## A NOTE ON INSECTS AS DISSEMINATORS OF FUNGUS SPORES

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The role of insects as disseminators of pathogenic organisms has long been recognized. However, greater attention appears to have been paid to those cases that involve internal, rather than external dissemination. The example under review in this paper presents a striking illustration of the possibilities of spore transmission in cases where the organisms are carried on the outer surface of the insect.

During the course of regular work in entomology at the University of British Columbia, a slide was made of both fore and hind wing of **Melanoplus mexicanus mexicanus** Sauss. **(Orthoptera, Locustidae)** from a specimen taken on meadowland on the University campus. Due to the fact that the wings were mounted in Berlese's mounting fluid, a medium which obviates the necessity for preliminary washing and dehydrating, the completed specimen was seen to have retained all its adherent debris, which proved upon inspection to consist almost entirely of the spores of a number of different fungi.

Due to the nature of the mount, an attempt at determination of the organisms involved was limited to a morphological basis, and culturing was out of the question. By this means, it was possible to trace the spores down only to genus. However, this was done, and the whole spore load was found to fall under five genera, as follows:

**Heterosporium**—Conidia two to several-septate, echinulate. Some species of this genus are destructive molds on carnation, hop, spinach, larch, and numerous **Liliaceae.**

**Stemphylium**—Conidia acrogenous, with muriform septation. This is a small genus, but includes pathogens of cucurbits and of wheat.

**Macrosporium**—Conidia muriform-septate and caudate. This genus includes species which cause black mold on various grasses, on crucifers, and on a wide range of garden plants.

**Cladosporium** or **Fusicladium**—Conidia ovoid, greenish or olivaceous, sparingly septate, acrogenous.

These two genera are not readily separable on a morphological basis. Between them they include many pathogenic species which attack drupaceous and pomaceous fruits, cucurbits, corn, oats, potatoes, tomatoes, and hardwoods.

**Uromyces** — One of the rusts, which attacks clover, alfalfa, and other leguminous fodder crops. Teliospores only were identified in the present instance.

While it is not suggested that all the spores observed represent pathogenic species, it is highly probable that many of them are harmful. That grasshoppers and other insects of like habitat may be a powerful factor in the spread of plant disease may, however, be judged from the following figures.

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Spore counts were made in a number of microscopic fields taken at random on both fore and hind wing with the results shown on the appended table.

| Field | Hetero sporium | Stem-phyllium | Macro-sporium | Clado-sporium | Uromyces |
|---|---|---|---|---|---|
| 1. | 31 | 1 | 6 | 108 | 3 |
| 2. | 31 | .. | .. | 56 | 5 |
| 3. | 1 | 1 | 1 | 31 | 15 |
| 4. | 4 | 1 | 3 | 21 | .. |
| 5. | 3 | 1 | 2 | 12 | 3 |
| 6. | 6 | .. | .. | 33 | 10 |
| 7. | 20 | 1 | .. | 62 | 11 |
| 8. | 13 | 2 | 1 | 29 | 2 |
| 9. | 5 | .. | .. | 25 | 4 |
| 10. | 10 | .. | .. | 22 | 4 |
| Average per field | 12.4 | 0.7 | 1.3 | 39.9 | 5.7 |
| Average per mm$^2$ | 126.5 | 7.14 | 13.3 | 407.1 | 58.6 |

Total Average Spores per mm$^2$ — 612.6.

Taking a conservative estimate of 400 square millimeters for the total area of the exterior surfaces of a member of this species, one arrives at the interesting figure of 244,800 for the gross spore load per insect. Since concentrations of grasshoppers up to 1,000 per square yard have been reported in the case of severe infestations, it will be seen that the sport count per acre will run into astronomical figures.

If only a small proportion of this total should prove to be pathogenic and viable, it will provide ample inoculum for the area involved, and it will be conceded that the prairie farmer may have some cause for his pessimism when he complains that when the grasshoppers have finished with his grain, the rust comes in and completes the work of destruction.

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