

THE INFLUENCE OF RAPESEED AND LUPINE ON THE CONTENT OF LOW DIALDEHYDE WHEN GROWN WITH WHEAT AND CUCUMBER SEEDS

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One of the main tasks of agricultural development is to increase the productivity of agricultural plants. For this purpose, green manure plants are used in crop rotation as one of the methods of allelopathic impact on cultivated plants [1]. By enriching the soil with nutrients, they, like organic fertilizers, affect the yield. One of them is a representative of the cruciferous family - rapeseed. Experimental models of the processes of joint germination of cucumber and wheat seeds with rape were created in the laboratory. It is of interest to find out what metabolic features are manifested in this case. The allelopathic interaction can be judged by the qualitative and quantitative changes in the lipid composition, including due to lipid peroxidation (LPO), due to the activation of metabolic processes with the participation of oxygen [2, 3]. The lipid degradation product is malondialdehyde (MDA).

Purpose of research – compare the effect of rapeseed and lupine on the content of malondialdehyde when they are germinated together with wheat and cucumber seeds.

Material and methods. The objects of the study were seeds of sowing cucumber (*Cucumis sativus*), common wheat (*Triticum vulgare*), rapeseed (*Brassica napus L*) and narrow-leaved lupine (*Lupinus angustifolius*).

During the study, 4 groups of seeds were germinated in equal numbers, under the same conditions (natural light, temperature 25°C, daily watering with distilled water), in Petri dishes on a filter paper substrate. Three days later, the MDA content was determined in four replicates.

The determination of the MDA content was carried out as follows: seedlings were ground in a cold 0.15M KCl solution (1:9). The samples were heated for 20 min in a boiling water bath and then cooled under running water and centrifuged for 10 min at 1500 rpm. The content of malondialdehyde was measured by the intensity of the developed color by reaction with thiobarbituric acid (TBA) on a spectrophotometer at a wavelength of 532nm ($\epsilon = 1.56 \cdot 10^5 \text{M}^{-1} \text{cm}^{-1}$) [4].

The results were processed by the method of parametric statistics using the statistical software package Microsoft Excel 2010. The statistical significance of the differences was determined by the Student's criterion, the differences were considered significant at $p < 0,05$.

Findings and their discussion. The results are shown in tables 1 and 2.

Table 1 – Comparison of MDA content (nmol/g) during separate and joint germination of the studied plants ($M \pm m$)

Separate germination			
Cucumber	Wheat	Rape	
0,18±0,008	0,11±0,004	0,056±0,003	
Joint germination			
Cucumber	Rape	Wheat	Rape
0,11 ± 0,005*↓	0,15±0,001*↑	0,06±0,001*↓	0,21±0,002*↑

Note. * – differences are statistically significant in relation to seeds, germinated separately. ↓, ↑ – decrease or increase in the indicator.

Table 2 – Comparison of MDA content (nmol/g) during separate and joint germination of the studied plants ($M \pm m$)

Separate germination			
Cucumber	Wheat	Lupine	
0,18±0,008	0,11±0,004	0,088±0,002	
Joint germination			
Cucumber	Lupine	Wheat	Lupine
0,13 ± 0,005*↓	0,11±0,0001*↑	0,08±0,001*↓	0,012±0,002*↓

Note. * - differences are statistically significant in relation to seeds, germinated separately. ↓, ↑ – decrease or increase in the indicator.

From table 1 it follows that with separate germination, the largest amount of MDA was observed in cucumber seedlings, then in wheat seeds and the smallest amount in rape.

When germinated with rapeseed, the MDA content in seedlings of cucumber and wheat seeds decreased by 1.6 and 1.8 times, respectively. In rapeseed, when germinated together with cucumber, the amount of MDA increased 3.7 times, and when germinated with wheat it increased 2.7 times. Thus, joint germination with rapeseed resulted in a lower accumulation of MDA in seedlings and, therefore, in a lower lipid peroxidation. Wheat and cucumber seeds, on the contrary, had a negative effect on rape seedlings, increasing the accumulation of MDA in them, and wheat was 40% more.

Joint germination with lupine (table 2) also had a beneficial effect on wheat and cucumber seedlings, but somewhat less efficiently than when germinating with rapeseed, reducing the MDA content in seedlings and wheat and cucumber by the same, approximately, 1.4 times.

Oilseed rape has a stronger protective antioxidant effect than a representative of legumes – lupine, it can be assumed due to its own lipids, which have a protective effect on the cell membranes of wheat and lupine seedlings.

Conclusion. Joint germination of wheat and cucumber seeds with green manure seeds leads to a decrease in oxidative stress in seedlings, and the representative of oilseeds, rape, has a 22% more favorable effect than the representative of legumes, lupine.

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ADAPTIVE REACTIONS AND STATE OF HEALTH OF STUDENTS IN THE URBAN ENVIRONMENT

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Environmental pollution is a risk factor for human health. This is indicated by the data of epidemiological studies, medical statistics, indicating a tendency for an increase in the incidence of diseases in the contaminated areas. The danger to health is confirmed by the data of special scientific studies aimed at quantifying the relationship between environmental pollution and its effect on the human body [1].

According to the national report of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, the largest environmental changes constantly affecting the population are: increased demand for energy and transport, urbanization, increased mobility of people, goods and services. The imbalance of the urban environment with environmentally unsustainable transportation systems and inadequate access to public spaces and green spaces contributes to increased air pollution, increased noise and heat islands, reduces opportunities for physical activity and negatively affects the physical and mental health of the population.

With an increase in the population of any city, including the city of Minsk, the level of production activity increases, therefore the problem of human interaction with nature is relevant for improving the environment.

Over the past decade, the effectiveness of environmental protection measures has increased significantly, which ensured the preservation of positive trends in the state of the environment in terms of controlled pollution parameters.