

Comparatively - Morphological Study of Some Species of Pollen and Interspecific Hybrids of Cotton and Their Fertility

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Abstract: : In this article, a morphological study of pollen of some species and interspecific hybrids of cotton in the *Magnibracteolata* Tod section, as well as their hybrids, was carried out. Pollen diameter, spike length, spacing between spikes, number of pores, size and location of pores were studied.

Keywords: Morphology, pollen, species, interspecific, hybrid, cotton, fertility.

1. INTRODUCTION:

It is known that the morphological parameters of pollen grains carry a lot of information, which is of great importance not only in taxonomic studies, but also in assessing the breeding material. Therefore, studies of the pollen morphology are largely decisive. The morphology of pollen grains is usually noted with the following indicators, such as: pollen diameter, length of spikes, space between spikes, number of pores, their size and arrangement etc.

Among the numerous works on the morphology of the cotton pollen grains, following researches are highlighted: L.G. Arutyunova [2], P. M. Sharma, K. Rastogi [5], A.L.Sagdullaeva-Umarova [3].

A number of important data sets on the morphology of cotton pollen grains are given in the works: A.A. Abdullaev, O.N. Lazareva [1]; G.S. Shakhmedova [4].

For example, in her work "Interspecific hybridization in the genus *Gossypium*" L.G. Arutyunova presents sizes of eight types of cotton pollen, and also hybrids. The author states that the biggest pollen within 105-118 microns in size is found in the *G. barbadense* species.

Diameter of the pollen grains of the studied species ranges from 39 to 301 μm . All hybrids with 52 chromosomal species have a pollen diameter greater than that of their parents. F.M.Mauer in "The generative organs of cotton" presents sizes of 9 species of cotton pollen: *G. hirsutum*, *G. barbadense*, *G. armourianum*, *G. davidsonii*, *G. arboreum*, *G. herbaceum*, *G. anomalum*, *G. sturtii* and *G. tricuspidatum*.

M. Sharma, K. Rostagi [5] described the morphological characteristics of the pollen grains of species *G. hirsutum*, *G. barbadense*, *G. herbaceum*.

A detailed morphological description of cotton pollen grains of species *G. hirsutum*, *G. barbadense*, *G. herbaceum* and *G. trilobum* was presented by V.A. Rumi (1969).

L.P.Shevchuk, A.A. Abdullaeva (1967) [1] work contains information on pollen morphology of cultivated and tropical forms relating to the 3 species of *G. hirsutum*, *G. barbadense*, *G. tricuspidatum*. The authors argue that the amount of pollen varies not only within the species, but also with the variety.

Sagdullaeva - Umarova (1974) [3], studying the pollen morphology of wild (*G. davidsonii*, *G. barbadense*, *G. thurberii*) and cultivated kinds of cotton (*G. hirsutum*, *G. barbadense*), comes to the conclusion about the correctness of the genus *Gossypium* reference to the *Malvaceae* family.

2. MATERIALS AND METHODS:

Pollen morphology was determined by T.M.Avetisyan [6] method. Mature pollen was poured with 10% KOH solution.

The pollen thus treated was transferred with a pipette onto a glass slide, washed with distilled water and enclosed in glycerin. The pollen was measured with an eyepiece screw micrometer - MOB-1-15 \times . For each variant, ten flowers were measured annually.

3. RESULTS AND DISCUSSION:

As our studies have shown, the pollen of the studied species and hybrids to a certain extent turned out to be morphologically similar to each other, all of them are spheroidal, large, small tubercular and multi-pore (Table 1).

According to the classification of G. Erdtman pollen of all studied species and hybrids was attributed to the fifth class, which includes pollen of the major axis 100–200 μm . Analysis of the arithmetic mean values of pollen grains showed that the size of pollen grains fluctuates within each species, as well as in hybrids (Table 1).

The high variability coefficient of the arithmetic mean value of pollen grains is caused, besides the natural variation in size, by the fact that cotton anthers usually contain 4-10% of sterile pollen grains.

The analysis showed that the largest pollen from the parent species is observed in the variety AN-Bayaut-2 (*G. Hirsutum*, fig.) and also in *G. barbadense* (*ssp. ruderale* and *var. Brasilense*). Pollen of *G. tomentosum* and *G. mustelinum* species is somewhat smaller in comparison with *G. hirsutum* (table 1).

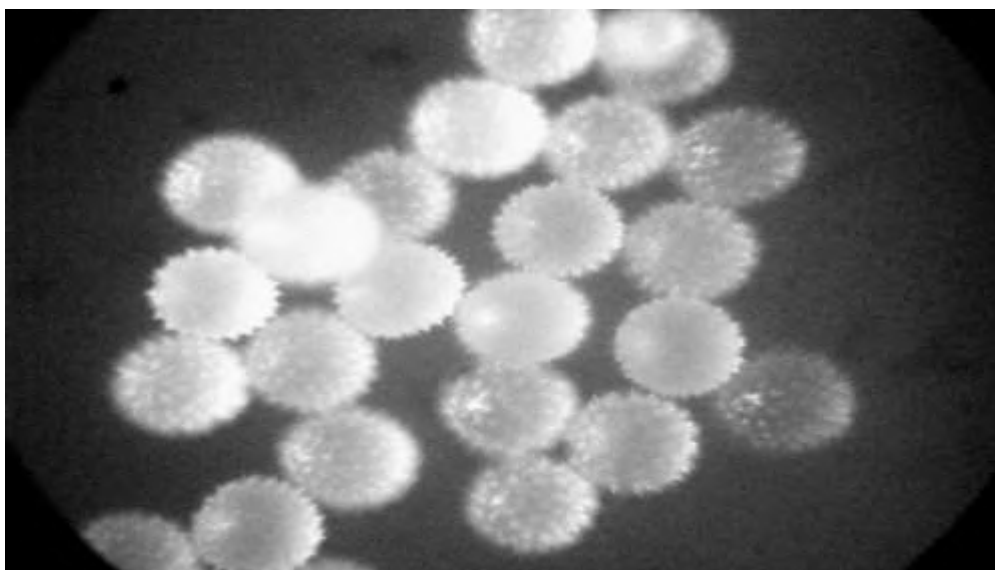


Figure: Pollen grains of AN-Bayaut-2 variety (×200).

Table 2: Characteristics of the morphological features of pollen grains of some tetraploid species, hybrids

№	Variant	Number of analyzed pollen grains (pcs)	Pollen grain diameter	Pore diameter	Spike length without visible base	Distance between spikes	The number of pores in the pollen grain	Variation coefficient (V)%
1	AN-Bayaut-2	300	109,5±0,87	9,25±0,9	7,93±0,5	15,45±0,5	12,7±0,4	0,64
2	<i>G. tomentosum</i>	300	90,82±0,12	8,64±0,12	13,0±0,2	14,31±0,2	7,69±1,1	4,64
3	<i>G. mustelinum</i>	300	106,8±0,5	11,30±0,1	14,6±0,2	14,85±0,2	11,8±3,1	6,2
4	<i>G. hirsutum</i> var <i>morili</i>	300	111,6±0,4	9,0±0,1	14,58±0,1	15,12±0,4	9,72±0,9	4,21
5	AN-Bayaut-2 × <i>G. tomentosum</i>	300	112,3±0,1	8,91±0,1	11,25±0,1	14,22±0,4	8,91±2,1	8,2
6	<i>G. hirsutum</i> var <i>morili</i> × <i>G. tomentosum</i>	300	117,3±0,4	10,53±0,1	7,65±0,2	13,05±0,1	14,1±2,3	11,01
7	<i>G. mustelinum</i> × <i>G. tomentosum</i>	300	126,91±0,5	11,25±0,1	16,38±0,6	16,56±0,4	9,2±0,7	9,65
8	AN-Bayaut-2 × <i>G. mustelinum</i>	300	125,3±0,6	11,06±0,5	14,58±0,7	11,9±0,56	12,5±0,2	12,1
9	<i>C</i> ₂ <i>G. hirsutum</i> AN-Bayaut-2 × <i>G. tomentosum</i>	500	138,9±0,6	8,28±0,2	17,01±0,4	12,5±0,35	10,8±1,4	10,7
10	<i>C</i> ₂ <i>G. hirsutum</i> var <i>morili</i> × <i>G. tomentosum</i>	500	135,3±0,6	11,07±0,6	14,6±0,7	12,0±0,6	12,5±0,17	11,4
11	<i>C</i> ₂ <i>G. mustelinum</i> × <i>G. tomentosum</i>	300	142,3±0,5	11,0±0,2	17,0±0,2	11,6±0,4	15,0±2,8	9,24
12	<i>C</i> ₂ <i>G. hirsutum</i> × <i>G. mustelinum</i>	306	106,0±0,4	11,0±0,3	16,0±0,2	11,2±0,2	14,2±2,8	7,21

Notes: C₂ denotes generations obtained from experimental cotton polyploids (C- from the name of the plant *Colchicum autumnale*, from which colchicin alkaloid is obtained).

Among F₁ hybrids the largest pollen in size is observed in combinations: *G. mustelinum* × *G. tomentosum* and AN-Bayaut-2 variety × *G. mustelinum*. In general, pollen grains in F₁ hybrids are larger than in the original species.

Analysis of pollen in plants of the 2nd generation from F₁ colchicization, C₂ - shows that it is larger in size than the parental species and F₁ hybrids. C₂ *G.hirsutum* × *G.mustelinum* pollen showed a big difference in size, but sterile pollen grains of this combination of plants turned out to be much more numerous.

Some authors have shown that the size of pollen grains can vary depending on the position of the stamens in the flower and on other conditions.

Thus, according to D.V. Ter-Avanesyan (1973) [6], the pollen grains of cotton from the upper and lower anthers of the same flower differ significantly from each other in size. The more advantageous the pollen is in relation to the power source, the better it develops. D.V. Ter-Avanesyan (1973) [6] also notes that the difference in the size of pollen grains depends on the species.

4. CONCLUSION:

The spikes of pollen grains of the studied species, varieties and hybrids turned out to be cone-shaped, and the germination pores are rounded and spaced in loops. Certain patterns in the number of pores on pollen grains among species or varieties are also not identified. The number of germination pores of all studied material ranged from 5 to 20 pcs.

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