

SUPPLEMENTARY INFORMATION

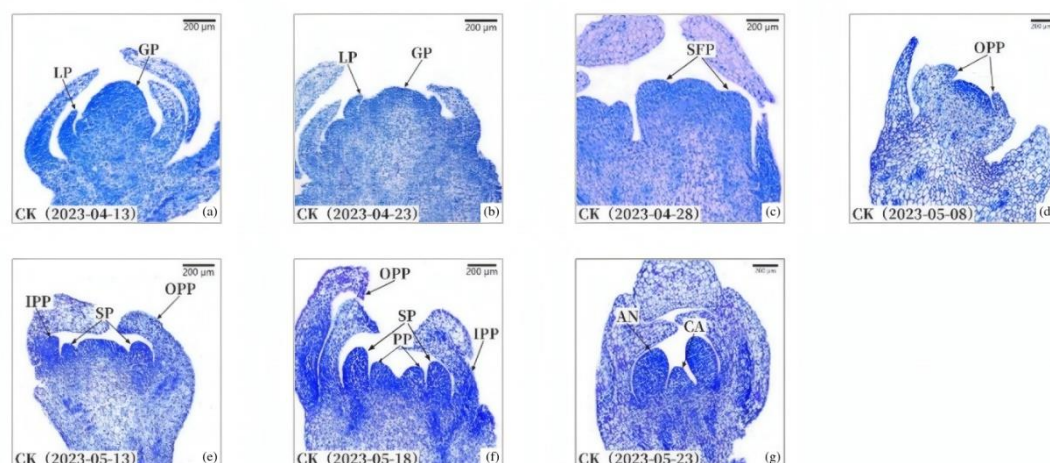
Effects of Gibberellic Acid and Ethephon on Flower Bud Differentiation, Endogenous Hormones, and Reserve Metabolism in LA Hybrid Lily

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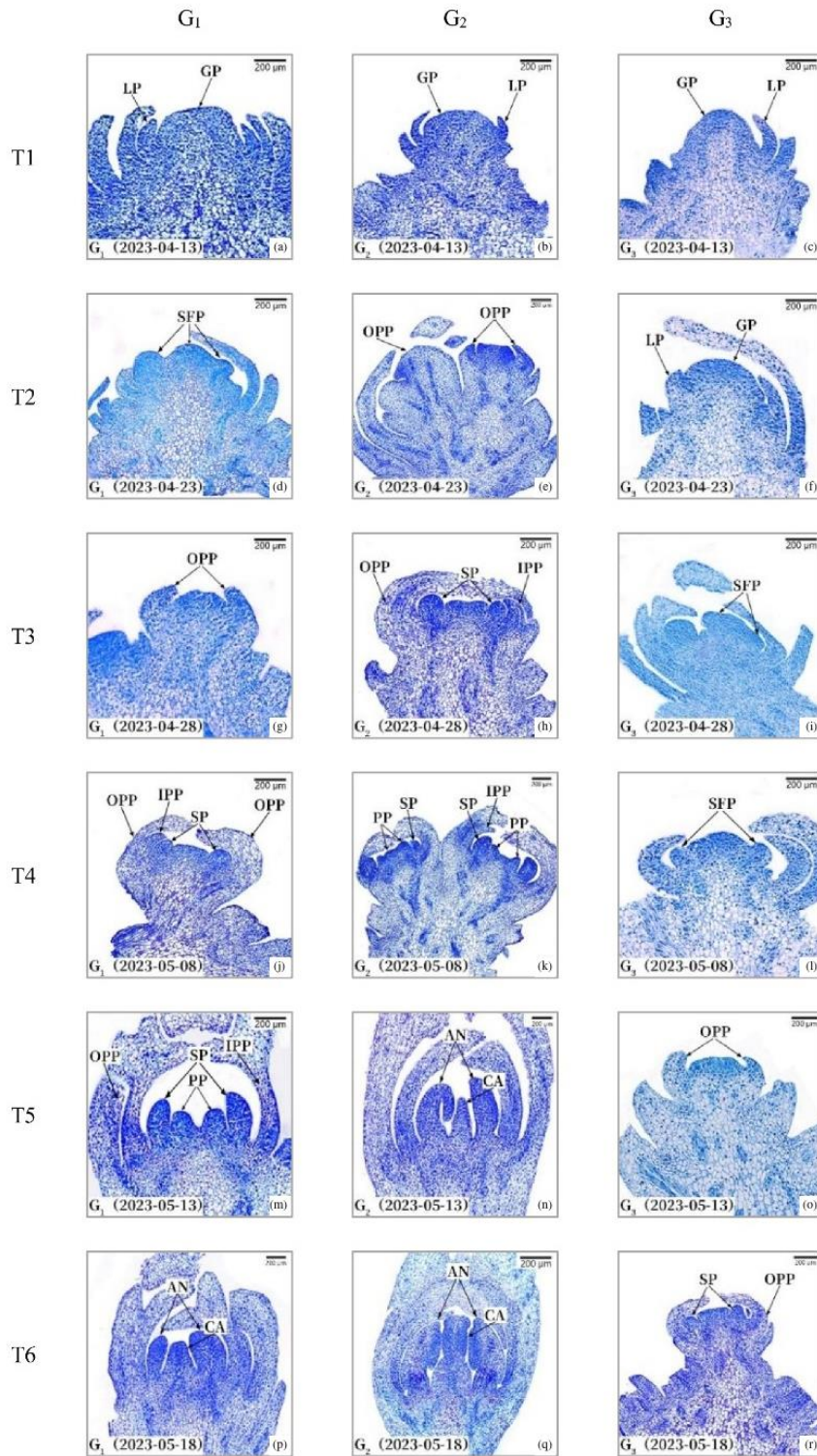
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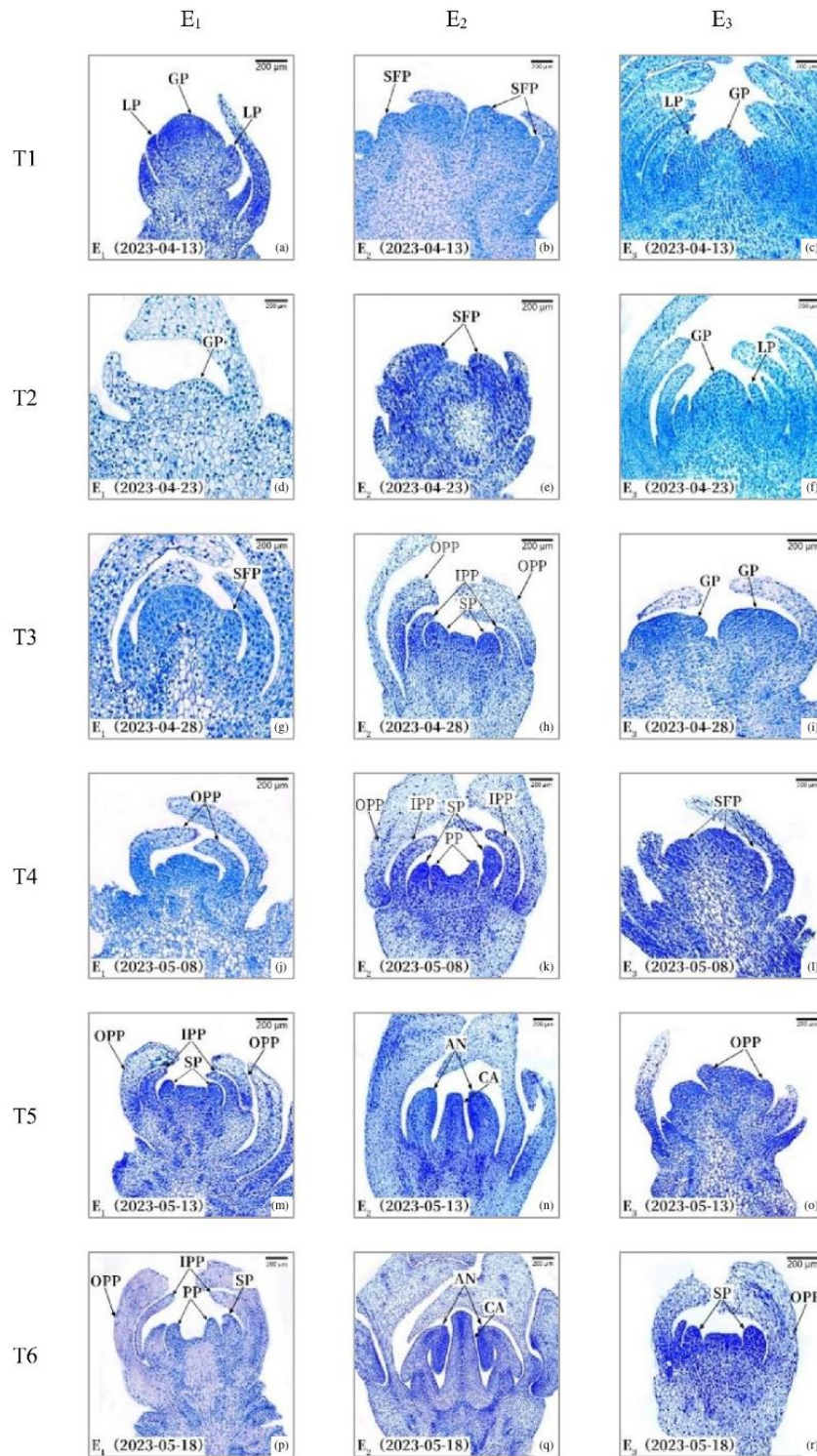
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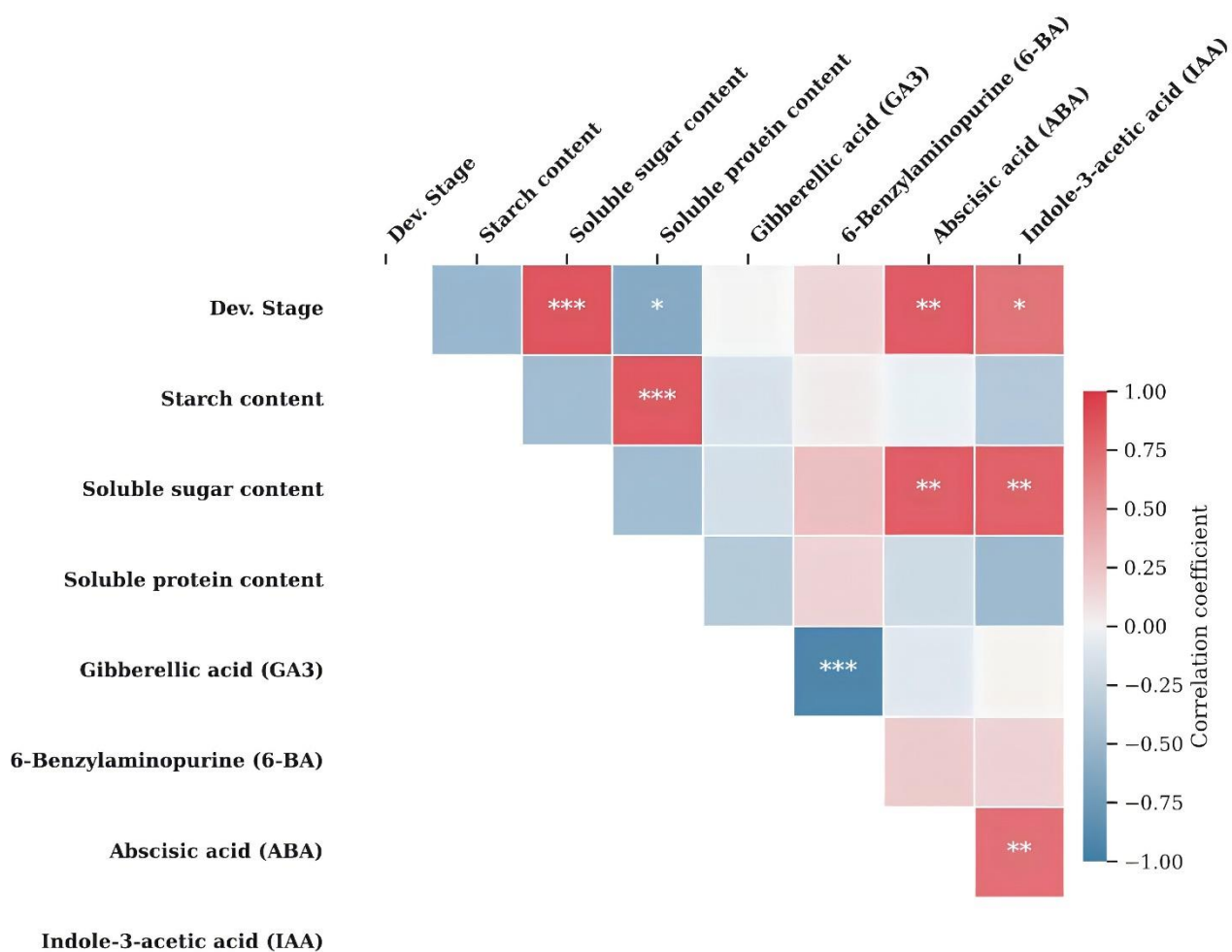
Supplementary Fig. S1. Flower bud differentiation process of the water-treated control in *Lilium* 'Indian Summerset'. (a) Undifferentiated stage; (b) initial differentiation stage; (c) floret primordium differentiation stage; (d) tepal primordium differentiation stage; (e) stamen primordium differentiation stage; (f) pistil primordium differentiation stage; (g) completion stage of flower bud differentiation. Abbreviations: LP, leaf primordium; GP, growing point; SFP, floret primordium; OPP, outer tepal primordium; IPP, inner tepal primordium; SP, stamen primordium; PP, pistil primordium; AN, anther; CA, carpel. Scale bar = 200 µm.



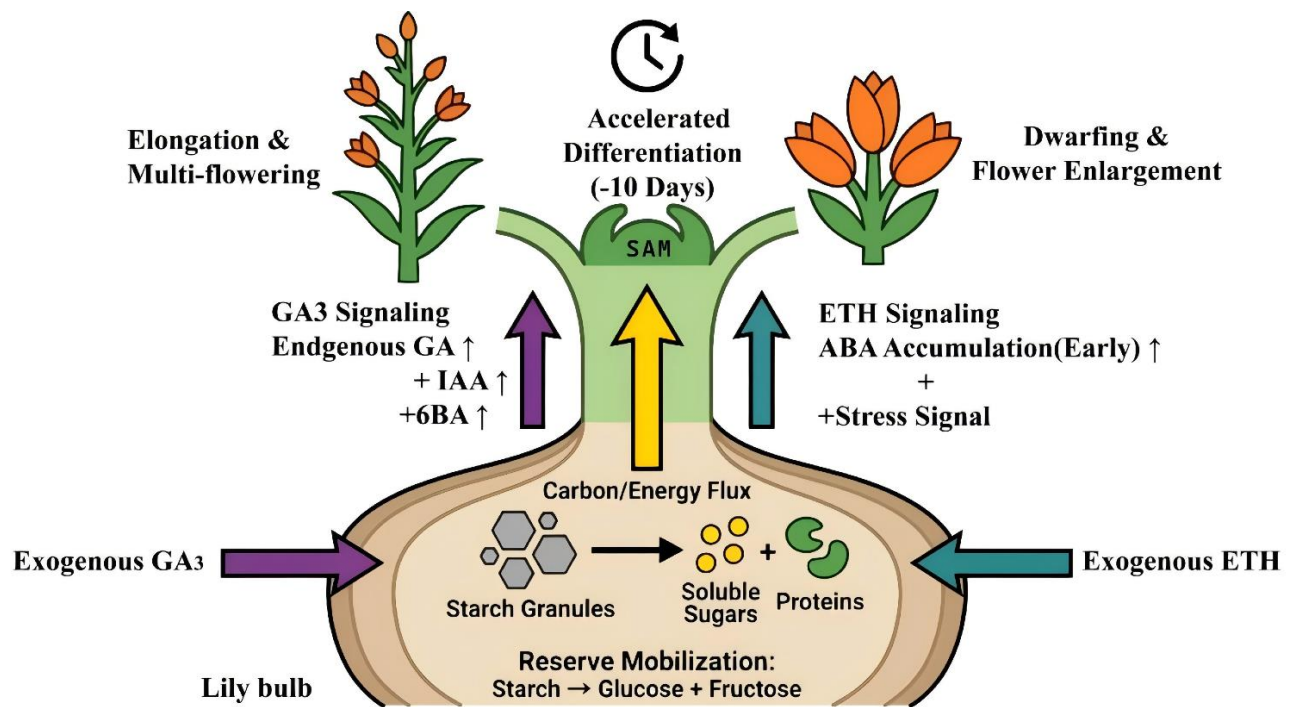
Supplementary Fig. S2. Effects of exogenous gibberellic acid (GA_3) treatment on the flower bud differentiation process in *Lilium* 'Indian Summerset'. The CK developmental sequence is shown in Fig. S1 and is therefore not repeated in this figure. (c) Undifferentiated stage; (a, b, f) initial differentiation stage; (d, i, l) floret primordium differentiation stage; (e, g, o) tepal primordium differentiation stage; (h, j, r) stamen primordium differentiation stage; (k, m) pistil primordium differentiation stage; (n, p) completion stage of flower bud differentiation; (q) floral development stage. Abbreviations: LP, leaf primordium; GP, growing point; SFP, floret primordium; OPP, outer tepal primordium; IPP, inner tepal primordium; SP, stamen primordium; PP, pistil primordium; AN, anther; CA, carpel. Scale bar = 200 μ m.



Supplementary Fig. S3. Effects of exogenous ethephon (ETH) treatment on the flower bud differentiation process in *Lilium* 'Indian Summerset'. The CK developmental sequence is shown in Fig. S1 and is therefore not repeated in this figure. (a, c, f) Undifferentiated stage; (d, i) initial differentiation stage; (b, g, l) floret primordium differentiation stage; (e, j, o) tepal primordium differentiation stage; (h, m, r) stamen primordium differentiation stage; (k, p) pistil primordium differentiation stage; (n) completion stage of flower bud differentiation; (q) floral development stage. Abbreviations: LP, leaf primordium; GP, growing point; SFP, floret primordium; OPP, outer tepal primordium; IPP, inner tepal primordium; SP, stamen primordium; PP, pistil primordium; AN, anther; CA, carpel. Scale bar = 200 μ m.



Supplementary Fig. S4. Pearson correlation analysis heatmap of physiological indices and flower bud differentiation stage. The color gradient represents the Pearson correlation coefficient (r), ranging from deep blue (negative correlation, -1) to deep red (positive correlation, 1). The differentiation stage (Dev. Stage) shows a significant negative correlation with starch content and positive correlations with soluble sugars and endogenous hormones. GA₃, Gibberellic acid; IAA, Indole-3-acetic acid; ABA, Absciscic acid; 6-BA, 6-Benzylaminopurine. Asterisks indicate statistical significance: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.



Supplementary Fig. S5. Schematic model illustrating the physiological mechanism of gibberellic acid (GA₃) and ethephon (ETH) regulation on flower bud differentiation in *Lilium*. Exogenous application of GA₃ and ETH modulates the balance of endogenous hormones, specifically increasing indole-3-acetic acid (IAA) and 6-benzylaminopurine (6-BA) levels while regulating abscisic acid (ABA) dynamics. Concurrently, these signals trigger carbon metabolism, promoting the hydrolysis of starch into soluble sugars (sucrose and reducing sugars), thereby providing the essential carbon skeleton and energy for morphogenesis. Solid arrows indicate promotion or positive regulation, while T-bars indicate inhibition. The coordination of hormonal signals and nutritional status ultimately accelerates the transition from the vegetative to the reproductive stage.