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N. Sokolova

EFFECT OF *LACTOBACILLUS PLANTARUM* ON SURVIVABILITY OF WHEAT UNDER OSMOTIC STRESS CONDITIONS

Odessa National I. I. Mechnikov University
Dvorianska street, 2, Odessa 65082, Ukraine
e-mail: onyonderlea@gmail.com

Lactobacillus plantarum ONU 12+311 positively affected survivability and osmotolerance of wheat seedlings under drought conditions. Pre-treatment of wheat seeds with the bacterial suspension led to an increase in plant survivability by 27.6% under sudden osmotic stress conditions.

Key words: lactobacilli, osmotic stress, stimulation activity

Osmotic stress of valuable crops during droughts is a major problem for modern agriculture. It is known that some endophytic bacteria and fungi are capable of alleviating the effects of osmotic stress in plants [Das et al., 2016]. Enhanced protection against phytopathogens, which are more likely to harm stressed plants, may account for the beneficial effect of endophytic microorganisms [Zhu et al., 1997].

On the other hand, lactic acid bacteria *Lactobacillus plantarum* are known to produce plant growth promoting and antagonistic compounds like phytohormones and bacteriocins [Goffin et al., 2010].

The aim of the work was to study the effect of bacterial suspensions of a mixture of *Lactobacillus plantarum* strains ONU 12 and ONU 311 on osmotolerance and survivability of wheat cv Kuyalnyk.

Materials and Methods

Overnight cultures of lactobacilli with concentration 10^8 cells/ml were used for preparation of 0,01% suspensions. Seeds were treated with the suspensions for 1 hour. *Lactobacillus plantarum* ONU 12 and ONU 313 strains used in this experiment were initially isolated from grape must.

Control seeds were soaked in sterile distilled water instead of bacterial suspensions. Germination was carried out under greenhouse conditions in soil.

Osmotic stress was modeled by adding 20% PEG-6000 (polyethylene glycol) to the soil. In total, 200 seeds were processed: 100 were soaked in distilled water, and 100 – in the biopreparation.

During grounding the seeds were divided into four groups: control (water); control (water + PEG); lactobacilli pre-treatment + PEG; lactobacilli pre-treatment + PEG added on the 3rd day of the experiment (in order to model sudden stress conditions).

The results were recorded after 2 weeks. Seed germination, turgor intensity and survivability of plants was taken into consideration.

Results and Discussion

It was revealed that the initial seed germination was approximately the same in all four variants, which may be explained by the addition of water during seed grounding.

By the 14th day of the experiment, reduced turgor was observed in most of the plants (Table 1).

Survivability of plants was the worst in the case of using PEG without lactobacilli treatment: 2,9 ± 2,3% (instead, in the absence of PEG, 16,5 ± 5,2% of the seedlings survived).

Pre-treatment of seeds with lactobacilli yielded some interesting results. In the case of the addition of PEG immediately to the soil, the results did not differ significantly from the control ones.

Table 1

Seed germination and survivability of wheat seedlings under drought conditions following pre-treatment with lactobacilli

Group	Seed germination, %	Plants with decreased turgor, %	Dead plants, %	Normal plants, %
Control (water)	72,0±6,3%	55,5±7,0%	28,0±6,3%	16,5±5,2%
Control (water + PEG)	68,0±6,6%	59,0±6,9%	38,1±6,8%	2,9±2,3%
Lactobacilli pre-treatment + PEG (added immediately)	72,0±6,3%	39,0±6,8%	47,2±7,0%	13,8±4,9%
Lactobacilli pre-treatment + PEG (added on the 3rd day)	72,0±6,3%	58,3±7,0%	11,2±4,5%	30,5±6,5%

However, when PEG was introduced into the soil on the 3rd day of the experiment (in order to model sudden stress conditions), treatment with lactobacilli contributed to the survival of 30,5 ± 6,5% of plants (against the control 2,9 ± 2,3%). In addition, only 11.2 ± 4.5% of the plants died (against the control 38.1 ± 6.8%).

Conclusion

Pre-treatment of wheat seeds with *Lactobacillus plantarum* ONU 12+311 contributes to an increase in plant survivability under osmotic stress conditions by 27.6%.

Literature

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