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MODELING OF TOMATO GENOTYPES STRESS-TOLERANCE BY COMPREHENSIVE ASSESSMENT ON SELECTIVE MEDIA *IN VITRO*

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Abstract: Global climate change has a negative impact on tomato production all around the world. This leads to annual losses of this crop due to disease and extreme weather conditions by 12-30%. To increase the supply of vegetables and expand the range of genotypes adaptive to biotic and abiotic environmental factors, it is necessary to use laboratory methods and methods of mathematical modeling. These techniques are needed to assess and select promising sources of resistance in the breeding.
The effectiveness of a complex rapid assessment of tissue culture *in vitro* in modified selective media MS was studied in terms of viability and biometric parameters of calli and regenerated plants of 10 tomato genotypes. The development of donor plants and the determination of the peroxidase level in their tissues were carried out after 21 days of cultivation. At the same time, the level of productivity and stability of the samples in soil conditions was studied.
The 71 studied parameters revealed 11 high degrees of correlation between the parameters of plants growing in selective media in vitro culture and the yield and resistance of tomatoes in soil conditions. These indicators were used to construct two variants of discriminant functions with the help of canonic discriminant analysis. This will make it possible to predict the level of stress resistance of tomato genotypes and simplify the assessment of a large number of genotypes by a set of traits in breeding practice.

Keywords: tomato, modeling, *Solanum lycopersicum*, screening, correlation, resistance

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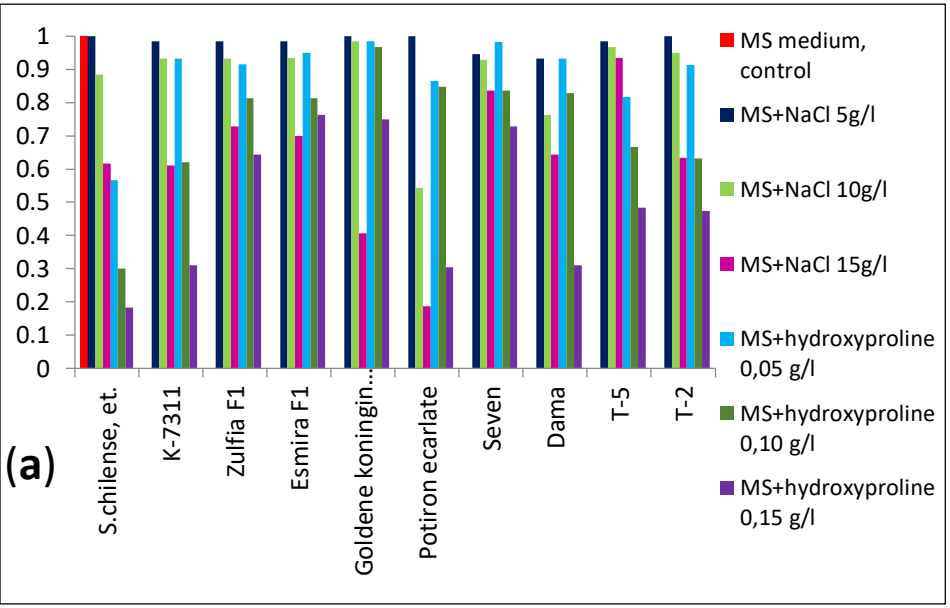
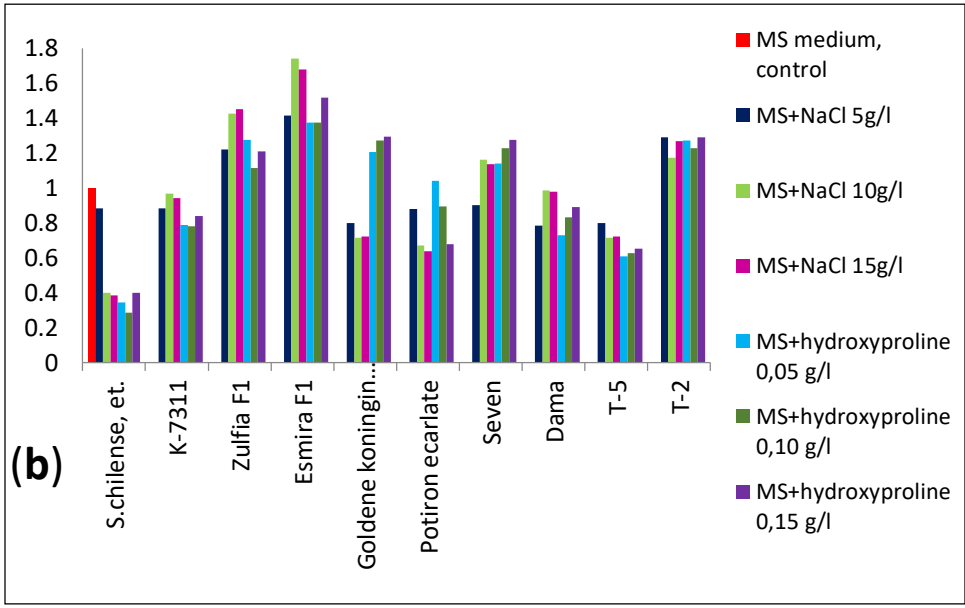
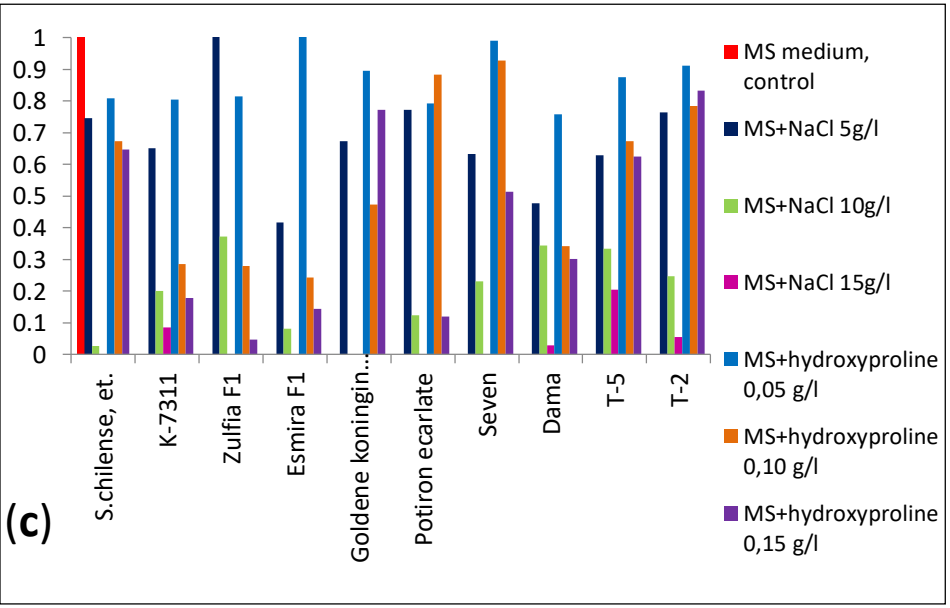
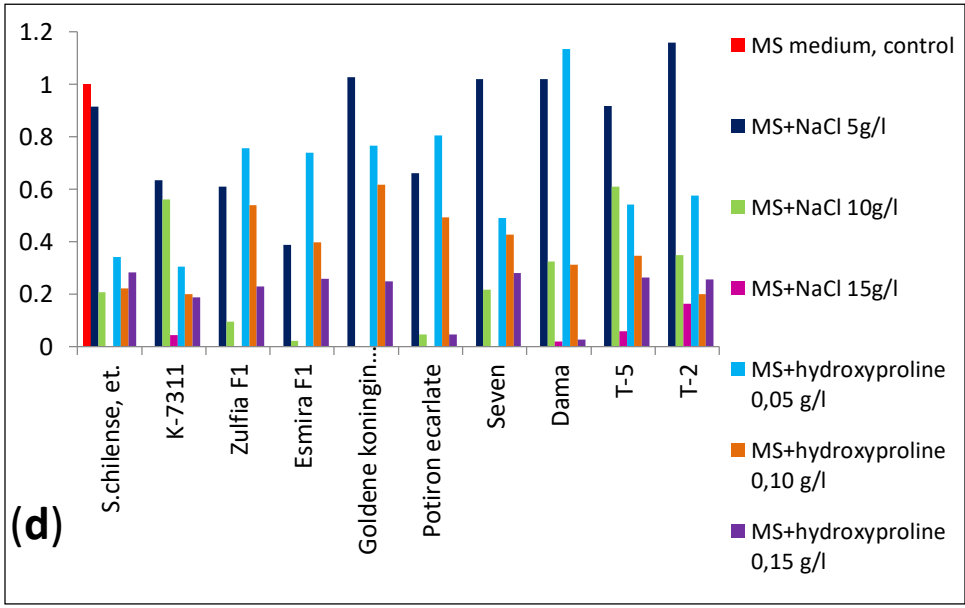
The effect of selective media with different concentrations of NaCl and hydroxyproline on characteristics of tomato regenerants, ratio to control: (a) proportion of living regenerants; (b) shoot height; (c) part of rooted regenerants; (d) root length

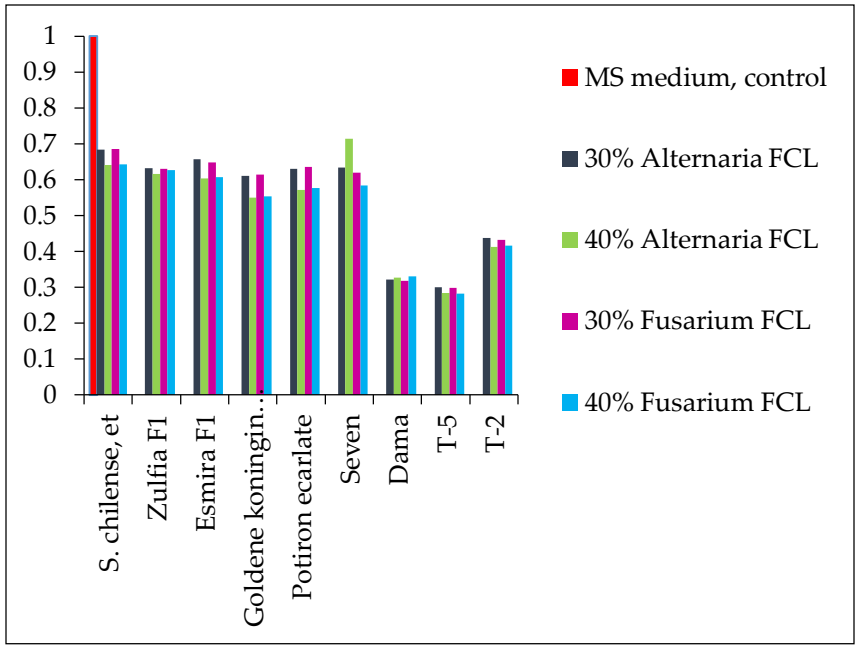


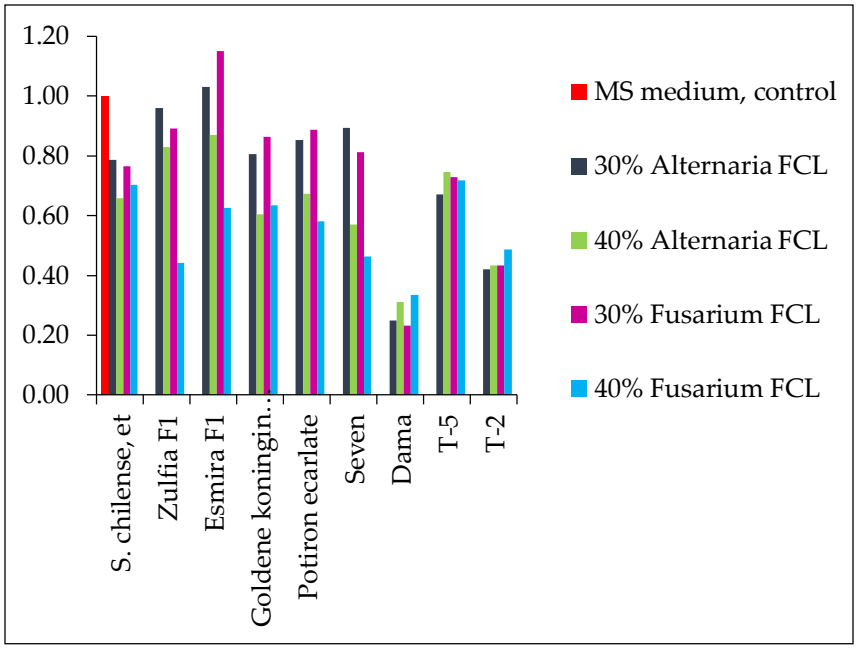




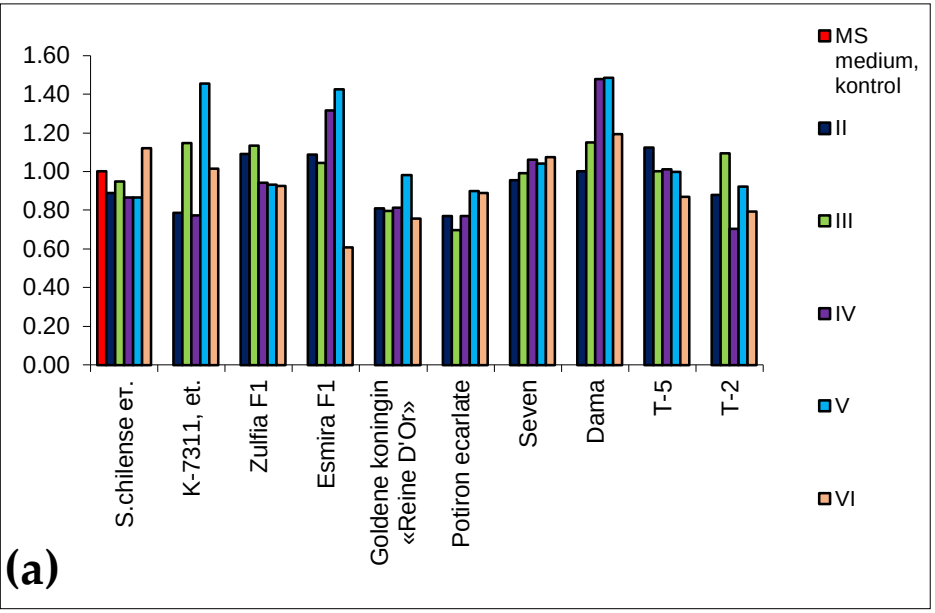


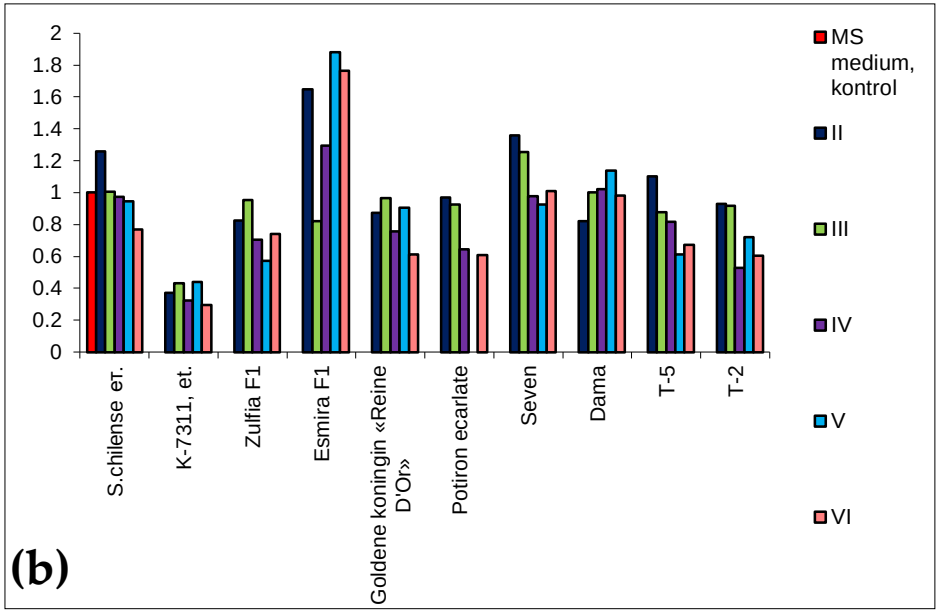
The effect of selective media with different concentrations of FCL of *Alternaria* and *Fusarium* spp. on characteristics of tomato explants, ratio to control: (a) callus volume; (b) height of regenerants

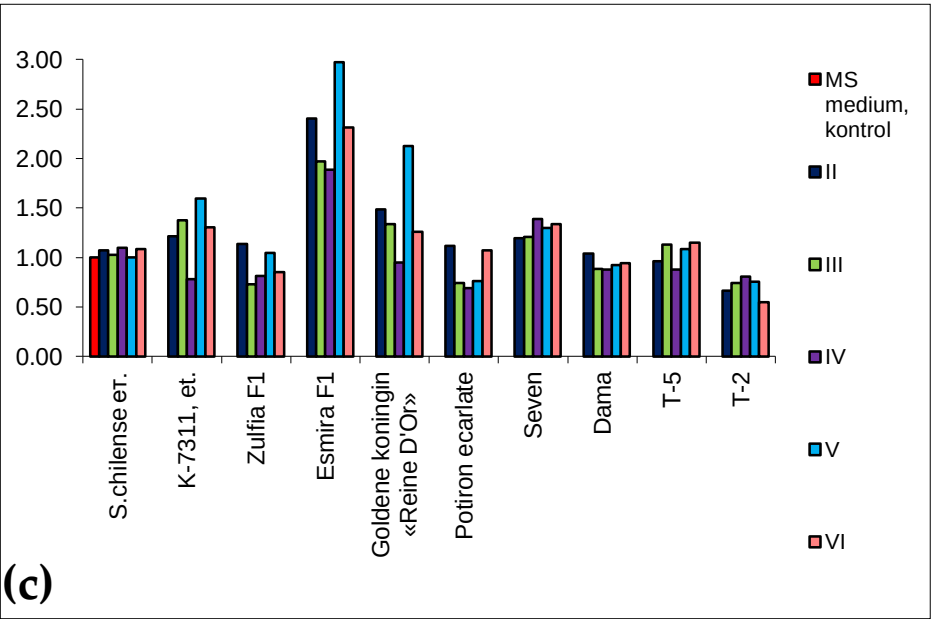




The effect of media with different ratio of mineral nutritional elements on characteristics of tomato regenerants, ratio to control:
(a) shoot height; (b) number of leaves; (c) root length; (d) root development index







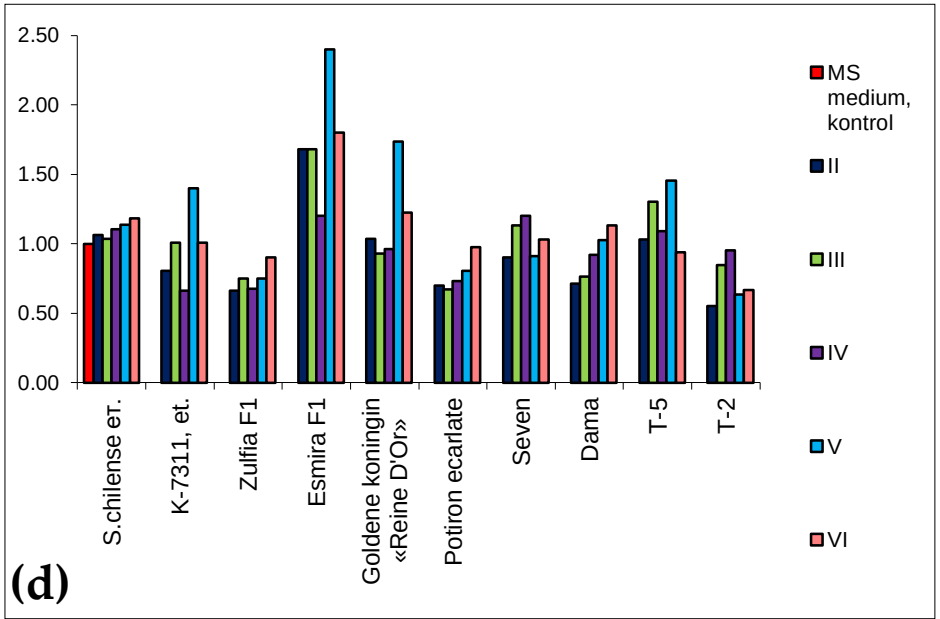
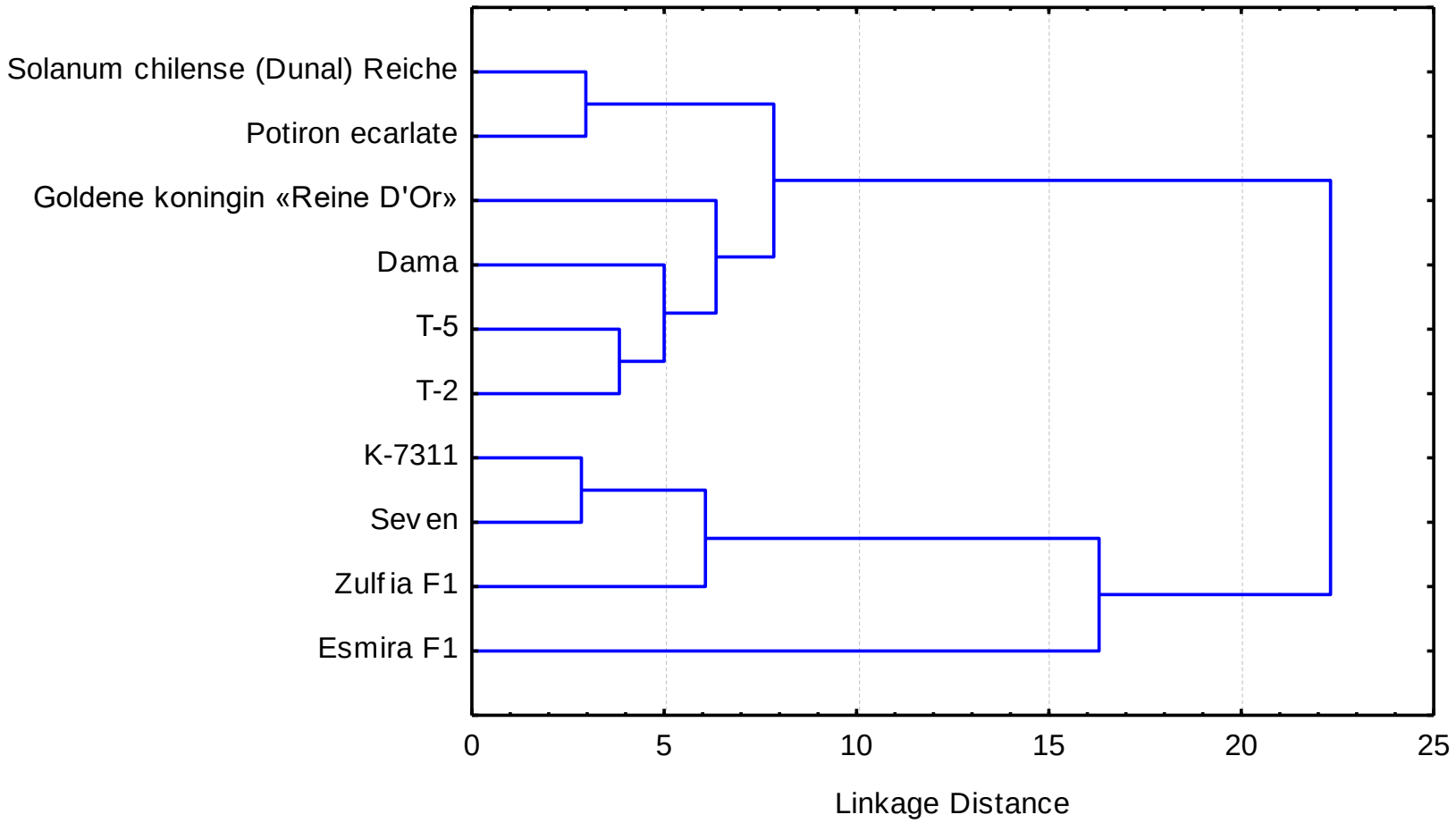


Figure 4. Tree diagram for 10 cases created by Ward's method, Euclidian distances between researches henotypes



Group A = -13,84-7,90*PNa10-3,82d5,91*PF40+30,24*RLII
Group B = -25,04+7,00*PNa10+5,10*PH0.05+1,51*PF40-6,33*RLII

PNa10 - Indicator of peroxidase activity on selective medium with the addition of Nacl 10 g/l

PH0.05 – Indicator of peroxidase activity on selective medium with the addition of hydroxyproline 0.05 g/l

PF40 – Indicator of peroxidase activity on selective medium with the addition of 40% FCL Fusarium

RLII – The length of the root on the modified medium *II*

The obtained system of discriminant equations allows the correct classification of samples into two groups (canonical correlation coefficient Canonical R = 0.96, Wilk`s Lambda criterion = 0.075 at the significance level p-level = 0.0038).

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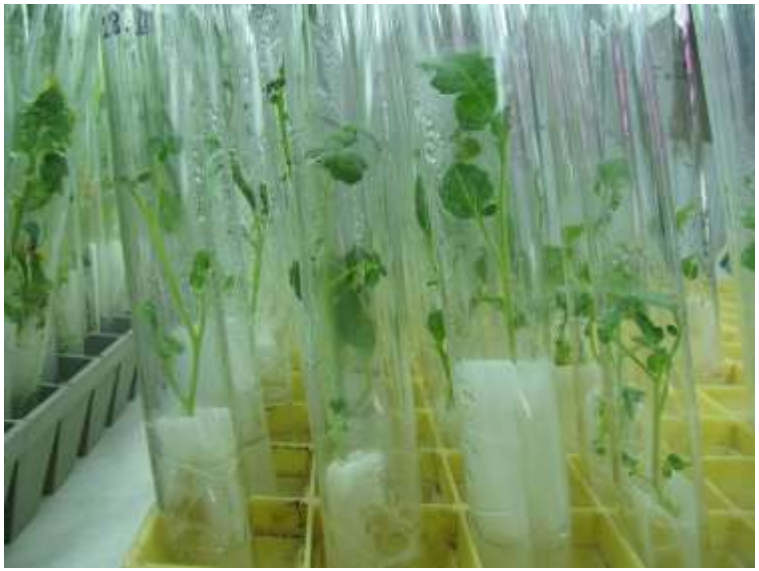
Conclusions

To develop models for assessing the stress tolerance of tomato samples to biotic and abiotic factors, the indices of 71 indicators on selective media in vitro culture were analyzed, which allowed to group the samples by a similar rate of response to cultivation on selective media and to establish 11 significant correlations, which were used to build a system of discriminant equations.

By using the functions that have already been defined, it will be possible to accelerate the assessment of a large number of genotypes by a set of traits in breeding practice, primarily by resistance to biotic and abiotic factors. This methodological approach for the assessment of genotypes can be used in tomato culture in both the early and final stages of selection.



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