SOME ASPECTS ABOUT USING OF MUTAGENIC AGENTS ON CORIANDER

ASPECTE PRIVIND FOLOSIREA UNOR AGENȚI MUTAGENI ASUPRA CORIANDRULUI

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Abstract. *When selecting and breeding medicinal herbs with economic importance the first step is obtaining a very diverse biological material by inducing a very large individual variability. For the plant breeding, both spontaneous mutation and induced mutation by using mutagens are important. Thus, the mutagen factors increase the variability coefficient among cultivated species, and from this new biological material it can be isolated useful forms for using them in the creation process of new hybrids and varieties (Leonte, 2011). The purpose of this paper is to present the mutagenesis researches done until today, which have helped to the enriching of the coriander seed material.*
Key words: mutation, mutagenic agents*, Coriandrum sativum* L.

Rezumat. *În selecția şi ameliorarea plantelor cu importanță medicinală şi economică un prim pas îl constituie obținerea unui material biologic foarte divers, inducerea unei variabilități individuale de largă amplitudine. Pentru ameliorare un rol important îl au mutațiile apărute spontan, ca şi cele declanşate dirijat sub acțiunea factorilor mutageni. Astfel factorii mutageni măresc permanent gradul de variabilitate în cadrul speciilor cultivate, iar din bogăția materialului biologic nou se pot izola formele utile în vederea folosirii acestora în procesul de creare a noi soiuri şi hibrizi (Leonte, 2011). Scopul acestei lucrări este de a prezenta cercetările de mutageneză efectuate până în prezent, care au ajutat la îmbogățirea materialului săditor al plantei.*
Cuvinte cheie: mutație, agenți mutageni*, Coriandrum sativum* L.

INTRODUCTION

Originally, coriander is a plant which grows in Asia, on sunny hills' and not very high rainfall areas, used for thousands of years in India, Iran and China. In Romania, coriander only grows cultivated is not spontaneous or in the wild. Traditionally, its seeds are used against gastric and intestinal diseases, but recent studies validate their use in various disorders. Coriander is known from the ancient times, being used for medicinal purposes and flavoring. In the selection and breeding of medicinal plants with economic importance, the first step is getting a very diverse biological material, inducing large individual variability amplitude. It has demonstrated that, the tendency to variability, manifested in any species, increased after intervention with various factors physical, chemical or biological, these being known as mutagenic factors. Chemical mutagens stimulate

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the mutational processes acting on nucleic acids at rest or replicative biosynthesis. Once entered the plants, chemical mutagens, enter in combination with different chemical components and determine the changes in physical and chemical structure of chromosomes.

The tasks of the breeding coriander in Romania are creating varieties with yields and high content in essential oil of good quality, shake and disease resistant and resistant to breaking diachene (www.regielive.ro).

MATERIAL AND METHOD

The present study was carried out on the basis of the information available in the literature. Taking into account the mechanisms of action of mutagenic agents and mode of manifestation of mutations in the cells, tissues and organs of the plant, was carried out an analysis of research works on the effect of mutagenic agents on morpho - physiological characters in coriander. Mutagenicity research, through emerging characters increases the variability of the species *Coriandrum sativum*.

RESULTS AND DISCUSSION

The first book about the coriander appeared in Russian literature in 1784 written by Balatov. In this book show that this plant, called "kişneţ" was widespread in the eastern parts of the USSR (Păun et al., 1986).

But consumption it is still attested in ancient times, the Bible attributed of coriander fruits role of Heavenly Manna. Coriander is also mentioned in some Sanskrit texts. The parts used are the seeds and leaves (Lavédrine, 2006).

The first information about the volatile oil content in the fruits of coriander are mentioned in the pharmacopoeia published in 1537 in Frankfurt am Main (Păun et al., 1986). The volatile oil extracted from coriander fruits was obtained for the first time in the ex USSR in 1885, the first major installation for extracting volatile oil of coriander building in 1896 to Alekseevsk-Voronej (Păun et al., 1986).

Activity for breeding of the coriander was initiated in 1932 in the ex USSR at the experimental station Alekseevsk by Luzina. The first varieties were obtained in 1950 by the method of individual selection, applied in local populations of *Voronej* and *Saratov*: *Alekseevski 26*, *Alekseevski 118* and *Alekseevski 247*. All by individual selection in the local population was created later variety Voznesenski 60.

By interspecific hybridization between *Coriandrum sativum* and *Foeniculum vulgare* and *Carum carvi* between *Coriandrum sativum* were created *Luci* and *Tminovidnîi* varieties; they are valuable in terms of volatile oil content (1.2%) (Păun et al., 1986).

Most countries use the local population coriander culture. In Romania varieties are *Sandra* (1987) and *Omagiu* (2000). *Sandra* variety was created by S.C.P.M.A. Fundulea by selecting individual repeated annually of the population "*of Braila*" and was approved in 1987. The vegetation period ranges from 95-105 days. It is resistant to diseases, falling and shaking, as well as breaking the fruit.

The plant height is greater than the local population of origin and flowering and fruit maturation are uniform (Emilia Constantinescu, 2008).

Omagiu variety approved in 2000 was created by S.C.P.M.A. Fundulea (Aglaia Mogârzan et al., 2010). This variety is more early with 5 days and it is superior to *Sandra*, achieving a production of 13-19 q / ha fruit, containing from 1.18 to 1.24% volatile oil rich in linalool and production of 16 to 22 l / ha of essential oil (Verzea, 2002).

In 1964, S. S. Raghuvanshi and Sheila Joshi studied influence of treatment with colchicine on the tips growth of seedlings of *Coriandrum sativum*. The growing tips of seedlings of *Coriandrum sativum* were treated with 0,2% colchicines for 24 hours wich lead to the production of tetraploids, mixoploids and diploid mutants. The mutants showed some characteristics different from the control: height higher, thicker and larger leaves formation of decks in the anaphase.

In 1965 the same authors conducted another study on pollen variability and pollen formation without intervention of meiosis in a variant of *Coriandrum sativum*. *Coriandrum sativum* seedlings were treated with 2% colchicines. Such, seedlings treated was very late in flowering. The cytological studies revealed interesting features. Its chromosome number has been found to be 2n=22. At diakinesis and metaphase I there is a tendency for formation of the chromosome bivalent. At anaphase I out of the 307 cells observed 240 were normal while others showed anomalies.

Also in 1965, Sheila Joshi and S. S. Raghuvanshi studying mutation, polyploidy and pollen variability in coriander. His study focused on morphological and cytological characters following treatment with colchicine from *Coriandrum sativum*. Treatment with colchicines and colchicine-gammexane not only resulted in the production of polyploids but also in obtaining diploid mutants with changed characters.

Studies on mutagenic effect of coriander plants were made in India by V.S. Kothekar in 1987. Thus, the seed of *Coriandrum sativum* Linn. (Sheetal variety and Pusa Selec. 360 variety) were treated with two mutagens: ethyl methane sulphonate and diethyl sulfate of different concentrations and their effects were seen on some parameters: germination, survival, plant height and leaf content of vitamin C. In the case of *C. sativum* varieties there was a general exponential fall in the values of germination, survival and plant height with gradual increase in the concentration of the two mutagens. The values of vitamin C content in variety Sheetal were enhanced at certain doses of EMS treatment. In Pusa Selec. 360 variety, however, no such trend was detectable.

R. Pasquale, A. Rapisarda, MP Germano, S. Ragusa and S. Kirjavainen, in 1995, studied the effects of high levels of cadmium in soil and atmosphere on growth coriander and the active components of it. Plants grown in contaminated soil (0, 10, 100 ppm of cadmium) showed a significant reduction in the length of the stems and roots and the number of the umbels, a yellowing and ultrastructural alterations of the leaves and a significant decrease in the essential oil composition.

The effect of radiation on volatile compounds of green coriander leaves was studied by XT Fan and KJB Sokorai in 2002. Fresh cilantro leaves (*Coriandrum sativum* L.) were irradiated with 0, 1, 2, or 3 kGy gamma radiation and then stored at 3 degreesC up to 14 days. Volatile compounds were extracted using solid-phase microextraction (SPME), followed by gas chromatographic separation and mass spectra detection at 0, 3, 7, and 14 days after irradiation. Most of the volatile compounds identified were aldehydes. Decanal and (E)-2-decenal were the most abundant compounds, accounting for more than 80% of the total amount of identified compounds. The amounts of linalool, dodecanal, and (E)-2-dodecenal in irradiated samples were significantly lower than those in nonirradiated samples at day 14. During storage at 3 degrees C, the amount of most aldehydes peaked at 3 days and then decreased afterward.

Khristova D., I. Ivanova and D. Nenkova, in 2005, demonstrates that biologically active substances PB-31 and XP-55, in doses of 30 ml / da and 20 ml / da, applied coriander have a positive effect resulting increase fruit volatile oil content.

Yasser AH Osman Kareem MK El Tobgy and El Sayed A. El Sherbini, (2009) studied the effect of some helium-neon laser treatments on fennel (*Feoniculum vulgare* Mill) and coriander (*Coriandrum sativum* L.) plants. The dry and wet fruits of fennel and coriander plants were exposed to helium-neon laser for 5, 10 and 20 minutes with power density of 95 mW/cm2. In most cases, the tallest plants, the highest number of branches per plant, number of umbels and essential oil percentage were obtained from the treatment of 20 min. helium-neon (He-Ne) laser exposure for wet fruits. The highest fruit yield of fennel was resulted from 5 min of exposure for dry coriander fruits. While in coriander, the highest yield was obtained from 20 min of exposure treatment for wet fruits.

In 2009, MD. Nazrul Islam Bhuiyan, Jaripa Begum and Mahbuba Sultana analysed the essential oil from the leaves and fruits of *Coriandrum sativum* L. using gas chromatography mass spectroscopic (GC-MS). The leaf oil contained 44 compounds mostly of aromatic acids. The seed oil contains 53 compounds where the major compounds are linalool (37.7%), geranyl acetate (17.6%) and γ-terpinene (14.4%). The compositions of both oils varied qualitatively and quantitatively.

In 2010, Kamal Pande Kishore, Lata Pande, Bharat Pande, Atul Pujari and Pankaj Sah have studied composition of essential oil of coriander obtained by hydro distillation at three stages of maturity by GC-MS and GC-FID. Essential oil yields showed marked increase during maturation process and forty one compounds were identified. Geranyl acetate (46.27%), linalool (10.96%), nerol (1.53%) and neral (1.42%) were the main compounds at the first stage of maturity (immature fruits). At the middle stage, linalool (76.33%), *cis* dihydrocarvone (3.21%) and geranyl acetate (2.85%) were reported as the main constituents. Essential oils at the final stage of maturity (mature fruits) consist mainly on linalool (87.54%) and *cis*-dihydrocarvone (2.36%).

CONCLUSIONS

1. The studies based on the existing research literature have found different results on the importance of mutagenic agents in the process of breeding of coriander.

2. At coriander the main mutagenic agents used in breeding were physical and chemical agents.

3. Because natural or artificial mutations tend to favor species, the starting point for obtaining new forms, we can say that the induction of mutations helps on the evolution of coriander (*Coriandrum sativum* Linn).

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