THE INFLUENCE OF THE NUTRITION SPACE UPON THE PRODUCTION, AT *CALENDULA OFFICINALIS* L. SPECIE, IN THE CONDITIONS OF CLUJ-NAPOCA

INFLUENȚA SPAȚIULUI DE NUTRIȚIE SUPRA PRODUCȚIEI, LA SPECIA *CALENDULA OFFICINALIS* L., ÎN CONDIȚIILE DE LA CLUJ-NAPOCA

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Abstract. *Flowers of calendula have colagog, healing, anti inflammatory and calming effect. The variant sown at the distance of 50 cm between rows and 10 cm between plants on row it is recommended for production. The period of vegetation at Calendula officinalis L. is about 154 days.*

Rezumat. *Florile de gălbenele au acțiune colagogă, cicatrizantă, antiinflamatoare şi calmantă. Varianta semănată la distanța de 50 cm între rânduri şi 10 cm între plante pe rând este recomandată pentru producție. Perioada de vegetație la specia Calendula officinalis L. este de cca. 154 de zile.*

Key words: *Calendula officinalis L., germination faculty, nutrition space, active principles.*
Cuvinte cheie:Calendula officinalis L., *facultatea germinativă, spatiul de nutriție, principii active.*

INTRODUCTION

Calendula plants are original from the Mediterranean area and west Asia, being spread in almost the entire Europe, as an ornamental and medicinal plant.

According to several traditions, calendula are meteorological sensitive plants, which can tell the weather, so that: if at 7 o clock in the morning it has its petals still closed, that means that it will rain, but if between 6 and 7 in the morning it has its petals then it means the weather will be fine. The Latin name of *Calendula* is due to the Latin word *Calendulae*, which is the first calendaristic day of the month, or even the month it flowers.

Calendula are cultivated for its flowers (*Calendulae flos)* with receptacle (*Calendulae flos cum receptaculis*) or flowers without receptacle (*Calendulae flos sine receptaculis*). Presently it is studied the action upon **HIV** (AIDS) virus, in order to stimulate the immunitary system. Because of its flavor it is used as an insecticide in rooms. Due to its high content in carotenoids pigments, it was used also as an additive in the food for birds in order to color the yolk of eggs.(NEAMȚU, G. 1986).

MATERIAL AND METHOD

The soil the experience was placed is a typical alluvial one, soil with a decreased alkaline reaction; average carbonated at surface, average supplied in humus, well supplied in total nitrate in the first 30 cm, with an average claz texture with a decreased level of clay supplied with mobile phosphorus and potassium.

In the experience it was used a local population of Cluj.

1. *Calendula officinalis* L. seeds germination

The experience started 2006 when seeds from *Calendula officinalis L.* were put to germinate according to the work methodology, in four repetitions of 100 seeds.

It was aimed on T.P layer (top of paper – Linhardt pots) at the temperature of 20 °C and light factor with the alternated day-night phases and dark.

The germinative energy was determined at 7 days, and the germination faculty at 14 days.

The variants taken into study are:

V_1: one month old– November 2006 (control variant)

V_2: 5 months old – March 2007

2. Study of the nutrition space influence upon the production of flowers at *Calendula officinalis L* specie

The variants taken into study are:

V_1: planted at 70 cm between rows and 10 cm between plants on row, resulting a density of 140000 plants/ha (control variant)

V_2 : 70 cm between rows x 20 cm between plants/row with 70000 plants/ha

V_3 : 70 cm between rows x 25 cm between plants /row with 50000 plants/ha

V_4 : 70 cm between rows x 30 cm between plants /row with 40000 plants/ha

V_5 : 50 cm between rows x 10 cm between plants/row with 200000 plants/ha

V_6 : 50 cm between rows x 20 cm between plants/row with 100000 plants/ha

V_7: 50 cm between rows x 25 cm between plants /row with 80000 plants/ha

V_8: 50 cm between rows x 30 cm between plants/row with 60000 plants/ha

Sowing was made in spring (26 04. 2006), determining the production of flowers at each harvest and also the total production of flowers.

3. Phenological determination at *Calendula officinalis L* **specie**

It was established the period of the vegetation phases and also of the vegetation period:

- The phase "vegetation start – the stem appearance"
- The phase "stem appearance – blossom "
- The phase 'blossom – flowering "
- The phase "flowering – seeds maturation "

4.The analyze of the active principles quality contained at *Calendula officinalis L.***specie**

To determine the flavonoids it was used spectophotometrical method with $AlCl_3$ described in Romanian Farmacopeea the IX edition, and in order to determine and in order to determine the carotenoids, spectophotometrical method based on the molar extraction of beta carotene

RESULTS AND DISCUSSION

1. The germination of *Calendula officinalis* L.specie

In table1. it can be observed that the germination faculty is influenced by the light factor, no mater on the seeds age registering significant negative differences at the variant without light.

Table 1.

The influence of light factor upon the germination faculty

Variants		% of germination	%	± difference	Significance
Afetr a month	Light	60,5	100	0	Control
	Dark	42,25	69,8	-18,25	0
After 6 months	Light	75,25	100	0	Control
	Dark	54,0	71,2	- 21,25	0

DL 5% = 12,0 1% = 18,26 0,1% = 29,34

From table 2. it can be observed that the age of seeds influence the germination faculty, at the germination in the conditions of light and also in the conditions of darkness. In the case of the seeds germinated in conditions of light it is registered a significant difference at the seeds germinated after 6 months. At those germinated in conditions of darkness the differences aren't statistically assured, but the values obtained are higher at the seed of 6 months old.

Table 2

The influence of seeds age upon the germination faculty

Variants		**% of germination**	**%**	**±Difference**	**Significance**
Light condition	1 month	60,5	100	-	Control
	6 month	72,25	124,4	14,75	x
Dark condition	1 month	42,25	100	-	Control
	6 month	54,0	127,8	11,75	-

DL 5% = 11,89 1% = 19,65 0,1% = 37,27

2. Study of the space nutrition influence upon the production of flowers at *Calendula officinalis L* specie

During 2006 there were made seven harvests

Total production of fresh flowers in 2006 was expressed depending on the distance of sowing and the densities resulted.

From table 3. it can be observed that the highest production with very positive significant compared to the control variant (9.247 kg/ha) were registered at the density of 50 x 10 cm (12.483kg/ha). Even if they don't have significant values, the variants 50 x 20 cm (9.923 kg/ha) and 50 x 25 cm (9.383 kg/ha), have higher production than in the case of the control variant (9.247 kg/ha).

The variants with the density 70 x 20cm (8179 kg/ha) and 70 x 25 cm (7.416 kg/ha) registered significant values and negative significant values compared to the control variant.

Table 3

The total production of fresh flowers at *Calendula officinalis L.*specie depending on the density and the distance of sowing (Cluj-Napoca 2006)

Sowing distances (cm)	**Density of plants /ha**	**Production of fresh flowers**		**±Difference**	**Significance**
		Kg/ha	**%**		
70 x 10 (Mt)	140.000	9.247	100	0	Control
70 x 20	70.000	8.179	88	- 1.068	0
70 x 25	50.000	7.416	80	- 1.831	00
70 x 30	40.000	8.475	92	- 772	-
50 x 10	200.000	12.483	135	3.236	xxx
50 x 20	100.000	9.923	107	676	-
50 x 25	80.000	9.383	101	136	-
50 x 30	60.000	8.267	89	- 980	-

DL 5% = 1.231,32 1% = 1.726,33 0,1% = 2.440,03

3. Phenological determinations at *Calendula officinalis L* specie

It is noticed from table 4., that the vegetation period at *Calendula officinalis* in 2006 was of 154 days. Of the total of the vegetation period, the vegetation start – stem appearance

phase represent 11%, stem appearance – blossom phase represent also 11%, blossom–flowering phase 60%, and flowering – seed maturation 18%.

Table.4.

The period of the phases and vegetation period at *Calendula officinalis* L, Cluj-Napoca, 2006

Phenological phases	**Period**	**No. days**	**% of total**
Vegetation start – stem appearance	04. V -20. V	17	11
Stem appearance – blossom	21 V – 06. VI	17	11
Blossom – flowering	07. VI – 06. IX	92	60
Flowering – seeds maturation	07.IX – 04.X	28	18
Total		**154**	100

4. The analyze of the active principles contained in *Calendula officinalis L.*

In order to appreciate the quality features it was determined the content in phenyl propanic derivates, flavones (expressed in g % rutozid) and carotenoids (expressed in beta carotene) from the flowers of *Calendula officinalis.*

After the determination, the content in active principles is presented as follows:

- phenyl propanic derivates 1,02g %
- flavones (expressed in rutozid) 0,42 g %
- carotenoids (expressed in beta carotene) 24 mg/ 100 g.

CONCLUSIONS

1. The germination faculty is influenced by the light factor, no matter of the seeds age
2. The variant sown at the distance of 50 cm between rows and 10 cm between plants on row it is recommended for production.
3. The vegetation period at *Calendula officinalis* L. is about 154 days.
4. At *Calendula officinalis* the content in active principles is presented as follows: phenyl propane derivates 1,02 g %, flavones expressed in rutozid 0,42 g % and carotenoids expressed in beta carotene 24 mg/100g.

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