

# Kaolin impacts on hormonal content and berry quality traits in *Touriga-Nacional* and *Touriga-Franca* grapevines during ripening

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## INTRODUCTION

One of the effects of climate variability is the phenology advancement in several Mediterranean crops. As a result, in grapevines, the sugar and organic acid metabolisms and secondary metabolites accumulation can be desynchronized during ripening.

Grape ripening onset is also coordinated by several hormones (abscisic acid (ABA), salicylic acid (SA), and indole-3-acetic acid (IAA)), regulating metabolic changes caused by interactions with abiotic stress factors (temperature, UV-B radiation, drought).

**KAOLIN** → a white clay mineral, considered to be a effective strategy against summer stress in grapevines, particularly in Mediterranean-type climate regions. Kaolin foliar application is known by its beneficial effects on leaf cooling, gas exchange and water use efficiency, with a possible role on berry acidity and colour conservation.

This study addresses the hypothesis that kaolin treatment can lead to several changes in berry quality attributes and hormonal content of two field-grown grapevine varieties during successive growing seasons (2017 and 2018).

## METHODOLOGY

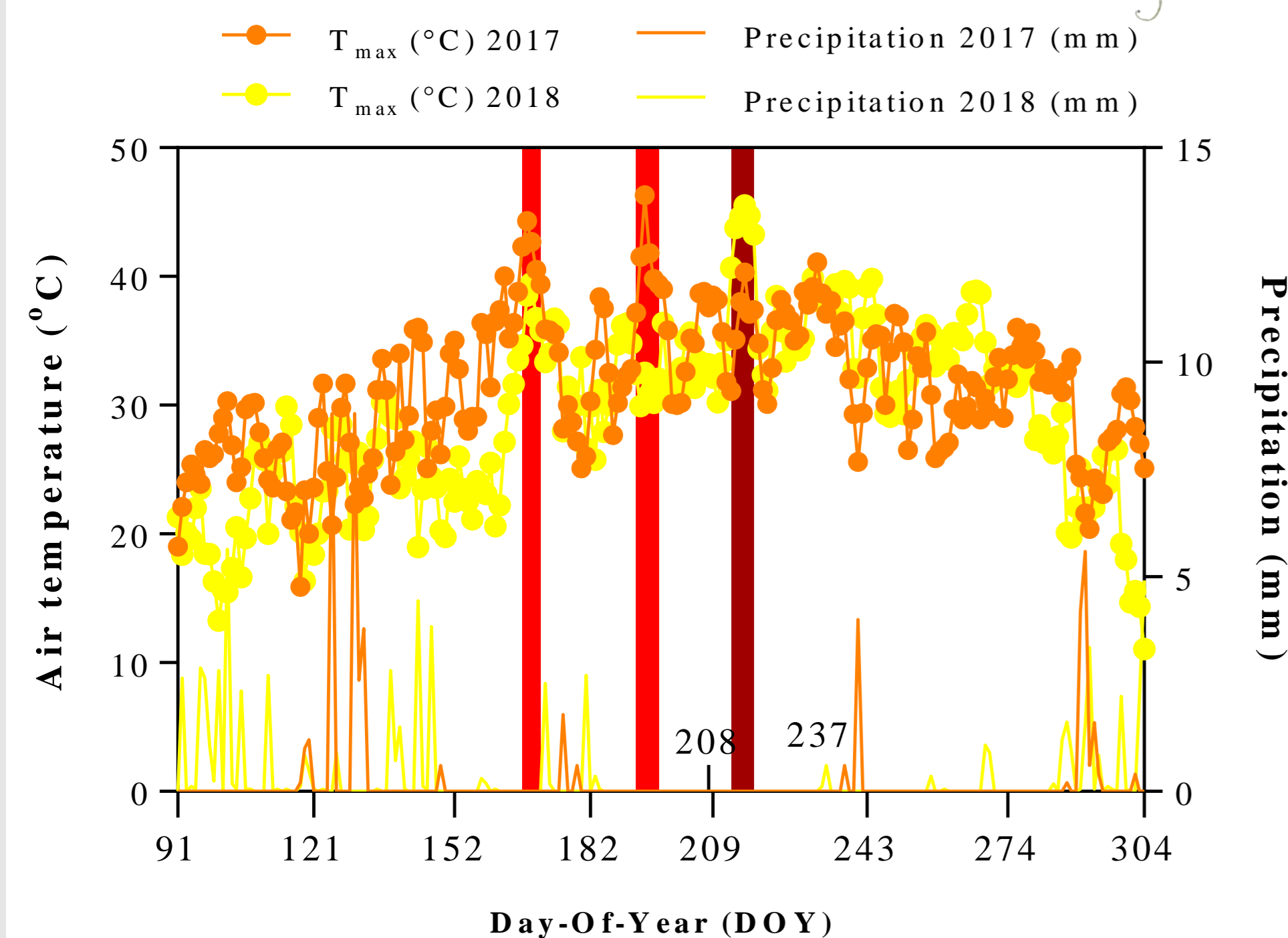
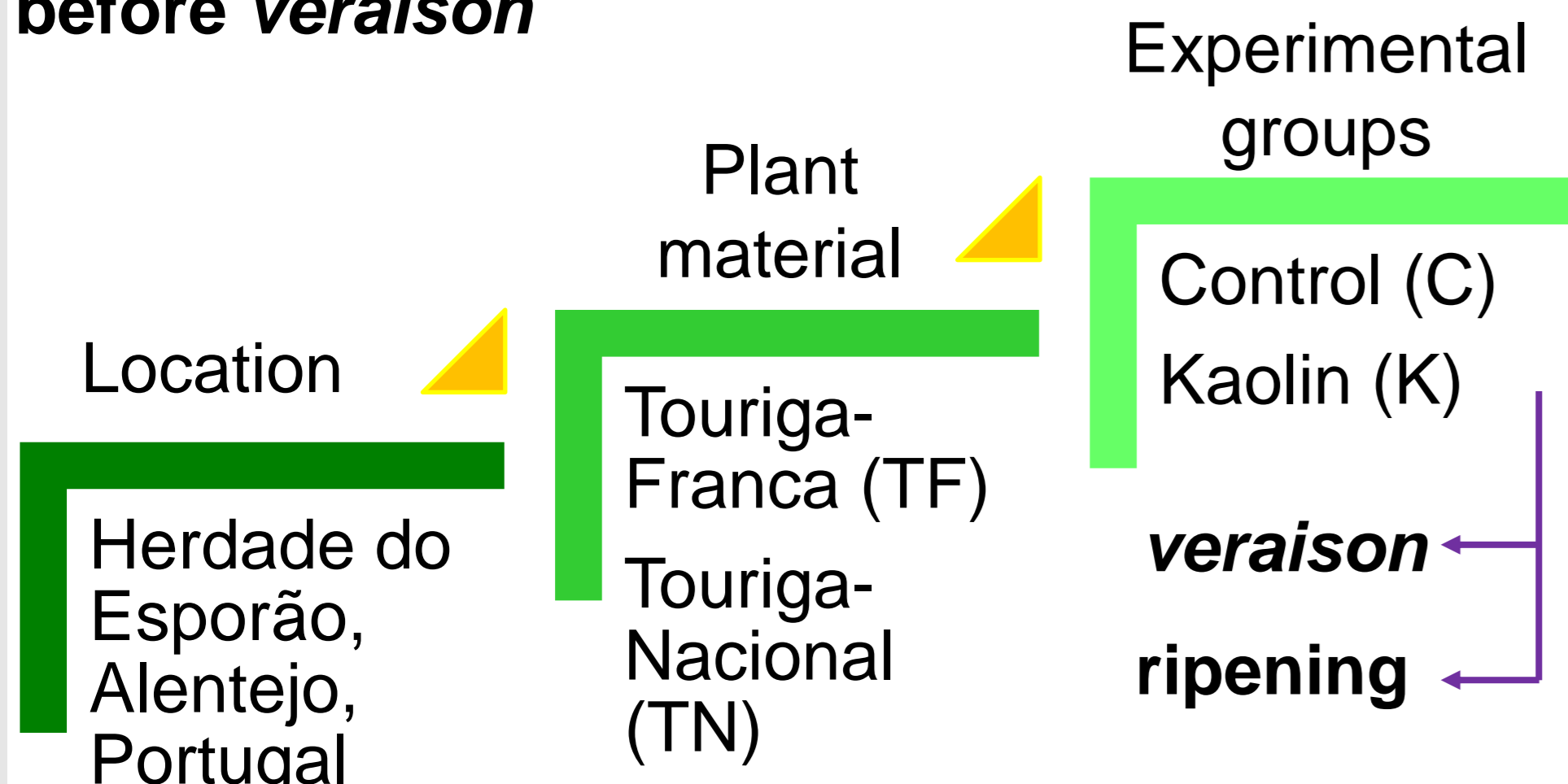


Fig.1 – Daily maximum air temperature and precipitation at the vineyard site. Vertical bars represent the heatwave events occurred during the experiment.

### Kaolin foliar application (5%) three weeks before veraison



Three groups of 100 berries were collected within each treatment, variety and developmental stage.

Analysis of phytohormones (ABA, IAA and SA), soluble sugars (SS), total acidity (TA), tartaric acid (TAc), malic acid (MAc), and anthocyanins (Ant). A principal components analysis (PCA) was performed to examine summer stress effects throughout berry ripening.

## RESULTS & DISCUSSION

### veraison

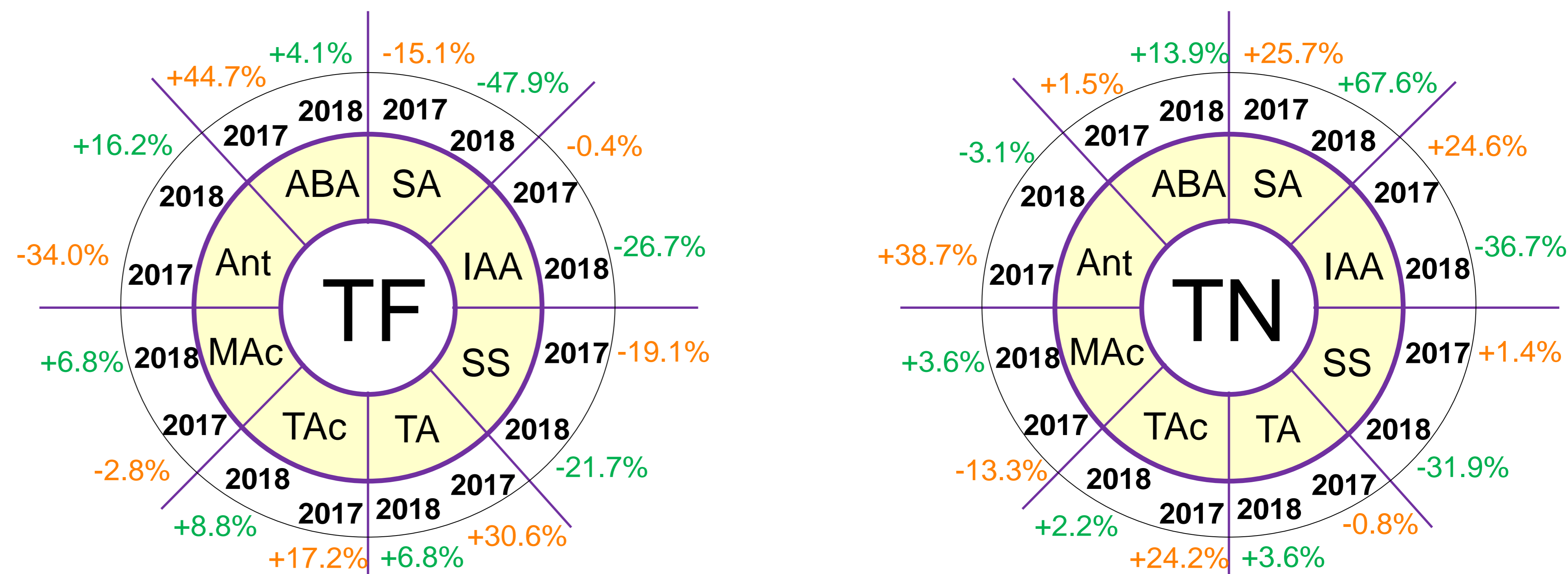


Fig. 2 – Impacts of kaolin application (% of variation) on hormonal content and quality traits at veraison in the 2017 and 2018 growing seasons. ABA- abscisic acid; IAA- indole-3-acetic acid; SA- salicylic acid; SS-soluble sugars; TA- total acidity; TAc- Tartaric acid; MAc- Malic acid; TF-Touriga-Franca; Touriga-Nacional.

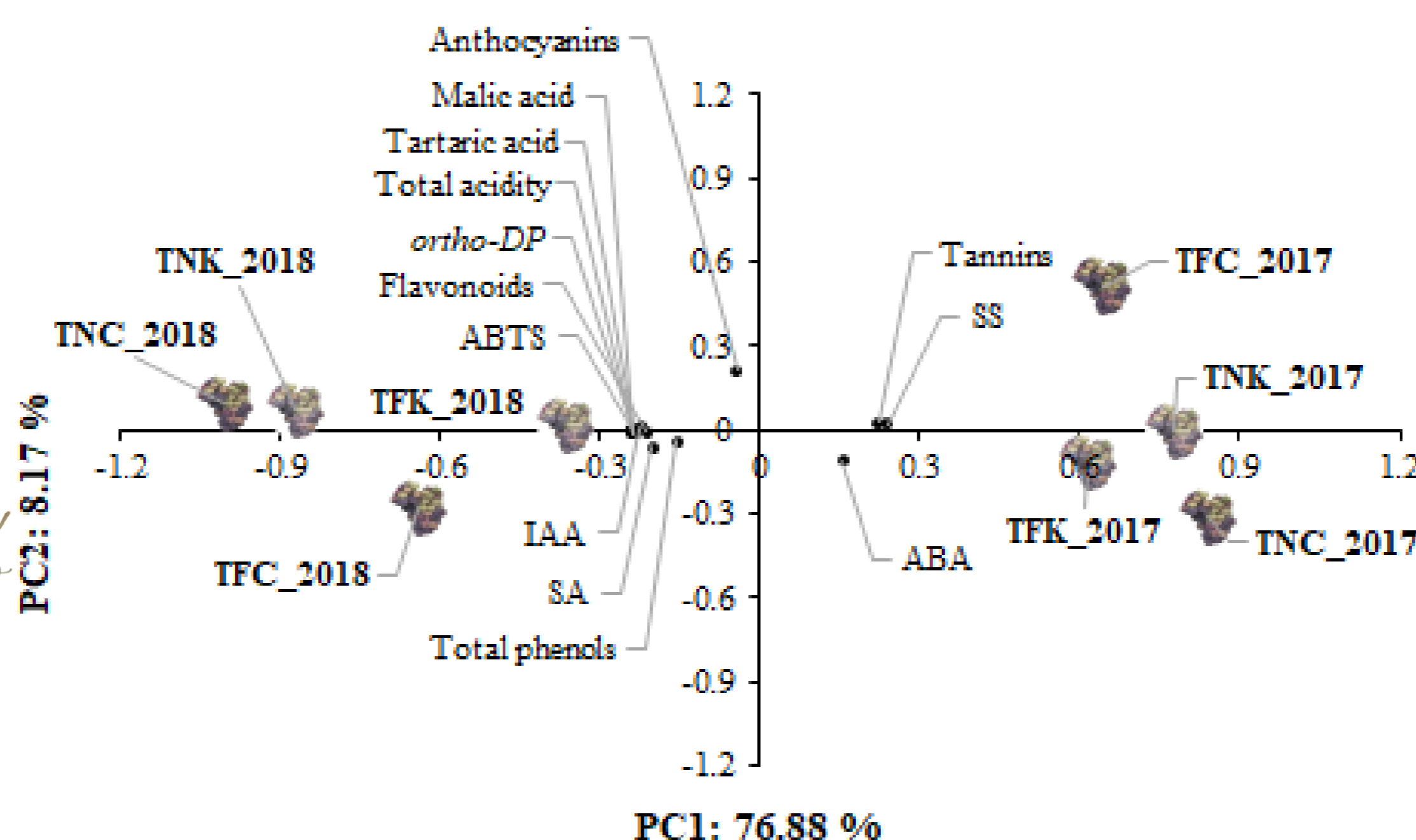


Fig. 3 – Principal components analysis (PCA) for berry quality traits, antioxidant defense, and hormonal content at veraison of control (C) and kaolin (K) treated berries.

Berries from the 2017 growing season displayed higher components related to berry ripening (ABA and SS).

TF\_C berries showed the highest score in both PC1 and PC2 → possibly higher ripening rate in control grapevines.

Kaolin treatment could have a ripening delaying effect in TF under adverse summer stress conditions.

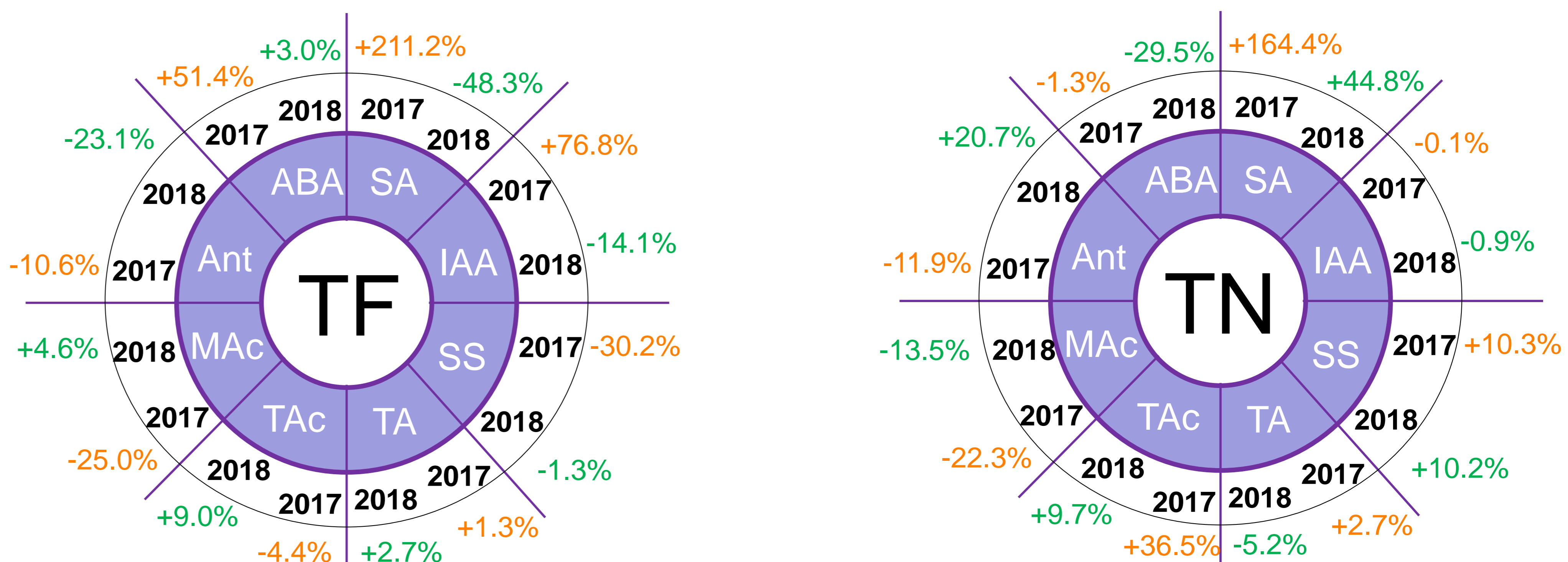


Fig. 4 – Impacts of kaolin application (% variation) on hormonal content and quality traits at ripening in the 2017 and 2018 growing seasons.

TF\_C berries showed the highest level of anthocyanins, tartaric acid and soluble sugars in both years, while showing lower acidity related components in 2017.

## CONCLUSION

Kaolin effects on modulating berry ripening seem to depend on the variety and stress severity, since under mild environmental conditions its effectiveness can be questionable.

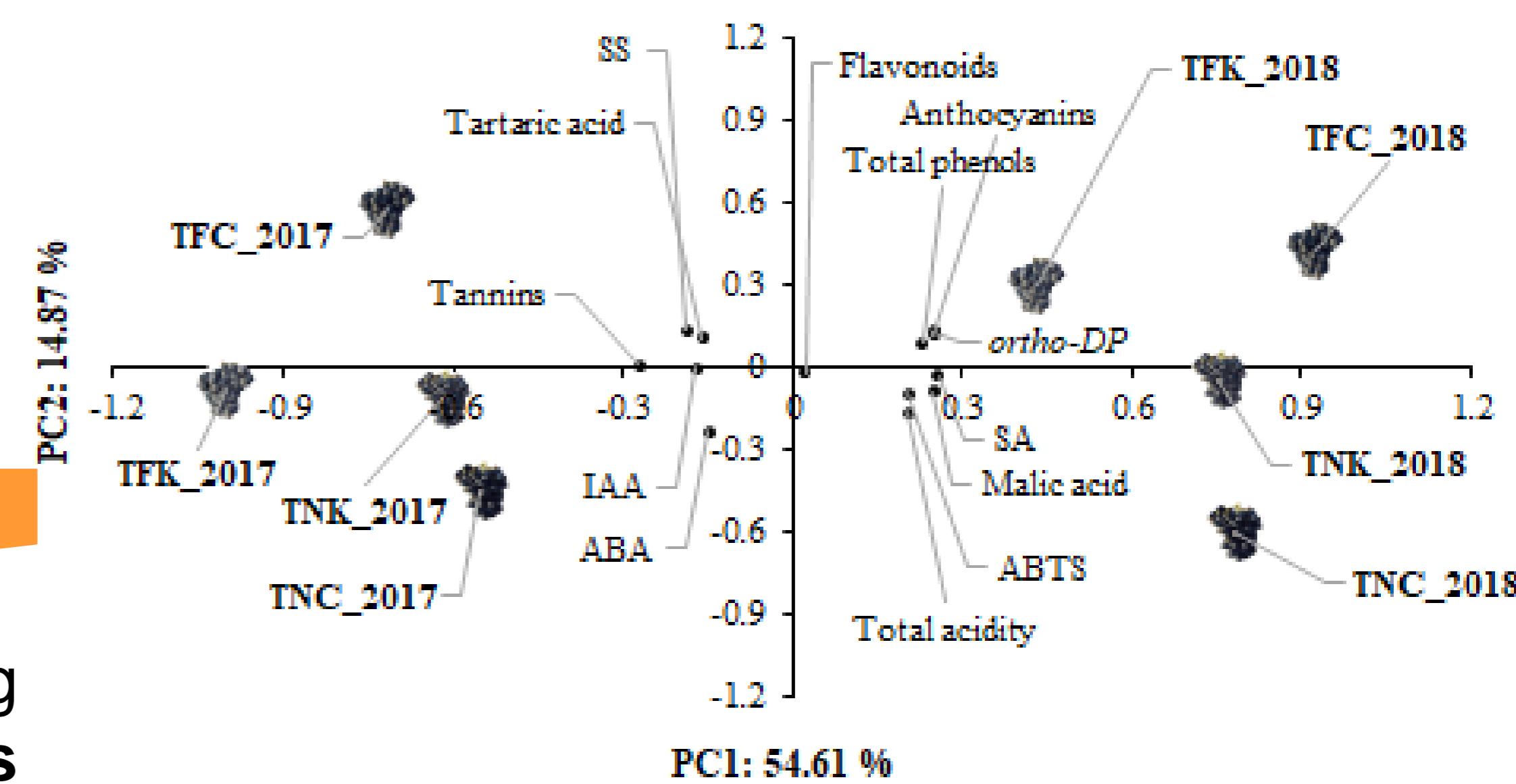


Fig. 5 – Principal components analysis (PCA) for berry quality traits, antioxidant defense, and hormonal content at ripening of control (C) and kaolin (K) treated berries.