THE CO_2 INFLUENCE ON THE GROWTH OF THUJA OCCIDENTALIS SUNKIST PLANTS

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Abstract

This paper presents an experimental regarding the influence of CO_2 on the growth of Thuja occidentalis Sunkist 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 Thuja occidentalis Sunkist 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 Thuja occidentalis Sunkist 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 Thuja occidentalis Sunkist. The planting was made in the milde 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

Comparing the plants growth in 2009 it is shown that the high of the stem is 9 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 Thuja occidentalis Sunkist plants cultivated in experimental culture in 2009

Variants	Plants growth		±D	The meaning of the difference
	Absolute (cm)	Relative (cm)		
V1 - control	33	100	-	-
V2 - CO_2 treatment	43	130	10	xxx

LSD 5% - 3,4
LSD 1% - 5,4
LSD 0.1% - 8.7

In 2011 too, the high of the plants was 41% bigger on Variant 2, as Variant 1, (table 2), the difference was very distinct meaningful.

Table 2

The growth of Thuja occidentalis Sunkist plants in 20011

Variants	Plants growth		±D	The meaning of the difference
	Absolute (cm)	Relative (cm)		
V1 - control	75	100	-	-
V2 - CO_2 treatment	106	141	31	xxx

LSD 5% - 4,8
LSD 1% - 8,6
LSD 0.1% - 15,6

Looking on the girth of the crown of Thuja occidentalis Sunkist plants in 2009 we can see that it is with 28% 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 Thuja occidentalis Sunkist plants in 2009

Variants	Girth of the crown		±D	The meaning of the difference
	Absolute (cm)	Relative (cm)		
V1 - control	32	100	-	-
V2 - CO_2 treatment	41	128	9	xxx

LSD 5% - 3,1
LSD 1% - 5,0
LSD 0.1% - 8,1

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 Thuja occidentalis Sunkist plants in 2011

Variants	Girth of the crown		±D	The meaning of the difference
	Absolute (cm)	Relative (cm)		
V1 - control	57	100	-	-
V2 - CO_2 treatment	80	140	23	xxx

LSD 5% - 5,9
LSD 1% - 10.6
LSD 0.1% - 19,2

Concerning the circumference of the stem on Thuja occidentalis Sunkist plants in 2009 this was bigger on Variant 2, with 57%, as Variant 1, the control, with very distinct meaningful difference.

Table 5

The circumference of the stem on Thuja occidentalis Sunkist plants in 2009

Variants	Circumference of the stem		±D	The meaning of the difference
	Absolute (cm)	Relative (cm)		
V1 - control	1,4	100	-	-
V2 - CO_2 treatment	2,2	157	0,8	xxx

LSD 5% - 0,30
LSD 1% - 0,46
LSD 0.1% - 0,69

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

Table 6

The circumference of the stem on Thuja occidentalis Sunkist plants in 2011

Variants	Circumference of the stem		±D	The meaning of the difference
	Absolute (cm)	Relative (cm)		
V1 - control	7,1	100	-	-
V2 - CO_2 treatment	9,4	122	2,3	xxx

LSD 5% - 0,5
LSD 1% - 0,8
LSD 0.1% - 1,4

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	75	251.200	30	20000	600.000	348.800	138,8
V2 - CO_2 treatment	106	270.990	40	20000	800.000	529.010	195,2

The highest profit was on Variant 2, Thuja occidentalis Sunkist plants treated with CO_2 with the highest rate of the profit (131,3%).

CONCLUSIONS

1. Growing of Thuja occidentalis Sunkist 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 Thuja occidentalis Sunkist 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 529.010 lei/ha.

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