INFLUENCE OF THE SOWING DATE ON THE STAGE OF THE STOCK AND SEED PLANTS IN CAROOT (*DAUCUS CAROTA* L.)

INFLUENȚA EPOCII DE SEMĂNAT ASUPRA FAZELOR DE PLANTE MAMĂ ŞI DE SEMINCER LA MORCOV (*DAUCUS CAROTA* L.)

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Abstract. *During the 2006-2008 period, on the experimental plots of R.I.V.F. G. Vidra, nine inbred carrot lines sown in three different sowing periods were studied in order to establish their influence on the stock plant stage and seed plants. Our studies aimed to establish the latest sowing dates in the carrot crop under the southern conditions of our country leading to getting of stock plants of optimum size (11-13 mm root diameter), which are able to vernalise in the winter field conditions. The latest sowing period was the period between the 15-25 September. By comparison with other two sowing dates (the last decade of August and the first decade of September, respectively) the latest sowing date led to getting of stock plants under optimum weight, which in about 30-40% couldn't by planted. In the seed crop field, the percent of plants which bore flower stems ranged between 60% (LFM86) and 26.5% (LFM14, LMP 14). The best results with the stock plants were well vernalised during winter field conditions and gave flower stems of over 98% were recorded for the sowing date from the decade of August. This sowing period affords obtaining of the planned seed stock under the southern conditions of our country.*

Key words: carrot, sowing date, development phase.

Rezumat. *În perioada 2006-2008, la ICDLF VIDRA, au fost studiate nouă linii consangvinizate de morcov în trei epoci de semănat şi influența acestora asupra fazelor de plante mamă şi de semincer. Studiul a avut ca scop stabilirea celei mai tardive epoci de semănat a morcovului, în zona de sud a țării, pentru obținerea de plante mamă, de mărime optimă, (11-13 mm diametrul rădăcinii în zona coletului), care să se vernalizeze în condițiile de iernare în câmp. Epoca de semănat, 15-25 septembrie, a fost cea mai tardivă. Comparativ cu celelalte două epoci (20 - 30 august şi 1-10 septembrie), semănatul în această epocă, a determinat obținerea de plante mamă care nu au avut dimensiuni optime, în proportie de 30 - 40%, care nu au fost transplantate. În câmpul semincer, procentul de plante care au emis tije florale, a fost cuprins între 60% (LFM86) şi 26,5 % (LFM 14, LMP 14). Cele mai bune rezultate (plante mamă care au întrunit condițiile pentru vernalizare în câmp şi au emis tije florale în procent de peste 98%) s-au înregistrat în epoca de semănat 20-30 august, ceea ce face posibil obținerea cantității de sămânță planificată, pentru zona de sud a țării.*

Cuvinte cheie: morcov, epoca de semannat, faze de dezvoltare.

INTRODUCTION

Under the temperate conditions of our country carrots behave like a biennial species. Although the two stages of this plant development (both vegetative and generative) have a genetic determination, the environmental factors have a strong influence open the behaviour of this species as a yearly and biennial plant (Meng, 1986; Atherton,1990).

In our growing area, in order to pass to the generative phase the carrot plants have to pass through a vernalisation stage e.g. to be subjected to low positive temperatures for a 60 days period (Dowker, 1975). However, there is a stage of juvenile of the plants when these temperatures are not active. So, the plants which have a smaller age of 12 weeks from the sprouting and a diameter under 11-13 cm at the top root level do not accumulate the vernalisation threshold and do not pass in the generative stage in the next year (Elena Chira, 1996). In order to avoid the influence of high temperatures after the vernalisation upon the appearance of the flower stems and upon the sex expression, it is recommended as the vernalisation stage to be surpassed from 60 days to 70 days (Hiller and Kelly, 1979).

In carrot, like to the other biennial species, the quantity and quality of the obtained seeds are influenced by the mother plants used for the setting up of the seed crops. But their storage under vernalisation conditions in refrigerating spaces requires supplementary expenses. That is why, during the 2006-2008 period at the RIFDG –Vidra a study was developed in order to establish the best sowing date to get mother plants which are able to pass to the generative stage in a higher percent (over 95%) under the open field wintering conditions.

MATHERIAL AND RESEARCH METHOD

The biological material used was represented by nine carrot inbred lines (both male sterile and male fertile lines) of neidearly range which represent the genitors for some F_1 perspective hybrids.

During the 2006 and 2007 period mother stock fields were set up sowing in the open field in the frame of three epochs, as following 20-30 August, 1-10 September and 15-25 Septmber. For each inbred line and each epoch 500 seeds were sown. In order to assure an optimum sprouting, the required water was assuared by irigation.

Seed crops were set up in 2007 and 2008 by planting of the selected biological material on the 30-31 of March in an isolated space under the hot house conditions, the roof being covered with a textile material of insect-proof type. For each line and each sowing date 200 mother plants were used.

The age of plants at the beginning of winter (30 November) was analysed, when the temperature level was lower, under 10^0C (during the vernalisation range of 1-10^0C). In spring, when winter was over (28-29 of March) the root diameter at the level of top root was measured for the plants which had survived in winter in open field conditions. In seed crop plots the number of plants which gave birth to flower stems was determined for each line and epoch of sowing. These data represent average values for the two years of experiments for the two plant stages. The difference significace was computed by the multiple comparison method.

RESULTS AND DISCUSSIONS

Depending on the sowing date and temperature which have influenced sprouting, growing and development of the plants on the date of 30th of November, their age was of 13.2 weeks for the first sowing epoch in 2006 and of only 9.2 weeks for the third epoch in 2007. The optimum temperature for sprouting of the carrot seed is of 15^{0}C while for the plant growing and development in the first stages, it is required 18-22^{0}C.

The higher temperatures recorded in August caused a longer period for the germination seeds and sprouting. Sowing in September made impossible production of mother plants having a minimum age of 12 weeks in the southern part of our country although the plantlets sprouted in 7-8 weeks after sowing (Table1).

Table 1

The age of mother plants which came into winter computed on 30 November

No.	Specification	Epoch 20-30 August	Epoch 1-10 September	Epoch 15-25 September
1	Sowing date	22 August	5 September	17 September
2	Sprouting date	29 – 31 August 2006 4 – 7 September 2007	11-14 September 2006 16-17 September 2007	24-25 September 2006 26-28 September 2007
3	Plant age	13,2 weeks 2006 12,0 weeks 2007	11,2 weeks 2006 10,7 weeks 2007	10,0 weeks 2006 9,2 weeks 2007

Regarding the influence of the sowing date upon the mother plant size one could notice that the percent of plants having an optimum size for vernalisation ranged between 98.8 and 95.4% for the first epoch while for the third epoch it ranged between 60 and 70% (Table 2).

But concerning the percent of mother plants which formed flower stems passing through the generative phase, on could notice that for the plants derived from the first sowing stage, out of the total number of stock plants planted, the percent of those which formed flower stems ranged from 98 to 100% while in the case of the other two epochs the percent was smaller, it ranged between 60 to 26.5% for the third epoch (Table3).

Such results can be explained by the fact that plants have continued to grow in spring, reaching the optimum size, but they didn't accumulate the temperature for vernalisation during the winter, being small both by age and by size.

For each sowing epoch and development stage of the plants (vegetative and generative) were recorded significant differences among the genotypes (which couldn't the correlated among them). So it was proved the influence of the environment all factors upon these characteristics of the species.

Table 2

Influence of the sowing date upon the mother plant stage in carrot during the 2006- 2007 period

No.	Inbred line	The first epoch (20-30 August)		The second epoch (1-10 September)		The third epoch (25-30 September)	
		% of mother plants having root diameter >13 mm	Significance*	% of mother plants having root diameter >13 mm	Significance*	% of mother plants having root diameter > 13 mm	Significance*
1	LMP14	98,8	a	87,6	b	60,0	e
2	LMP15	98,6	a	82,2	d	70,0	a
3	LMP53	98,5	a	88,5	a	64,6	c
4	LFM14	97,1	b	84,6	c	70,0	a
5	LFM15	96,8	b	84,2	c	69,4	a
6	LFM53	96,6	b	77,2	g	67,8	b
7	LFM74	95,3	c	79,2	f	60,9	d
8	LFM77	95,6	c	84,4	c	64,6	c
9	LFM86	95,4	c	81,9	e	60,3	e

* Variants having the same letter have not a significance difference for P 5= %

Table 3

Influence of the sowing date upon the seed plant stage in carrot during the 2007-2008 period

No.	Inbred line	The first epoch (20-30 August)		The second epoch (1-10 September)		The third epoch (25-30 September)	
		% of plants which gave flower stems	Significance*	% of plants which gave flower stems	Significance*	% of plants which gave flower stems	Significance*
1	LMP14	100,0	a	71,6	a	26,5	f
2	LFM14	100,0	a	45,9	g	26,5	f
3	LFM 86	100,0	a	55,2	d	60,0	a
4	LFM74	99,4	ab	51,4	e	59,2	a
5	LMP53	99,2	b	49,5	f	54,4	b
6	LFM53	99,4	b	59,8	c	54,0	b
7	LMP15	98,4	c	65,3	b	44,2	c
8	LMP15	98,0	c	64,9	b	48,5	d
9	LFM77	98,0	c	70,8	a	39,6	e

* Variants having the same letter have not a significance difference for P 5= %

CONCLUSIONS

The research works carried on the influence of the sowing date upon the stage of mother plant and seed crop led to the following conclusions:

1. The sowing date and temperatures during germination and sprouting influenced the age of the carrot mother plants which came into winter;

2. The latest sowing date (25-30 September) revealed the lowermost percent of mother plants of optimum size, and in the seed crop field it caused the least percent of seed plants, for all the genotypes, ranging among 60% (LFM86) and 26.5% (LFM14, LMP14);

3. For the same sowing period among genotypes were recorded significant differences for the plant stages;

4. The highest percent of seed plants, were 98% for all the inbred lines were obtained in the two experimental years when were used mother plants got in the first sowing epoch (20-30August). This percent of seed plants assure an optimum number of plants per ha and, it represented one condition for getting the amount of the planned seed.

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