ACCLIMATIZATION AND MULTIPLICATION CAPACITY AT SOME *PRUNUS SPECIES* (ARBUTUSES OR TREES) WITH ORNAMENTAL VALUE

Vlad Mariana*, Vlad Ioan*, Vlad Ioana Andra*

* University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: mariana_popvlad@yahoo.com

Abstract

The purpose of the study is: expending the culture of Prunus triloba Lindl. and Prunus padus L. species, which are species with ornamental value through stimulating multiplication and their expending in the architectural landscape space . For the most part there are grown the species with stature of arbutus with falling leaves, solitary planted, in the trellis or in groups when species have persistent foliage, in the form of hedge (from the species with moderate or lower stature), fence shaped after the flowering from March – April or September. The effect of the phytohormones in stimulating the rooting of the cuttings, at some ornamental species (Cachiţa-Cosma, D., 1988), is known, and also their use in floriculture and even in the plant production, these being the considerations that formed the basis of the established purpose of this study.

Key words: *Prunus triloba,* rooting, cuttings, auxine, β indolil butyric acid.

INTRODUCTION

Prunus genere (*Rosaceae* family) includes over 200 species of arbutuses or trees with falling or perdurable foliage, woody species found near the forests (Săvulescu T., 1966). They can be found in temperate regions of the Northern Hemisphere, on costal sands, in rocky areas or even on the cliffs, in the mountainous regions from South – East Asia (Pârvu, 2003). Some species are cultivated for their different colored bark, others for their nicely colored foliage in autumn, ensuring a spectacular ornamental landscape layout (Sonea, Palade, Iliescu, 1987). They have a very good rusticity and a remarkable adaptability in other climates and areas around the globe (e.g. on our continent), and are used in parks and ornamental gardens, and so are the species which are studied by us (Vlad, 2010). They can tolerate temperatures down to – 15^0C and even lower (20). Like other ornamental arbutuses, they prefer a well drained, rich soil, exposed to the Sun, for a good maturation of the wood (Vlad, 2010). They multiply in a generative and equally vegetative manner, but in our conditions they do not couple seeds and vegetative multiplication is practiced: cuttings, grafting or layers (Micu, 1979). In practice there are used green, semi-woody cuttings, with heels, planted in cold greenhouses in July – September (Iliescu, 2008). Woody species as other species with ornamental value, for their expending

in culture, are multiplying through unconventional methods, through *in vitro* tissue cultures (Zăpârțan, 2001).

Prunus triloba Lindl specie, ornamental arbutus, grows vigorously of 2-3m, with dark colored branches, elliptic leaves, pink flowers, and abundant flowering which takes place before the flush. In the specie's biology we can recall that it is thermophilic, light loving, with modest desires towards the water and little pretentious regarding the soil, although it prefers a calcareous soil for an abundant flowering and it gives brightly colored flowers (Ciocîrlan, 1988). The used arbutuses isolated or in groups, and even in association with other species, usually multiply through grafting on samplings of peach and through suckers, but with a low productivity (Encyclopédie universelle, 1999). Cuttings can also be applied successfully when heel seedlings, not very woody are used, planted in greenhouses with cold seedbeds, made up in summer after the flowering and kept in a moderate and controlled moisture and luminosity regime. *Prunus* genre includes several groups of ornamental trees (of ornamental prunes, almond trees, peaches, cherry trees, and sour cherry trees) and of bird cherry trees, of this last group *Prunus padus* L is also part (*bird cherry* – in popular language), originating in Europe and "Colorata" *Prunus padus* variety, with an American origin, adapted in certain conditions (4), and the arbutuses of the genre, for example *triloba* Lindl specie, studied by us is part of the group of almond trees and peaches (Iliescu, 2008).

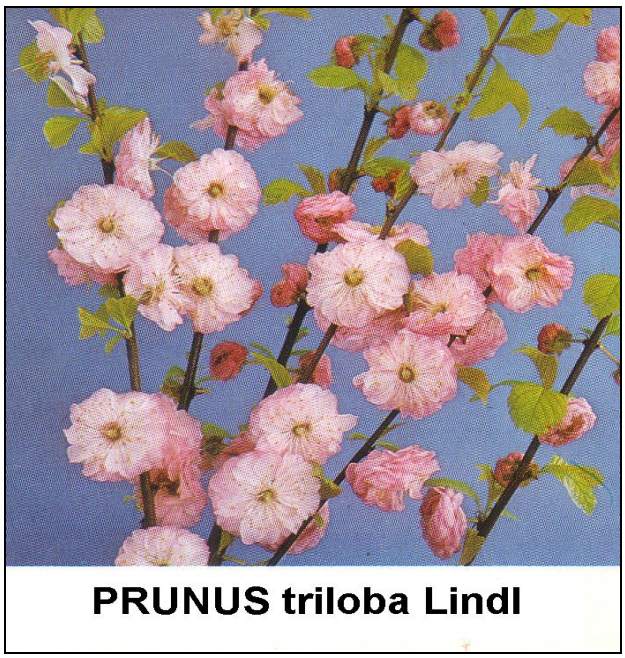

Fig. 1. *Prunus triloba* Lindl

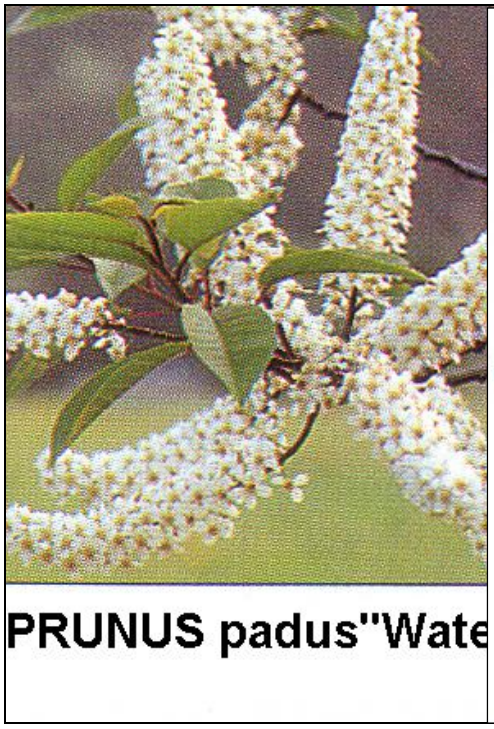

Fig. 2. "Alberti" var.

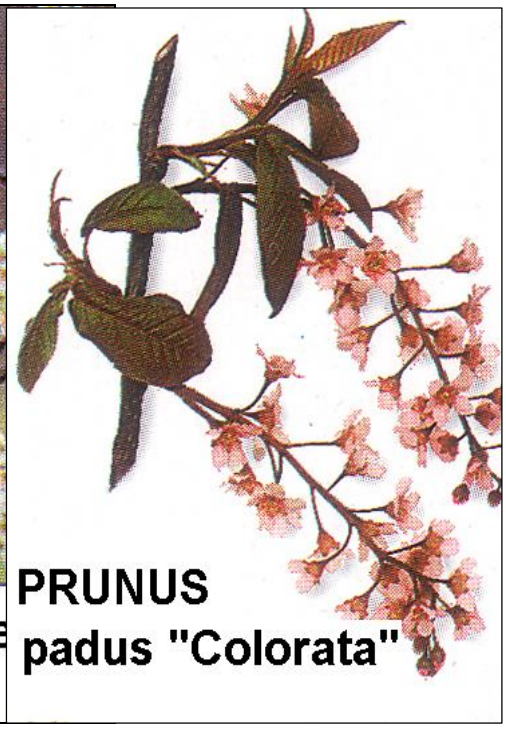

Fig. 3. "Colorata" var.

MATERIAL AND METHOD

The species studied by us are: *Prunus triloba* Lindl arbutus and *Prunus padus* L. three (with two varieties). Originating in China, *Prunus triloba* Lindl is the most frequent in culture, it blooms in early spring from March until April, its flowers have a cup with a diameter of 3-4 cm, pink, usually solitary, rarely two (similar to the rose flower), very ornamental, spheral fruit, red (about 1cm ø). The variety studied by us „Multiplex" (Fig.1) has lower stature, first it blooms and then it leafs, pink flowers, solitary flower buds (2-4cm ø). *Prunus padus* L. is a taper tree, originating in Europe, Northern Asia or Central Japan (3), it bears temperatures under -15^{0}C and it blooms in April – Mai. Elliptic and obsolete leaves of 6-10cm, of light green color, in autumn with shades of yellow or red, with cup-shaped flowers (1-2 cm ø), placed in the shape of oscillating cluster, white and very perfumed (Fig. 2 „*Albertti*" var. with flowers placed in a compact cluster). There are many other varieties with colored flowers as for example "*Colorata"* var. (Fig. 3) studied by us, with rosy, pink, red purple flowers, perfumed and very ornamental by port and color.

Growth phytohormones are frequently used in the growth regulation of some ornamental plants or in stimulating the rooting or the cuttings (9). The method that we present consists of stimulating the rooting of the

cuttings of the recalled species, which through classical methods are rooting in a low percentage and generate a weak root system, with a small capacity of adaptation (7). There were experienced rhyzogene auxine powders containing AIB (β indolil butyric acid) in the following variants and concentrations:

P_o = witness (only the talcum powders);
P_1 = powder with a concentration of 100ppm AIB;
P_2= powder with a concentration of 200ppm AIB;
P_3= powder with a concentration of 300ppmAIB;
P_4 = powder with a concentration of 400ppm AIB,

Table 1

Experimental variants, with a content of rhyzogene powders

Var.	**Auxine**	**Concentration (ppm.)**	**Bonus / % *(Prunus triloba*)**	**Bonus / % (*Prunus padus*)**
P_0	witness	-	xx (10-15%)	xx (between 7-10%)
P_1	AIB	100	xxxxx (10-25%)	xxx (between10- 25%)
P_2	AIB	200	**xxxxxx (< 75%)**	xxx (between 10-25%)
P_3	AIB	300	xxx (about 20%)	xxxx (between 40-45%)
P_4	AIB	400	xxx (about 20%)	**xxxxx (< 65%)**

Note: AIB = β indolil butyric acid as powder (ppm = parts per million)

The powders from the variants presented in table 1, were applied at the basis of the cuttings' heel of the recalled varieties and then, were planted in cold greenhouses. The experiment for stimulating the rooting of the cuttings was initiated at the beginning of summer, after the flush (the middle of summer), when the sprigs have already formed new wood, using the semi-woody cuttings. The chosen period is known as being favorable to the vegetative multiplication of the arbutus species and ornamental trees.

RESULTS AND DISCUSSION

Observations were made after 60 and respectively 90 days from the moment of applying the treatment tracing: rooting duration or time of the cuttings, the percentage of rooted cuttings, the number and the length of the roots, according to the specie and the experimented variants (P_o - P_4).

The rooting capacity of the ***Prunus triloba*** Lindl cuttings is presented in table 2 which shows the rooting time of the cuttings (expressed in days), the percentage of rooted cuttings (%), the number of roots (average) and their length (cm), as well as overall observations concerning the aspect and the vigour of the new root system.

Table 2

The results concerning the rooting of the *Prunus triloba Lindl* (after 60 days)

Var.	Rooting time (days)	Rooting percentage (%)	No. of roots/cutting (average)	Length of the roots (cm)	Observations concerning the aspect of the new root system
P_0	60	12	6	1,5-2,0	Unsatisfactory aspect
P_1	**50**	63	**44**	6	Well rooted cuttings, good aspect
P_2	**50**	**85**	**50**	**7,5-8,0**	Well rooted cuttings, very good aspect
P_3	60	21	12	4,0	Short roots, satisfactory aspect
P_4	60	20	14	4,5	Short roots, satisfactory aspect

Rooting time of the cutting of *Prunus triloba* specie treated with auxine powders which contain β indolil butyric acid is of 50 and respectively 60 days depending on the concentration of auxine (see table 2), in the case of this specie a lower concentration (100-200ppm) stimulated rooting, reducing the time of 50 days, forming a root system with a very good aspect. At the higher concentrations of auxine in the powder, the formation time of the roots is longer, beyond 60 days, and the roots are short and the aspect of the rooted cutting is low to satisfactory. It seems that the high concentration has a slight inhibition or slow action on the root formation.

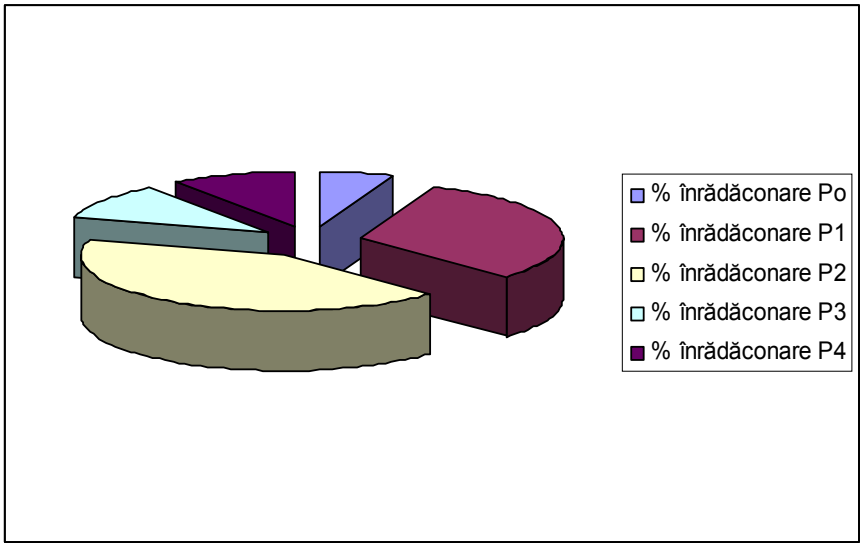

Fig. 4. The percentage of rooted cuttings at *Prunus triloba Lindl* specie

The percentage of rooted cuttings at *Prunus triloba* is presented in Figure 4 of which we can see that the medium concentration of auxine from

the powder (P_2 - 200ppmAIB) gives the highest percentage of rooted cuttings, about 85%, followed by P_1 (cu 100ppm AIB), of about 53%, while higher concentrations (P_3 and P_4, with 300 and 400ppm AIB), inhibit the percentage of rooted cuttings, being barely of 20-21%, and on P_o (witness) of 12%. We can conclude that for stimulating the rooting of this specie's cuttings medium concentrations of rhyzogene powder of 200 - 100ppm are beneficial.

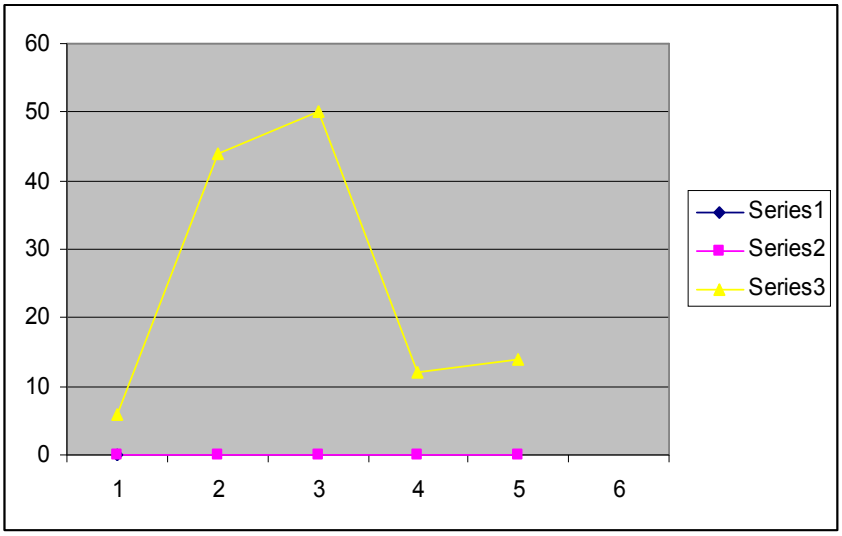

Fig. 5. The average number of roots per cutting at *Prunus triloba* Lindl specie (**1** = P_o; **2** = P_1 ; **3** = P_2 ; **4** = P_3 ; **5** = P_4)

The average number of roots per cutting after about 50-60 days is presented in Figure 5. We see that to this parameter of *Prunus triloba* cuttings reaches the highest average of roots, on P_2 also, with 200ppm AIB (with a medium concentration of auxine), a number of about 50 roots /cutting, long of about 8 cm, with a very good aspect of the root mass. On the variants with a high concentration of AIB the average number of roots is of 12-14 roots/cutting (short roots with an unsatisfactory aspect), and on the witness sample of only 6 roots/cutting, thin and frail.

The evolution of the root system at the cuttings of ***Prunus padus*** *L* **specie** contains the analysis of the same parameters as in the case of the previous specie. The rooting time of the cuttings (days) was followed after 70, 80 and respectively 90 days (see Table 3). The effect of the treatment applied to the cuttings in the case of this specie is reverse. The cuttings treated with the maximum concentration (P_4 – 400ppmAIB) appropriately rooted in the shortest time, about 70 days, followed by the other three concentrations of 100, 200 and 300ppm AIB (P_1, P_2 and P_3), which rooted in

about 80 days, and the untreated cuttings, after over 90 days (witness sample, P_o).

Table 3

The value of the root system at the cuttings of *Prunus padus L* specie (after 90 days)

Var.	Rooting time (days)	Rooting percentage (%)	No. of roots/cutting (average)	The length of the roots (cm)	Observations concerning the aspect of the new root system
P_0	90	7	3 – 4	5	Unsatisfactory aspect
P_1	80	18 – 20	8	7	Satisfactory aspect
P_2	80	23	10	8	Satisfactory aspect
P_3	80	**40 – 42**	25	10	Good aspect
P_4	**70**	**65 – 68**	32	**10-12**	Very good aspect

As a result of the analysis of *the rooting percentage* of *Prunus padus L* cuttings we can see the favorable effect of the high concentration of auxine in the rhyzogene powder, which stimulated a rooting percentage of 65-68% on the variant with 400ppmAIB (P_4) and of 40-42% on the variant with 300ppm AIB(P_3). In Figure 6 we can see this effect and also the much smaller rooting percentages on the other variants: on the variant with 200ppm AIB (P_2), about 23%; on the one with 100ppmAIB (P_1) about 20%; and on the witness sample (P_o) of only 7%. We believe that in order to increase the percentage of rooted cuttings we must also experiment higher concentrations of auxine incorporated into the powder and even other auxines (e.g. ANN. AIB etc.), or other phytohormones.

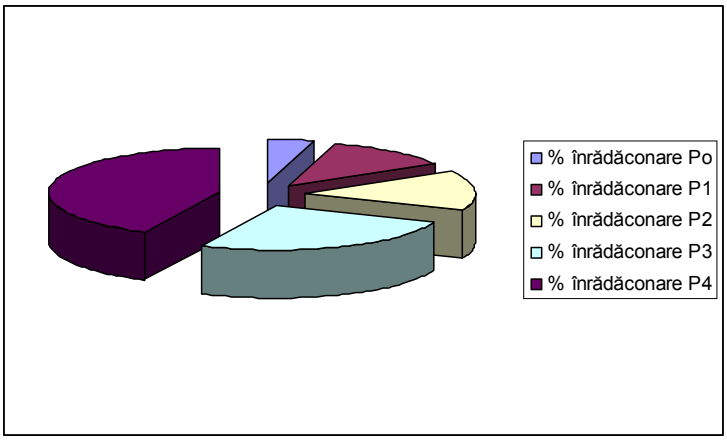

Fig. 6. The percentage of rooted cuttings at *Prunus padus* L.

The average number of roots per cutting at *Prunus padus* L is presented graphically in Figure 7, in which we can see the evolution of this parameter. Following the graphic we can observe that the average number of roots *is directly proportional to the growth of the auxine concentration within the rhyzogene powder*. The highest average was obtained on variant P_4 (with 400ppmAIB) about 32 roots/cutting of 10-12cm length, and with a very good aspect of the root system; followed by P_3 (with 300ppmAIB), with about 10 roots/cutting of about 10 cm length and a good aspect of the roots. On the other variants with a low concentration of AIB, the number is small, of 8-10 roots/cutting, with a frail aspect, and on the witness the number of roots is even smaller 3-4 roots/cutting of about 5 cm, with an unsatisfactory aspect.

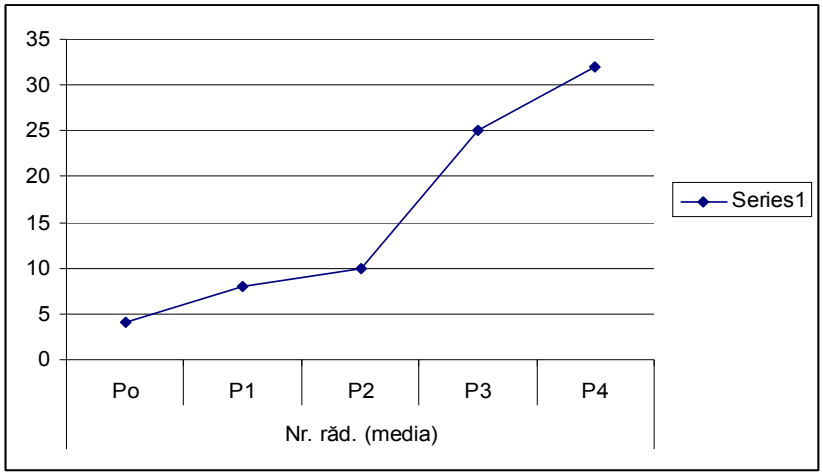

Fig. 7. The average number of roots/cutting at *Prunus padus* L.

CONCLUSIONS

- *The rooting time* of the ***Prunus triloba*** Lindl cuttings is lesser at a treatment with a low concentration of auxine, of 100-200ppm AIB, and greater at a higher concentration of auxine, of 300 -400ppm (60 days).
- *The percentage of rooted cuttings* reaches a maximum value on a balanced concentration of auxine, of 85% (on P_2 with 200ppm AIB), and a higher concentration (300-400ppmAIB) inhibits root formation, the percentage being of only 20-21%.
- *The average number of roots per cutting* at *Prunus triloba* Lindl reaches a maximum value at a treatment with moderate concentration of auxine (P_2 and P_1), resulting 50 roots/cutting, of about 8 cm on P_2, and 40-44 roots/cutting, of about 6 cm on P_1. Higher concentrations of powder with AIB (300-400ppm), inhibit rooting at this specie.

- At ***Prunus padus*** L, *the rooting time* of the cuttings decreases along with the increase of the concentration of auxine within the powder: at a high concentration (P_4) rooting takes place at 70 days, whereas at all other concentrations the time is of 80 days, so that on the witness it extends up to 90 days.
- At *Prunus padus* L., we see a reverse phenomenon, the higher the concentration of auxine within the powder the bigger the increase of the rooting percentage. Hence: on P_o we have a small percentage of under 8%, on P_1 and P_2 the percentage reaches about 22-23%, on P_3 it reaches 42%, so that on P_4 to be over 68%.
- At *Prunus padus* L we do not have a maximum bonus, we believe that for this specie the rooting of the cuttings can be ensured by a higher dose of auxine incorporated into the talcum powders, or in other auxines or types of phytohormones.
- The other followed parameters (number and length of the roots) reach values according to the concentration of the rhyzogene powder. Hence, on the high concentration of 400ppmAIB (P_4) the number of roots exceeds 32 roots/cutting, of 10-12 cm length, while at the other ones it is of 8-20 roots/cutting, depending on the increase of the concentration of AIB within the powder.

REFERENCES

1. Burnie G., et al., 1999, „Botanica – Encyclopedie de botanique et d'horticulture" ed. Könemann, Cologne, pp. 709-716
2. Cachița-Cosma D., 1988, în: Utilizarea bioregulatorilor în producția vegetală, Gergen, I., et al. 1988, Ed. Facla, pp. 8-19
3. Ciocîrlan V., 1988, Flora ilustrată a României, Ed. CERES, vol II. p. 331
4. Gergen I., et al., 1988, Utilizarea bioregulatorilor în producția vegetală, ed. Facla, Bucureşti.
5. Iliescu A.F., 2008, Cultura arborilor şi arbuştilor ornamentali, Eitura. CERES, pp. 316- 320; 370-372
6. Lazăr M., E. Teodorean, l981, Influența auxinei (AIA) şi a alarului (B9) asupra butaşilor unor soiuri de crizanteme (L'influence de L'auxine et de L'alar sur la rhizogenese de boutures de quelque chrysanthemum); Contribuții Botanice (Cluj-Napoca), pp. l56-160
7. Le Calendrie du Jardinage, 2002, Atelier martine et Daniel Sassier (eds.), Paris, Ed. Sélection du Reader's Digest
8. Micu M., 1979, Cercetări cu privire la aplicarea tratamentelor pentru stimularea înrădăcinării şi creşterii butaşilor verzi la unele specii de plante ornamentale, Contribuții Botanice, Cluj – Napoca
9. Milică C.I., 1983, Aplicarea regulatorilor de creştere în culturile horticole, Sinteza nr. 734, Bucureşti, pp. 104-112
10. Neamțu G., Irimie F., 1992, Fitohormoni de creştere, Ediotura CERES, Bucureşti, pp. 45–101

11. Pârvu C., 2003, Enciclopedia plantelor, Plante din flora României, Vol. II pp. 151-193
12. Sonea V., Palade L., Iliescu A.F., 1987, Arhitectură peisajeră, Editura Didactică şi pedagogică, Bucureşti, pp. 28-36
13. Vlad I., 2010, Floricultură, Editura Universiţii din Oradea
14. Vlad M., 2005, Arhitectură ornamentală, Editura Imprimeriei de vest, Oradea, pp. 104-110
15. Vlad M., I. Coman., 2010, Aspects regarding *in vivo* and *in vitro* conservation of *Lilium martagon* L. în Notule Botanice, USAMV, Cluj – Napoca (sub tipar)
16. Wharton E., 1995, Villas et jardins d'Italie, P.U.F., Paris, p 14 – 24
17. Zăpârţan M., 2001, Conservarea florei spontane prin înmulţire in vitro, Ed. ALC MEDIA GROUP, Cluj – Napoca, 35; 100-104
18. * * *, 1966, Flora RPR, T. Săvulescu (ed)., vol. I-XIII, p. 332
19. * * *, 1999, Encyclopédie universelle des 15.000 de plantes, Editor Christopher Brickell, en association avec la Royal Horticultural Society, Editura LAROUSSE-BORDAS, imprimată în Germania iulie, 2000, pp. 830-834
20. * * *, 2008, Enciclopedia ilustrată a florilor şi florei sălbatice, Editura Aquila'93, Oradea (traducere Alina Balaj), pp. 39-45