

# “Flavescence dorée” in Switzerland: spread of the disease in canton of Ticino and of its insect vector, now also in cantons of Vaud and Geneva

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## Abstract

An important outbreak of “flavescence dor e” (FD) was observed in 2004 in canton of Ticino, at the Swiss – Italian border. Careful monitoring and sample analysis using nested PCR confirmed the spreading of the disease in the southern part of the canton in 2005, and its further movement into the northern part in 2006. So far, FD appears to be restricted to canton of Ticino, but in 2006, a nationwide monitoring revealed that the insect vector of the disease, *Scaphoideus titanus* Ball, largely present in Ticino, is now also present in vineyards of cantons of Vaud and Geneva.

**Key words:** “Flavescence dor e”, *Scaphoideus titanus*, Switzerland, “bois noir”, nested PCR.

## Introduction

Grapevine yellows have been present in Switzerland for several years: “bois noir” (BN) was first identified in canton of Valais about 15 years ago (Cazelles and Kuszala, 1993) and has now spread to other wine-producing cantons, whereas “flavescence dor e” (FD), so far restricted to canton of Ticino, was detected in 2004 only (Gugerli *et al.*, 2006). In the summer of 2004, an important outbreak of FD was observed at Pedrinate, in the south most district (Mendrisio) of canton of Ticino, at the Swiss-Italian border, with a typically focussed distribution of diseased plants, contrasting, in BN, with a much more random distribution, particularly towards the outer limits of the vineyards. In that vineyard, 169 Gamaret vines – over a total of 2,637 - were tested positive for FD using nested PCR.

## Materials and methods

For the molecular tests, samples (30 mg of petiole tissue) were disrupted and homogenized using a Qiagen (QG) TissueLyser, then processed through a QG BioSprint 96 automated workstation. Briefly, samples were transferred to QG disruption microtubes containing one tungsten carbide bead/tube. Samples were quick-frozen in liquid nitrogen (30 sec.), disrupted for 1 min. at 30 Hz. This step was repeated once, then 1 ml of lysis buffer (200 mM Tris pH 8.0, 100 mM EDTA, 0.5% Tween 20, 50 ug/ml proteinase K) was added. Samples were homogenized (30 Hz, 1 min.) and incubated first at 50  C for 30 min., then at 85  C for 20 min. After centrifugation (7,500 rpm, 5 min.), 200  l supernatant aliquots were transferred to the BioSprint 96 workstation, to be processed according to the manufacturer's protocol. Purified samples were used in a nested PCR; PCR conditions and primers were as reported (Gugerli *et al.*, 2006; Maixner *et al.*, 1995; Deng and Hiruki, 1991; Smart *et al.*, 1996).

## Results

Besides the main and primary focus at Pedrinate, diseased plants were found later in two other localities, belonging to the same district (table 1). Six grapevine varieties were affected and showed clear yellows symptoms (intense reddening or yellowing, leaf roll, delayed cane maturation, grape wilt).

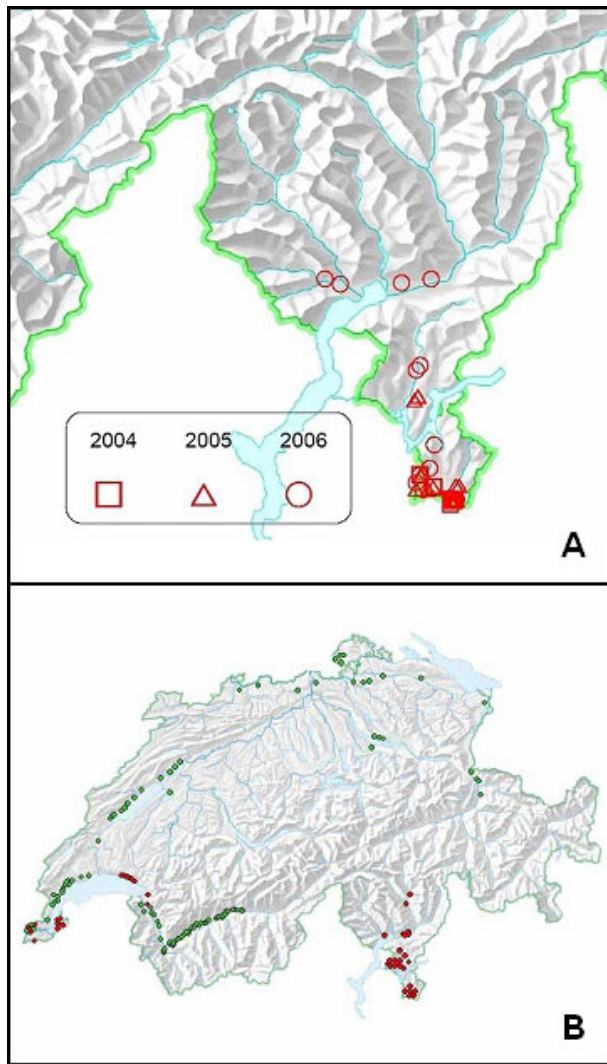
In 2005 (table 1), diseased grapevines (7 varieties) were found in five additional localities in the district of Mendrisio. In 2006 (table 1), FD spread to two more localities of the district of Mendrisio.

While limited until 2005 to the Sottoceneri, FD moved further north, and for the first time across the Monte Ceneri rift and into the Sopraceneri, appearing in the districts of Lugano (3 localities), Locarno (2 localities) and Bellinzona (1 locality). Eight grapevine varieties were affected.

The FD outbreak of 2004 triggered mandatory insecticide treatments in the diseased areas (buprofezine, 350 ha in 2005 and 366 ha in 2006) against the insect vector, *Scaphoideus titanus* Ball. Present in Ticinese vineyards since at least 1967 (Schaub and Linder, 2007), *S. titanus* was found in 1996 in canton of Geneva, on the southern shore of lake L eman. In 2006 (figure 1), a nationwide monitoring (Schaub and Linder, 2007) confirmed the presence of the vector in canton of Geneva, and its presence on the northern shore of lake L eman as well; moreover, the vector was also found in the wine producing regions of Lavaux and Chablais, in canton of Vaud, but not in the region of La C ote.

**Table 1.** Molecular detection by nested PCR on phytoplasmas in samples collected in Ticinese vineyards between 2004 and 2006.

	total	FD	FD+BN	BN	negative
2004	280	45	4	146	85
2005	223	21	27	145	30
2006	489	31	25	393	40



**Figure 1.** A: spread of FD in canton of Ticino between 2004 and 2006. B: presence (red circles) and absence (green circles) of *S. tитanus* in Swiss vineyards, as revealed by the nationwide monitoring in 2006. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org)).

## Discussion

The symptoms observed in the vineyards on the one side, and the molecular diagnosis on the other side, correlate extremely well. The nested PCR approach allows to unambiguously differentiating between FD and BN, which is important, as these two diseases cannot be distinguished in the vineyards. The year 2006 saw a sharp increase in the number of BN-infected vines throughout Switzerland, for reasons as of now unknown (but the presence of certain weeds, outside, but also inside the

vineyards may be a factor). BN-diseased plants can now be seen also in small groups, and also well inside the plots. Thus, an emerging focus of FD could go visually undetected, or undistinguished, masked by the BN-diseased vines. In this context of early warning, a robust, sensitive and reliable test is of critical importance.

FD, a quarantine disease, requires by law that the diseased plants be destroyed. This policy has been in effect in canton of Ticino in 2004, 2005 and 2006. Several thousands of plants were destroyed so far. The vines most affected by the disease are Gamaret and Chardonnay, then Pinot noir and Cabernet Sauvignon.

The presence of *S. tитanus*, now confirmed in cantons of Geneva and Vaud, two of the major wine producing cantons of Switzerland, is worrying and requires careful, if not extensive, monitoring. The absence of the insect vector in La Côte, which is bordered by two compromised areas (Lavaux and Geneva), suggests that *S. tитanus* is not spreading naturally, and that it is being introduced by anthropogenic means.

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