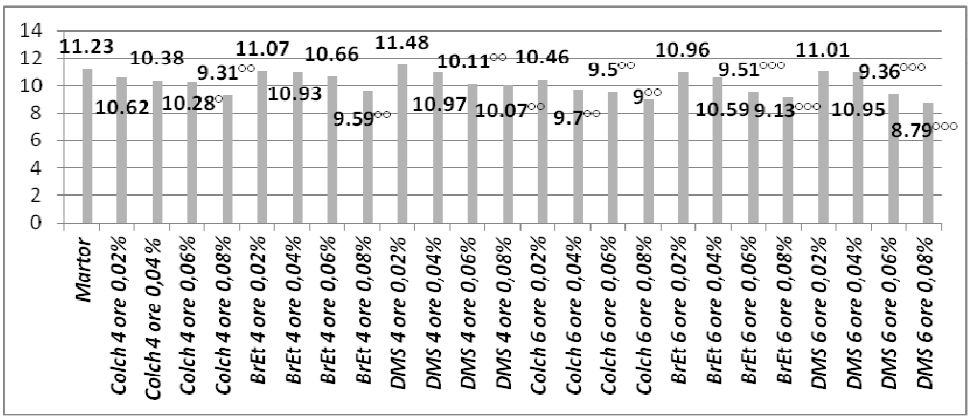

Fig. 4 - Influences of mutagen agents on the number of branches and its significance in M_1 generation to Omagiu variety

At *Omagiu* variety, variants showed significant differences in concentration of 0.08% to treatment with colchicine for 4 hours (average 9.31) and at concentrations of 0.04% (average 9.70), 0.06% (mean 9.50), 0.08% (average 9.00) to treatment for 6 hours (fig. 4).

Treatment with ethidium bromide, to *Sandra* variety, caused significant differences in concentration of 0.08% during exposure to 6 hours with an average of 9.14 (fig. 3). On *Omagiu* variety, ethidium bromide showed significant differences at concentrations of 0.06% (average 9.51) and 0.08% (average 9.13) to treatment time of 6 hours (fig. 4).

Dimethyl sulfate had a strong effect on the number of branches per plant to *Sandra* variety for concentrations of 0.08% (average 10.35) - 4 hours and 0.06% (average 9.67) and 0.08% (average 9.58) - 6 hours (fig. 3). On *Omagiu* variety was very significant differences to exposure time of 6 hours at concentrations of 0.06% (average 9.36) and 0.08% (average 8.79) (fig. 4).

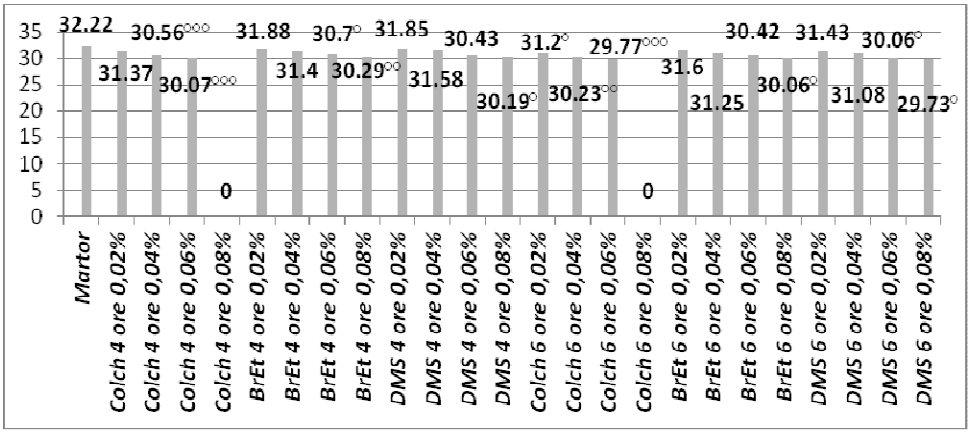

Fig. 5 - Influences of mutagen agents on the number of umbels and its significance in M_1 generation to Sandra variety

If umbels number per plant, to the control variants of *Sandra* variety have averaged 32.22, to *Omagiu* variety the control have an average value of 31.06 (fig. 5 and fig 6).

On *Sandra* variety, differences from the control were highly significant for treatment with colchicines at a concentration of 0.06% (average 30.07 respectively 29.77), with exposure time of 4 to 6 hours (fig. 5) .

Significant differences were recorded and at *Omagiu* variety to concentrations of 0.04% (average 27.48), 0.06% (average 21.50) and 0.08% (20.00) on during the treatment with 6 h (fig. 6).

Ethidium bromide to *Sandra* variety had a pronounced effect on the variants at treatment for 4 hours with concentrations of 0.08% with a mean of 30.29 (fig. 5). On the variety *Omagiu* differences from control were highly significant to concentration of 0.08% during treatment with 6 hours recording an average of 22.58 (fig. 6).

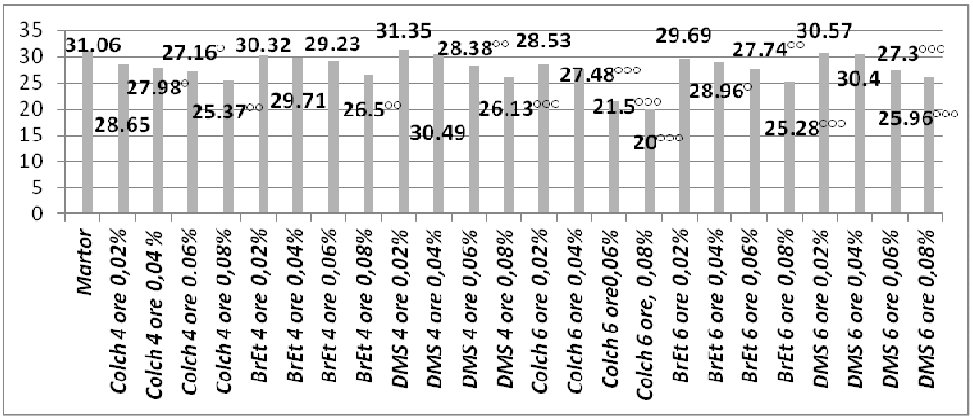

Fig. 6 - Influences of mutagen agents on the number of umbels and its significance in M_1 generation to Omagiu variety

Dimethyl sulfate led to a different decrease in the number of umbels per plants between the two varieties.

On *Sandra* variety the differences compared with control were significant at concentrations of 0.06% (average 30.06) and 0.08% (average 29.73) (fig. 5).

CONCLUSIONS

1. The results led to the conclusion that reducing plant height, number of branches and number of umbels is achieved with increasing mutagen dose used, recording both distinct and significant differences compared with untreated control.

2. After treatments with colchicines (0.06% and 0.08%), it was found that plant height and number of umbels is in decrease as concentrations of colchicines is increases, the differences were significant.

3. Treatment with ethidium bromide and dimethyl sulfate led to sharp decreases to the number of branches and umbels, especially to *Omagiu* variety at concentrations of 0.06% and 0.08%.

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