

STUDIES ON INFLUENCE OF SOME MUTAGEN AGENTS ON THE GERMINATION OF SEEDS AND PLANTULE GROWTH WITH THE *CALENDULA OFFICINALIS* L. SPECIES

STUDII PRIVIND INFLUENȚA UNOR AGENȚI MUTAGENI ASUPRA GERMINĂRII SEMINTELOR ȘI CREȘTERII PLANTULELOR LA SPECIA *CALENDULA OFFICINALIS* L.

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Abstract. *It is well-known that mutagen agents act on the chromosomal set of cell that may influence at its turn anatomically, morphologically and physiologically, the treated species. The application of various doses of mutagen substances may cause a series of metabolic troubles resulting in the decrease or the increase of the tissue formation and differentiations processes. The work notes the changes occurring in the stage of Calendula officinalis L. seed germination and in the stages of the plantules under the influence of the plantules under the influence of the mutagen agents.*

Rezumat. *Se cunoaște că agenții mutageni acționează asupra garniturii cromozomice a celulelor care poate influența la rândul ei anatomic, morfologic și fiziologic speciile tratate. Aplicarea dozelor diferite de substanțe mutagene pot provoca o serie de tulburări metabolice având ca rezultat diminuarea sau intensificarea proceselor de formare și diferențiere a țesuturilor. Lucrarea urmărește observații privind modificările apărute în etapa germinării semințelor de Calendula officinalis L. și a primelor faze de creștere a plantulelor sub influența unor agenți mutageni.*

The germination is the test that establishes the maximum potential seeds germination, from the seeds lot, that can be used for comparing the quality of these and also to appreciate the value of insemination from the field. The germinal energy is the test through which the seeds germination speed can be determined and it is expressed through the germinated seeds rate, in a period equal to a third-half from the established period for the germinal power determination.

MATERIALS AND METHODS

The biological material used is represented by *Calendula officinalis* L. seeds, at which the establishment of the germinal energy, the germinal power and also the influence that mutagen substances have on the little roots and stalks growing were followed.(1,2,5)

The used mutagen substances were: Ethidium bromide, Dichlorphenoxyacetic acid (2-4 D acid), colchicine (3,4) and nicotinic acid.(6)

The ethidium bromide, the dichlorphenoxyacetic acid (2-4 D acid) and the colchicine were used in concentrations of 0,01; 0,02; 0,03 and 0,04 %, and the nicotinic acid had concentrations of 0,50; 0,75; 1 and 1,5%.

The experiment was carried out in the same conditions for all the used substances, in order to analyze comparatively the obtained results.

For each test, the seeds were put to germinate in Petri dishes, 20 seeds in each plate/slate, having as a substratum filter paper, over which the substances in the specified doses were administered.

The established number of days for the determination of germinal energy was of 3 and that for the establishing of germinal power was of 10 days.

The germination temperature was of 20°C. (degrees)

After 3 days, the germinated seeds were counted and removed from the samples and the percentage value of the germinal energy was calculated.

The rest of germinated seeds were also counted after 10 days. At the second reading it was also added for each variant the number of seeds from the first reading, thus being obtained the percentage value of the germinal power.

In order, to make evident the modifications appeared in the growing process of little roots and also the influence of the used substances on the growing process intensity, linear measurements were made at an interval of 3, 6 and 10 days.

RESULTS AND DISCUSSIONS

Analyzing the evolution of *Calendula Officinalis L.* seeds that were put to germinate, it was seen that in the same experimental conditions, their behaviour concerning the parameters taken into study is different.

From the analysis of the obtained results, differences between variants were noticed not only in terms of the used substance kind but also, from its concentration.

In the case of the seeds treated with colchicine, ethidium bromide (excepting the concentration of 0,03 %) and 2.4-D acid, the germination process was launched beginning with the first treatment day.

It was noticed a growth of the germinated seeds process at the treatment of seeds with colchicine, unlike the witness sample and, it was also noticed that, together with the concentration growth, the percentage of germinated seeds also grows.

The values of germinal energy are equal in the case of solutions with 0.01, 0.03, and 0.04% with a slight growth in the case of 0.02% concentration solution.

In case of applying the treatment with ethidium bromide, the same phenomenon was noticed that is of germinated seeds number growing, directly proportional to the growing of the substance concentration.

It was remarked on the other hand, that at the concentration of 0,03% the germinal process was inhibited.

Analyzing the presented data in table nr.1, it is observed that in the case of 2,4D acid, the seeds germinal energy is increased (95%) at 0,01% concentration, and it decreases at approximately 50% in the case of 0,02%, and 0,03% concentration, after that it is registered a slight growth at 0,04% concentration.

The nicotinic acid has totally blocked the germinal process.

Tabelul 1

The influence of the substances on the seeds germinal energy and the germinal power

Substanța	3 zile	10 zile	Total germ	Total neg	E.G (%)	F.G (%)
witness	6	9	15	5	30%	75%
colc 0.01%	15	1	16	4	75%	80%
colc 0.02%	16	2	18	2	80%	90%
colc 0.03%	16	0	16	4	80%	80%
colc 0.04%	16	0	16	4	80%	80%
ethidium bromide 0.01%	11	3	14	6	55%	65%
ethidium bromide 0.02%	13	3	16	4	65%	80%
ethidium bromide 0.03%	0	0	0	-	-	-
ethidium bromide 0.04%	10	6	16	4	50%	80%
2,4 D acid 0.01 %	19	1	20	-	95%	100%
2,4 D acid 0.02 %	10	1	11	9	50%	55%
2,4 D acid 0.03 %	9	-	9	11	45%	45%
2,4 D acid 0.04 %	12	-	12	8	60%	60%
Nicotinic acid 0.50%	0	0	0	-	-	-
Nicotinic acid 0.75 %	0	0	0	-	-	-
Nicotinic acid 1%	0	0	0	-	-	-
Nicotinic acid 1.5 %	0	0	0	-	-	-

EG= germinal energy; FG= germinal power.

From the analysis of the presented data in table 2, it results that the used substances had both stimulating action and a slowing action of the growing process both on the little roots and also on the stalks. In this way in the case of colchicine, it was noticed the fact that, at 0,01% concentration, the growth is faster and it decreases slowly as the concentration increases.

A stimulating effect was observed on the growing of both the little roots and also the stalks. Concerning the samples treated with ethidium bromide and 2,4D acid, it has been noticed a pretty slow growth of both the little roots and also the stems.

After only three days in the ethidium bromide case, a certain growth was noticed and in 2,4D acid case, the process was only launched starting with the sixth day.

The growth process was also slowed down in the case of little roots. What was noticed, was a growth in thickness of the little roots, at the samples treated with ethidium bromide and 2,4D acid, probably due to the modifications appeared at the cellular level (the multiplication of the cells number) as a result of mutagen agent action.

Table 2

The influence of the substance on the growth of the little roots and stalks at *Calendula Officinalis L.*

Substanța	roots			stalks		
	3 zile (cm)	6 zile (cm)	10 zile (cm)	3 zile (cm)	6 zile (cm)	10 zile (cm)
witness	3,5	5.5	7.5	1	4	6
colc 0.01%	2.5	7.6	10.5	0.5	5.5	9.5
colc 0.02%	2	6.6	10.5	1	4.7	8
colc 0.03%	1.5	5.1	9.7	1	5.5	10
colc 0.04%	1.2	4.8	7.5	1	5	8.5
ethidium bromide 0.01%	0.5	1.5	2.5	1	1.1	2.5
ethidium bromide 0.02%	0.5	1.5	2.5	0.7	1	1.5
ethidium bromide 0.03%	-	-	-	-	-	-
ethidium bromide 0.04%	0.7	1.5	2.5	0.5	1.5	2.5
2,4 D acid 0.01 %	-	1	1.5	0.6	1.2	1.7
2,4 D acid 0.02 %	-	0.2	0.7	0.5	0.5	0.7
2,4 D acid 0.03 %	-	0.1	0.6	0.5	0.8	1
2,4 D acid 0.04 %	-	0.1	0.7	0.5	1	1.5
Nicotinic acid 0.50%	-	-	-	-	-	-
Nicotinic acid 0.75 %	-	-	-	-	-	-
Nicotinic acid 1%	-	-	-	-	-	-
Nicotinic acid 1.5 %	-	-	-	-	-	-

CONCLUSIONS

1. The chemical substances used in this experiment acted in different ways.
2. The colchicine had a strong stimulating effect, not only on the germinal process but also on the growth.
3. In the ethidium bromide and 2,4D acid case, even though the germination started fast, modifications appeared at the little roots level, thus being created a thickness of them, the lengthening process is very reduced, and in the case of 0,03% concentration, the germinal process was totally inhibited.
4. Regarding the nicotinic acid action, this totally had a negative character , inhibiting the germination process totally.
5. The greatest values of the germinal power were registered in the case of the colchicine and ethidium bromide treated seeds, followed by 2,4D acid.

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