

ASPECTS ON VIABILITY, CELL EXUDATE AND MITOSIS ACTIVITY IN WHEAT SEEDS

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Keywords: viability, sugars, aminoacids, mitosis

Abstract: The role of the cell exudate and of the mitosis in studying of cell membrane modifications was the purpose of this work. There were analysed the seed exudate and mitosis activity values, as well as the correlations between these indices and seed viability in six different wheat seed samples. The results have indicated negative correlations significant for viability-sugars efflux and for viability-aberrant cells. Between viability and dividing cells were found positive correlations.

INTRODUCTION

Last decades, the plant field researchers tried to find a relationship between seed cells membrane modifications and the values of some biochemical and physiological indices. Thus, in 1969, Heydecker showed that accurate information concerning cell membrane modifications can obtain through seed exudate exploration.

Trying to evidence the role of the cell exudate and of the mitosis within the study of cell membrane modifications, this paper analyses six local cultivars of wheat, with various viability values, determining the seed exudate indices (sugars and aminoacids efflux) and mitosis activity in root meristem tips.

MATERIALS AND METHODS

The biological material was represented by wheat seed samples belonging to six local cultivars, whose viability is reproduced within parenthesis: W1 (91%); W2 (81%) W3 (56%); W4 (68%); W5 (34%); and W6 (87%).

For viability assessment there were used 50 seeds in 4 replicates for each sample. (Anghel et al., 1959; Ellis et al., 1985). The distilled water, which imbibed a special filter paper put into Petri boxes, represented the germination medium. The germination temperature was 25°C, and the maximum test assessment duration was 7 days. There were considered germinated the seeds whose rootlets were at least 1 mm length.

The total sugars dosing in exudate has been accomplished in 2 replicates of each 3 g, which were incubated in 7 ml distilled water at 25°C (darkness conditions). After 5 hours there were dosed the total sugars, using a method based on reducing of picric to picramic acid by monoglucides (Schell, 1980). The results were expressed as µg sugars at 1g of seed.

For aminoacids exudate dosing there was worked in 2 replicates, each one of 3,5 g seed and 5 ml distilled water, which were introduced in thermostat at 25°C (darkness conditions). After 5 hours, it has dosed the free aminoacids in extract, using a micromethod relied on colour reaction between the aminoacids from exudate and ninhydrine reagent (Villegas and Mertz, 1975). The results were expressed as µg aminoacids at 1g of seed.

The mitosis activity was evaluated by means of Feulgen method (Raicu et al., 1983), allowing the cytological examination of the first meristem divisions in the root tips. There were investigated 1000 cells in 2 replicates (for each sample), and the result was expressed at 1000 examined cells, for the number of dividing cells, number of aberrant cells (percentage).

RESULTS AND DISCUSSION

The table 1 reproduces the mean values of viability and exudate indices in wheat seeds.

Table 1. Mean values of viability and exudate indices in wheat seeds

Index Sample	Viability (G%)	Sugars efflux (µg/g)	Aminoacids efflux (µg/g)
W1	97	160,30	20,15
W2	90	215,40	48,50
W3	86	248,55	78,45
W4	75	277,84	59,75
W5	65	286,20	59,62
W6	42	425,08	81,35

The greatest values of sugars and aminoacids efflux were registered in the sample with lowest viability (W6), whereas the least values of the same indices were found in the highest viability sample (W1).

The figures 1 and 2 reproduces the correlations between viability, on one hand, and sugars (S), and aminoacids (A) efflux, on the other hand, in the six studied samples.

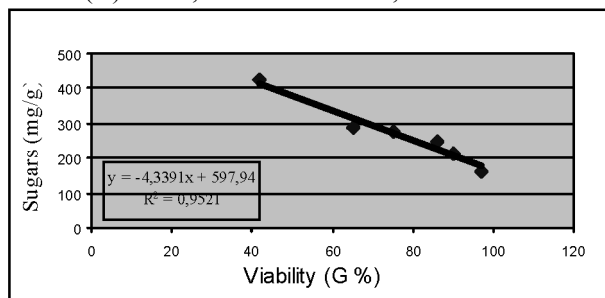


Fig. 1 Linear regression for the correlation between viability and sugars efflux

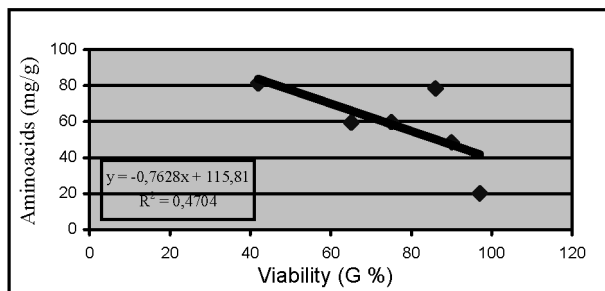


Fig. 2 Linear regression for the correlation between viability and aminoacids efflux

As seen, between viability (G) and sugars (S), and aminoacids (A) were found negative correlations, significant as to relationship G-S.

Beside sugars efflux, where one could establish an indirect and significant relationship between viability and this index, in the case of aminoacids efflux was more difficult to find such a relationship, as seen in the fig. 2 ($R^2=0,4704$).

In the table 2 is rendered the number of dividing cells, as well as the aberrant cell percentage, in the six wheat samples.

The most intense mitosis activities have been registered in W1, W2 and W3, where the viabilities have been higher too. The aberrant cells percentage ranged between 0,5% (W1) and 5,7% (W6).

Table 2. The cell division dynamics in wheat samples

Indices Samples	Dividing cells (number)	Aberrant cells (%)
W1	120	0,5
W2	102	1,2
W3	110	0,9
W4	94	2,3
W5	96	3,0
W6	65	5,7

Linear regressions for correlations between viability - dividing cells (fig. 3), and viability - aberrant cells (fig. 4) have evidenced a positive significant correlation in the first case, and a negative significant correlation in the second one.

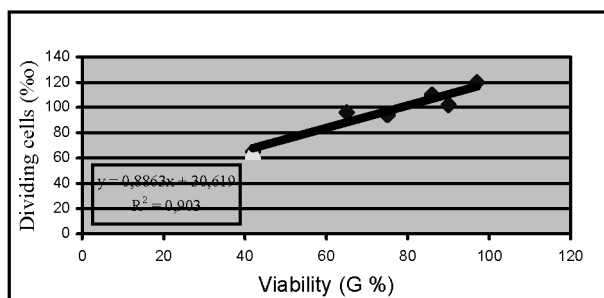


Fig. 3 Linear regression for the correlation between viability and dividing cells

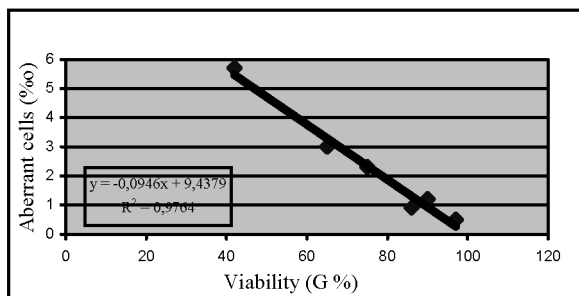


Fig. 4 Linear regression for the correlation between viability and aberrant cells

CONCLUSIONS

Analyzing six wheat seed samples, with various viabilities, as to relationships between viability, on one hand, and sugars, aminoacids efflux, and mitosis activity (in root meristem tips), on the other hand, were found negative correlations, significant for the relationships viability-sugars efflux and viability-aberrant cells, and a positive correlation, significant for the relationship viability-dividing cells.

As other research on cereal seeds, this work evidences the role of cell exudate and mitosis activity indices in studying cell membrane modifications. An increase of sugars and aminoacids

efflux values, as well as of aberrant cells number can indicate a certain degree of membrane deterioration.

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