

# THE STUDY OF SOME QUANTITATIVE CHARACTERS TO CORIANDER (*CORIANDRUM SATIVUM* L.) IN THE M<sub>2</sub> MUTAGEN GENERATION

## STUDIUL UNOR CARACTERE CANTITATIVE LA CORIANDRU (*CORIANDRUM SATIVUM* L.) ÎN GENERAȚIA MUTAGENĂ M<sub>2</sub>

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**Abstract.** The coriander belongs to the Apiaceae family, crop species is *Coriandrum sativum* L., local varieties are Omagiu and Sandra (Imbrea F., 2006). The seeds from the two varieties of coriander were treated with three types of chemical mutagen agents, like: colchicine, ethidium bromide and dimethyl sulphate, with respective concentrations of 0,02%, 0,04%, 0,06%, 0,08%; each concentration having four and six hours for action time. The control variant was represented by each variety, which did not apply mutagenic treatments. The harvested plants were M<sub>1</sub> generation each plant seeds being sown in the following year, resulting the M<sub>2</sub> generation. For all the lines, we made biometric measurements regarding the characters: the number of fruits/plant, number of umbels and weight of fruit/plant. In M<sub>2</sub> generation, there can be identified and selected those useful mutants and plants with valuable traits, mutation being found in homozygous state.

**Key words:** *Coriandrum sativum* L., number of fruits/plant, number of umbels and fruit/plant weight.

**Rezumat.** Coriandrul face parte din familia Apiaceae, specia cultivată este *Coriandrum sativum* L. Soiurile zonate sunt Omagiu și Sandra (Imbrea F., 2006). Semințele de la cele două soiuri de coriandru, s-au tratat cu trei substanțe mutagene: colchicină, bromură de etidium și DMS, în 4 concentrații, respectiv: 0,02%, 0,04%, 0,06%, 0,08% fiecare concentrație având ca timp de acțiune patru și șase ore. Varianta martor a fost reprezentată de fiecare soi în parte, la care nu s-a aplicat tratamente mutagene. Plantele recoltate au constituit generația mutagenă M<sub>1</sub>, semințele fiecărei plante fiind semănate în anul următor, rezultând generația mutagenă M<sub>2</sub>. Pentru toate descendențele, s-au efectuat determinări biometrice asupra următoarelor caractere cantitative: numărul de fructe/plantă, numărul de umbel și greutatea fructelor / plantă. Din generația M<sub>2</sub> se pot identifica și reține, prin selecție, acele mutante utile și plantele cu însușiri valoroase la care mutațiile se pot afla în stare homozigotă.

**Cuvinte cheie:** *Coriandrum sativum* L., numărul de fructe/plantă, numărul de umbel și greutatea fructelor/plantă

## INTRODUCTION

The coriander is an annual species, of Mediterranean origin (Verzea Maria, 2002). Is grown on all continents. Occasionally appears wildly.

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In Romania is cultivated more in the south and east (Oroian Silvia, 2004). The varieties grown in our country are Sandra (since 1987) and Omagiu (since 2000) (Muntean et. al., 2003).

The coriander (*Coriandrum sativum* L.) is an aromatic plant, from which, either fresh leaves or fruits (seeds) are used; which have a bitter-sweet taste with a slight tinge of celerity.

## MATERIAL AND METHOD

The biological material was represented by plants of *Coriandrum sativum* L. from generation M<sub>2</sub>. The M<sub>2</sub> generation plants were obtained through the sowing of the M<sub>1</sub> generation seeds. The M<sub>1</sub> generation plants were obtained from seeds treated with 3 types of chemical mutagen agents, like: ethidium bromide, colchicine and dimethyl sulphate, in concentration of 0.02%, 0.04%, 0.06%, 0.08%, each concentration having an action time of four and six hours.

Observations on the three quantitative characters (number of fruits/plants, number of umbels and fruit weight) were made in the experimental field of the farm Ezăreni belonging to Science Teaching Station of Iasi city, in 2012. The results were processed using mathematical and statistical methods: analysis of variance and differences limit.

## RESULTS AND DISCUSSIONS

The majority of chemically induced mutations, for cross-pollinated species, are recessive; they can be phenotypically identified starting with M<sub>2</sub> generation, after the respective traits have been previously conditioned by homoalele genes. (Leonte, 2003).

In M<sub>2</sub> generation was made a selection based on the results of the biometric determination of all variants of it.

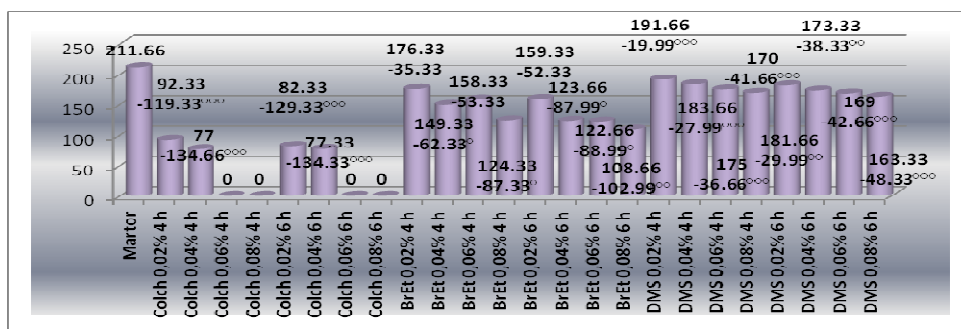
### *The number of umbels*

#### *Sandra variety*

For number of umbels per plant, the Sandra variety control sample had recorded an average of 211.66 (fig. 1).

At the treatment time of 4 and 6 hours, the colchicine had a marked effect of reducing the number of umbels per plant at concentrations 0.02% (119.32 - 4 hours respectively 129.32 - 6 hours) and 0.04% (134.66 - 4 hours respectively 134.32 - 6 hours), the differences being very significant compared with the control sample (fig. 1).

The 4 hours treatment with ethidium bromide in a concentration of 0.04% (62.32) and 0.08% (87.32) and the 6 hours treatment with the ethidium bromide in a concentration of 0.04% (87.99) and 0.06% (88.99) caused a reduction of umbels number, the differences from the control sample being significant. Significant differences were achieved as well for the concentration of 0.08% (102.99) at 6 hours treatment time (fig. 1).

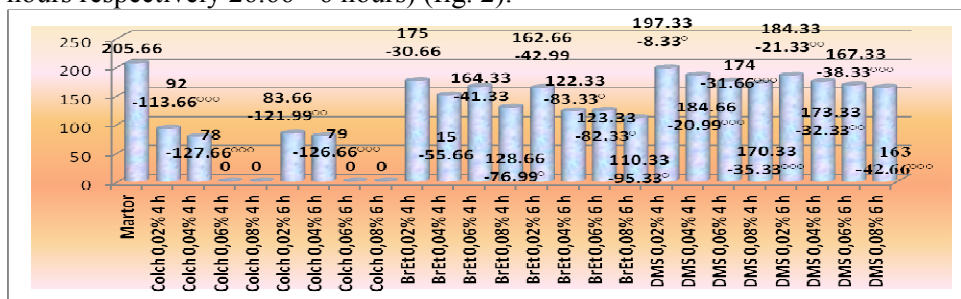


**Fig. 1** - The influence of mutagen agents over the number of umbels in M<sub>2</sub> generation for Sandra variety

The dimethyl sulphate treatment to all four concentrations – 0.02% (19.99), 0.04% (27.99), 0.06% (36.66) and 0.08% (41.66) for a 4 hours treatment time, determined significant decreases in the number of umbels per plant, recording significant differences compared to the untreated control sample (fig.1). Substantial differences were also recorded for 6 hours treatment time at concentrations of 0.06% (42.66) and 0.08% (48.32).

#### *Omagiu variety*

For the Omagiu variety, like the Sandra variety, the negative differences compared to the control sample (control average 205.66) (fig. 2) were very significant for the 4 and 6 hours treatment time with colchicine in concentrations of 0.02% (113.66 - 4 hours respectively 121.99-6 hours) and 0.04% (127.66 - 4 hours respectively 26.66 - 6 hours) (fig. 2).



**Fig. 2** - The influence of mutagen agents over the number of umbels in M<sub>2</sub> generation for Omagiu variety

The ethidium bromide had a negative effect over the number of umbels, leading to significant differences compared to control sample, to treatments with an exposure time of 6 hours at concentrations of 0.04% (83.32), 0.06% (82.32) and 0.08% (95.32) (fig. 2).

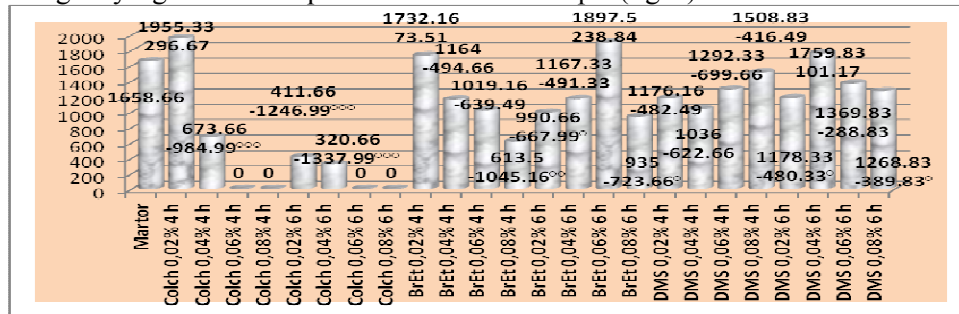
The DMS led to a pronounced decrease in the number of umbels: for the 0.04% (20.99), 0.06% (31.66) and 0.08% (35.32) concentrations, with a 4 hours treatment time and respectively the 0.06% (38.32) and 0.08% (42.66) concentrations, with the time of exposure of 6 hours (fig. 2).

#### *The number of fruit per plant*

##### *Sandra variety*

Control sample for the Sandra variety recorded an average number of fruits per plant of 1658.66 (fig. 3).

The colchicines treatments for this variety, for concentration of 0.04% (984.99 - 4 hours respectively 1337.99 - 6 hours) and for concentration of 0.02% (1246.99 - 6 hours) had a strong effect by reducing the number of fruits per plant, the differences being very significant compared to the control sample (fig. 3).

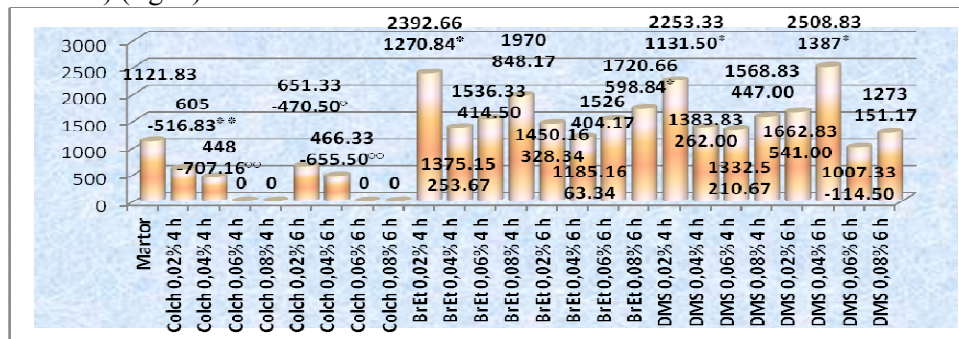


**Fig. 3** - The influence of mutagen agents over the average number of fruits/plant in  $M_2$  generation for Sandra variety

Ethidium bromide and dimethyl sulphate at concentrations of 0.02% (667.99 respectively 480.32) and 0.08% (723.66 respectively 389.82), with a 6 hours exposure time, had a reducing effect with significant differences from the control sample (fig. 3).

#### *Omagiu variety*

The number of fruits per plant for the Omagiu variety registered both negative and positive differences compared to the control sample (average control 1121.83) (fig. 4).



**Fig. 4** - The influence of mutagen agents over the average number of fruits/plant in  $M_2$  generation for Omagiu variety

The treatment with colchicine at concentration of 0.04% with a 4 and 6 hours treatment caused decreases in the number of fruits per plant with distinct significant differences from control sample (707.16 - 4 hours respectively 655.49 - 6 hours) (fig.4).

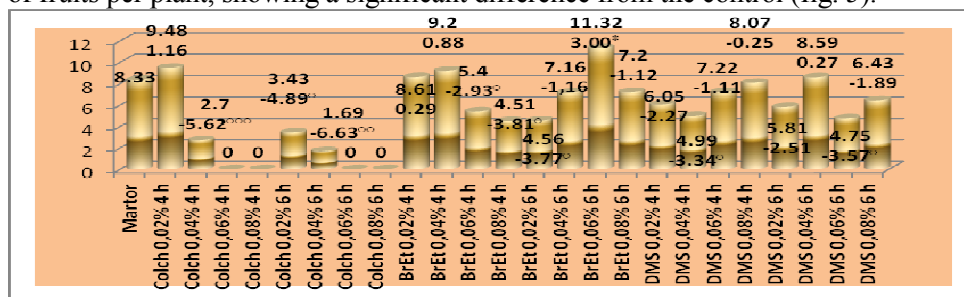
The colchicine in concentration of 0.02% with a 4 hours treatment time produced positive differences, distinct significant (516.83) compared to the control sample.

Ethidium bromide and dimethyl sulphate had the effect of increasing the number of fruits per plant at a concentration of 0.02% for the 4 hours treatment time, leading to significant differences compared to the control sample (1270.83 or 1131.50) (fig. 4). With a duration of 6 hours, the treatment with etidium bromide with a concentration of 0.08% (598.83) and dimethyl sulphate with a concentration of 0.04% (1387.00) showed significant differences compared to the control sample (fig. 4).

### ***Fruit / plant weight***

#### ***Sandra variety***

Regarding the fruit weight yielded per plant, Sandra variety recorded an average of 8.33 (fig. 5). For this variety, ethidium bromide in concentration of 0.06% (2.99) with a 6 hours treatment time, had the effect of increasing the weight of fruits per plant, showing a significant difference from the control (fig. 5).



**Fig. 5** - The influence of mutagen agents over the average weight of fruits/plant (gr) in M<sub>2</sub> generation for Sandra variety

The 4 hours treatment with colchicine in concentration of 0.04% (5.62) showed an effect of reducing the weight of fruits per plant, which led to very significant differences compared to the control sample (fig. 5).

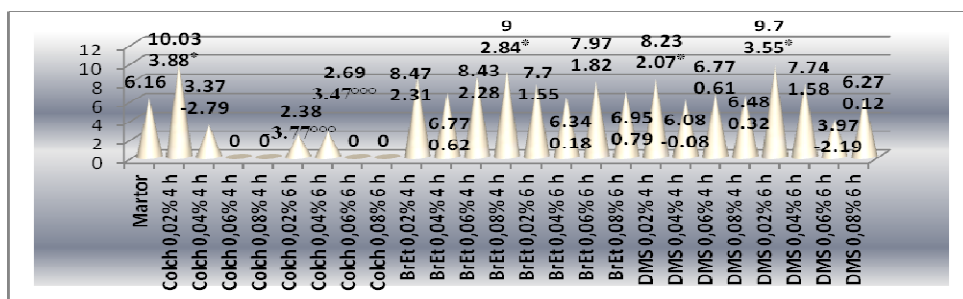
Dimethyl sulphate resulted in a significant difference compared to the control sample at a treatment of 4 hours exposure time with the concentration of 0.04% (3.33) and handling time of 6 hours at the concentration of 0.06% (3.57) (fig. 5).

#### ***Omagiu variety***

Regarding the fruit weight yielded per plant, Omagiu variety recorded an average of 6.16 (fig. 6).

At a treatment time of 6 hours, the colchicine in concentrations of 0.02% (3.77) and 0.04% (3.46) had negative effects, very significant compared to the control sample (fig. 6).

At a concentration of 0.02% (3.87) and with a 4 hours treatment time, the colchicine determined significant positive difference compared to the control sample (fig. 6).



**Fig. 6** - The influence of mutagen agents over the average weight of fruits/plant (gr) in M<sub>2</sub> generation for Omagiu variety

The dimethyl sulphate treatments with duration of 4 and respectively 6 hours at concentration of 0.02% (1.07-4 hours respectively 3.57- 6 hours) resulted in a significant positive difference, compared with the control (fig. 6).

The ethidium bromide had an effect of increasing fruit weight per plant at the concentration of 0.08% (2.84) at the 4 hour treatment, the difference being significant compared with control sample (fig. 6).

## CONCLUSIONS

1. In M<sub>2</sub> generation, to both Sandra variety and Omagiu variety, the number of umbels per plant was reduced following the treatment with colchicine for an 4 hours exposure, the differences being very significant compared to the control sample (0.02%: 119.33 respectively 113.66, 0.04%: 134.66 respectively 127.66).

2. The 4 hours treatments with ethidium bromide and dimethyl sulphate in the concentration of 0.02% for Omagiu variety, the average number of fruits per plant increases compared to control sample, differences being significant (1270.84 respectively 1131.50).

3. The 6 hours treatments with colchicine led to a decrease in the average fruit weight yielded per plant at the Sandra variety (0.04%: 6.63) and Omagiu variety (0.02%: 3.77; 0.04%: 3.46), the differences being very significant compared to the control sample.

## REFERENCES

1. Imbrea F., 2006 - *Plante medicinale și aromatice*, Editura Eurobit, Timișoara.
2. Leonte C., 2003 - *Ameliorarea plantelor*, Editura Ion Ionescu de la Brad, Iași.
3. Muntean Leon S., Muntean S., Muntean L., Vârbă D., Fițu A., Vârbă Rodica, 2003 - *Tehnologii de agricultură ecologică – Plante medicinale și aromatice*, Editura Risoprint, Cluj-Napoca.
4. Oroian S., 2004 - *Botanică farmaceutică, vol. II: plante medicinale și aromatice*, Editura Universității de Medicină și Farmacie, Târgu-Mureș.
5. Verzea M., 2002, - *Tehnologii de cultivare a plantelor medicinale și aromatice*, Editura Orizonturi, București.