THE INFLUENCE OF BIOTIC AND ABIOTIC FACTORS UPON RHIZOGENESIS AT *ARGYRANTHEMUM FRUTESCENS* (L.) Sch. Bip.

INFLUENŢA FACTORILOR BIOTICI ŞI ABIOTICI ASUPRA RIZOGENEZEI LA *ARGYRANTHEMUM FRUTESCENS* (L.) Sch. Bip.

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Abstract. *Considering that Argyranthemum, in climate conditions in our country behave as annual plant, for the planting of material production potting-up is used on large scale. Research on factors influencing the rhizogenesis was carried within the floriculture course of USAMV Cluj, and the factors in the study are: the cultivar, the cuttings and the rooting substrate. From the obtained results it stands out the Butterfly variety, rooted in the mixed substrate composed of pearlite and peat.*
Key words: *Argyranthemum,* rhizogenesis, cutting, substratum

Rezumat. *In condiţiile climatice din România, specia Argyranthemum frutescens se comportă ca plantă anuală, iar pentru producerea materialului săditor se utilizează pe scară largă butăşirea. Cercetările privind factorii care influenţează rizogeneza s-au efectuat la USAMV Cluj, în cadrul disciplinei de Floricultură, iar factorii luaţi în studiu au fost cultivarul, tipul de butaş şi subs tratul de înrădăcinare. În urma rezultatelor obţinute s-a evidenţiat cultivarul „Butterfly", înrădăcinat pe substrat mixt format din perlit şi turbă.*
Cuvinte cheie: *Argyranthemum,* rizogeneză, butaş, substrat

INTRODUCTION

At the superior plants, the reproduction can be sexual or asexual. The sexual reproduction is realized through seeds and has the advantage that for one single plant you can obtain a large number of new plants, the disadvantage is of the unfaithful transmission of the parent's characteristics to the offsprings.

The asexual or vegetative reproduction is realized by using parts of the plant and has the advantage that the obtained plants keep identically all the characteristics of the mother plant.

In this case, the most used method is potting up. It is based on the quality of some species to recompose new plants from organs or organic fragments when they are cut off from the mother plant and are placed under optimal environmental conditions. The recomposition referrs both to the radicular system and the aerial plant parts. Potting up bases on the universal phenomena of polarity according to which some plant parts react differently to the two morphological poles. At the apical pole the aerial vegetative parts are recomposed, and at the basic pole the generating of the radicular system is carried out. In the case of cuttings, the first stage of recomposition

of an entire plant is the development of the radicular system, and in the second stage, the aerial parts are developed. The rhizogenesis is the assembly of phenomena which lead to the formation of the radicular system. For the tip cuttings, the mechanism of rhizogenesis is directly linked to the existence of the cambium which plays an important role in the radicular initiation, in two stages:

- the differentiation and development of cambium cells in primar meristems which later develop to radicular meristems;

- the development of the callus as a consequence of the proliferation of cambial cells, which form later radicular meristems. At the *Argyranthemum* variety, the radicular primordiums originate in groups of meristematic cells of primary type which appear between the vascular bundles, and the roots appear on the lateral parts and on the basis of the cuttings.

MATERIAL AND METHOD

The biological material used in this experiment is represented by the species *Argyranthemum frutescens* (L) Sch. Bip. *Astereaceae* family**,** with two cultivation forms: „Butterfly" with yellow flowers (fig. 1) and „Paris daisy" with pink-lilac flowers (fig. 2), belonging to the didactic collection of the USAMV Cluj-Napoca.

Fig. 1. *Argyranthemum frutescens* cv. „Butterfly"

Fig. 2. *Argyranthemum frutescens* cv. „Paris daisy"

The experiment was carried out in the year 2009, as a multiple factor-experiment, namely:

Factor A: **the cultivar,** with two scales: - „***Butterfly"***; - „***Paris daisy"***

Factor B: **the cutting type,** with two scales: - ***tip cutting***; ***- bole cutting***

Factor C: **the rooting substrate,** with three scales: - ***pearlite; - peat; - pearlite + peat - mixture, mixed in relation 1:1***

By combining the three experimental factors, we obtain 12 variants with three repetitions.

The work method was harvesting the tip cuttings (fig. 3) and the bole cuttings (fig. 4) from the mother plants of the two cultivars, healthy from the phytosanitarian point of view and biologically pure. These have been formed and prepared for rooting. After the formation, the cuttings were treated with rhizogene substances (Radistim) and then introduced in the three substrates. The maintenance works meant keeping the humidity of the substrate and the atmosphere constant, and the operations for fighting the pests have been carried out in 7 days terms.

Observations and biometric establishing have been carried out regarding the number of formed roots, as well as the degree of development of the roots, expressed by their length in centimeters.

Fig. 3. Shaped tip cuttings

Fig. 4. Shaped bole cuttings

RESULTS AND DISCUSSIONS

It seems that the influence of the cultivar on the number of formed roots is not so important, which is proven by the reduced number of roots formed at the cultivar „Paris daisy" (table 1)**,** where the average number of roots is 7.06**,** being therefore significantly negative compared to the reference (the „Butterfly" cultivar), which forms an average number of 18.5 roots.

Table 1

The influence of the cultivar on the root number

Cultivar	Average number of roots	%	Difference	Meaning
Butterfly	18.50	100	0.00	Mt
Paris daisy	7.06	38.1	-11.44	000

DL 5%		0.24
DL 1%		0.55
DL 0.1%	1.76	

Regarding the influence of the cutting type on the number of developed roots, the bole cuttings distinguish themselves at both cultivars, as they develop on an average 23.3% more roots (table 2) as the tip cuttings (reference), the differences being significantly positive.

Table 2

The influence of the cutting type on the root number

Cultivar	Average number of roots	%	Difference	Meaning
Tip cutting	11.44	100	0.00	Mt
Bole cutting	14.11	123.3	2.67	***

DL 5%	0.27
DL 1%	0.44
DL 0.1%	1.83

The rooting substrates like the peat and pearlite + peat-mixture distinguish themselves significantly positive from the reference (pearlite), leading to the development of averagely 12.25 roots, which represents a procentual growth of

14.8%, respectively 15.42 cutting roots with a procentual growth of 44.5%, compared to the reference (table 3).

Table 3

The influence of the substrate on the root number

Rooting substrate	Average number of roots	%	Difference	Meaning
Pearlite	10.67	100	0.00	Mt
Peat	12.25	114.8	1.58	***
Pearlite + peat-mixture	15.42	144.5	4.75	***

DL 5% 0.20
DL 1% 0.28
DL 0.1% 0.39

The same tendency is also noticed in the case of the combined action of the substrate and the type of cutting (table 4), where the two substrates distinguish themselves significantly positive of the reference (pearlite), which in the case of the tip cuttings lead to the development of averagely 9.33 roots on a cutting, and at the bole cuttings - of 12.0 roots. The tip cuttings rooted in peat averagely develop 11 roots compared to the bole cuttings, rooted in the same substrate, which develop 13.5 roots. The mixed substrate, consisting of pearlite and peat, averagely leads to the development of 14.0 roots at the tip cuttings and of 16.83 at the bole cuttings.

Table 4

The influence of the substrate - cutting type interaction on the number of roots

Rooting substrate	Cutting type	Average number of roots	%	Difference	Meaning
Pearlite	Tip cutting	9.33	100.0	0.00	Mt
Peat		11.0	117.9	1.67	***
Pearlite + peat-mixture		14.0	150.0	4.67	***
Pearlite	Bole cutting	12.0	100.0	0.00	Mt
Peat		13.5	112.5	1.50	***
Pearlite + peat-mixture		16.83	140.3	4.83	***

DL 5% 0.29
DL 1% 0.40
DL 0.1% 0.55

In order to produce good quality planting material, a mostly good rooting is required, this means both the forming of a big number of roots, and the their harmonious and strong development. To this respect, the present experiment presents data regarding the influence of the experimental factors studied regarding the length of the radicular system. According to the data presented in table 5, the cultivar has a pretty low influence on the length of the radicular system, where „Paris daisy” distinguished itself significantly negative compared to Butterfly. On the other hand, the bole cuttings distinguish themselves significantly negative compared to the tip cuttings, as the roots are with 29.5% shorter (table 6).

Table 5

The influence of the cultivar on the length of the radicular system

Cultivar	The average length of the radicular system	%	Difference	Meaning
Butterfly	5.02	100	0.00	Mt
Paris daisy	1.92	38.02	-3.10	0

DL 5% 1.45
DL 1% 3.34
DL 0.1% 10.64

Table 6

The influence of the cutting type on the length of the radicular system

Cutting type	The average length of the radicular system	%	Difference	Meaning
Tip cutting	4.07	100	0.00	Mt
Bole cutting	2.87	70.5	-1.20	00

DL 5% 0.43
DL 1% 0.71
DL 0.1% 1.33

Table 7

The influence of the substrate on the length of the radicular system

Rooting substrate	The average length of the radicular system	%	Difference	Meaning
Pearlite	2.60	100	0.00	Mt
Peat	3.05	117.3	0.45	***
Pearlite + peat-mixture	4.75	182.7	2.15	***

DL 5% 0.20
DL 1% 0.28
DL 0.1% 0.38

Table 8

The influence of the interaction between the substrate and the cutting type on the length of the radicular system

Rooting substrate	Type of cutting	Average number of roots	%	Difference	Meaning
Pearlite	Tip cutting	3.25	100.0	0.00	Mt.
Peat		3.55	109.2	0.30	*
Pearlite + peat- mixture		5.40	166.2	2.15	***
Pearlite	Bole cutting	1.95	100.0	0.00	Mt.
Peat		2.55	130.8	0.60	***
Pearlite + peat- mixture		4.10	210.3	2.15	***

DL 5% 0.29
DL 1% 0.40
DL 0.1% 0.54

The rooting substrate has a very signi-ficant importance for the development of the radicular system, where the pearlite - peat - mixture is highly distinguished, because for this substrate the radicular system obtains an average length of 4.75 cm, compared to the medium length obtained with pearlite, which is of only 2.60 cm. The

development of the radicular system in peat is with 17.3% better than the reference, reaching an average length of 3.05 cm (table 7).

The data regarding the influence of the interaction rooting substrate - cutting type is presented in table 8. Again, the pearlite - peat mixture is distinguished strongly positive, which leads to the medium development of the roots at the tip cuttings to 5.40 cm and of the bole cuttings to 4.10 cm.

Fig. 5. Tip cuttings rooted in pearlite

Fig. 6. Bole cuttings rooted in the three substrates

CONCLUSIONS

1. The number of roots developed by the cutting is influenced both by the cultivar, and here the „Butterfly" cultivar distinguishes itself, and by the cutting type, where the bole cuttings develop the biggest number of roots;

2. The rooting substrate has influenced the number of roots, whereas the peat - pearlite mixture obtained the best results.

3. The development level of the roots, expressed by their length is inversely proportional with their number, whereas the bole cuttings have a big number of roots, but with a significantly lower development, still, the mixed substrate consisting of pearlite and peat by his superior characteristics, succeeds to stimulate the develoment of the radicular system up to optimal values.

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