# THE $CO_2$ INFLUENCE ON THE GROWTH OF JUNIPERUS CHINENSIS PLUMOSA PLANTS

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

University of oradea, Facultty, for Enverionmental Protection, 26 General Magheru St., 4100848, Oradea, Romania: marianapopvlad@yahoo.com

***Abstract***

*This paper presents an experimental regarding the influence of $CO_2$ on the growth of Juniperus chinensis Plumosa plants. Incresing the $CO_2$ content in solariums, from 0.07% to 0.1% has a result in increasing the growth rate.*

**Key words**: $CO_2$ administration, growth rate, circumference of the stem, economical efficiency.

## INTRODUCTION

The experience made in Leş nursery (Oradea) with $CO_2$ administration in solarium, influenced favorable the growth potential of the Juniperus chinensis Plumosa plants.

It is known that in outdoor the air contains 0.03% of $CO_2$ can decrease so much that can slow and even stop the plant assimilation.

The suplimentation of $CO_2$ is a way to improve the growing potential of the plants.

Incresing the $CO_2$ content in solariums, from 0.07% to 0.1% has a result in increasing the growth rate, only when the conditions of temperature, light, water and soil are proper.

## MATERIAL AND METHOD

In this experiments were used Juniperus chinensis Plumosa plants. The plant is very valuable throgh his decorative effect, has slow growing, 4-5 m high [1]. Is not very often in our country because of the absence of the plant material as a result of the slow growing and the low rate of multiplication.

The experiment had two variants:

V1 - control

V2 - $CO_2$ treatament

Each variant was 100mp and 40 plants of Juniperus chinensis Plumosa. The planting was made in the midLSDe of the April, in containers. After the planting the temperature was 16-18°C by dsy and 11-14°C by night , for 1 week, and in rest 20-21°C by day and 16-18°C by night.

In the air the humidity was 60-70% and in soil 70-75%.

The irrigation was made on drop and in June by aspersion.

The fertilization was made only by laboratory tests.

The $CO_2$ administration begun 1 hour after sun rising and stopped 2 hours before the set. 1 liter of $CO_2$, on pressure of 1 atm. and temperature of 20°C, has 2 grams weight. To obtein 0.1% $CO_2$ concentrationin the air, where used 6 grams of $CO_2$/hour/mp.

The uniform assessment of $CO_2$ was made by using polietilen tubs, 30 m lenght, penetrated on each meter.

The $CO_2$ was administrated between 1th of April and 10 of September, every year in period 2009-2011.

There were measured the follows characteristics of the plants: the high of the growth, the circumference of the stem and of the crown and it was estimate the economical efficiency of every variant.

**RESULTS AND DISCUSSIONS**

Comparing the plants growth in 2009 it is shown that the high of the stem is 14 cm higher on the plants of Variant 2, with very distinct meaningful difference as the control. The difference is the result of high content of $CO_2$ (0.1%) in the solarium of V2 plants. (table 1)

*Table 1*

The growth of Juniperus chinensis Plumosa plants cultivated in experimental culture in 2009

| Variants | Plants growth | | ±D | The meaning of the difference |
|---|---|---|---|---|
| | Absolute (cm) | Relative (cm) | | |
| V1 - control | 35 | 100 | - | - |
| V2 - $CO_2$ treatment | 49 | 140 | 14 | xxx |

LSD 5% - 4,4
LSD 1% - 6,7
LSD 0,1% - 10,1

In 2011 too, the high of the plants was 39% bigger on Variant 2, as Variant 1, (table 2), the difference was very distinct meaningful.

*Table 2*

The growth of Juniperus chinensis Plumosa plants in 2011

| Variants | Plants growth | | ±D | The meaning of the difference |
|---|---|---|---|---|
| | Absolute (cm) | Relative (cm) | | |
| V1 - control | 78 | 100 | - | - |
| V2 - $CO_2$ treatment | 109 | 139.7 | 31 | xxx |

LSD 5% - 8,8
LSD 1% - 15,9
LSD 0.1% - 28,7

Looking on the girth of the crown of Juniperus chinensis Plumosa plants in 2009 we can see that it is with 36% bigger on Variant 2, with $CO_2$ treatment, as Variant 1, the control, with distinct meaningful difference. (table 3)

*Table 3*

The girth of the crown of Juniperus chinensis Plumosa plants in 2009

| Variants | Girth of the crown | | ±D | The meaning of the difference |
|---|---|---|---|---|
| | Absolute (cm) | Relative (cm) | | |
| V1 - control | 36 | 100 | - | - |
| V2 - $CO_2$ treatment | 49 | 136 | 13 | xxx |

LSD 5% - 4,9
LSD 1% - 7,8
LSD 0.1% - 12,6

In the last year of the experiment, 2011, the girth of the crown was bigger on the variant with the plants which benefited of a higher percent of $CO_2$ in atmosphere, with very distinct meaningful difference as the control. (table 4)

*Table 4*

The girth of the crown of Juniperus chinensis Plumosa plants in 2011

| Variants | Girth of the crown | | + - D | The meaning of the difference |
|---|---|---|---|---|
| | Absolute (cm) | Relative (cm) | | |
| V1 - control | 65 | 100 | - | - |
| V2 - $CO_2$ treatment | 88 | 135 | 23 | xxx |

LSD 5% - 6,2
LSD 1% - 11,5
LSD 0.1% - 22,7

Concerning the circumference of the stem on Juniperus chinensis Plumosa plants in 2009 this was bigger on Variant 2, with 28 %, as Variant 1, the control, with very distinct meaningful difference.

*Table 5*

The circumference of the stem on Juniperus chinensis Plumosa plants in 2009

| Variants | Circumference of the stem | | ±D | The meaning of the difference |
|---|---|---|---|---|
| | Absolute (cm) | Relative (cm) | | |
| V1 - control | 2,1 | 100 | - | - |
| V2 - $CO_2$ treatment | 2,7 | 128 | 0,6 | xxx |

LSD 5% - 0,2
LSD 1% - 0,3
LSD 0.1% - 0,5

In 2011, the last year of the research, the circumference of the stem on Juniperus chinensis Plumosa plants, was bigger on Variant 2, as Variant 1, the control. (table 6)

*Table 6*

The circumference of the stem on Juniperus chinensis Plumosa plants in 2011

| Variants | Circumference of the stem | | + - D | The meaning of the difference |
|---|---|---|---|---|
| | Absolute (cm) | Relative (cm) | | |
| V1 - control | 7,2 | 100 | - | - |
| V2 - $CO_2$ treatment | 10,1 | 140 | 2,9 | xxx |

LSD 5% - 1,2
LSD 1% - 1,8
LSD 0.1% - 2,8

Looking to expenses, to the value of the entire production and to the profit level we can define the economical efficiency of every variant.

*Table 7*

Economical efficiency

| Variants | The high of the plants (cm) | Expenses (lei/ha) | Average price (lei/pcs) | Production (pcs/ha) | The value of the production (lei/ha) | Profit (lei/ha) | The rate of the profit (%) |
|---|---|---|---|---|---|---|---|
| V1 - control | 78 | 309.100 | 32 | 19000 | 608.000 | 298.900 | 112,6 |
| V2 - $CO_2$ treatment | 109 | 415.700 | 39 | 19000 | 741.000 | 325.300 | 125,0 |

The highest profit was on Variant 2, Juniperus chinensis Plumosa plants treated with $CO_2$ with the highest rate of the profit (125,0 %).

**CONCLUSIONS**

1. Growing of Juniperus chinensis Plumosa plants , a very valuable plant through his decorative effect, is a profitable activity depending by the way of growing.
2. In solariums the concentration of $CO_2$ can decrese so much that can slow and even stop the plant assimilation.
3. Increasing the $CO_2$ content has a result in increasing the potential of the growth of Juniperus chinensis Plumosa plants.

4. Increasing the $CO_2$ content in solariums, from 0.07% to 0.1% has a result in increasing the growth rate (28-50%), by only when the conditions of temperature, light, water and soil are proper.
5. The $CO_2$ administration begun 1 hour after sun rising and stopped 2 hours before sun set.
6. 1 liter of $CO_2$, on pressure of 1 atm. and temperature of 20°C, has 2 grams weight.
7. To obtain 0.1% $CO_2$ concentration in the air, where used 6 grams of $CO_2$/hour/mp.
8. The uniform assessment of $CO_2$ was made by using polietilen tubs, 30 m length, penetrated on eachmeter.
9. The $CO_2$ was administrated between 1th of April and 10 of September, every year in period 2009 - 2011.
10. The expenses generated by $CO_2$ administration are recovered and more, ensure a net profit of 562.100 lei/ha.

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