

Table S4. Mechanisms of lignin regulation mediated by *NAC* in different plants

Plant species	Name of NAC transcription factor	Lignin biosynthesis related genes (Upregulation)	Regulatory mechanisms of lignin biosynthesis in NAC	References
<i>Capsicum annuum</i>	<i>CaNAC76</i>	<i>CaCAD1</i>	Silent <i>CaNAC76</i> in <i>C. annuum</i> reduces lignin content; heterologous overexpression of <i>CaNAC76</i> in <i>A. thaliana</i> induces <i>CaCAD1</i> expression, increases lignin content, and enhances cold tolerance.	[8]
<i>Oryza sativa</i>	<i>OsNAC5</i>	<i>OsCCR10</i>	Overexpression of <i>OsNAC5</i> in <i>O. sativa</i> directly activates <i>OsCCR10</i> expression, regulating root lignin accumulation and enhancing drought tolerance.	[10]
	<i>OsNAC17</i>	<i>OsPAL7</i> <i>OsCCR29</i> <i>OsCAD8D</i>	Overexpression of <i>OsNAC17</i> in <i>O. sativa</i> induces the expression of lignin-related genes, promotes lignin accumulation in leaves and roots, and enhances drought tolerance.	[38]
<i>Citrus grandis</i>	<i>CgNAC043</i>	<i>CgMYB46</i> <i>CgCCoAOMT</i> <i>CgC3H</i>	Overexpression of <i>CgNAC043</i> in <i>C. grandis</i> directly activates the promoters of <i>CgMYB46</i> , <i>CgCCoAOMT</i> , and <i>CgC3H</i> , upregulates <i>CgMYB58</i> expression, and promotes lignin accumulation in vacuoles.	[46]
<i>Pyrus</i>	<i>PbNAC47</i>	<i>PbC3H1</i> <i>PbHCT17</i>	<i>PbNAC47</i> forms a complex with <i>PbAGL7</i> and <i>PbMYB73</i> in <i>Pyrus</i> , synergistically activating target genes to promote lignin synthesis in stone cells and secondary wall thickening.	[45]
<i>Pyrus pyrifolia</i>	<i>PpNAC187</i>	<i>PpCCR</i>	<i>WRKY46</i> directly activates the transcription of <i>NAC187</i> , which in turn activates the expression of <i>CCR</i> , promoting lignin accumulation.	[44]
	<i>PpNAC187</i>	<i>PpCCR</i> <i>PpCOMT</i>	Transient overexpression of <i>PpNAC187</i> in <i>P. pyrifolia</i> fruit tissue induces <i>PpCCR</i> and <i>PpCOMT</i> expression, thereby increasing lignin accumulation.	[37]
<i>Eucalyptus grandis</i>	<i>EgNAC141</i>	<i>CCOAMT1</i> <i>COMT</i> <i>CSE</i> <i>CCR1</i> <i>CAD1</i>	Overexpression of <i>EgNAC141</i> in <i>A. thaliana</i> induces lignin synthesis gene expression, promotes lignin deposition, and increases xylem area.	[39]
<i>Angelica dahurica</i>	<i>AdNAC20</i>	<i>MYB46</i> <i>C3H</i> <i>CCoAOMT</i>	Overexpression of <i>AdNAC20</i> in <i>A. dahurica</i> induces lignin synthesis gene expression and increases lignin accumulation; heterologous	[11]

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			overexpression in <i>A. thaliana</i> similarly promotes lignification and affects bolting and flowering.	
<i>Apium graveolens</i>	<i>AgNAC1</i>	<i>AtCCoAOMT</i>	Overexpression of <i>AgNAC1</i> in <i>A. thaliana</i>	[40]
		<i>AtPAL</i>	induces lignin-related gene expression and	
		<i>AtLAC</i>	increases lignin accumulation; its regulatory	
		<i>AtCOMT</i>	effect is enhanced under salt stress.	
<i>Ziziphus jujuba</i>	<i>ZjNAC</i>	<i>F5H</i>	Injection of <i>ZjNAC</i> into <i>Z. jujuba</i> fruit peel	[36]
			significantly upregulates <i>F5H</i> expression,	
			increasing local lignin accumulation.	

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