INTRODUCTION

Seedless fruits appear spontaneously in grapevine (Vitis vinifera L.) as a result of somatic variation, Stenospermocarpic and parthenocarpic seedlessness are known. The first type is widely used in table grapes production because seed development aborts after fertilization giving rise to seed traces and almost normal size berries. In contrast, small berries without seeds develop in the absence of fertilization in parthenocarpic cultivars that are appreciated for raisin production. The cultivar Corinto Blanco is a parthenocarpic somatic variant of the Spanish seeded cultivar Pedro Ximénez. Morphological and molecular comparison of flower development and gametogenesis between both genotypes were directed to understand the genetic and molecular basis of this parthenocarpic phenotype.

FRUIT AND SEED PHENOTYPE

Partial phenotypic reversion was observed in 2.6% of Corinto Blanco berries. These berries carried one seed and displayed a comparable size to that of Pedro Ximénez berries.

MICROGAMETOGENESIS ANALYSIS

Pollen viability analysis was performed using carmine staining. The red-stained pollen is viable. Corinto blanco pollen is practically sterile while Pedro Ximénez pollen showed more than 70% of viability in both analyzed years.

MACROGAMETOGENESIS ANALYSIS

Corinto Blanco ovule degeneration with exfoliated integuments, disorders during mitosis after mother cell meiotic reduction, resulting in ovules without elements of embryo sac.

TRANSCRIPTOME COMPARISON

Transcriptomic analyses of closed flowers were done comparing both genotypes at 50% bloom time using the NimbleGen Vitis HX12 microarray. Significant genes according to a 5% FDR in a 2-class SAM (Significance Analysis Microarrays). We identified 441 genes up-regulated and 949 down-regulated in the parthenocarpic somatic variant (2-FC). Functional enrichment analysis indicated that transcripts related with sugar metabolism and transport, vesicular transport and seed storage proteins were more highly expressed in Pedro Ximénez. In contrast, secondary metabolism, responses to biotic stress and to oxidative stress, and salicilate and brassinosteroid signaling were over-represented within Corinto Blanco up-regulated transcripts. The responses activated in Corinto Blanco flowers could be related with the observed ovule degeneration at the same stage. Interestingly, genes related with cell cycle and gametogenesis were down-regulated in Corinto Blanco. The expression of these genes could be related with defects in macro- and micro-gametogenesis in Corinto Blanco.

OFFSPRING

To analyze the inheritance of the parthenocarpic trait, we collected the seeds of Corinto Blanco seeded berries. Plants from these seeds were obtained using an in vitro germination protocol because these seeds did not germinate under regular conditions. In addition we generated a self-cross progeny of Pedro Ximénez. Genetic analysis of parthenocarpic will be performed in these progenies when they set fruits.

CONCLUSIONS

Preliminary results suggest the presence of defects in the meiotic mechanisms central to the process of gametogenesis in Corinto Blanco, providing clues for further characterization of the origin of parthenocarpic in this cultivar.