# On Finnish Micromycetes 2
# *Puccinia malvacearum* Bert. in Finland

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The very rainy summer 1962 in Finland seemed to be quite advantageous for many parasitic fungi. E.g., in the Botanical Garden in Turku many of the cultivated plants suffered from severe infections of rusts and powdery mildew fungi. One of the most conspicuous contaminations was seen in the family *Malvaceae*, where almost all of the plants were attacked by *Puccinia malvacearum*. As this species is very rare in Finland, the observations on its occurrence seemed to be worth of reporting.

*General occurrence and development. P. malvacearum* is a typical leptopuccinia, and was known only in its telio- or teleutostage, until WATERHOUSE (1953) was able to find also spermogonia in leaves of *Malva rotundifolia*. The species is native in Chile, and was spread in the latter half of the 19th century into Europe (1869) and all over the world, causing bad damage in many cultivations. For the rapid spreading, as well as for the rather well-known general morphology and cytology, to ERIKSSON (1911), LINDFORS (1924) and to GÄUMANN (1959, with the references) is referred.

*Occurrence in Scandinavia and Finland. P. malvacearum* was spread in 1874 to Denmark, in 1882 to Sweden, and in 1890 to Norway. In 1953, HYLANDER, JØRSTAD & NANNFELDT list the species found in Denmark, Norway and / or Sweden on 5 species of *Malva*, 3 species of *Althaea*, on *Lavatera* spp., on *Kitaibelia vitifolia* and on *Malope trifida*. In 1890 the fungus was found also in Finland in Varsinais-Suomi (Brödtorp in Pohja commune) and in Uusimaa (Fagervik in Inkoo commune), where it had infected and finally killed all stands of *Althaea rosea* (HISINGER 1891). After this, however, there are no new records from Finland.

*Occurrence in Turku Botanical Garden in 1962. P. malvacearum* was collected on the following malvaceous plants (species marked with an asterisk are not listed by SYDOW (1903 p. 477) or by GÄUMANN (1959 p. 801):

*Althaea armeniaca* Ten.
**A. kragujavacensis*[1]
**A. nudiflora* Lindl.
*A. rosea* (L.) Cav.
*Kitaibelia vitifolia* Willd.
*Malope trifida* Cav.
*Malva alcea* L.
*M. crispa* L.
*Malva moschata* L.
*M. neglecta* Wallr.
*M. rotundifolia* L.
*M. verticillata* L.
**Sida napaea* Cav.
**Sidalcea malvaeflora* A. Gray
**S. diploscypha* A. Gray

The strength of the infection varied widely. *Malva rotundifolia* was overwhelmingly worsest attacked; in the rather big and manybranched individual not a single healthy branch or leaf could be found; accordingly, this plant finally died appr. 20.9. In contrary, *Lavatera thuringiaca*, *L. cochemiriana*, *Hibiscus trionum* and *Malva hispanica* showed no signs of infection. Fig. 1 presents the relative positions and sizes of the malvaceous plant groups in the Botanical Garden. It shows that *Malva rotundifolia* together with some of its neighbours as *Malva verticillata*, *Althaea nudiflora*, *A. kragujavacensis* and *A. rosea* are heavily attacked, while *M. hispanica*, in spite of its »favourable» position, remained unattacked. *Malva rotundifolia* was also the first species on which infection was found (already in the end of May); soon after this also the *Althaea*-species became infected. According to ERIKSSON (1911), *A. rosea* seems to be the main host of this fungus. In most cases studied the parasite has also been observed to spread with the seeds of it. In the present case, however, *M. rotundifolia* seems to be the primary source of infection. To measure somehow the strength of infection correlated to the distance from *M. rotundifolia*, a simple Spearman's correlation test was performed. In this test, the figures indicating the

[1] Host determination not checked.

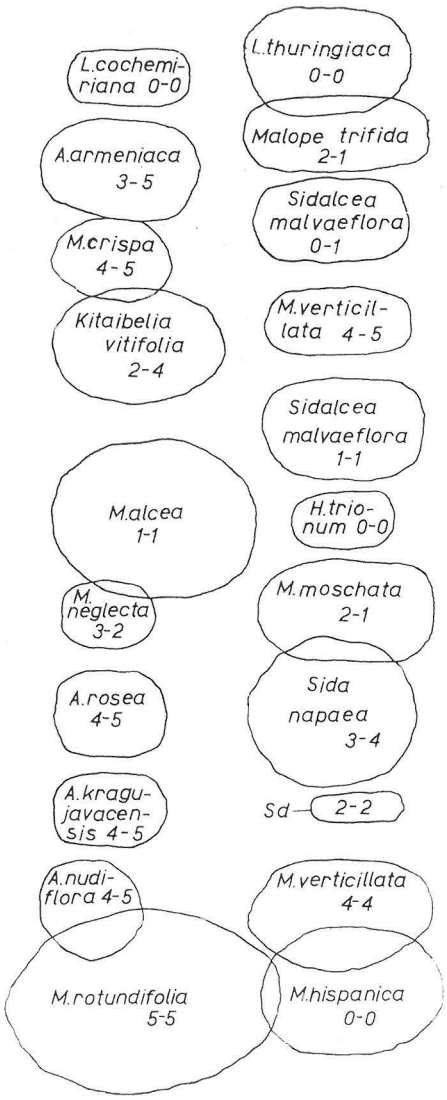


Fig. 1. Relative positions and sizes of the malvaceous plant groups in Turku Botanical Garden in 1962. The figures indicate the strength of infection (from 0 to 5), estimated 20. VIII (first figure) and 20. IX (second figure). Sd = *Sidalcea diploscypha*. 1:40.

strength of infection (from 0 to 5) and the absolute distance between the plant groups and *Malva rotundifolia* (from 0 to 870 centimetres) served as variates. The result was from the first infection values $r = 0.41 \pm 0.22$ and from the second infection values $r = 0.30 \pm 0.22$ (for these infection values, see Fig. 1). Hence, the variation in the infection strength cannot be correlated with the distance from *M. rotundifolia*. It deserves yet to be mentioned, that *Althaea cannabina*, growing ca. 50 meters from the other malvaceous plants together with other textile plants, showed no sign of infection. In this case, the greater distance might have an influence, as all other *Althaea* species were heavily infected. Unfortunately, the plant was cut down before I had time to examine the result of the infection experiment. ERIKSSON (1911 p. 15) presents similarly the positions and relative infection strengths for the malvaceous plants grown in the Bergius' Botanical Garden in Stockholm in 1900. It shows, e.g., that from 6 stands of *Malva moschata* 5 were weakly contaminated, the only *Althaea rosea* stand was heavily infected, and *Malope trifida* had a very weak infection. Among other plants, *Malva alcea*, *Lavatera thuringiaca* and *Sidalcea malvaeflora* remained healthy.

*Infection experiments*. The teliospores of *P. malvacearum* are known to germinate at any time without needing any winter rest, and this held true also in this case. They form thus an excellent opportunity to make infection experiments. Spores from *Malva rotundifolia* here inoculated into leaves of the remaining 4 healthy plants (*Lavatera thuringiaca*, *L. cochemiriana*, *Hibiscus trionum* and *Malva hispanica*). This took place by setting whole spore groups into the leaf stalks and leaf veins into places, from which the epidermis was scratched off. Microscopic examination after some days showed that there were plenty of germinating teliospores. After 10 days, a local infection was developed on one contamination point in one *L. thuringiaca* leaf. This was not markedly enlarged at the end of the three week observation period and did not produce any spores. All other ca. 20 contamination points on *L. thuringiaca* yielded no result, and also experiments on *L. cochemiriana*, *Hibiscus trionum* and *Malva hispanica* showed no response. An especial attempt was made to carry the fungus on *M. hispanica*, but without any success. It can shus be rather safetely stated, that the last three tpecies, and also *L. thuringiaca*, were immune against this race of *P. malvacearum*. *Lavatera* species seem also generally to be little susceptible for *P. malvacearum;* e.g., in 73 contamination sites any *L.olbia* could ERIKSSON (1911) find only one with a positive result (*Sida rhombifolia* could not be infected at all). GÄUMANN (1959 p. 803) does not list any *Hibiscus* species among the hosts; *Malva hispanica* is, however, known as a host for *P. malvacearum*. The results described point thus to some specialisation inside the species.

Infection experiments were also performed to transfer the parasite on leaves of *Gossypium arboreum* and *Hibiscus rosa-sinensis*, growing in the greenhouse, but without success.

Material collected on *Malva rotundifolia*, *M. crispa*, *Althaea nudiflora* and *Kitaibelia vitifolia* will be distributed in Fungi Exsiccati Fennici.

## LITERATURE


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