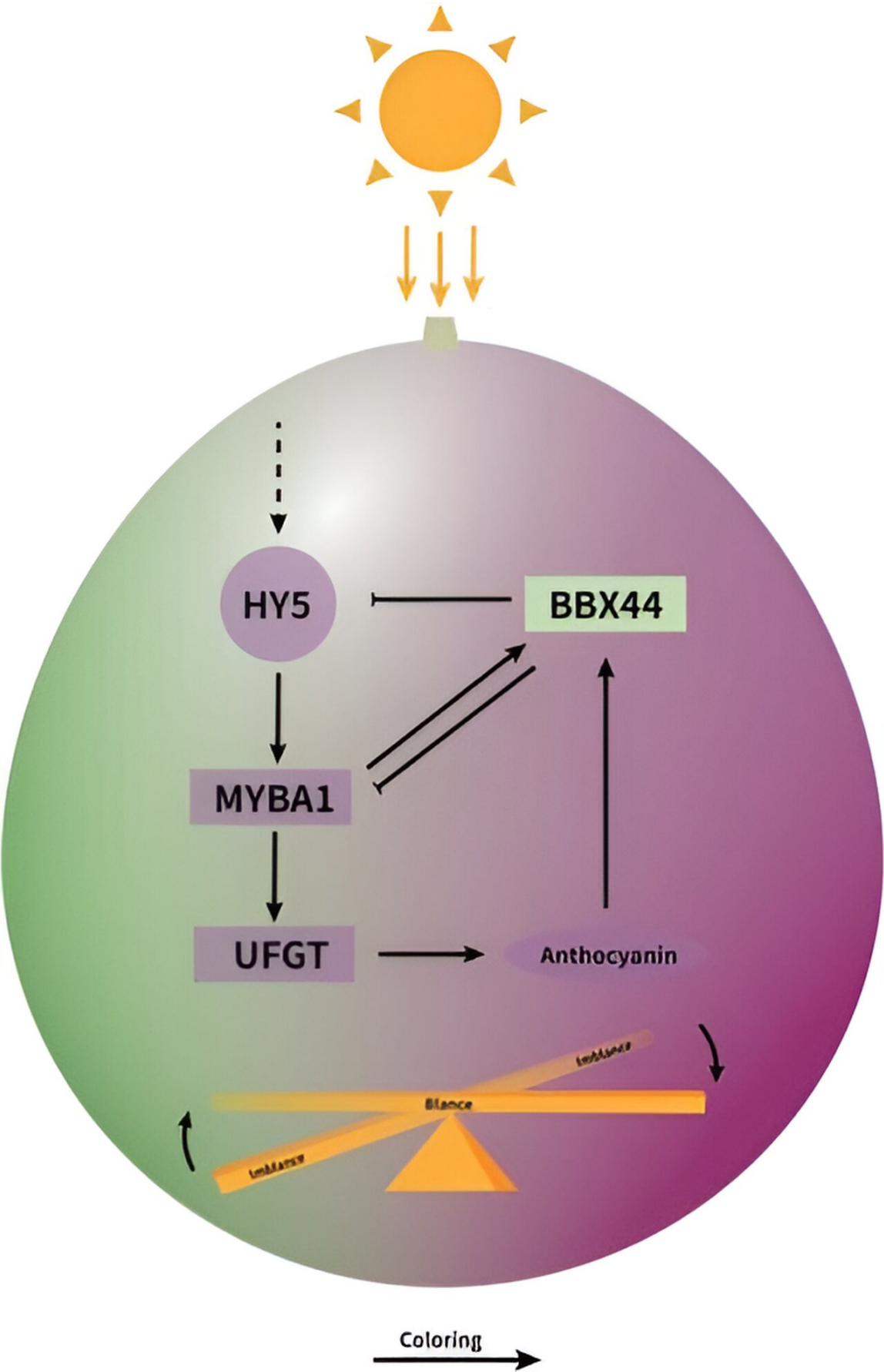


Unlocking the color code: The role of VvBBX44 and VvMYBA1 in regulating grape anthocyanin biosynthesis

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A model for the BBX44-MYBA1 regulatory loop controlling anthocyanin biosynthesis in grapevine berry. Credit: *Horticulture Research*

Anthocyanins significantly influence grape quality and color, with transcription factors HY5 and MYBA1 playing pivotal roles in their biosynthesis. Recent findings show that VvBBX44, a B-box protein, inhibits anthocyanin production in grapes by suppressing VvHY5 expression, yet the specific regulatory mechanism remains elusive.

While [anthocyanin](#) synthesis involves a complex network of MYB [transcription factors](#) and BBX proteins, the interaction between VvBBX44, VvHY5, and MYBA1 and its impact on [grape](#) quality requires further investigation.

Horticulture Research published research titled "[VvBBX44 and VvMYBA1 form a regulatory feedback loop to balance anthocyanin biosynthesis in grape.](#)" This study focuses on the molecular mechanism by which VvBBX44 regulates anthocyanins, aiming to enhance our understanding of anthocyanin biosynthesis in grapes.

The results demonstrated that VvBBX44 localizes to both the nucleus and cytoplasm and lacks transcriptional activity in yeast. Knockout experiments using CRISPR-Cas9 showed increased anthocyanin in VvBBX44-deficient grapevine callus, along with elevated expression of VvMYBA1 and VvUFGT, highlighting VvBBX44's role as a repressor.

Binding assays confirmed that VvBBX44 directly suppresses VvMYBA1 by binding to its promoter. Analysis of grape berry development stages revealed that the expression of VvBBX44 and VvMYBA1 change in

response to berry coloring, with VvMYBA1 activating VvBBX44 expression, further supporting their feedback relationship.

Additional experiments showed that VvBBX44 represses the transcriptional activity of VvMYBA1 on VvUFGT and VvBBX44, and does not physically interact with VvMYBA1. Furthermore, the external application of anthocyanin stimulates VvBBX44 expression, indicating a [feedback loop](#) that regulates anthocyanin synthesis to prevent overaccumulation.

Overall, the research highlights a complex regulatory network involving VvBBX44 and VvMYBA1 that controls anthocyanin biosynthesis in grapevine. This network is characterized by a feedback loop where VvBBX44 represses VvMYBA1 to balance anthocyanin production, providing insights into the mechanisms plants use to regulate metabolite accumulation and suggesting potential targets for enhancing grape quality through [genetic manipulation](#).

More information: Wenwen Liu et al, VvBBX44 and VvMYBA1 form a regulatory feedback loop to balance anthocyanin biosynthesis in grape, *Horticulture Research* (2023). [DOI: 10.1093/hr/uhad176](https://doi.org/10.1093/hr/uhad176)

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