

Pollen atlas

One of the main methods for establishment and confirmation of botanical and geographical origin of bee products (honey, bee pollen, beebread) is pollen analysis. Pollen grains are considerably in forms and sizes. Identification of any pollen grains depends on explorer skill sets and is impossible without the collection of reference slides and/or pollen atlases.

Unfortunately the number of pollen atlases is not enough all over the world. Some of them contain information about pollen grains from specific regions. Other atlases are not enough informative because pollen grain microphotographs have no clear picture or were made by electron microscope although most of melissopalynologists use the light microscope.

Morphological characteristics and colored microphotographs of non-acetylyzed pollen grains for 288 nectar and nectarless plant species belonging to 61 families of Russian territories are presented with the pollen atlas.



The pollen atlas includes pollen grains of nectar and nectarless plants and honeydew elements which can be recognized when analyzing bee products by a microscope. The microphotographs of honey preparations from different Russian regions are also presented.

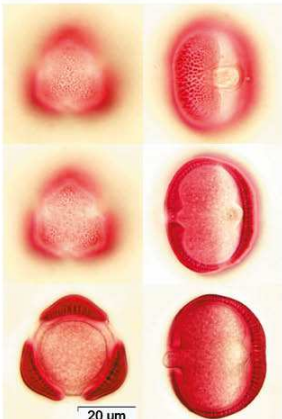
Reference slides of pollen grains were prepared using each of blooming plants and herbarium. Due to the minimal treatment of pollen grains there is no significant deformation and the exine sculpture remains unchanged. Pollen grains were colored by fuchsine and mounted in glycerine jelly solution (Бурмистров, 1990).

Sizing pollen grains were carried out by light microscope Olympus BX51 with image viewing system Olympus DP71 and software "Cell B". The polar axis (**P**) and equatorial

diameter (**E**) of not less than 50 pollen grains have been measured. The maximum diameter (**D**) of apolar pollen grains, tetrads and polyads was determined. The average, minimum and maximum values of **P**, **E**, **D** are tabulated. The main morphopalynological parameters considered are a type, a group, a polarity, a shape, a geometrical form in polar and equatorial views, a structure and a number of apertures.

Pollen grain microphotographs were taken with trinocular light microscope Levenhuk D670T (at a magnification of 400-1000).

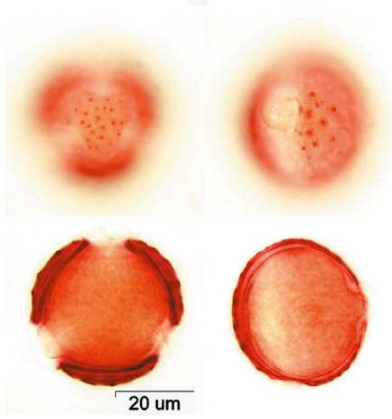
***Centaurea cyanus* L.**
Василек синий



20 μ m

Morphology of pollen grains / Морфология пыльцевых зерен			
Type/Тип	Shape/Форма	Equatorial view/ Экваториальная проекция	Polar view/ Поллярная проекция
isopolar, tricolpate/ равнополярные трехбороздно-оросые	prolate/вытянутая	elliptic/эллиптическая	subtriangular 3-lobate/ треугольная 3-лопастная
Aperture/Апертуры	P, μ m/мкм	E, μ m/мкм	Exine/Экзина
colp long, narrow, ora large, bilobate/ борозды длинные, узкие, оры крупные, экваториально вытянуты	36,5 (34,0-39,0)	29,1 (26,6-31,0)	microechinate/ мелкошиповатая

***Centaurea phrygia* L.**
Василек фригийский



20 μ m

Morphology of pollen grains / Морфология пыльцевых зерен			
Type/Тип	Shape/Форма	Equatorial view/ Экваториальная проекция	Polar view/ Поллярная проекция
isopolar, tricolpate/ равнополярные трехбороздно-оросые	prolate, spheroidal/ вытянутая сферoidalная	subcircular/округлая	subcircular 3-lobate/ округлая 3-лопастная
Aperture/Апертуры	P, μ m/мкм	E, μ m/мкм	Exine/Экзина
colp long, narrow, ora large, bilobate/ борозды длинные, узкие, оры крупные, экваториально вытянуты	34,4 (31,7-37,5)	31,6 (29,0-33,7)	echinate/шиповатая

In most cases pollen grains are represented in two projections: polar and equatorial. Pollen grains having a volume shape, some microphotographs were taken at different heights of microscope objective for precise reproduction of the pollen grain profile, the exine sculpture, the apocolpium and the mesocolpium in each projection.

The pollen atlas is recommended for palynologists, botanists, explorers of experimental laboratories, students and teachers of biological specialties, beekeepers.

The atlas was awarded by the Gold medal at the 44-th APIMONDIA International Apicultural Congress in Daejeon, Korea (September 2015).