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**Research Note**

# First results with a spore trap for collecting infectious sporangia of downy mildew

W. K. KAST

K e y w o r d s : Plasmopara viticola, spore release, spore trap, long distance spread.

**Introduction:** The amount of spores found in the air is an important character used in epidemiological studies (VANDERPLANK 1963). The concentration of spores in the air is even an essential element of some prognostic models (i. e. KREMHELLER and DIERKS 1983; OBERHOFER 1986). A lot of different devices for counting spores are described (HIRST 1952; PERKINS 1957; EDMONDS 1972; ANONYMOUS 1976; FAULKNER and COLHOUN 1977; STEDMAN 1978; SCHWARZBACH 1979; WILI 1985; GADOURY and MACHARDY 1993). Most of these traps collect the spores on a medium, which is evaluated visually by microscope. In this process spores with thin walls get deformed, what makes it even more difficult to distinguish spores of related species. Especially in vineyards with natural green cover other oomycetes may occur on wild herbs. It is not possible to tell the difference between physiological races such as races resistant against fungicides or races adapted to resistant vine varieties.

To overcome the problems mentioned above SCHWARZBACH (1979) developed a trap for powdery mildews, which uses leaf segments to detect the spores. This trap doesn't count the spores itselfes but the symptoms (pustules) they produce on the leaf segments. That makes the trap especially suited for proving low numbers of spores in a mixture of particles. One particular advantage of this trap is meeting the fact that only viable, infectious spores are counted. Our intention was to construct a spore trap for downy mildews answering the following requirements:

1. separation of sporangia from the air and from an air-water-mixture of splash of rain and 2. specific proof of viable sporangia.

**Construction of the plasmopara trap**: A fan (Figure: 5) sucks the air out of the case. With the low pressure in the case, air and the splashes are sucked through an inlet-jet (Figure: 1) and are blown into the separation chamber (Figure: 2) filled with about 1 ml of destilled water. If there is a surplus of water, it is directed through a filter back into the system regulating the water level (Figure: 8).

The separation chamber is poured out and refilled from the regulation system in adjustable periods. The water is led into a seperate chamber below. There are placed petri-dishes on a rotating plate. The plate loads 14 petri-dishes filled with a runny agar. This agar is used to supply a leaf disk which is posed upside down on the agar. After removal from the trap the petri-dishes are closed and stored at a temperature of about 23 °C for 16 h at daylight. After one week sporagiophores will grow, if viable sporangia were present in the water.

**Results up to now:** Spore traps were posed (one in 1992 and two in 1993) between the vines of an untreated vineyard. In both years powdery mildew infections were already existing on about 0.5 % of the leaves at the positioning time. In 1992 powdery mildew spread very in-

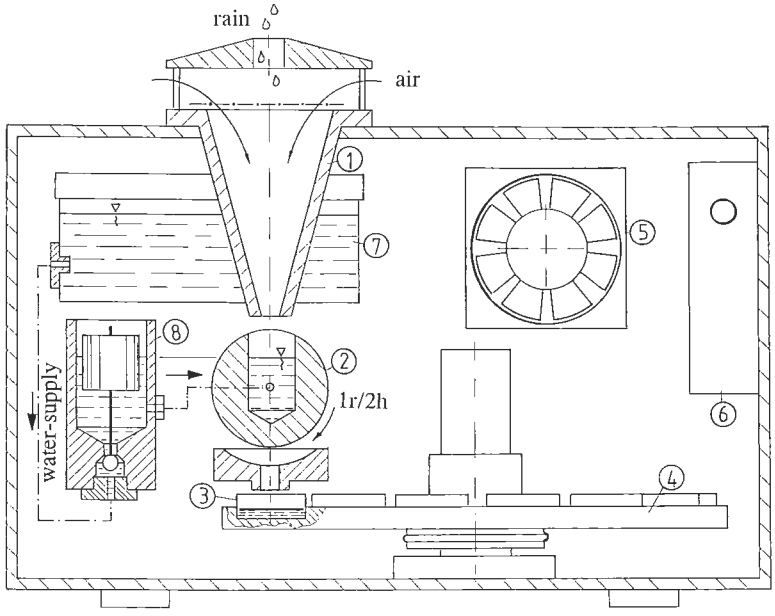


Figure: Technical sketch of the downy mildew spores trap. (1) inlet for air and rain; (2) separation-chamber filled with water; (3) petri-dish filled with runny agar-agar and a leaf-disk; (4) plate for 14 petri-dishes; (5) blower; (6) electronic control toes; (7) store cupboard for water; (8) regulation of the water level in the separation chamber.

Staatl. Lehr- und Versuchsanstalt für Wein- und Obstbau, Traubenplatz 5, D-74189 Weinsberg, Germany.

tensely. In September up to 100 % of the leaves were infected. In 1993 the spread was low, only 4 % of infected leaves were found in September. Nearby an electronic advicer for plant protection (HP-100, Lufft GmbH) was installed. The HP-100 calculates an index for viable sporangia based on BLÄSER (1978). In 1993 a third spore trap was installed on the flat roof of our institute ca. 300 m away from the next possibly infected vines. The distance to the test site with downy mildew infections was 900 m.

Viable sporangia could be detected in 58 cases in 1992. In 1993 three traps together collected sporangia in only 56 cases. There were no differences between the numbers of spores detected at different times of day as described by CORBAZ (1972). Larger numbers of sporangia could be shown, when the HP-100 indicated out "living-sporangia". But in a lot of cases, especially in the trap on the roof of the institute, sporangia were even detected in periods when the HP-100 predicted no viable spores at all (0 %). The proofs of sporangia were not correlated to wind speed, temperature and humidity but there was a correlation to rainfall. The percentage of viable spores calculated by the HP-100 was correlated to the proofs only if the trap was installed near infected vines.

**Hypothesis**: Based on the results mentioned above the hypothesis was developed that two different types of spore release exist:

1. Release into water as described by BLÄSER (1978) for new, quickly germinating sporangia, which are the source of extremely local spread and high damage.

2. Release into dry air for older, slowly germinating sporangia without relevant damage potential. These cause the long distance spread of the fungus.

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