Cluster architecture and fruit composition as influenced by rachis tipping

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ABSTRACT

A field study was conducted to determine the effect of cluster tipping at different phenological stages on bunch compactness and the resulting fruit quality. Cluster tipping at fruit set appeared to reduce compactness, however, it was not significantly different from other treatments. The same was true of fruit compositional attributes such as sugars, malic and tartaric acids, pH, titratable acidity, K and YAN. Hence, cluster tipping has limited use as a production practice in loosening compact clusters.

INTRODUCTION

Grapes (*Vitis vinifera* L.) are one of the most valuable cultivated fruit in the world today consumed as fresh fruit (table grapes) and processed products such as wine, juice, etc. One of the main problems of grape production is bunch (cluster) compactness (density), a key cluster morphological feature determining composition of grape and the resulting wine. This is because tight clusters ripen more heterogeneously, and most importantly, they are prone to fungal pathogens such as *Botrytis cinerea* and *Erysiphe necator*, which cause bunch rot and powdery mildew, respectively (Figures 1). Typically, in a compact cluster, spherical berry shape is morphed due to tight packing preventing air circulation to interior berries that remain hidden by the squeezed exterior berries. There are several viticultural strategies to reduce bunch compactness. For instance, leaf removal at pre-flowering or full-flowering typically reduces bunch compactness by affecting the number of berries through the effect on fruitset. Other crop management practices that have been applied to generate loose bunches include crop load management, the use of diverse rootstocks, late first shoot topping, bunch thinning, berry or bunch sections thinning, and shoot trimming (Bondada et al. 2016). In this study, we investigated the effect of rachis tipping at different phenological stages on bunch compactness and fruit composition of Syrah grapes.

Figure 2. Cluster tipping at fruit set, and berry analysis.

MATERIALS AND METHODS

The study was conducted in an experimental teaching vineyard at WSU Tri-Cities, Richland, WA with mature vines of Syrah trained to VSP system. All vines were pruned to two-node spurs to equate the shoot density to 20 shoots/m. The vineyard with north-south oriented rows had vine by row spacing of 6 x 9 feet on a uniformly deep loamy fine sand. All vines were drip-irrigated and standard cultural practices were performed to maintain healthy vines. Cluster tipping was performed at different phenological phases starting at pre-flowering stage (Figure 2). Grapes from all treatments were harvested on the same day and various fruit quality attributes including Brix, pH, titratable acidity, malic and tartaric acid contents, potassium, and YAN were analyzed to assess the quality differences among different treatments. A scale was developed to determine bunch compactness.

Figure 1. *Botrytis cinerea* infection in white (upper image) and red (lower images) cultivars, which also include Erysiphe *necator infection.*

RESULTS AND DISCUSSION

Cluster tipping at fruit set appeared to reduce compactness, but it was not significantly different from other treatments (Table 1). The same was true of increased contents of sugars, potassium, and malic and tartaric acids, for reduced levels of titratable acidity and pH, and for berry weight and bunch compactness. The YAN in all treatments were below the threshold levels (Tables 2 and 3).

Table 2. Fruit composition as influenced by bunch stem tipping

Treatments	Brix	Sugars	pH	TA
T1	25.3 ± 0.30	401 ± 26	3.62 ± 0.02	4.23 ± 0.12
T2	25.1 ± 0.26	427 ± 12	3.62 ± 0.03	4.27 ± 0.12
T3	25.6 ± 0.30	418 ± 5.2	3.62 ± 0.03	4.13 ± 0.12
T4	25.8 ± 0.41	437 ± 22	3.71 ± 0.02	3.90 ± 0.05

T1 – Control, Cluster tipping at fruit set (T2), pea size (T3), and at veraison (T4).

Table 3. Fruit composition as influenced by bunch stem tipping

Treatments	Malic acid	Tartaric acid	YAN	Potassium
T1	2.35 ± 0.07	7.84 ± 0.52	64 ± 4	2.5 ± 0.23
T2	2.60 ± 0.03	8.61 ± 0.20	47 ± 7	2.85 ± 0.06
T3	2.21 ± 0.07	7.89 ± 0.16	79 ± 17	2.51 ± 0.05
T4	2.47 ± 0.04	8.01 ± 0.29	62 ± 8	2.85 ± 0.23

Table 1. Cluster architecture as influenced by rachis tipping

Ttms	Berry wt. (gram)	Compactness
T1	1.55 ± 0.07	2.56 ± 0.13
T2	1.64 ± 0.03	2.36 ± 0.03
T3	1.66 ± 0.01	2.4 ± 0.01
T4	1.81 ± 0.06	2.4 ± 0.03

Treatments same as in tables 1 and 2

Bunch compactness scale: 1 - loose, 2 – gaps in the cluster, 3 - tight

CONCLUSIONS

Cluster tipping showed limited use in loosening compact clusters.

REFERENCES

Bondada, B., Covarrubias, J.I., Tessarin, P., Boliani, A.C., Marodin, G. and Rombolà, A.D. (2016) Postveraison shoot trimming reduces cluster compactness without compromising fruit quality attributes in organically-grown Sangiovese grapevines. Amer. J. Enol. Vitic. 67: 206–211.

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