

Influence of clinostation on alfalfa (*Medicago* spp.) and mustard (*Sinapis* spp.) microgreens

One of the tasks of space biology is to search for sources and increase the efficiency of production of food biomass in extreme, extraterrestrial conditions, and artificial conditions of space vehicles. One of the methods of obtaining food biomass is the cultivation of microgreens in order to create a basis for autonomous and restorative nutrition of astronauts [1].

The aim of the work was to evaluate the influence of clinostation on growth of alfalfa (*Medicago* spp.) and mustard (*Sinapis* spp.) microgreens.

For this purpose, plants seeds were placed on wetted wool base in two plastic containers of $18 \times 10.5 \times 6$ cm size. The first day of seed's germination was conducted at room temperature in darkness. Clinostation, as a model conditions for microgravitation, was applied to a container containing tested plants seeds with wetted wool base on the second day of germination. Clinostat of the Cisco model was used with a rotational speed of four revolutions per hour. An otherwise similar control container received no clinostation. Both containers were placed in the thermostat at 25°C and under artificial illumination by LED phytolamp. Illumination was carried out periodically, with 8 hours of darkness and 16 hours of light. The length of 40 sprouts of each variant was measured after 6 days of growth (Fig. 1).



Fig. 1. State of the plants after 6 days of cultivation

The null hypothesis was proposed that there was no statistically significant difference between the mean values of sprouts length between control and experimental samples. Results of sprouts length measurements are shown in table 1. Obtained data were tested for normality by the Shapiro–Wilk test. The t test was used for testing of the hull hypothesis by using programming language R.

Table 1. Measurements of microgreens length, mm

Parameter	Alfalfa		Mustard	
	Clinostation	Control	Clinostation	Control
Sample mean	1.73	1.86	2.46	2.67
Sample variance	0.0806	0.1381	0.3679	0.8758

The value of t obtained for alfalfa was -1.8593 (> -1.99) and the probability of obtaining this value for a two-tailed test was 0.0667 or 6.67% (> 0.05 or 5%), so we are able to accept the null hypothesis and conclude that clinostation had no significant effect on alfalfa microgreens growth in these conditions.

The value of t obtained for mustard was -1.1767 (> -1.99) and the probability of obtaining this value for a two-tailed test was 0.2435 or 24.35% (> 0.05 or 5%), so we are able to accept the null hypothesis and conclude that clinostation had no significant effect on mustard microgreens growth in these conditions.

Experimental results show that modelled microgravitation has no statistically significant effect on lengths of alfalfa (*Medicago* spp.) and mustard (*Sinapis* spp.) microgreens.

1. Kyriacou M. C., De Pascale S., Kyratzis A., Rouphael Y. Microgreens as a component of space life support systems: A cornucopia of functional food // *Frontiers in plant science*. — 2017. — Vol. 8. — 1587.

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