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STIMULATION AND PLANT PROTECTION PROPERTIES OF *LACTOBACILLUS PLANTARUM*

Antagonistic and plant stimulation activities of *Lactobacillus plantarum* strains were studied. 50% of the studied strains-antagonists caused the complete inhibition of *Rhizobium radiobacter* C58 on a model of carrot explants *Daucus carrota* L. If crown gall appeared, the manifestation of symptoms was less as compared with the control. Stimulation activity was studied on a model of seedlings of *Quercus robur* L. Treatment with *L. plantarum* suspensions didn't improve the germination but positively effected the growth of seedlings (7,1-11,0% increase in plant height).

Key words: *Lactobacillus plantarum,* seedlings, crown gall, stimulation.

Introduction

Lactic acid bacteria are well known for their high antagonistic activities including the activity against plant pathogen [5]. But the studies of the effect of lactobacilli on crown gall agent *Rhizobium radiobacter,* by former nomenclature - *Agrobacterium tumefaciens* and *Agrobacterium vitis (Rhizobium vitis)* have been just recently started and need more attention from scientists.

The conception of Effective Microorganisms started in 1980s includes a wide use of lactic acid bacteria in fertilization and stimulation of plant growth [3].

The **aim** of the investigation was to study the possibility of some strains to inhibit the phytopathogen *Rhizobium radiobacter* C58 and to stimulate the growth of plants.

Materials and Methods

The effect of *Lactobacillus plantarum* strains on crown gall pathogenesis was studied on carrot roots (*Daucus carota* subsp. *sativus L.*). For test-object treatments, overnight culture of rhizobias in

LB-broth [1] (at concentration 10^8 CFU/ml) and experimental mixture of lactobacilli were mixed in a ratio of 1:1. Mixture of rhizobias overnight culture with sterile distillated water in a ratio of 1:1 was used as a positive control. The negative control was sterile distillated water. Lactobacilli were grown overnight in MRS medium [2].

Carrot roots were thoroughly washed in chlorine-containing detergent, rinsed in running water, dipped in ethanol and flamed, peeled from the external tissues, and then cut into discs with the thickness of 0,5 cm. Disks were placed in sterile Petri dishes with watered filter paper. On the surface of fresh cut discs (cambial ring) 100µl of rhizobial culture mixed with lactobacilli were applied. Positive and negative controls were applied the same way.

Disks were placed in sterile Petri dishes at 25 º C for 21 days, and after the results were evaluated by the following scale: «+ + + +» - 100% cambial ring covered with tumours, «+ + +» - 75% of cambial ring have tumours, «+ +» - 50 % cambial ring covered with tumours, «+» - less than 25% of cambial ring covered with tumours, «-» - no tumours.

To study the stimulation activity, a model of oak *(Quercus robur L.)* was used. 1% suspension of overnight *Lactobacillus plantarum* ONU 12 culture was applied to surfaces of acorns, and after incubation for 1 hour the suspensions was poured to the soil where the acorns were planted. Commercial soil with abundance of peat (Polisski Universalnii) was used. Germination and subsequent growth occurred under greenhouse conditions (20-22°C).

After germination, seedlings were poured with 1% suspensions of lactobacilli every week. After 2 months of cultivation, the heights of seedlings were measured.

Results and Discussion

The studied strains of lactobacilli prevented the crown gall infection in the majority of cases (Table 1).

50% of the studied strains-antagonists caused the complete inhibition of *Rhizobium radiobacter* C58. Other strains inhibited infection in 60% of cases (Table 1).

Only one strain - *L. plantarum* ONU 365 - was the less effective - it inhibited gall formation only in 30% of samples.

It can bee seen that the studied strains of lactobacilli are the effective antagonists against crown gall agent on carrot discs. The further experiments should include more plant species used as test models.

Literature data show perspective results of treating agriculturally important plants with lactic acid bacteria to stimulate their growth [3, 4].

We were interested in applying lactobacilli to a plant well studied in forestry but not from the view of treatment with lactic acid bacteria - to oak *Quercus robur L.* We found out that applying *L. plantarum* suspensions didn't improve the germination: it reached 83,3% both in a control just treated with water and in experimental acorns inoculated with lactobacilli. But the mean height of seedlings was 7,1-11,0% increased in plant treated with *L. plantarum* ONU 12 suspension. Next experiments with other concentrations of overnight bacterial suspensions will be carried out.

Table 1

Formation of gall on carrot discs by *Rhizobium radiobacter* C58 in presence of antagonists

Antagonistic strains	Results of three independent experiments		
L. plantarum 011	0	0	0
L. plantarum ONU 365	0	+	+
L. plantarum ONU 337	0	0	0
L. plantarum ONU 471	0	0	++
L. plantarum ONU 356	0	0	0
L. plantarum ONU 355	0	0	0
L. plantarum ONU 475	0	0	++
L. plantarum 06	0	0	+
L. plantarum ONU 474	0	0	0
L. plantarum ONU MFL	+	0	0
-(control)	++	+++	++

Conclusions

Strains *L. plantarum* 011, *L. plantarum* ONU 337, *L. plantarum* ONU 356 , *L. plantarum* ONU 355, *L. plantarum* ONU 474 are the active antagonists against the crown gall agent. *L. plantarum* ONU 12 can be used as plant growth stimulator.

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