Early assessment of yield potential in vineyard systems: influence of nitrogen and water status on the number of inflorecences

Anne Merot, Aurelie Metay, Maëlle Lis, Nathalie Smits

EARLY ASSESSMENT OF YIELD POTENTIAL IN VINEYARD SYSTEMS: INFLUENCE OF NITROGEN AND WATER STATUS ON THE NUMBER OF INFLORESCENCES

Anne MEROT [1] *– Aurélie METAY* [2] *– Maëlle LIS* [1] *- Nathalie SMITS* [1]

[1] UMR SYSTEM, INRA, 2 place Viala 34060 Montpellier cedex, France, Email: anne.merot@supagro.inra.fr
[2] UMR SYSTEM, Montpellier Supagro, France

Introduction

The yield is a key variable to assess the performances of vineyard systems. During the developmental and reproductive cycle, which spreads over two years, various yield components are established. Guilpart *et al.* (2014) showed that the number of bunches per plant, the number of berries per bunches and the weight of berries explain 60%, 30% and 10% of the yield, respectively. The economic importance of early yield assessment for field management explains the numerous studies in this field. The number of inflorescences per plant is determined the year before bunch emergence and growth. Thus the potential yield is largely determined at this time. In this work, we analyzed the effect of the nitrogen status and water status on the number of inflorescences which is a major component of potential yield.

Materials and Methods

The field trial was located in the South of France (Gard and Vaucluse) and included different pedoclimatic conditions, soil management and fertilization strategies. Ten to 15 vineyards, planted with cv. Grenache and managed conventionally or organically, were followed each year from 2013 to 2015. Thirty plants were sampled on each field. On each plant, the number of inflorescences and number of berries per bunch were counted. The weight of 200 berries at harvest was measured.

Water Stress Index: On the same plant, the apex of two primary brunches was classified between three options: active growth, reduced growth or growth stopped. These observations were performed every ten days after flowering and until bunch closure. They were used to calculate an indicator of water stress at field scale in every vineyard (Rodriguez-Lovelle *et al*., 2009).

Leaf N content – SPAD unit: In each field, 30 plants were selected. Two successive readings on two fully expanded leaves were taken by a SPAD-502, across the whole surface of the leaf at three phenological stages (flowering, bunch closure and veraison). This measure is a good indicator of leaf nitrogen content (Metay *et al*., 2015).

Results and Discussion

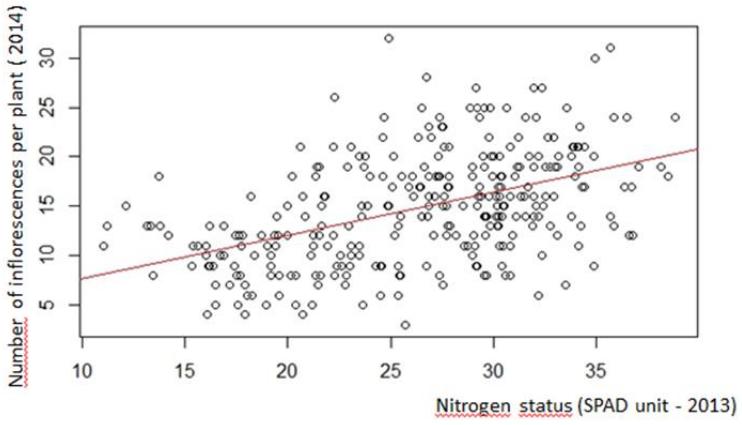

Figure 1. Relationship between the nitrogen status the previous year at flowering (2013) and the number of inflorescences per plant (2014)

The number of inflorescences per plant is statistically correlated with the leaf nitrogen content at flowering of previous year (figure 1; R^2 = 0.22; *P*-value <$2e^{-16}$ ***). An increase in leaf nitrogen content led to more inflorescences per plant. The data collected covered a large range of leaf nitrogen contents from 15 to 40 (SPAD unit).
Our data also showed that the water stress at flowering of previous year influenced the number of inflorescences: severe stress lowers inflorescence number.
These preliminary results have to be completed. We examined separately the relation between the nitrogen status or the water status and the number of inflorescences whereas the processes including water and nitrogen are interlinked. Furthermore, we have to focus on the second year of the yield elaboration: the relations between nitrogen, water or other determinants during year n and the yield components of the same year.

Conclusions

Our results provide evidence for a critical period of sensitivity for bunch development at flowering time of the previous year. This is particularly valuable for early yield prediction and decisions regarding crop management.
However, this only refers to potential yield, whereas actual yield prediction would need further information about pest and disease incidence.

References

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