Impact of cluster leaf removal on grape disease pressure for cold-hardy hybrid cultivars under climatic conditions of eastern Canada.

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Introduction

Fruit zone management (FZM) involves leafing around grape clusters and thinning clusters. One of the main objectives of the FZM is to improve the aroma, flavor and pigment profiles of the grape, promote earlier maturity, and reduce disease. Despite the apparent advantages of FZM on grape quality, the precise impact on disease development is not well documented. FZM is expected to limit the development of grape diseases such as bunch rot by Botrytis (*Botrytis cinerea*), downy mildew (*Plasmopara viticola*) and powdery mildew (*Erisyphe necator*) (Zoecklein et al. 1992 ; Percival et al. 1994). The impact of these practices involves the promotion of a microclimate less favorable to the development of the disease and better penetration of fungicides into the canopy (Huglin and Schneider 1998). However, the timing of the application of the practices is crucial to have the targeted effect.

The objective was to study the influence of fruit zone management practice on microclimate, fungicide penetration (cover efficiency), fungal disease development, pathogen populations and yield losses (damage).

Methods

In 2020 and 2021, FZM were evaluated for their effect on downy mildew in plots planted with Vidal blanc, and on powdery mildew and Botrytis bunch rot in plots planted with Seyval blanc (3 repetitions, 5 vines). At both sites and for both grape varieties, the following five practices of leafing around the cluster zone were:

1) one side of the row at nouaison
2) two sides of the row at nouaison
3) one side of the row at veraison
4) two sides of the row at veraison
5) no leafing (control)

Parameters:

- Microclimate (temperature, relative humidity, leaf wetness, solar radiation)
- Fungicide penetration (hydrosensitive paper)
- Downy mildew and powdery mildew, on leaves and at harvest on clusters
- Botrytis bunch rot was assessed at harvest on clusters
- Disease pressure (pathogen's airborne inoculum)

Results and discussion

Results are generally consistent for the two years. Regardless of the treatment, the effect of FZM practices was small but significant and allow reduction of diseases occurrence.

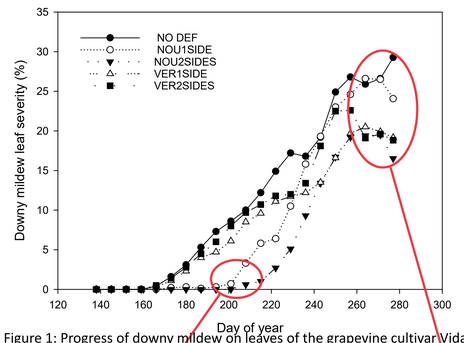


Figure 1: Progress of downy mildew on leaves of the grapevine cultivar Vidal

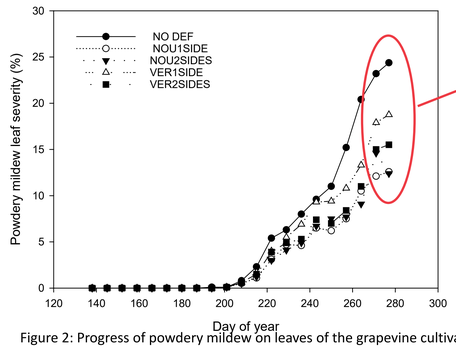


Figure 2: Progress of powdery mildew on leaves of the grapevine cultivar Seyval

Leaf removal at nouaison reduced occurence of powdery mildew on leaf.

Leaf removal globally reduced occurence of powdery mildew on fruits at harvest.

Leaf removal at nouaison delay leaf infection by Downy mildew

Leaf removal generally reduced leaf infection by Downy mildew at the end of the season and on fruit at harvest.

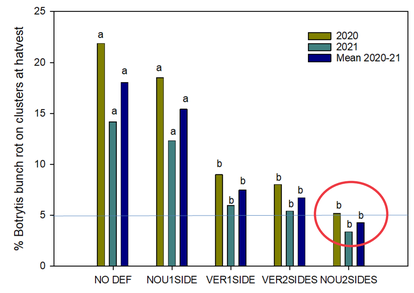


Figure 3: Severity of botrytis bunch rot at harvest on clusters of the grapevine cultivar Seyval

Leaf removal on two sides of the row at nouaison and one and two sides at veraison reduced presence of *Botrytis* on fruits at harvest, but only leaf removal on two sides at nouaison resulted in a lower than 5% threshold at harvest.

- ✓ Overall, lower disease severity was observed when leaves were removed at nouaison as compare with veraison.
- ✓ The difference in disease severity may be explained by lower humidity and better fungicide penetration in the canopy where leaves around the clusters were removed on both sides of rows.
- ✓ The removal of leaves from the fruiting area promoted the penetration of fungicides during a localized treatment but also of general coverage.
- ✓ Results may be included in a comprehensive strategy developed to reduce disease and fungicide resistance development under northeastern conditions.

In general, leaf wetness periods were shorter in plots with leaf removal. Similarly, higher solar radiation and wind speed within the canopy (cluster zone) were observed in plots with leafing .

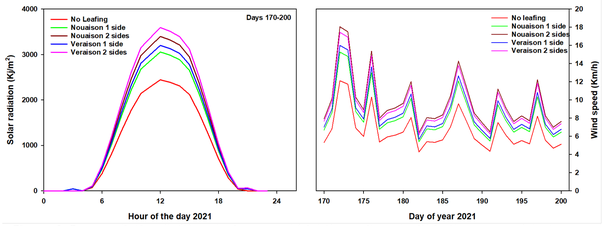
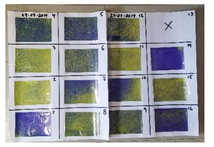


Figure 4: Solar radiation (left) and wind speed (right) monitored within the canopy (cluster zone) in 2021

Table 1: Percent pesticide penetration into the canopy (cluster zone) for the different leafing treatments

% Penetration within the canopy (%)	Before leafing (stage 25)	After leafing at nouaison (stage 29)	After leafing at nouaison (stade 31-33)	After leafing at véraison (stade 35+)	After leafing at véraison (stade 38)
Control	46.7a	44.8a	42.1c	37.8c	39.6c
Nouaison one side	51.2a	69.6bc	58.7b	51.6b	48.9c
Nouaison two sides	47.8a	89.4a	74.6a	64.1b	58.7b
Veraison one side	44.9a	39.6c	44.3c	79.6a	62.4b
Veraison two sides	48.3a	41.2c	48.3c	88.5a	76.3a



Significantly more fungicide penetration in the canopy with leaf removal.

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