CYTOLOGICAL VARIABILITY OF POLLEN GERMINATION AT *AMPELOPSIS BREVIPEDUNCULATA* (MAXIM.) TRAUTV.

CITOLOGIA GERMINĂRII POLENULUI DE *AMPELOPSIS BREVIPEDUNCULATA* (MAXIM.) TRAUTV.

PĂDUREANU SILVICA
University of Agricultural Sciences and Veterinary Medicine Iassy

Abstract*: The paper presents the cytological characteristics of pollen germination process at Ampelopsis brevipedunculata (Maxim.) Trautv. The author analysed the phases of pollen tube building under different conditions of glucide composition from nutritive medium. The results obtained offer information regarding the ecophysiological and genetical characteristics of taxon under study.*

Rezumat: *În lucrare se prezintă caracteristicile citologice ale procesului de germinare a polenului de Ampelopsis brevipedunculata (Maxim.) Trautv. S-au urmărit stadiile de edificare ale tubului polinic în diferite condiţii ale compoziţiei glucidice din mediul nutritiv. Rezultatele obţinute oferă informaţii privind caracteristicile ecofiziologice şi genetice ale taxonului luat în studiu.*

The specialised literature hasn't presented concrete data regarding the cytology of pollen germination at *Ampelopsis brevipedunculata* (Maxim.) Trautv., species which belongs to *Vitaceae* family. The pollen of this species has been studied from morphological point of view [4, 3] and germination capacity point view. In order to complete the studies regarding *Ampelopsis brevipedunculata* pollen, we consider necessary to analyse the cytological characteristics of germination process.

MATERIAL AND METHODS

The biological material used for the study of the cytological traits of the pollen germination was represented by four individuals of *Ampelopsis brevipedunculata* (Maxim.) Trautv., *Vitaceae* family. This taxone were cultivated in Botanical Garden from Iassy, Taxonomic Sector. The taxone were planted in 1965.

In order to study the pollen, 500 anthers in anthesis phase were sampled from 500 inflorescences/year under study, in the period 1998-2000. The values from the tables represent the arithmetical means of the yearly values during the research period.

The pollen grains were inoculated on nutritive media artificially agarised, to which saccharose, in different concentrations, ranging from 0 to 45%, were added. The quantity of the pollen inoculated on these mediu was the same in all the cases. In order to maintain a wet medium, which is vital for the viability of the polllen grains, the so called „wet rooms van Tieghem" [5].

The cytological aspects of the pollen germination were studied by microscopic measurements of the pollen tubes at 5, 24, 48 and 72 hours after pollen inoculation on the media, using the optical microscope IOR MC_1. The same microscope was used to take micropictures to mark the development stages of the male gametophyte under study.

RESULTS AND DISCUSSIONS

We have noticed at variants where glucide concentration from the medium allowed pollen germination, that the building of pollen tube was preceded by a vesicle formation. This finding was also confirmed by specialised literature [1, 2] according to which the development of male gametophyte makes its appearance by a vesicle formation.

In the first stage, the vegetative cell passes into the formed vesicle and in the next phase, when the pollen tube becomes differentiated, the generative cell gets into it (fig. 1, 2).

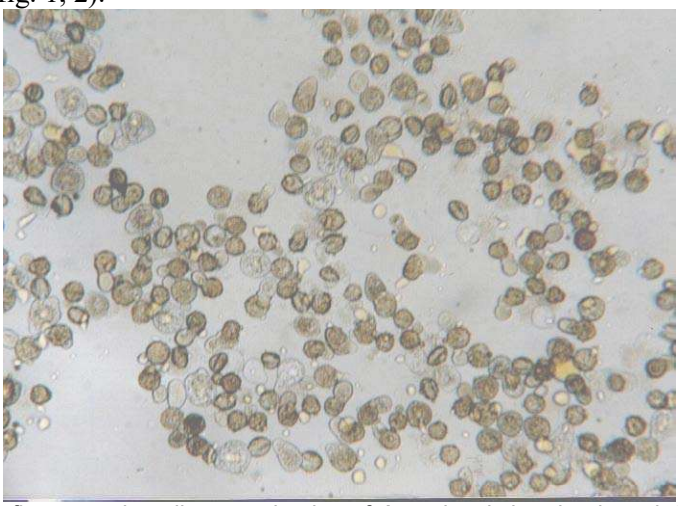

Fig. 1 -The first stage in pollen germination of *Ampelopsis brevipedunculata* (Maxim.) Trautv. on a medium with 15% saccharose, 5 hours after inoculation: vesicle formation (100X) (Original)

Fig. 2 - The beginning of pollen tube evidence at *Ampelopsis brevipedunculata* (Maxim.) Trautv. on a medium with 15% saccharose, 5 hours after inoculation (200X) (Original)

Five hours after inoculation, the average length of the pollen tubes recorded values ranging between 78 and 191 μm (fig. 3, tab. 1).

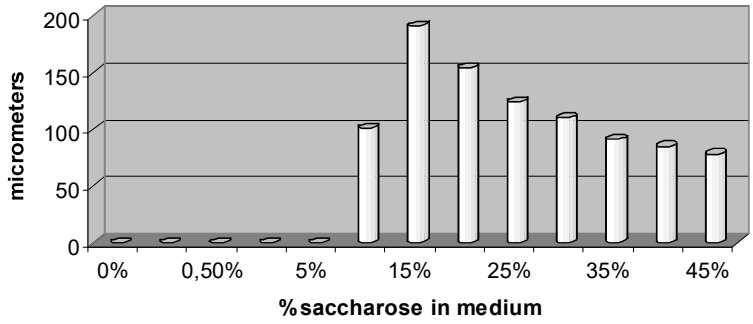

Fig. 3 The average lenght on the pollen tube at *Ampelopsis brevipedunculata* , 5 hours after inoculation

Twenty-four hours after inoculation, the pollen tubes lengthened up to 490 μm (fig. 4, tab. 1).

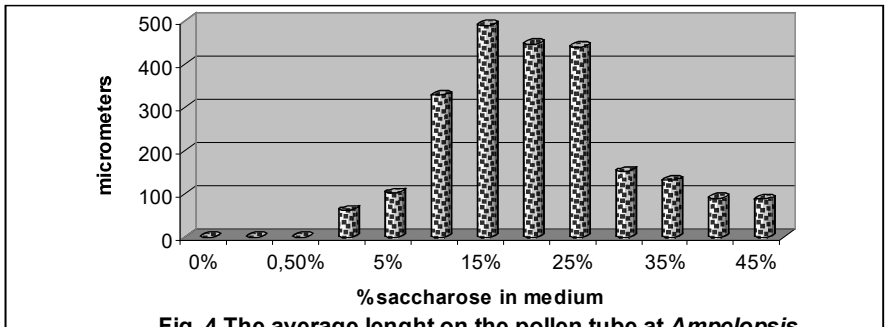

Fig. 4 The average lenght on the pollen tube at *Ampelopsis brevipedunculata* , 24 hours after inoculation

Forty-eight hours after inoculation the pollen tubes reached 970 μm (fig. 5, tab. 1).

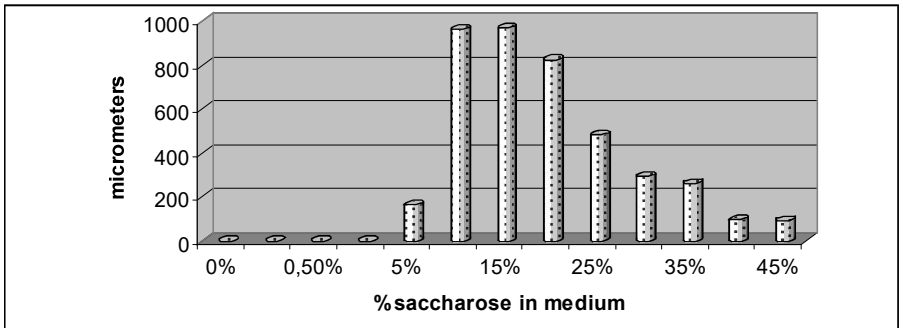

Fig. 5 The average lenght on the pollen tube at *Ampelopsis brevipedunculata* , 48 hours after inoculation

Seventy-two hours after inoculation, the tubes formed on a medium with 5% saccharose degenerated on the whole and on hyperglucide media (more than 25% saccharose) the resorption affected only several pollen tubes. The length of the viable tubes ranged between 137 and 1313 μm (fig. 6, tab. 1).

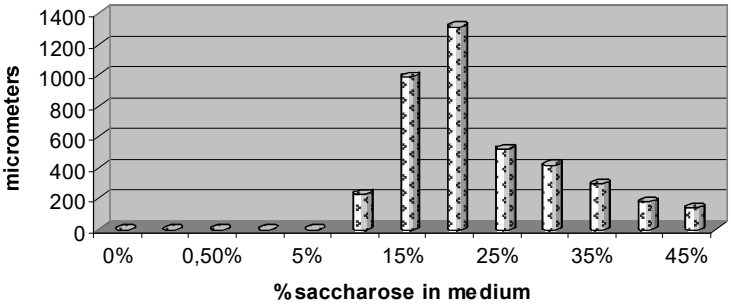

Fig. 6 The average lenght on the pollen tube at *Ampelopsis brevipedunculata* , 72 hours after inoculation

Table 1

The average length of the pollen tube at *Ampelopsis brevipedunculata* during the germination

hours after inoculation	saccharose concentration (%) in germination media												
	0	0.2	0.5	2	5	10	15	20	25	30	35	40	45
5	0	0	0	0	0	101	191	154	124	110	91	85	78
24	0	0	0	62	102	328	490	447	440	152	131	90	87
48	0	0	0	0	164	963	970	824	483	292	261	97	91
72	0	0	0	0	0	231	990	1313	520	417	295	177	137

The dynamic analysis of length growth for pollen tubes has shown that this parameter was much influenced by glucide concentration of nutritive mediums (fig. 7).

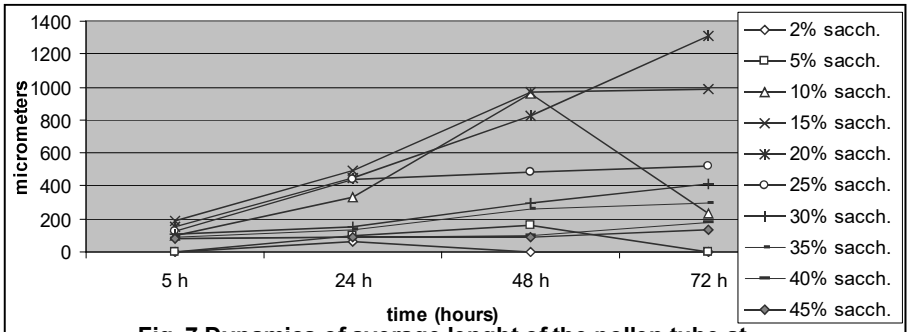

Fig. 7 Dynamics of average lenght of the pollen tube at *Ampelopsis brevipedunculata*

The longest pollen tubes were formed on media with 15%, 20% and 25% saccharose, where they appeared thick like felt.

If we take into account that the average length of the flower style at the taxon under study is about 0.42 mm, we may estimate that the growth speed of the pollen tubes during the first 24 hours after pollination is sufficient to ensure fecundation and fructification, under normal meteorological conditions, when the glucide concentration of the stigmatic liquid may be about 5 – 25%.

In droughty periods the stigmatic secretion may reach a glucide concentration higher than 25% with negative effects on speed penetration of the pollen tubes in style.

The laboratory results have proved that on hyperconcentrated media (more than 25% saccharose) the pollen tubes may reach lengths ranging between 91 and 292 μm, 48 hours after inoculation, and between 137 and 417 μm, 72 hours after inoculation on a nutritive medium. We may conclude that if *Ampelopsis brevipedunculata* is affected by lasting droughts during the flowering period, it may not ensure the fructification.

Media without glucide content induced the death of pollen grains.

On media with a minimum saccharose content (0.2%, 0.5%, 2%) mammillas formation was resorbed.

On media with 5% saccharose numerous mammillas were formed, but only part of them became pollen tubes, whose length would not allow the penetration into the embryonal sac.

Due to the fact that the annual results obtained during the research period are very similar, we may conclude that the algorithm of the germination process has a high genetic stability.

CONCLUSIONS

1. The development of the male gametophyte at *Ampelopsis brevipedunculata* (Maxim.) Trautv. bigins with a vesicle formation.

2. The vegetative cell is established close to the top of the pollen tube, being followed by the generative cell, which divides mitotic in pollen tube.

3. There is a close positive correlation between pollen germination capacity and the length of the pollen tubes.

4. The sequence of the development stages of the male gametophyte, being the same in all the cases under study and in years with different meteorological conditions, proves that this cytological process is the expression of the major genes.

5. Most favourable nutritive media for the development of the stages at normal speed of the pollen tube at *Ampelopsis brevipedunculata* (Maxim.) Trautv. are those with a glucide composition of 15 – 25%.

BIBLIOGRAPHY

1. **Baranov P.A.**, 1946 - *Stroenie vinogradnoi lozy*. *Ampelografia SSSR*. **1**, Piscepromizdat, Moscova.
2. **Pădureanu Silvica**, 2003 - *The cytological variability of the pollen grain germination at Fetească neagră grape-vine variety*. Anale şt. Univ."Al.I.Cuza" Iaşi, Tom. XLIX, s.II-a, Biol.veget., 79-88
3. **Pădureanu Silvica**, 2003 - *Researches regarding the variability of some morphological characters of the pollen at Ampelopsis aconitifolia Bge. and A. brevipedunculata (Maxim.) Trautv*. Anale şt. Univ. „Al.I.Cuza" Iaşi, Tom. XLIX, s. II-a, Biol.veget., 89-94.
4. **Petria Elena**, 1970 - *Contribuţii la cunoaşterea structurii microsporilor fam. Vitaceae* (I) (g. *Ampelopsis, Cayratia, Ampelocissus*). Acta Bot. Horti Bucarest, 391-426
5. **Raicu P**., 1962 - *Metode noi în genetică*. Ed. Did. Pedag., Bucureşti.