RESEARCH ON THE USE OF MUTAGENIC AGENTS ON GROUNDNUT (*ARACHIS HYPOGAEA* L.)

CERCETĂRI PRIVIND UTILIZAREA UNOR AGENȚI MUTAGENI LA ARAHIDE (*ARACHIS HYPOGAEA* L.)

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Abstract. *The importance of mutations for plant breeding lies in their hereditary character and from the fact that, along with genetic recombination, represents the main source of variability of organism (Țirdea, 2002). Knowing the characters variability and traits of a species is particularly important in choosing the best germplasm sources and specifying ways forward in the process of plant breeding. After treatment of biological material with different physical or chemical mutagens, very heterogeneous populations are produced in terms of improvement value (Leonte, 2011). In this literature review we present recent researches concerning mutagenesis in groundnut.*
Key words: variability, mutation, mutagenic agents.

Rezumat. *Importanța deosebită a mutațiilor pentru ameliorarea plantelor rezidă din caracterul lor ereditar şi din faptul că, alături de recombinarea genetică, reprezintă principala sursă de variabilitate a organismelor (Țîrdea, 2002). Cunoaşterea variabilității caracterelor şi însuşirilor unei specii este deosebit de importantă în alegerea celor mai potrivite surse de germoplasmă şi în precizarea direcțiilor de urmat în procesul de ameliorare. În urma tratamentului materialului biologic cu diferiți agenți mutageni, fizici sau chimici, se obțin populații foarte heterogene în privința valorii ameliorative (Leonte, 2011). Scopul acestei lucrări este de a prezenta cercetările de mutageneză realizate până în prezent la arahide.*
Cuvinte cheie*:* variabilitate, mutație, agenți mutageni.

INTRODUCTION

Naturally inflicted mutations, as those triggered conducted under the influence of mutagens permanently increase the variability in the cultivated species. Thus, the wealth of new biological material can be isolated forms thereof useful for use in creating new varieties and hybrids (Leonte, 2011).

The breeding peanuts objective is to develop varieties with high yield, early maturity, high protein and oil content, resistant to diseases and insect pests. To achieve these objectives and bring about desired improvement in crop, the most sophisticated technique of mutation breeding can be explored by the plant breeders (Sonone, 2011).

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Mutation breeding is an important method for inducing new variability, which is an essential requirement of any plant breeding programmer in the changing agricultural pattern of the day (Sonone, 2011).

Groundnuts are considered to be an important source of protein and other nutrients. These can be placed both in seed and in other organs of the plants. So, seeds are containing increased quantities of proteins and fats. In the past few years efforts are being made to improve the quality of groundnut. Studies were initiated to characterize and evaluate some varieties and to select superior ones and to induce genetic variation through X rays radiation (Iancu, 2011).

MATERIAL AND METHOD

The study was conducted based on analysis of information existing in the literature. Were investigated: the significance of specialized terms and mutagenic action of physical and chemical factors used in the mutational peanuts. Mutagenicity investigations have shown that mutations methods challenge the artificially developed and perfected continuously.

RESULTS AND DISCUSSIONS

Groundnut provides considerable amounts of mineral elements to supplement the dietary requirements of humans and farm animals (Asibuo et al., 2008). Groundnut seed contains 44-56 % oil and 22-30 % protein and is a rich source of minerals (phosphorus, calcium, magnesium and potassium) and vitamins (E, K and B group) (Savage şi Keenan, 1994) and 9,5-19 % carbohydrates as both soluble and insoluble (Croker și Barton, 1957, Oke, 1967, Woodroof, 1983).

Groundnut quality could be increased through selection for increased percent of protein or fats in the seed. Using irradiation it can be obtained variability in plants, both morphologically and in chemical composition of the seed. This approach for groundnut crop was applied in different doses between 5000-10000 R and there were identified variants where smaller or bigger doses presented no influence and variants with significant influence (Iancu and Soare, 2011).

Irradiation presents some specific features, determined by the used source and by the plant or body that is subject to the direct or indirect irradiation. Direct irradiation is practiced in whole plants, plant parts, seeds that are at rest or in the process of germination, pollen, ovules, meristems growth. Cereals, pulses, industrial crops, irradiation is more easily if using seeds (Leonte, 2011).

For a better success in plant breeding by mutations a very practical value presents the initial material which begins the mutational process and the organs subjected to irradiation. Doses of irradiations applied to dried seed of groundnut generally accelerated the growth process, having stimulatory effect upon plant development (Iancu and Soare, 2011).

Using mutant forms starting material is the main way to improve the use of useful mutants. The most frequently mutated forms are used as genitors in

hybridization work, for their valuable characteristics to be combined with other genitors, to obtain new varieties with traits and characters harmonized (Leonte, 1996).

In our country, works of induced mutagenesis to groundnuts were made by Pop L., Valeria Marghitu and Chichea I. (quoted by Iancu, 2010), their results confirming the value of this method as a mean of obtaining increase variability, profitable for selection. So, with the help of ionizing radiations it were obtained some groundnut lines, some of them emphasizing yield increase and quality. As concern the influence of gamma radiations upon the pods yield, these increased the yield until 6000 R and those to 10000 R substantially reduced to some varieties. Under the influence of gamma rays it was obtained Tâmburești variety (1983) experimented presently along Venus variety obtained as a result of repeated selection in 1999 by a team of teachers from Agriculture Faculty (Iancu, 2010).

Gamma rays are used for proper storage of groundnuts against infestation by various pests and microbial contamination during storage (Seda et al., 2001, Who, 1988). Therefore it has been proposed as a good alternative to methyl bromide and other fumigants for pest control (Ogbadu, 1980).

Munteanu (2008) states that chemicals were used for the first time with the role of mutagen during the Second World War in Germany, by Auerbach and the former USSR by Rappoport.

Mutations caused by different chemicals are similar to those produced by radiation or other mutagenic factors. Effectiveness of the mutagenic substances depends on each and every bodys specific, the sexual stage of cell development that influences the concentration of the substance, the application, physiological condition of the body and environmental factors such as temperature and others (Tirdea, 2002).

In peanut, Ashri and Goldin (1965) reported the mutagenic activity of DES (diethyl sulfate). Later, Ashri (1970) discovered a monogenic dominant mutation with recessive lethal effects in the M1 derived from DES soaked peanut seeds, and Ashri and Herzog (1972) further studied the differential physiological sensitivity of peanut varieties to seed treatments with DES and EMS (ethane methyl sulfonate).

Sivaram et al (1985) and Zhu et al (1997) developed high yielding mutant lines after EMS treatment of peanut seeds. Previous attempts at chemical induced mutation in peanut reported alternations in external characters, but seldom mention if there were also changes in internal quality traits (Jung et al 2000, Wang et al. 2006).

Wang et al (2002) obtained large- podded and small- podded mutants following sodium azide treatment of peanut cultivar L7-1. Undesirable changes in the internal quality of the small-podded mutant were merely detected in subsequent studies using one large-podded mutant, one small-podded mutant and the wild type (Wang et al, 2006).

The mutant plants produced by treatment of sodium azide are capable to survive under various conditions and have improved yields, increased stress

tolerance, longer shelf life and reduced agronomic input in comparation to normal plants (Fahad Al-Quarainy și Salim Khan, 2009).

The successful utilization of sodium azide to generate genetic variability in plant breeding has been reported in barley (Kleinhofs and Sander, 1975) and other crops (Avila și Murty, 1983, Micke, 1988, Routaray et al., 1995).

The most effective dosage for inducing morphological mutation was established at 0,03% sodium azide. The main advantage of mutations breeding is the possibility of improving one or two characters without changing the rest of the genotype (Mensah și Obadony, 2007).

Mutation breeding supplement conventional plant breeding as a source of increasing variability and could confer specific improvement without significantly altering its acceptable phenotype (Ojomo et al., 1979).

CONCLUSIONS

1. Physical and chemical mutagens are widely used to produce mutations to increase genetic variability in target materials.
2. After treatment with mutagenic agents we obtain numerous mutations that show changes in morphological characters.
3. Under the influence of chemical mutagens, mitotic cell division is modified, causing the morphological changes of plants.
4. Mutagenic chemical substances that got into the body combine with different chemical components and produce changes at a chemical and physical level of the chromosomes.

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