

HORMONE	SYNTHESIS		SIGNALING		TRANSPORT		CATABOLISM		REFERENCE
AUXIN	TAA1	TRYPTOPHAN AMINOTRANSFERASE OF ARABIDOPSIS1	TIR1	TRANSPORT INHIBITOR RESPONSE 1	PIN	PIN-FORMED			[13,30,256,266–270]
	YUC	YUCCA	AFB	AUXIN SIGNALING F-BOX PROTEIN	AUX1/LAXS	AUXIN TRANSPORTER 1 /LIKE-AUXS			
	ASA1	ANTHRANILATE SYNTHASE alpha SUBUNIT 1	AUX/IAA	AUXIN/INDOLE ACETIC ACID	PILS	PIN-LIKES			
			ARFs	AUXIN RESPONSE					
			IAR	INDOLE-3-ACETIC ACID (IAA)-ALA HYDROLASE					
	CK	IPT	ISOPENTENYL TRANSFERASE	AHK	ARABIDOPSIS HISTIDINE-KINASE RECEPTORS	CONJUGATION			
CRE1/AHK4				CYTOKININ RESPONSE 1	UGT76C2 CYTOKININ GLYCOSYLTRANSFERASE				
B-ARR				TYPE-B ARABIDOPSIS RESPONSE REGULATORS					
A-ARR				TYPE-A-ARABIDOPSIS RESPONSE REGULATORS					
GA	GA1/CPS	ENT-COPALYL DIPHOSPHATE SYNTHASE	SLY	SLEEPY					[276–278]
			DELLAs	GA INSENSITIVE (GAI)					
				REPRESSOR OF GAI (RGA)					
				RGA-LIKE (RGL)					
BR	DET2	DEETIOLATED2	BRI1	BRASSINOSTEROID INSENSITIVE1					[279–283]
			BRL1/3	BRASSINOSTEROID INSENSITIVE1-LIKE RECEPTOR KINASE 1/3					
			BSK	BRASSINOSTEROID-SIGNALING KINASE					
			BES1	BRI1-EMS-SUPPRESSOR1					
			BKI 1	BRASSINOSTEROID KINASE INHIBITOR 1					
			BZR1/2	BRASSINAZOLE RESISTANT 1/2					
			BIN2	BRASSINOSTEROID INSENSITIVE 2					
			BIL1/2	BIN2 like1/2					
ABA	ABA1 /ZEP	ZEAXANTHIN EPOXIDASE	ABI1	ABA INSENSITIVE 1					[284–287]
	ABA2 /SDR	SHORT-CHAIN DEHYDROGENASE/REDUCTASE							

**Table S1. Proteins encoded by genes whose loss or gain of function were used in this review (continuation)**

HORMONE	SYNTHESIS		SIGNALING		REFERENCE
ABA	ABA3/MCS	MOLYBDENUM COFACTOR SULFURASE	HAB1	HYPERSENSITIVE TO ABA1	
			HAI1/3	HIGHLY ABA-INDUCED1/3	
			AIP1 (HAI2)	AKT1-INTERACTING PHOSPHATASE1	
			PERK4	PROLINE-RICH EXTENSIN-LIKE RECEPTOR KINASE 4	
ETHYLENE	ETO1/HSP3	ETHYLENE OVERPRODUCER 1/ HYPERSENSITIVE TO PHOSPHATE STARVATION 3	ETR1/2	ETHYLENE RESPONSE 1/2	[288–291]
	ETO2/ACS	1-AMINOCYCLOPROPANE-1-CARBOXYLATE (ACC) SYNTHASE	EIN4	ETHYLENE INSENSITIVE 4	
			EBF1	EIN3-BINDING F BOX PROTEIN 1	
			EIN2/5/6	ETHYLENE INSENSITIVE2/5/6	
			CTR1	CONSTITUTIVE RESPONSE 1	
			EIN3/EIL 1	ETHYLENE INSENSITIVE3/EIN3-LIKE	
			ERF1	ETHYLENE RESPONSE FACTOR1	
JA	AOS	ALLENE OXIDE SYNTHASE	COI1/2	CORONATINE INSENSITIVE 1/2	[292–296]
	OPR3	12-OXOPHYTODIENOATE REDUCTASE 3	JAZ	JASMONATE ZIM DOMAIN PROTEINS	
			NINJA	NOVEL INTERACTOR OF JAZ	
			MYC2/3/4	Helix- loop-helix (bHLH) proteins	
SA	SID2	SALICYLIC ACID INDUCTION DEFICIENT 2 (ISOCHORISMATE SYNTHASE)	NPR1/3/4	NONEXPRESSOR OF PR GENES 1/3/4	[24,297,298]
SL	MAX1	CYTOCHROME P450 MONOOXYGENASE	MAX2	MORE AXILLARY GROWTH 1	[299,300]
	MAX3/CCD 7	CAROTENOID CLEAVAGE DIOXYGENASE 7			
	MAX3/CCD 8	CAROTENOID CLEAVAGE DIOXYGENASE 8			

**Table S2. Primary root (PR) phenotype of loss or gain of function mutants of genes that participate in hormone homeostasis compared to WT under different abiotic stresses**

Hormone	Mutant name	Mutant	Type of abiotic stress									Reference
			Osmotic	Salinity	ABA application	Cold	Oxidative	Heavy metal	Nutrient deficiency	High temperature	Alkalinity	
AUXIN	<i>yucID</i>	<i>GoF</i>						Strong inhibition in response to Al stress				[175]
	<i>YUC1</i>	<i>OE</i>							Short PR in response to low Pi			[221]
	<i>YUC4</i>	<i>OE</i>			Short							[144]
	<i>yuc9</i>	<i>LoF</i>						Long PR under Al stress.				[178]
	<i>yuc8 yuc9</i>	<i>LoF</i>						Long PR under Al stress				[93,178]
	<i>wei2 (asa1)</i>	<i>LoF</i>									Less affected	[265]
	<i>taal1-1 (ckrc1-1, wei8)</i>	<i>LoF</i>						Long PR under Al stress		Short	Less affected	[175,176,260,265]
	<i>tir1-1</i>	<i>LoF</i>			Long			Long under Cd treatment				[67,75,142,182]
	<i>TIR1</i>	<i>OE</i>							Short PR under high P			[222]
	<i>tir1 afb2</i>	<i>LoF</i>		Long			Long					[124]
	<i>tir1-1 afb2-3</i>	<i>LoF</i>								Short		[258]
	<i>tir1 afb3</i>	<i>LoF</i>					Long					[124]
	<i>afb3-1</i>	<i>LoF</i>							Not inhibited by NO3			[208]
	<i>tir1 afb2 afb3</i>	<i>LoF</i>							Short PR under high Pi			[222]
	<i>iaa5-1</i>	<i>LoF</i>	Short									[120]
	<i>iaa7 (axr2-1)</i>	<i>GoF</i>			Long				Long PR under high Pi			[67,75,142,217]
	<i>iaa6-1</i>	<i>LoF</i>	Short									[120]
	<i>iaa14 (slr-1)</i>	<i>GoF</i>						Long PR under Al stress. Long PR under Cr(VI) stress				[175,176,198]
	<i>iaa17 (axr3)</i>	<i>GoF</i>		Inhibited				Long PR under Cd or Cr(VI) stress. More sensitive to La3+				[93,182,194]
	<i>iaa19-1</i>	<i>LoF</i>	Short									[120]
	<i>iaa28-1</i>	<i>GoF</i>							Short PR under low or high Pi treatment			[217]
	<i>arf1</i>	<i>LoF</i>						Long PR under Al stress.				[175]

**Table S2. Primary root (PR) phenotype of loss or gain of function mutants of genes that participate in hormone homeostasis compared to WT under different abiotic stresses (continuation)**

Hormone	Mutant name	Mutant	Type of abiotic stress									References
			Osmotic	Salinity	ABA application	Cold	Oxidative	Heavy metal	Nutrient deficiency	High temperature	Alkalinity	
AUXIN	<i>arf2-101</i>	<i>LoF</i>			Hypersensitive to ABA, short PR							[143]
	<i>ARF2</i>	<i>OE</i>			Long							[143]
	<i>arf6</i>	<i>LoF</i>						Long PR under Al stress.				[175]
	<i>arf8</i>	<i>LoF</i>										
	<i>arf9</i>	<i>LoF</i>										
	<i>arf10</i>	<i>LoF</i>										
	<i>arf16</i>	<i>LoF</i>										
	<i>arf7 arf19</i>	<i>LoF</i>										
	<i>arf10 arf16</i>	<i>LoF</i>										
	<i>pin1</i>	<i>LoF</i>						More inhibition by As(III). Long PR under Cu excess. Less sensitive to La3+				[123,194,199]
	<i>pin2 (eir1-1)</i>	<i>LoF</i>		Short	Less sensitive to low ABA concentrations			More inhibition by As(III). Long PR under Al or Cd stress.	Long PR under ammonium or high Pi conditions. Short PR under low-B. Decreased growth under Fe stress	Short	Short	[66,67,75,121,142,174,175,182,194,217,264,265]
	<i>pin2 (eir1-4)</i>	<i>LoF</i>						More inhibition by As(III)				[174]
	<i>PIN2</i>	<i>OE</i>						Improved tolerance to As(III).				[174]
	<i>pin4-3</i>	<i>LoF</i>						Less sensitive to La3+				[194]
	<i>pin1 pin3 pin7</i>	<i>LoF</i>						Long PR under Cd stress				[182]
	<i>pil6</i>	<i>LoF</i>								Short		[257]
	<i>PIL6</i>	<i>OE</i>								Long		[257]
	<i>PIN8</i>	<i>OE</i>						Strong inhibition in response to Al stress				[175]
	<i>aux1-7</i>	<i>LoF</i>	Short	Short	Long			More inhibition by As(III). Long PR under Al or Cr(VI) stress.	Long PR under ammonium or high Pi conditions. Decreased growth under Fe stress	Short	Less affected	[67,75,75,115,121,123,142,175,177,194,217,257,265]
	<i>aux1-T</i>	<i>LoF</i>			Less sensitive to low and high ABA levels							[66]
	<i>aux1-22</i>	<i>LoF</i>							Long PR under low B			[244]
	<i>iar3</i>	<i>LoF</i>	Long									[125]
	<i>iar4-7 and iar4-8</i>	<i>LoF</i>		More affected by salt								[301]

**Table S2. Primary root (PR) phenotype of loss or gain of function mutants of genes that participate in hormone homeostasis compared to WT under different abiotic stresses (continuation)**

Hormone	Mutant name	Mutant	Type of abiotic stress									References
			Osmotic	Salinity	ABA application	Cold	Oxidative	Heavy metal	Nutrient deficiency	High temperature	Alkalinity	
CK	<i>ipt3</i>	<i>LoF</i>							Short PR under NO3 supply			[205]
	<i>ipt5</i>	<i>LoF</i>										
	<i>IPT3</i>	OE							Reduced growth under K-deficient and K-sufficient conditions			[238]
	<i>ipt3 ipt7</i>	<i>LoF</i>						Long PR under Al stress				[176]
	<i>ipt5 ipt7</i>	<i>LoF</i>										[176]
	<i>ipt1 ipt3 ipt5 ipt7</i>	<i>LoF</i>		More growth					Insensitive to K deficiency			[176,238]
	<i>IPT8</i>	OE		Inhibited growth								[130]
	<i>cre1 ahk2</i>	<i>LoF</i>						Long PR under Al stress				[176]
	<i>ahk2</i>	<i>LoF</i>	Short PR under normal water potential (-0.25 MPa)	More inhibition under 75 or 150 mM salt				Long PR under Al stress	Not affected by K-starved conditions			[112,176,238]
	<i>ahk3</i>	<i>LoF</i>	Long PR under low (-1.2 MPa) and moderate water (-0.7 MPa) potential	More inhibition under 150 mM salt					Not affected by K-starved conditions			[112,238]
	<i>ahk4 (cre1-12)</i>	<i>LoF</i>	Long PR under normal water potential					Long PR under Al stress	Less sensitive to CK under P availability. Less affected by K-starved conditions			[112,176,224]
	<i>ahk2 ahk3</i>	<i>LoF</i>	Long PR under moderate water potential	More inhibition under 75 and 150 mM salt	Short				Short PR under NO3 constant supply. Not affected by K-starved conditions. Short PR under B deficiency			[112,148,149, 205,238,247]
	<i>ahk2 ahk4</i>	<i>LoF</i>	More inhibition under low and moderate water potential	More inhibition under 75 mM salt stress					Short PR under NO3 constant supply. Less affected by K-starved conditions			[112,205]

**Table S2. Primary root (PR) phenotype of loss or gain of function mutants of genes that participate in hormone homeostasis compared to WT under different abiotic stresses (continuation)**

Hormone	Mutant name	Mutant	Type of abiotic stress									References
			Osmotic	Salinity	ABA application	Cold	Oxidative	Heavy metal	Nutrient deficiency	High temperature	Alkalinity	
CK	<i>ahk3 ahk4</i>	<i>LoF</i>	More inhibition under low water potential						Short PR under NO3 constant supply. Not affected by K-starved conditions			[112,205,238]
	<i>arr1 arr11</i>	<i>LoF</i>			Short							[148,149]
	<i>arr1 arr12</i>	<i>LoF</i>			Short				Short PR under B deficiency			[148,149,247]
	<i>arr1 arr10 arr12</i>	<i>LoF</i>						Long PR under Al stress	Short PR under B deficiency			[176,247]
	<i>arr1 arr11 arr12</i>	<i>LoF</i>			Short							[148]
	<i>ARR1</i>	<i>OE</i>						Short PR under Al stress				[176]
	<i>ARR12</i>	<i>OE</i>						Short PR under Al stress				[176]
	<i>ARR5</i>	<i>OE</i>			Short							[148]
	<i>ckx3-1</i>	<i>LoF</i>						Short PR under Al stress				[176]
	<i>CKX</i>	<i>OE</i>	Long									[126,127,129]
	<i>ugt76c2</i>	<i>LoF</i>			Long							[147]
	<i>UGT76C2</i>	<i>OE</i>			Short							[147]
GA	<i>gal-3</i>	<i>LoF</i>					Less affected by DPI					[165]
	<i>gai</i>	<i>GoF</i>							Short PR under low Pi			[226]
	<i>gal-t</i>	<i>LoF</i>							Short PR under low Pi;			[226]
	<i>gai-t6 rga-24</i>	<i>LoF</i>				Long						[132]
	<i>sly1-10</i>	<i>LoF</i>							Short PR under low Pi			[226]
	<i>gai-t6 rga-t2 rgl1-1 rgl2-1</i>	<i>LoF</i>		Long	Less affected	Long			Long PR under low Pi			[117,132,226]



**Table S2. Primary root (PR) phenotype of loss or gain of function mutants of genes that participate in hormone homeostasis compared to WT under different abiotic stresses (continuation)**

Hormone	Mutant name	Mutant	Type of abiotic stress									References
			Osmotic	Salinity	ABA application	Cold	Oxidative	Heavy metal	Nutrient deficiency	High temperature	Alkalinity	
ABA	<i>hab1-1 abi1-2</i>	<i>LoF</i>						Short PR in the co-treatment of Cu with ABA				[201]
	<i>abi1 abi3 hab1</i>	<i>LoF</i>			Long							[146]
Ethylene	<i>acs1-1 acs2-1 acs4-1 acs5-2 acs6-1 acs7-1</i>	<i>LoF</i>			Long							[146]
	<i>acs2-1 acs4-1 acs5-2 acs6-1 acs7-1 acs9-1</i>	<i>LoF</i>			Long							[146]
	<i>acs1-1 acs2-1 acs4-1 acs5-2 acs6-1 acs7-1 acs9-1</i>	<i>LoF</i>			Long							[146]
	<i>eto1-1</i>	<i>LoF</i>			Short. Long PR under ABA-AVG treatment			Short PR under Al or Cr(VI) stress	Short PR under low or high P Long PR in response to Fe		Hypersensitive	[75,135,146,195,217,234,235,265]
	<i>eto1-2</i>	<i>LoF</i>						More inhibition under Al and NAA co-treatment				[175]
	<i>eto2-1</i>	<i>GoF</i>							More growth in response to Fe			[251]
	<i>hsp3-1</i>	<i>LoF</i>							Short PR under under high or low Pi.			[235]
	<i>hsp3-2</i>	<i>LoF</i>							Short PR under under high or low Pi			[235]
	<i>ein2-1</i>	<i>LoF</i>			Long			Long PR under Al or Cr(VI) stress. More sensitive to Pb	Not growth repression under low K	Short	Long	[67,75,135,176,179,195,202,243,262,265]
	<i>ein2-5</i>	<i>LoF</i>	Short	Short	Long PR under ABA-AVG treatment		Long PR under MV treatment					[135,146,146,166,177]
	<i>ein3-1</i>	<i>LoF</i>									Long	[265]
	<i>ein4-1</i>	<i>LoF</i>						Long PR under Cd treatment				[187]
	<i>ein3-1 eil1-1</i>	<i>LoF</i>					Long PR under MV treatment	Long PR under Al or Cd stress				[166,176,177,179,187,188]
	<i>EIL1</i>	<i>OE</i>						More growth inhibition under Cd stress				[187]
	<i>EIN3</i>	<i>OE</i>						More growth inhibition under Cd stress				[187]
	<i>etr1-1</i>	<i>LoF</i>			Long PR under ABA-AVG treatment				Not growth repression under low K			[146,243]
	<i>etr1-3</i>	<i>LoF</i>						Long PR under Al or Cr(VI) stress	Reduced growth in response to Fe		Long	[177,195,251,265]



**Table S2. Primary root (PR) phenotype of loss or gain of function mutants of genes that participate in hormone homeostasis compared to WT under different abiotic stresses (continuation)**

Hormone	Mutant name	Mutant	Type of abiotic stress								References	
			Osmotic	Salinity	ABA application	Cold	Oxidative	Heavy metal	Nutrient deficiency	High temperature		Alkalinity
Ethylene	<i>ERF1</i>	<i>OE</i>		Long								[136]
	<i>ctr1</i>	<i>LoF</i>						More inhibition under Cd stress	Short PR under low or high Pi. Long PR in response to Fe			[187,217,234,243,251]
	<i>ebf1-1</i>	<i>LoF</i>						More inhibition under Cd stress				[187]
	<i>EBF1</i>	<i>OE</i>						Long PR under Cd treatment				[187]
JA	<i>opr3</i>	<i>LoF</i>							Long PR under P deficiency.			[236]
	<i>aos</i>	<i>LoF</i>						Long PR under Al stress. Short under Cd treatment				[180,189]
	<i>myc2-2</i>	<i>LoF</i>						Long PR under Al stress				[180]
	<i>myc2/3/4</i>	<i>LoF</i>		Long								[118,137]
	<i>jai3-1</i>	<i>LoF</i>		Long								[118,137]
	<i>coi1-2</i>	<i>LoF</i>		Long				Long PR under Al stress				[118,137,180]
SA	<i>sid2-2</i>	<i>LoF</i>							Less PR growth under the cotreatment: SA and high or low N			[210]
	<i>nahG</i>	<i>OE</i>						Long PR under Cd stress	Less PR growth under the cotreatment: SA and high or low N.	Short		[190,210,262]
	<i>npr1-1</i>	<i>LoF</i>						Less inhibition under Al stress				[179]
SL	<i>max2-1</i>	<i>LoF</i>							Less reduction of PR length under low Pi.			[237]
CROSSTALK	<i>ein2 tir1</i>	<i>LoF</i>			Inhibited							[75]
	<i>ein2 aux1</i>	<i>LoF</i>			Less inhibition							[75]
	<i>eto1-1 aux1-7</i>	<i>LoF</i>									Long	[265]
	<i>ein2-1 npr1-1</i>	<i>LoF</i>						More Inhibition under Al stress				[179]
	<i>arf7arf19 coi1-2</i>	<i>LoF</i>						Long PR under Al stress				[176]