Maturity indicators to predict grape skin strength for controlling *Drosophila suzukii*

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Introduction

Drosophila suzukii has become a pest of economic importance ever since it has spread around the world through fruit trade. In vineyards, it is thought that the risk of infestation is correlated with the strength of the grapes' skin. There is an idea that there might be a common threshold in skin strength when a grape transitions from being safe from infestation to being susceptible. Here we explore the relationships between *D. suzukii* infestation, penetration force and other grape properties.

Material and methods

At the Agroscope research vineyard in Pully, 17 different cultivars were followed throughout the 2017 growing season and five of these cultivars were also tracked at five other sites in Western Switzerland. Weekly, 50 berries were controlled for infestation by *D. suzukii* and berries' penetration force was measured using an Universal Testing Machine TAxT2i Texture Analyzer equipped with a 2 mm blunted needle. Grape maturity was determined inspecting 20 seeds and brix, pH, titratable acidity, tartaric acidity, malic acidity, yeast assimilable nitrogen, ammonia as well as alpha amino nitrogen was measured with an infrared spectro-photometer (FOSS WinescanTM).

Results and discussion

Although infestation risk increased with decreasing skin strength (R=-0.26, P<0.01), cultivars were found to be infested by *D. suzukii* at a penetration force from 46 to 108 cN (Fig 1). Thus, the idea of a common threshold was not supported. Factors related to grape maturity, such as days until harvest (R=-0.39, P<0.001), Brix (R=0.39, P<0.001), total acidity (R=-0.27, P<0.01), tartaric acidity (R=-0.38, P<0.001), malic acidity (R=-0.29, P<0.01) or seed coloration (R=0.29, P<0.01), were overall better indicators to predict infestation risk than skin strength. Thus, there does not seem to exist an exact moment where a cultivar switches from being safe from infestation to being susceptible. It is rather a gradual process based on probabilities.

We also failed to correlate penetration force with any single tested grape property or with a statistical combination of them. Moreover, penetration force within a cultivar behaved quite different among locations and cultivars collected the same date at different sites differed of up to 35 cN (Fig 2). These differences made it impossible to apply the progression of penetration force throughout the season from one vineyard to another. We therefore failed to discover any general relationships that might be used to indicate a grapevine's susceptibility to *D. suzukii* infestation in practice.

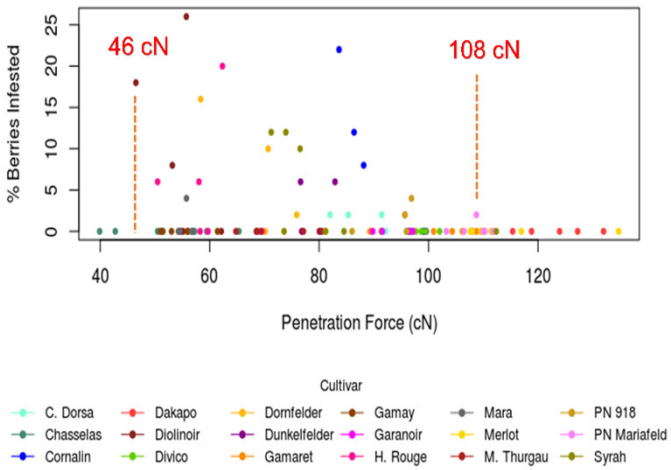

Fig 1. Penetration force graphed against *D. suzukii* infestation at Pully 2017.

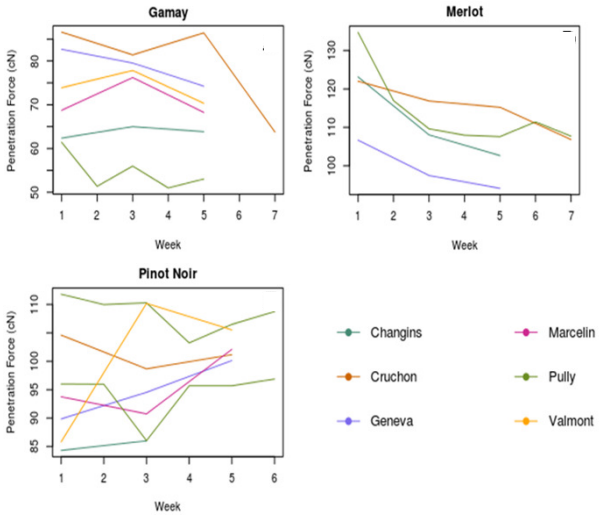

Fig 2. Progression of penetration force in 3 cultivars for 6 vineyards in 2017.

Abstract

The risk of *Drosophila suzukii* infestation in vineyards is thought to be correlated with grapes' skin strength. However, the idea of a common threshold is not supported by our data since cultivars were found to be infested by *D. suzukii* across a wide range. Factors related to grape maturity were overall more suited to forecast the risk of infestation. We also were not able to predict skin strength by any other grape property and penetration force within a cultivar behaved quite different among sites. Thus, we failed to discover any general relationships that might be used to indicate a grapevine's susceptibility to *D. suzukii* infestation.

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