ABSTRACT

The medicinal plants, including coriander (*Coriandrum sativum* L.), are one of the most important concerns of man from the beginning of its existence. Currently, the coriander is one of the most important condiments used in the food, perfumery and pharmaceutical industries and represent a valuable concentrated fodder for animals.

The doctoral thesis entitled ***„Researches regarding the effect of mutagenesis on some morpho-physiological traits in coriander (Coriandrum sativum L.)”*** is divided in two parts and comprises seven chapters. The first part describes: the *Coriandrum sativum* L. species, the mutagenic agents used and the studies undertaken so far in coriander breeding.

The second part includes the presentation of the biological material and research methods, the natural and institutional environment as well as the results and conclusions.

Chapter I – ***Description of the Coriandrum sativum L. species*** - includes information regarding the history, biological and technological peculiarities of coriander.

Coriandrum sativum L. belongs to the *Umbelliferae* family and it is an annual cultivated plant. It is characterized by: swivel root system; straight stem, with a lot of branches; leaves of different shape and size, differentiated according to the level at which they are located; the flowers are clustered in compound umbels and the fruit is a spherical indehiscent kernel.

In chapter II – ***Description of the mutagen agents*** - are presented the properties, type of action and effect of colchicine, ethidium bromide and dimethyl sulfate, applied on organisms.

Chapter III - contains data regarding the actual state of researches on the effect of mutagens on morphological and physiological traits. The documentation found in Romania prove the fat that the researches regarding the breeding of the *Coriandrum sativum* L. species are quite modest.

In chapter IV are presented the objectives, material and methods used for researches.

The researches carried out during the three years of study have aimed the following objectives:

- induction of mutations with chemicals in order to increase the variability of the *Coriandrum sativum* L. species;

- monitoring of the behavior of some mutants for the identification of the valuable biological forms in terms of productivity;
- the determination of the phases of plant growth and development in the pedo-climatic conditions of Moldavia;
- evaluation of the effect induced by chemicals on the morpho-physiological traits of coriander;

As biological material, we used the seeds of two local varieties of coriander: *Sandra* and *Omagiu*,from the National Institute for Agricultural Research and Development, Fundulea.

The chemical substances were used in different concentrations: 0.02% 0.04%, 0.06% and 0.08%. The seeds of the two varieties, before sowing, were subjected to 4 and 6 hours treatments with colchicine, etidium bromide and dimethyl sulfate.

The experience was desingned in randomized blocks, with three repetitions and untreated control.

In the laboratory, we studied the chimical sensitivity of *Coriandrum sativum* L. species by determining the germination energy and faculty, and also the roots and stems development, regarding the lenght.

The cytogenetic investigations were performed on root meristems obtained from the seed germination. The meristems were used later, in the Feulgen method.

The mitotic index and the frequency of chromosomal aberrations in mitosis were determined using cytogenetic methods.

There were made observations o the M_1 and M_2 generations the influence of chemical mutagens on the following characters:

- the degree of plant emergence;
- the plant height;
- the number of branches per plant;
- the number of umbels per plant;
- the average number of fruits per plant;
- the average weight of fruits per plant;
- the weight of a 1000 grains
- the survival degree of the plants.

Regarding the physiological analysis, it was determined the assimilatory pigments content and the photosynthesis intensity.

The determination of the pigments in the vegetation period was carried out using the spectrophotometric method, at the Physiology Lab, from UASVM from Iasi.

The determination of the photosynthesis intensity was done directly in the field using the LCpro + portable device.

The statistical interpretation of the data was made using the least significant difference (DL 5%, DL1%, DL 0.1%).

For the M_3 generation was made a characterization of the descendants regarding the plant height, number of umbels per plant and number of branches per plant. Thus, it was determined the average values of some quantitative characters and also the variance coefficient (s%).

Chapter V - ***Environmental and institutional conditions of the researches*** - includes information regarding the topography, vegetation and soil of the Ezăreni farm, the L.E.C.O.M. structure and thee climatic conditions for the years 2011 – 2013.

Chapter VI - ***Results and discussion*** - presents the results of the researches. This chapter is divided into several chapters: the determination of the sensitivity of *Coriandrum sativum* L. after the treatments with chemical mutagenic agents, cytogenetic effects induced by these treatments on the species taken into study, results for the M_1 and M_2 generations and characterization of the M_3 descendants.

As a results of the tests carried out for determining the sensitivity of *Coriandrum sativum* L. species from treatments with three mutagenic substances it was found that: in the same experimental conditions, the germination energy and faculty and also the growth in length of the roots and stems depend on the substance used and its concentration. The colchicine and etidium bromide treatments determinated a quite slow growth of roots and stems.

The cytogenetic analysis revealed that, for the both varieties, ethidium bromide had the strongest mutagenic effect, causing reductions of the mitotic index. The mitotic index reduces along with the increase of the mutagenic agent action.

The biometrics elements analyzed in the M_1 and M_2 generations showed variability under the influence of the treatments applied compared with the untreated control, with significant, distinct and highly significant statistically differences.

After the morphological assessment of the M_1 generation, it was found that for both varieties, the colchicine treatments had an reducing effect on the plant emergence level, plant height, number of branches per plant, the number of umbels per plant, survival degree of the plants, average number of fruits on the plant, average weight of fruits per plant and weight of a 1000 grains.

In the M_2 generation it was found that the lowest frequency of the mutations was manifested after the dimethyl sulfate treatment and the lowest frequency was registered after the colchicine treatment.

The analysis of the chlorophyll pigments content revealed that for the both varieties of coriander, the highest values were recorded in the flowering stage and the lowest, in the fruit ripening stage. The 6 h colchicine treatments with a 0,02% concentration determined the highest content of chlorophyll and carotenoid pigments for the *Sandra* variety.

On the other side, at the same exposure time, colchicine in concentration of 0.04% determined the lowest content of chlorophyll and carotenoid pigments for the *Omagiu* variety. Regarding the ratio of the a and b chlorophylls, for both varieties, the maximum is reached during the fruit ripening.

The process of photosynthesis has reached the highest value in the flowering stage of the plants, after the 4 and 6 hours treatments, with dimethyl sulfate, followed by the ones with ehidium bromide and colchicine.

The morphological and physiological investigations carried out in our experiments helped in the selection of the best lines in order to obtain a new variety.

Following the results, we can conclude that for this species the treatment with chemical mutagens is an effective method to increase the genetic variability in order to obtain new biological forms.

In the M_3 generation, 30 lines were followed, but due to low seed germination energy, only 3 lines have reached the maturity, and they were retained for their practical importance.