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RESEARCH CONCERNING THE INFLUENCE OF ALTERNATIVE METHODS FOR FIGHTING AGAINST WEEDS AND OF FOLIAR FERTILIZATION ON *Phylostachys pubescens* SPECIES DEVELOPMENT

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Abstract

Giant bamboo culture begins to gain increasingly more land in Romania, becoming an attractive crop for farmers, not only because of its multiple utilities, but also because of the ease with which it maintains culture immediately after setting up. Choosing the most effective schemes of fertilization and the practice of alternative methods of weeds control, represent two of the essential technological links which any farmer must take into account when proposing the establishment a culture of giant bamboo, according to some minimal inputs. It was found so that, taking 2 foliar treatments during the growing season of the crop, with total soluble and total assailable fertilizers for the crop, associated with mulching or setting up land cultivation of dwarf clover under „culture hidden" to combat weeds, have induced a bamboo plants accelerated growth and development, in the context of the use of technological practice gentle with the environment.

Key words*: foliar fertilizer, mulch, dwarf clover, eco-friendly, technological links.*

INTRODUCTION

The giant bamboo, *Phyllostachys eudilis*, has attracted worldwide attention as a versatile plant with multiple uses. Its uses varied from subsistence, commercial food (young shoots) to construction and furniture (Azziniand Salgado, 1981). It offers economical and ecological benefits to many people in the world.
Ecological plasticity, growth vigor and species diversity are characteristic of bamboo.
It is a plant found almost everywhere and is known for its rapid growth. A bamboo stem reaches the full height in about 60-90 days. In the three to five years, crops are already matured and can already be harvested, depending on intentional uses (Bezze et al., 2017).
Bamboo protects the environment and cleans the air we breathe. Bamboo strains release 35% more oxygen than tree stems. Some species of bamboo can hold up to 12 tons of carbon dioxide in the air per hectare (Lobovikov et al., 2005).
It can also reduce the intensity of light and protect humans from ultraviolet radiation (Benzhi et al., 2005).
Bamboo is a good plant for soil preservation. With its radicular system that explores a large volume of soil, bamboo can provide effective soil erosion control, support river dams and serve as a windbreaker against strong winds.
At the present stage, where more and more emphasis is placed on the practice of environmental friendly technology links, finding alternative weed control methods as well as finding the most effective fertilization schemes become two major objectives to be taken into account when we want to achieve the expected results in terms of minimum inputs.
Therefore, the use of mulch or perennial leguminous crops to eliminate plant competition with a wide range of weeds that invade crops a year is simple, at the fingertips of any bamboo grower.
At the same time, supplementing the necessity of nutrients by administering during the

fertilizer period completely soluble and totally assimilable by plants, fertilizers that can be applied both by plant leaf spraying on plants and by fertilization, is an easy and cheap method at the same time with maximum effectiveness due to the fact that the nutritional elements, found in ionic form (the preferred form of the plants), are rapidly and totally taken over by the nutrients, thus counteracting the possible deficiencies that may occur at a given moment (Dobrinoiu et al., 2014; Dobrinoiu et al., 2011).

In the present paper we intend to establish the impact of the two technological links on the growth and development of bamboo plants in order to protect the environment from aggressive interventions on the soil under the conditions of the traditional farming system.

MATERIALS AND METHODS

In order to achieve our objectives, namely to determine the impact of using alternative weed control methods and the use of foliar fertilizers on the biometric parameters specific to bamboo culture, we have devised a bifactorial type experience in the field according to the subdivision parcel method, the experimental factors taken in the study being the following:

Factor A - weed control method with 3 graduations:

a1 - mechanically mowed;

a2 - mulch layer;

a3 - clover in hidden culture.

Factor B - fertilization scheme with 3 graduations:

b1 - unfertilized;

b2 - fertilized with POLYFEED 14-14-28 + 2% MgO + ME, 10 kg / ha;

b3 - fertilized with POLYFEED 14-14-28 + 2% MgO + ME, 15 kg / ha.

The experience was set in 3 rehearsals, and following the combination of the two factors studied, 9 experimental variants (3 x 3) were obtained.

Interpretation of the experimental results was done by the variance analysis method, according to bifactorial experiments based on the subdivision parcel method.

In order to track the weed control level in the spring of 2017, the variants in which we proposed to combat the weeds by mechanically breeding were left in their natural state while, in the variant where the combat was carried out by the mulching of the soil, I placed a 15 cm thick mulch on the surface of the field, the mulch being chopped cereal straw at a length of 10 cm.

In the case of controlling the weeds by setting up the clover culture as a hidden culture, at the deprivation, we made the clover sowing using 5 kg seed/ha for this purpose.

Immediately we recorded the emergence of the weed species present in the crop, we performed the mapping operation, identifying both the total number of weeds present in each experimental variant and the weed species present in the crop, separately for each experimental variant.

Regarding the fertilization factor, foliar fertilizer administration was done by leaf sprays directly on the plant, in two distinct vegetation phenophases, namely the beginning of the strain stretch (May) and the intensive growth phase of the strains (August), using this for a fertilizer dose of 10 or 15 kg/ha of commercial product.

During the entire vegetation period of the bamboo culture, we carried out biometric observations and determinations, namely: the total number of stems present on the plant, the height of the stems, the branching degree of the stems, the diameter of the stems.

The experimental results obtained were centralized in synthetic tables and analyzed statistically, according to the method of setting the field experience.

RESULTS AND DISCUSSIONS

The competition of bamboo plants with weeds is one of the most important problems, especially in the first two years of setting up the plantation, which is why we need to take the most effective measures to counteract their growth and development, taking into account that the system root plants of bamboo plants did not have the time to explore a large volume of soil so as to cope with the over 800 species of weeds that naturally grow on the preluvosols in southern Romania.

Analyzing the number of weeds present in the experiment (Table 1), we find that the greatest number of weeds were found in experimental

variants where mechanical mowing was used to control their development, the differences from the average of the experience, taken as a witness, being statistically ensured from significant (a1b3) to very significant (a1b2 and a1b3).

Table 1. Influence of weed control method and fertilization scheme on weed number

EXPERIMENTAL VARIANT	NUMBER OF WEEDS/m^2	RELATIVE VALUES (%)	DIFFERENCE	SEMNIFICATION
a1b1	63	324.0	43.56	xxx
a1b2	37	190.3	17.56	xxx
a1b3	25	128.6	5.56	x
a2b1	17	87.4	-2.44	-
a2b2	11	56.5	-8.44	oo
a2b3	8	41,2	-11.44	ooo
a3b1	7	36.0	-12.44	ooo
a3b2	5	25.7	-14.44	ooo
a3b3	2	10.2	-17.44	ooo
AVERAGE (Controll)	19.44	100.0	Controll	Controll

$DL_{5\%} = 4.32$; $DL_{1\%} = 6.46$; $DL_{0,1\%} = 9.12$

The main weed species present in these experimental variants were: *Agropyron repens, Cynodon dactylon, Cirsium arvense, Sonchus arvensis, Sonchus asper, Convolvulus arvensis, Rumex acetosa*, predominantly perennial monocotyledonous species.

By practicing the soil mulching system and that of clover sowing in a hidden crop, we can see that the number of weeds has dropped drastically with statistical assurance from distinctly significant negative (a2b2) to very significant negative (a2b3, a3b2 and a3b3) , so that the combination of the two alternative ways of controlling weeds by supplementing the nutrients needed by the administration of foliar fertilizers becomes technologically worthwhile to account for and at the expense of any farmer (Table 1). The most representative weed species present in these experimental variants were *Sonchus arvensis, Sonchus asper, Convolvulus arvensis, Rumex acetosa* the perennial monocotyledonous weeds, virtually nonexistent. This aspect is particularly important in the context in which, as already known, perennial monocotyledonous weeds are considered to be a weed problem and their control can only be achieved by the use of total herbicides, which can not be achieved in bamboo plantations because, bamboo itself is a perennial graminee species.

Table 2. Influence of weed control method and fertilization scheme on the number of strains per plant (04.06.2017)

EXPERIMENTAL VARIANT	NUMBER OF STRAINS/plant	RELATIVE VALUES (%)	DIFFERENCE	SEMNIFICATION
a1b1	14	54.6	-11.6	ooo
a1b2	15	58.5	-10.6	ooo
a1b3	19	74.2	-6.6	ooo
a2b1	22	85.9	-3.6	oo
a2b2	24	93.7	-1.6	-
a2b3	28	109.3	2.4	x
a3b1	32	125.0	6.4	xxx
a3b2	36	140.6	10.4	xxx
a3b3	41	160.1	15.4	xxx
AVERAGE (Controll)	25.6	100.0	Controll	Controll

$DL_{5\%} = 2.12$; $DL_{1\%} = 3.42$; $DL_{0,1\%} = 5.9$

The total number of strains formed on a plant during the vegetation period varied within fairly wide limits, with statistical assurance from very significant negative for variants where weed control was achieved by mechanical mowing (a1b1, a1b2 and a1b3) (a3b1, a3b2 and a3b3), the highest number of strains being recorded in the case of variants where foliar fertilizations were applied with 10 and 15 kg respectively POLYFEED/ha (Table 2).

Table 3. Influence of weed control method and fertilization scheme on stems height (04.06.2017)

EXPERIMENTAL VARIANT	STEMS HEIGHT (cm)	RELATIVE VALUES (%)	DIFFERENCE (cm)	SEMNIFICATION
a1b1	83.5	63.6	-47.7	ooo
a1b2	96.5	73.5	-34.7	ooo
a1b3	98.3	74.9	-32.9	ooo
a2b1	116.2	88.5	-15.0	o
a2b2	124.8	95.1	-6.4	-
a2b3	147.4	112.0	16.2	x
a3b1	162.3	123.7	31.1	xxx
a3b2	168.7	128.6	37.5	xxx
a3b3	183.4	139.8	52.2	xxx
AVERAGE (Controll)	131.2	100.0	Controll	Controll

$DL_{5\%} = 14.78$; $DL_{1\%} = 19.23$; $DL_{0,1\%} = 24.52$

As a result of determinations related to the maximum height of the strains, it can be seen that minimal values of this biometric indicator were recorded in cases where weed control was done by mechanical mowing, (a1b1, a1b2 and a1b3). The rest of the experimental variants recorded a progressive increase of the value of this parameter, the maximum values being recorded for the alternatives used as an alternative weed control method, the establishment of the clover culture in the hidden culture (a3b1, a3b2 and a3b3), the experimental results obtained following the determinations being statistically very positive (xxx) (Table 3).

Table 4. Influence of weed control method and fertilization scheme on stems diameter (04.06.2017)

EXPERIMENTAL VARIANT	STEMS DIAMETER (mm)	RELATIVE VALUES (%)	DIFFERENCE (mm)	SEMNIFICATION
a1b1	3.0	34.1	-5.8	ooo
a1b2	5.0	56.8	-3.8	oo
a1b3	6.0	68.2	-2.8	oo
a2b1	7.0	79.5	-1.8	-
a2b2	9.0	102.2	0.2	-
a2b3	10.0	113.6	1.2	-
a3b1	11.2	127.2	2.4	x
a3b2	13.4	152.2	4.6	xxx
a3b3	15.1	171.6	6.3	xxx
AVERAGE (Controll)	8.8	100.0	Controll	Controll

$DL_{5\%} = 1.83$; $DL_{1\%} = 2.33$; $DL_{0,1\%} = 3.98$

The diameter of the strains increased, directly proportional to the increase in nutrient intake, and the maximum values of this dendrometric defecer were recorded in experimental variants where the foliar fertilization was supplemented by the symbiotic activity of clover plants (a3b2 and a3b3) significantly positive (xxx) (Table 4.).

Table 5. Influence of weed control method and fertilization scheme on the number of strains per plant (04.09.2017)

EXPERIMENTAL VARIANT	NUMBER OF STRAINS/plant	RELATIVE VALUES (%)	DIFFERENCE	SEMNIFICATION
a1b1	18	56.8	-13.7	ooo
a1b2	21	66.2	-10.7	ooo
a1b3	24	75.7	-7.7	ooo
a2b1	28	88.3	-3.7	oo
a2b2	32	100.9	0.3	-
a2b3	36	113.5	4.3	xx
a3b1	38	119.8	6.3	xxx
a3b2	43	135.6	11.3	xxx
a3b3	46	145.1	14.3	xxx
AVERAGE (Controll)	31.7	100.0	Controll	Controll

$DL_{5\%} = 2.63$; $DL_{1\%} = 3.12$; $DL_{0,1\%} = 5.52$

As plants progress into vegetation, there is a direct proportional increase in the value of the main dendrometric parameters taken into study. Thus, the number of strains formed on a plant varied from 18 strains/plant to 46 strains/plant, the largest number of strains being formed in the experimental variants where the elimination of bamboo weed plants competition was achieved by sowing the clover, the differences from the average of the experience (taken as a witness), being very significant positive (xxx) (Table 5).

Table 6. Influence of weed control method and fertilization scheme on stem height (04.09.2017)

EXPERIMENTAL VARIANT	STEMS HEIGHT (cm)	RELATIVE VALUES (%)	DIFFERENCE (cm)	SEMNIFICATION
a1b1	91.5	61.4	-57.4	ooo
a1b2	106.8	71.7	-42.1	ooo
a1b3	118.2	79.3	-30.7	ooo
a2b1	136.4	91.6	-12.5	oo
a2b2	144.3	96.9	-4.6	-
a2b3	158.7	106.6	9.8	-
a3b1	182.9	122.8	34.0	xxx
a3b2	198.2	133.1	49.3	xxx
a3b3	203.5	136.6	54.6	xxx
AVERAGE (Controll)	148.9	100.0	Controll	Controll

$DL_{5\%} = 12.46$; $DL_{1\%} = 18.32$; $DL_{0,1\%} = 24.22$

Combining foliar fertilization with clover sowing in hidden crops, as an alternative weed control method, has increased the growth rate of bamboo strains, increasing by a few tens of centimeters per month (Table 6.). Thus we notice that for these experimental variants, the intake of nutrients brought about by the practice of these two technological links resulted in very positive values (xxx) of this parameter. This must be taken into account when we aim to obtain a superior wood in both quantitative and qualitative terms, and also if we want to shorten the time of harvesting wood.

As regards the diameter of the strains (Table 7), it is observed that these increased with the advancement of the plants in the vegetation, the highest values being obtained under conditions of combining the weed control method by sowing clover in a hidden crop with the foliar administration of 15 kg of POLYFEED/ha.

Table 7. Influence of weed control method and fertilization scheme on strain diameter (04.09.2017)

EXPERIMENTAL VARIANT	STEMS DIAMETER (mm)	RELATIVE VALUES (%)	DIFFERENCE (mm)	SEMNIFICATION
a1b1	5.0	44.6	-6.2	ooo
a1b2	7.0	62.5	-4.2	oo
a1b3	8.0	71.4	-3.2	oo
a2b1	10.0	89.3	-1.2	-
a2b2	12.2	108.9	1.0	-
a2b3	13.3	118.7	2.1	x
a3b1	14.1	125.9	2.9	xx
a3b2	14.5	129.4	3.3	xx
a3b3	16.3	145.5	5.1	xxx
AVERAGE (Controll)	11.2	100.0	Controll	Controll

$DL_{5\%} = 1.92$; $DL_{1\%} = 2.82$; $DL_{0,1\%} = 4.46$

We can therefore conclude that, in order to obtain the greatest number of strains at the surface unit and higher values of the main dendrometric parameters, bamboo culture becomes imperative to choose the most efficient methods of stimulating the rhythm of growth and development of the plants, under conditions of practical alternative weed control, practical to be mild with the environment.

CONCLUSIONS

The issue of eliminating competition between bamboo plants and weed species is essential

especially during the first two years of setting up the plantation, therefore choosing effective methods to combat them is the key to successfor any farmer who wishes to set up such a plant plantation.

Combating perennial monocotyledonous weed species by using total herbicides is practically impossible, bamboo being itself a perennial monocotyledonous species.

Using weed control methods by using the mulch or clover culture as a hidden crop was very effective in weed control, so the number of weed caps decreased very significantly with plant growth, monocotyledonous species perennials almost disappearing.

The vegetative use of fertilizers, which are totally soluble and totally assimilable by plants, intensifies the growth and development of bamboo plants, the effect of which is reflected in the high growth rate in height and diameter of the stems.

Combining foliar fertilization with the alternative method of controlling weeds by setting up clover culture in hidden culture is two of the technological links that we must take into account when aiming to obtain bamboo of high quality wood but at the same time environment friendly technology links.

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