The TIR1 protein of Arabidopsis funktions in auxin response and is related to human SKP2 and yeast Grr1p

Publikation:	Rugger et al. 1997
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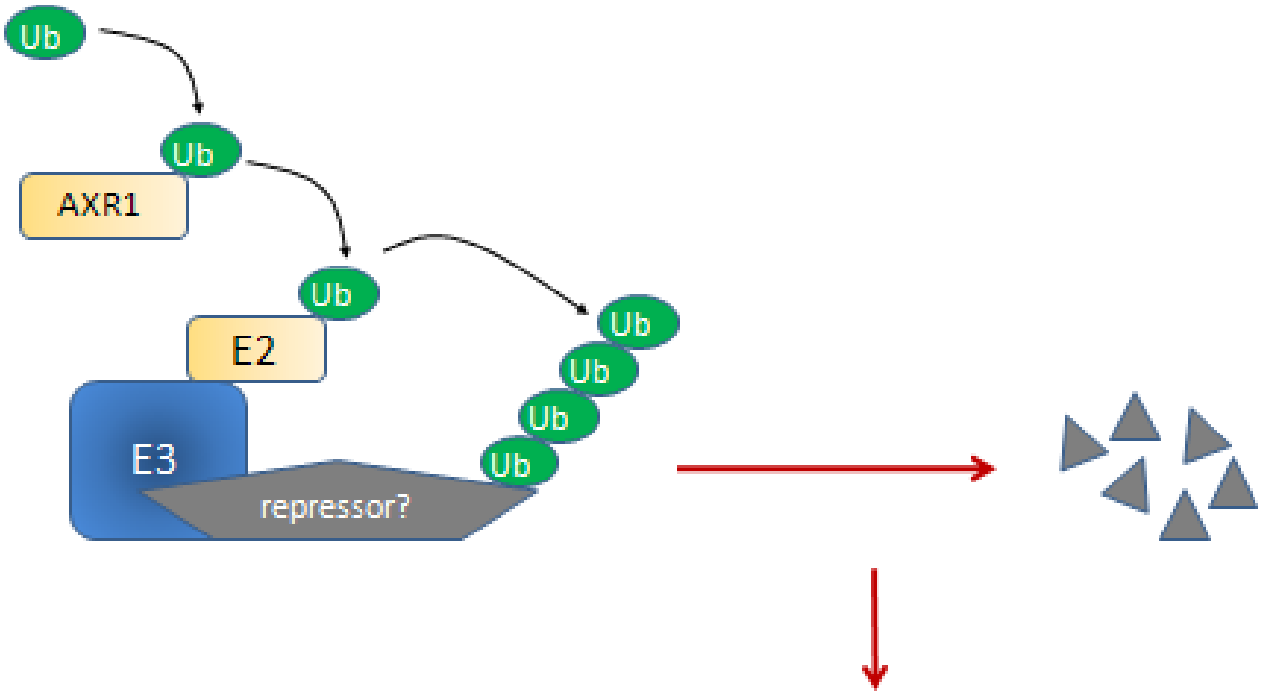
Gliederung

- Einleitung
- Polar auxin transport
- Genetic characterization of the *tir*1 mutants
- *tir*1 response to auxin-transport
- *tir*1 mutans affected in auxinresponse
- TIR1 involved in lateral root formation
- *tir*1 deficient in cell-elongation
- *tir*1 and *axr*1 interaction
- Isolation of TIR1
- TIR1 similar proteins

Einleitung

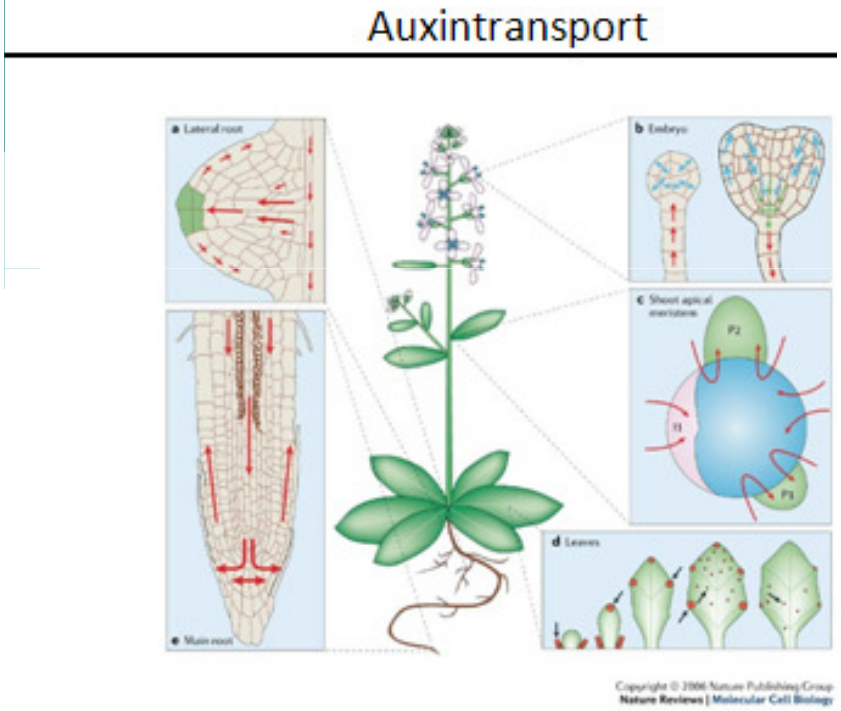
preliminary model (1993)



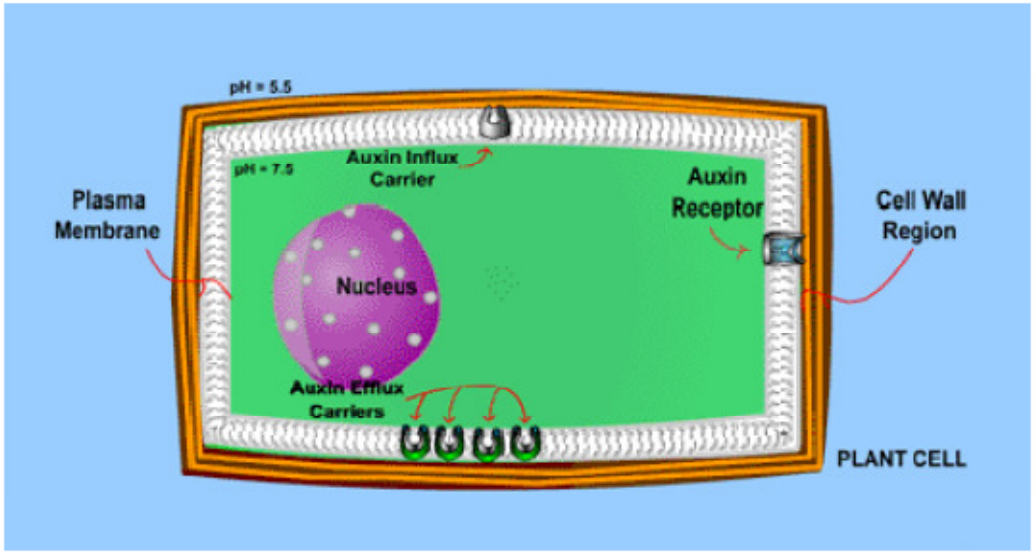
AXR1 similar to ubiquitin-activating enzyme E1

auxin response

Polar auxin transport



Teale et al. Nature Reviews Molecular Cell Biology 7, 847–859 (November 2006) | doi:10.1038/nrm2020



http://plantandsoil.unl.edu/croptechnology2005/UserFiles/Image/siteImages/5MajorAuxinBindingProteinsLg.gif

Genetic characterization of the *tir*1 mutants

Table 1. *Segregation of CPD resistance in a* tir1-2 × *wild-type* F_2 *population*

F_2 root length (mm)	F_2 genotype[1]		
	tir1/tir1[2]	*tir1/+*[2]	+/+[2]
17	2		
16	5		
15	1		
14			
13			
12		1	
11			
10		6	
9		6	
8		7	6
7		3	4
6		2	4
5			
4		1	
3		1	
Totals	8	27	14

[1]Genotype determined by analyzing CPD resistance in F_3 plants.
[2]Number of seedlings.

Untersuchung:

- reinerbig
- mischerbig
- Wildtyp

=> Dosiseffekt

Table 2. *CPD resistance in* tir *homozygous and heterozygous plants*

Line	Root length (mm)	±S.E.	No.
+/+	7.8	0.1	32
tir1-1/tir1-1	15.7	0.3	33
tir1-3/tir1-3	15.8	0.4	34
tir1-7/tir1-7	13.0	0.5	33
tir1-1/+	10.9	0.3	15
tir1-3/+	12.5	0.3	17
tir1-7/+	12.6	0.2	17

*tir*1 response to auxin-transport

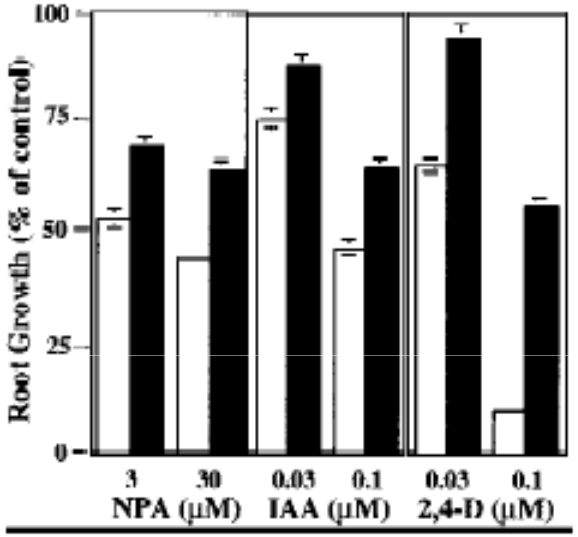


Figure 1. The roots of wild-type (open bars) and *tir1-1* (solid bars) seedlings are resistant to the growth-inhibiting properties of NPA, IAA, and 2,4-D. Seeds were germinated on nutrient medium. After 3 days, seedlings were transferred to media containing the indicated compound. Five days later, new root growth was measured and plotted as a percentage of root growth on medium without compound. Bars represent standard errors. Absence of bar indicates error less than thickness of line ($n = 12$).

- NPA/CPD als Transportinhibitoren
- IAA/2,4 D als Auxinüberdosis

*tir*1 mutans affected in auxinresponse

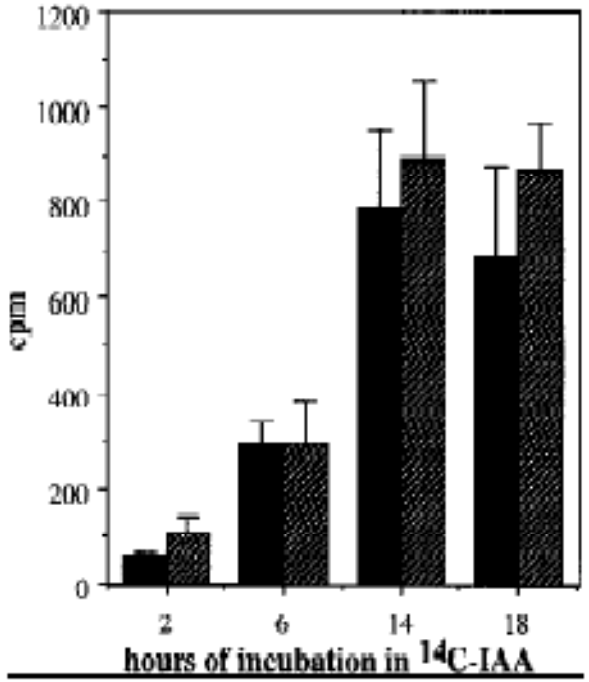


Figure 2. Polar auxin transport is similar in wild-type (solid bars) and *tir1-1* (hatched bars) inflorescence stems. Two and one-half centimeters of stem was excised, and the apical end was placed in a nutrient solution containing 1 μM [^{14}C]IAA for the times indicated. The amount of radioactive IAA transported to the basal end of the stem was assayed by liquid scintillation. Each column represents the mean of three replicates; the bar represents the standard error of the mean.

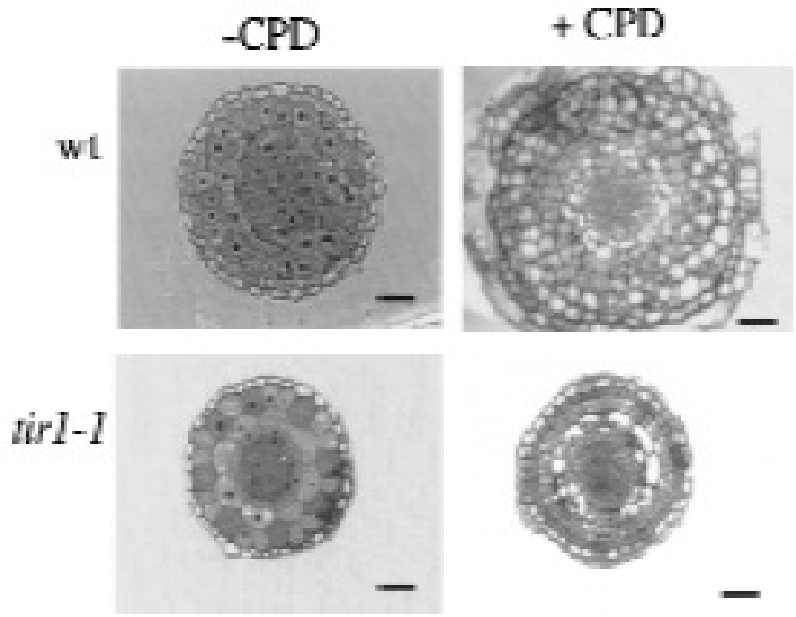
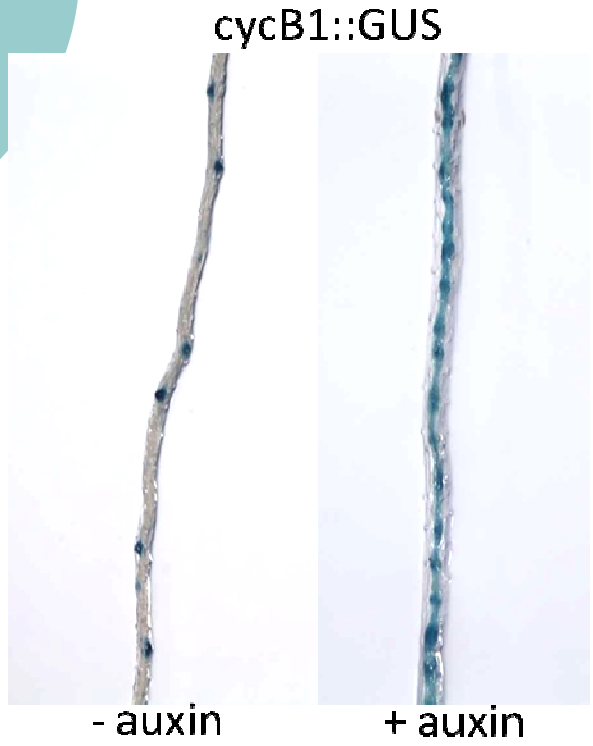


Figure 3. Cell proliferation in response to CPD is reduced in the roots of *tir1-1* seedlings. Seedlings were grown for 7 days on nutrient medium plus or minus 5 µM CPD, fixed, and embedded in Spurrs (Ruegger et al. 1997). Root cross sections 300 µm from the root tip are shown. Bars, 20 µm.

Vergleich Zellzahl und Differenzierung

TIR1 involved in lateral root formation



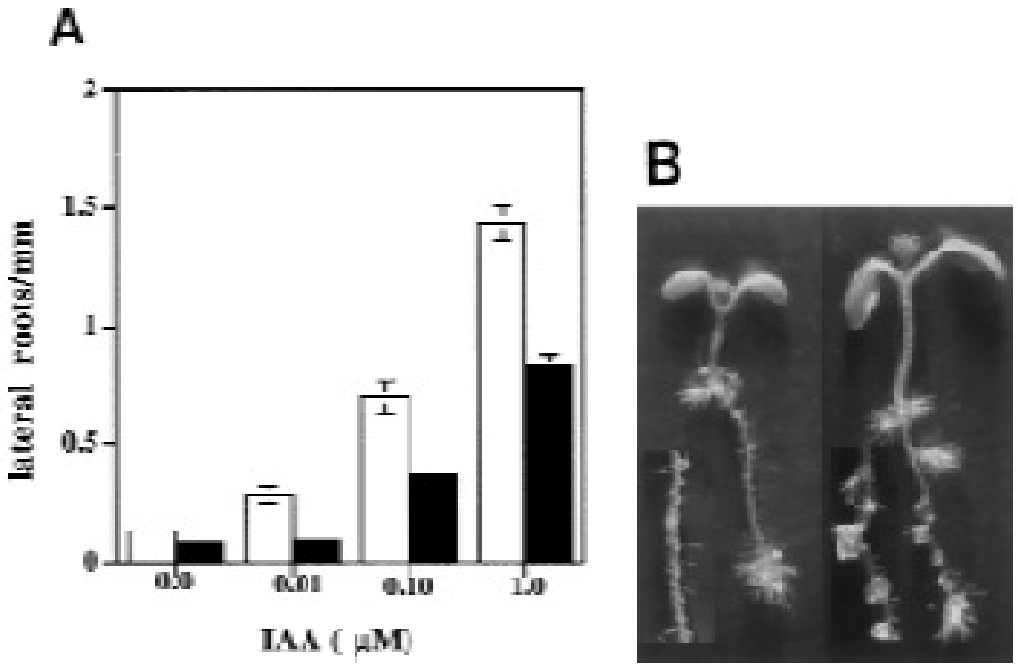


Figure 4. The *tir1-1* mutant is deficient in IAA-induction of lateral roots. (*A*) Eight-millimeter root segments were excised from 5-day-old wild-type (open bar) and *tir1-1* (solid bar) seedlings grown on nutrient medium and transferred to medium with IAA. Lateral roots were counted after 5 days by use of a dissecting microscope. Bars represent standard errors. Absence of bar indicates error less than thickness of line ($n = 10$). (*B*) Ten-day-old wild-type (*left*) and *tir1-1* (*right*) seedlings grown on 0.5 μM 2,4-D. (*Insets*) Higher magnification images of roots.

*tir*1 deficient in cell-elongation

An F-box protein that functions in auxin response

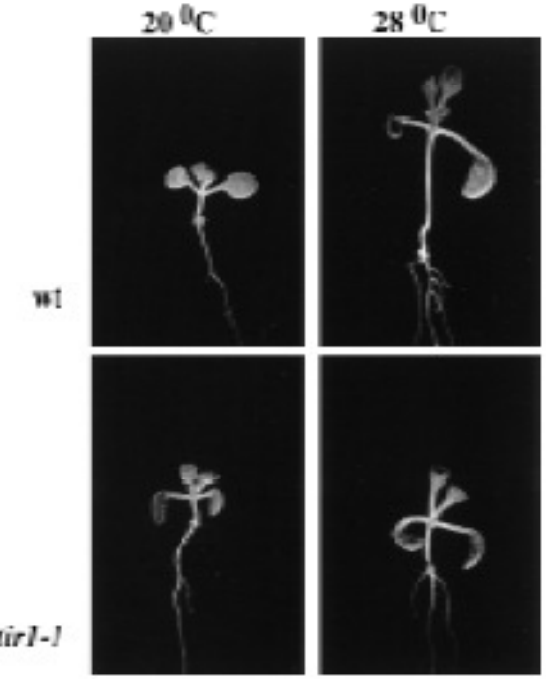
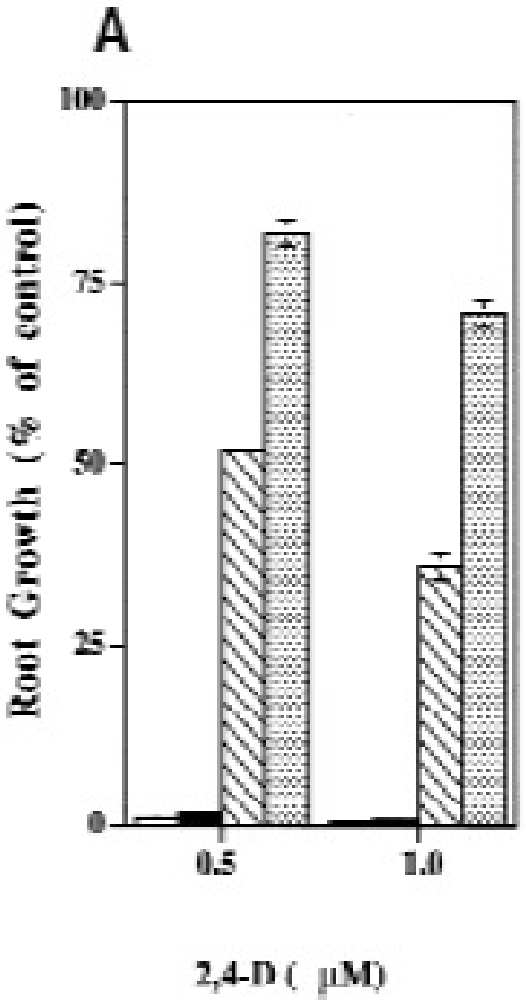


Figure 5. Hypocotyl elongation in response to elevated temperature is reduced in *tir1-1* seedlings compared with wild-type seedlings. Seedlings were grown on vertically oriented agar medium for 9 days at the two temperatures.

Erhöhte IAA-Produktion bei 28°C

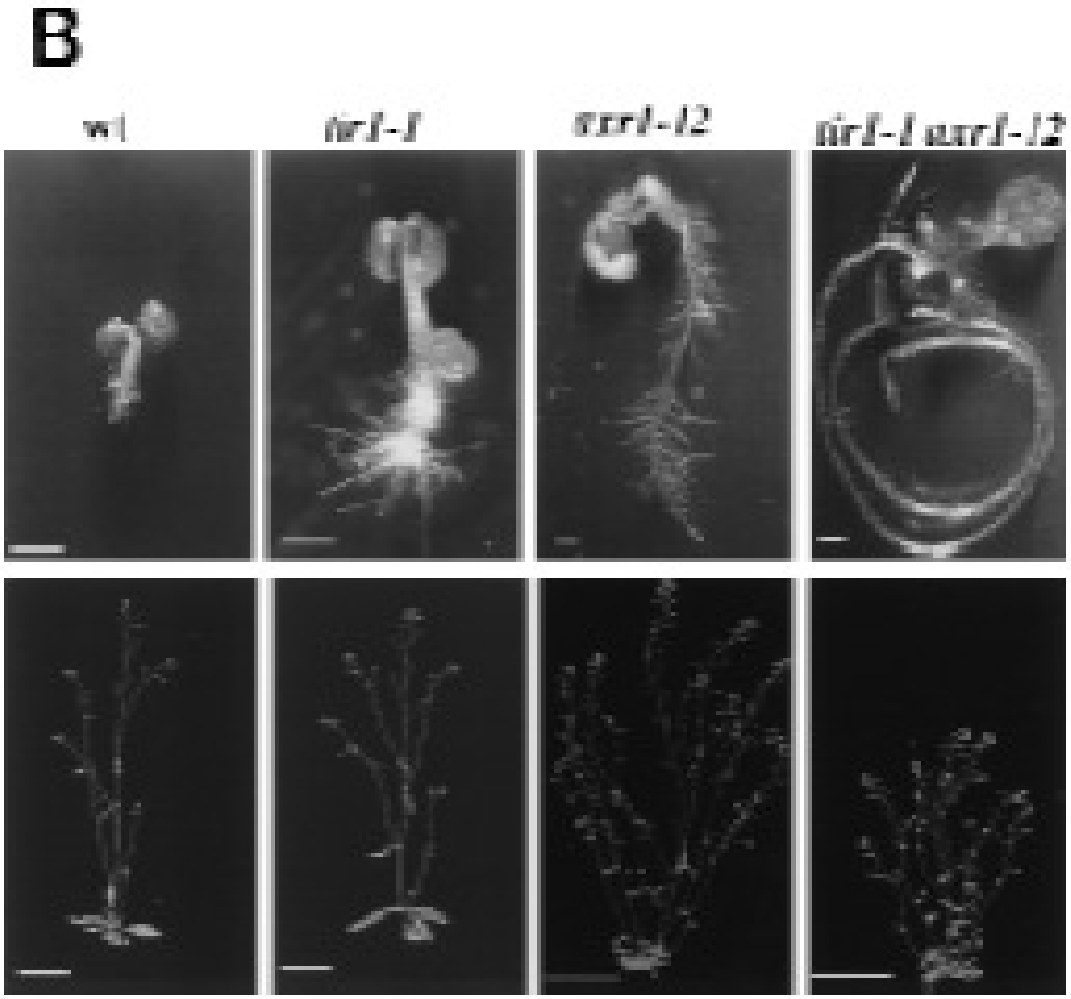
=>Hypocotylstreckung

*tir*1 and *axr*1 interaction



Reaktion auf hohe Auxindosen

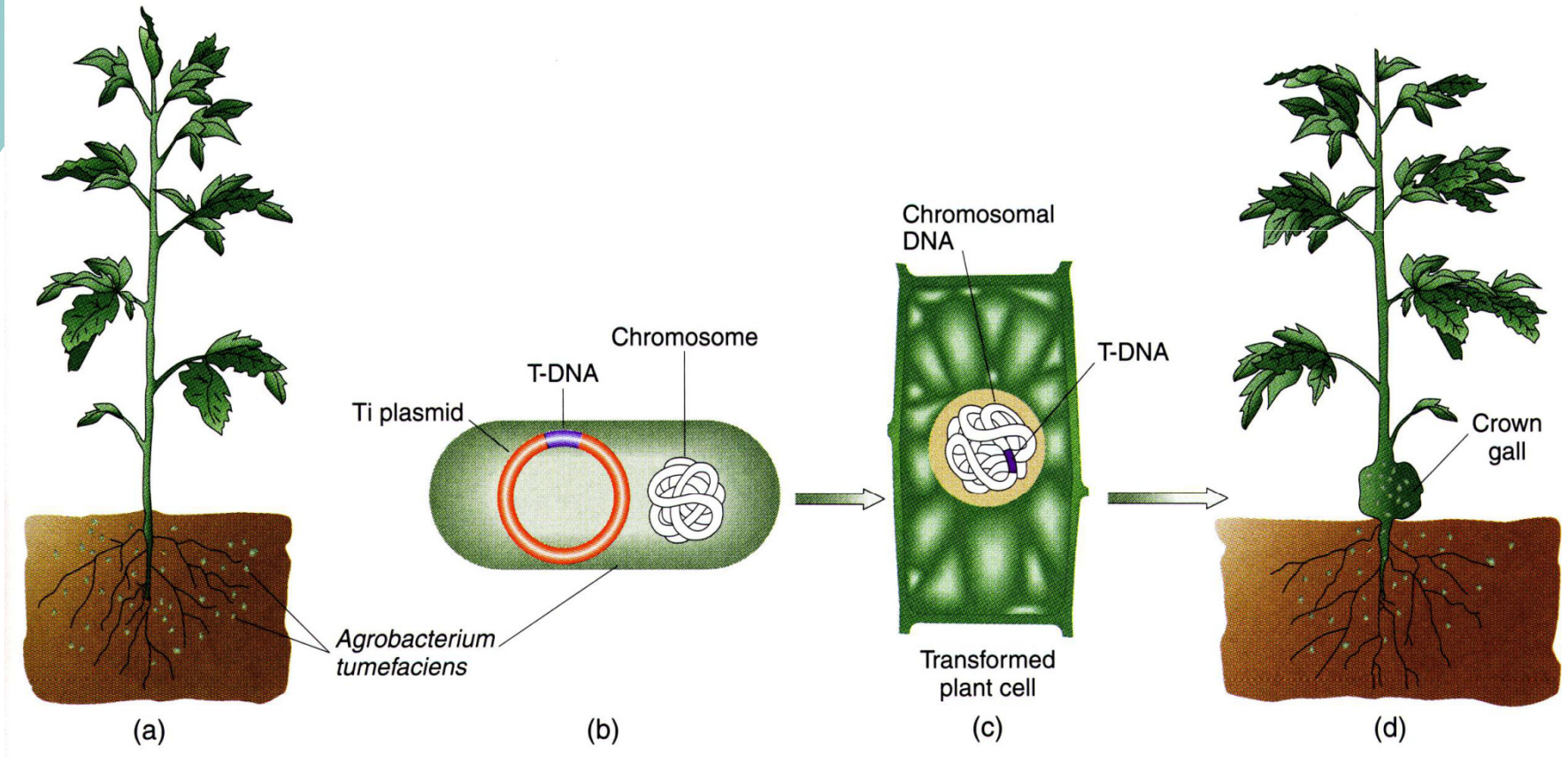
*tir*1 allein keine Reaktion



Wurzel-
reaktion

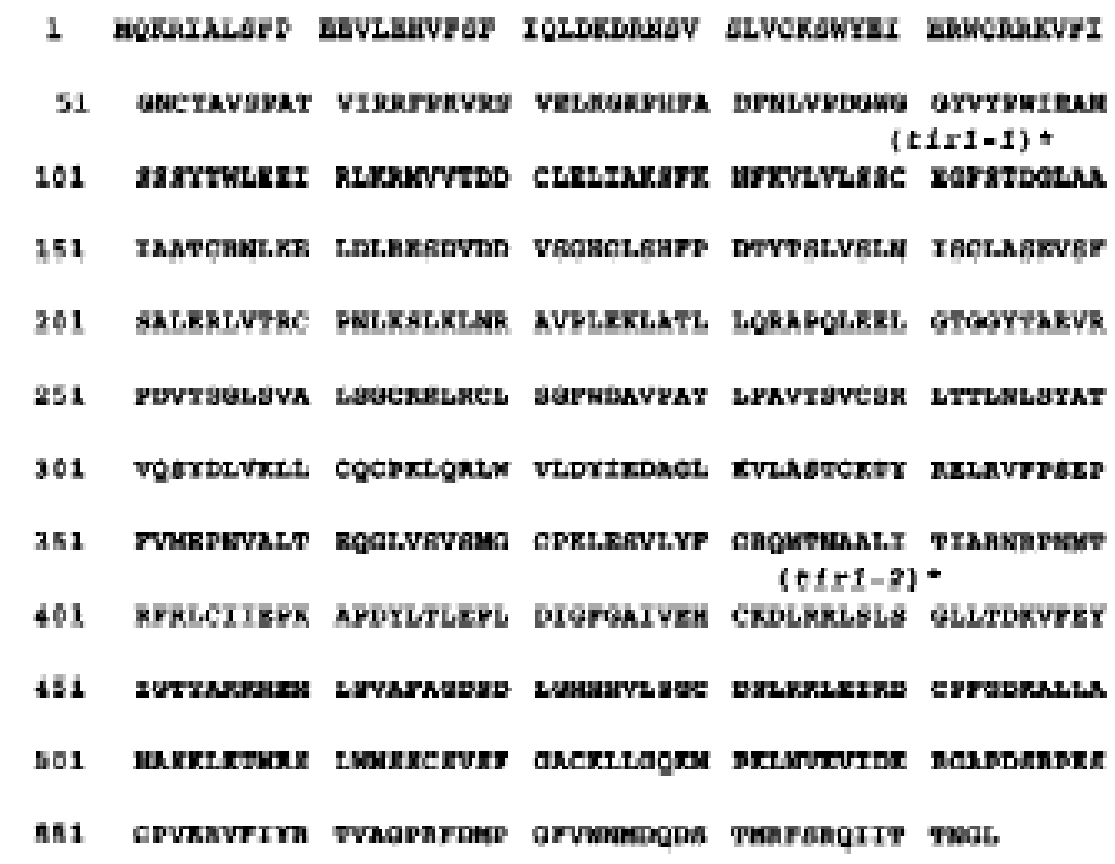
Appical-
dominanz

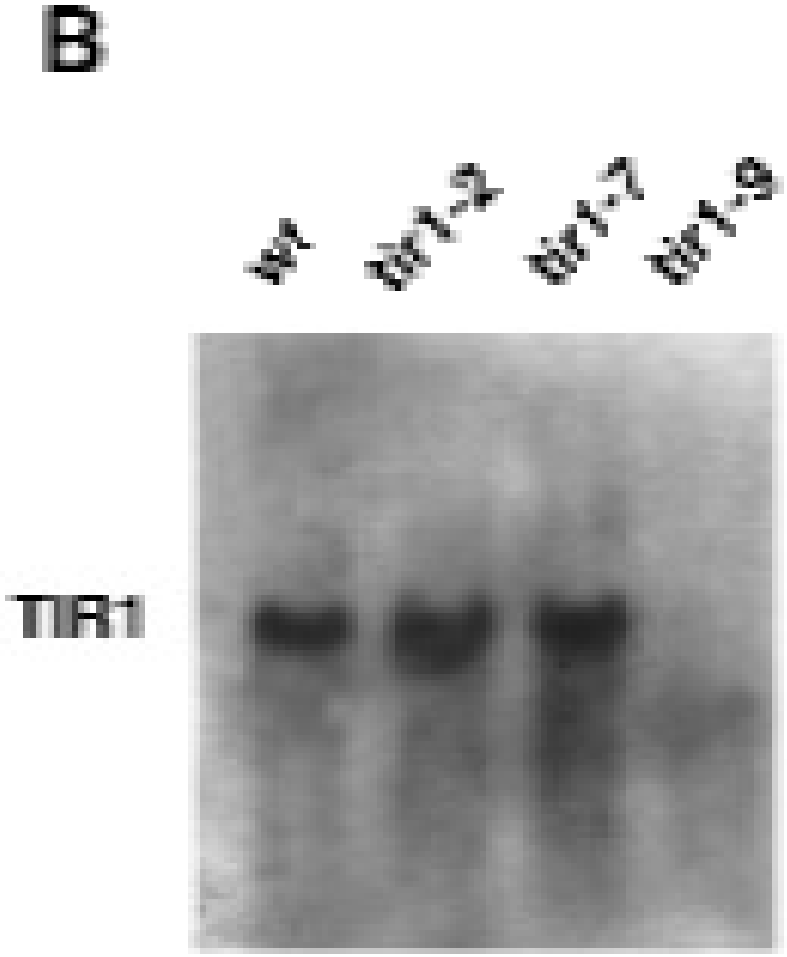
T-DNA

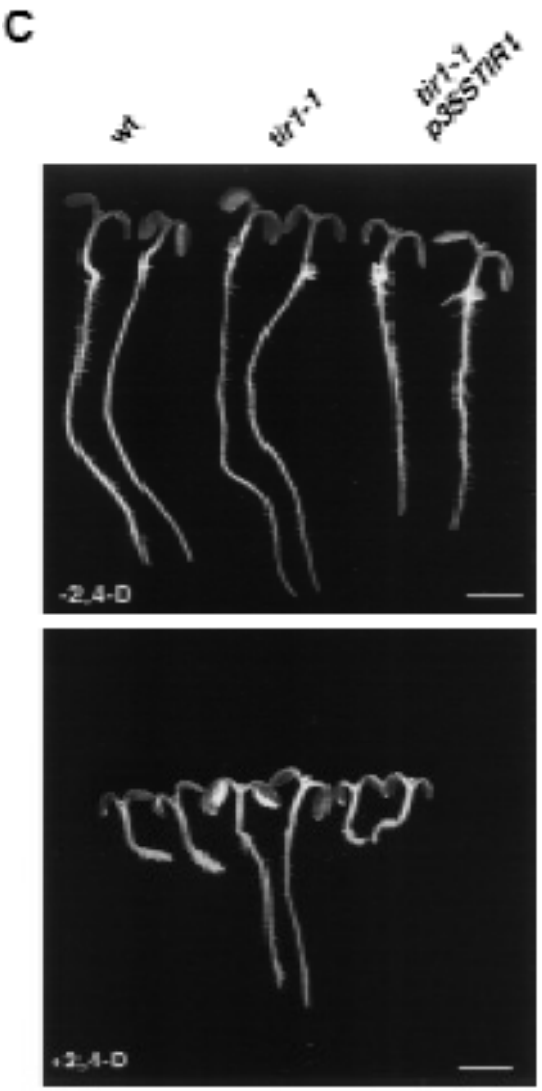

Chromosomal DNA
T-DNA
Chromosome
T-DNA
Ti plasmid
Crown gall
Agrobacterium tumefaciens
Transformed plant cell
(a)
(b)
(c)
(d)

Isolation of TIR1

A




B
WT
tir1-2
tir1-7
tir1-9
TIR1



ultimativer Genbeweis

TIR1 similar proteins

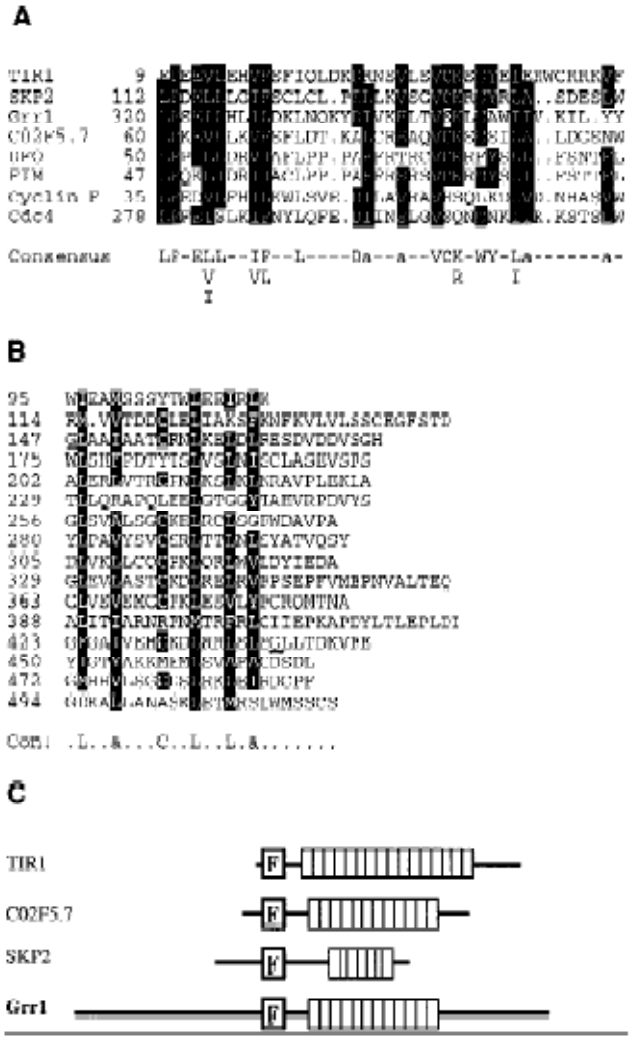
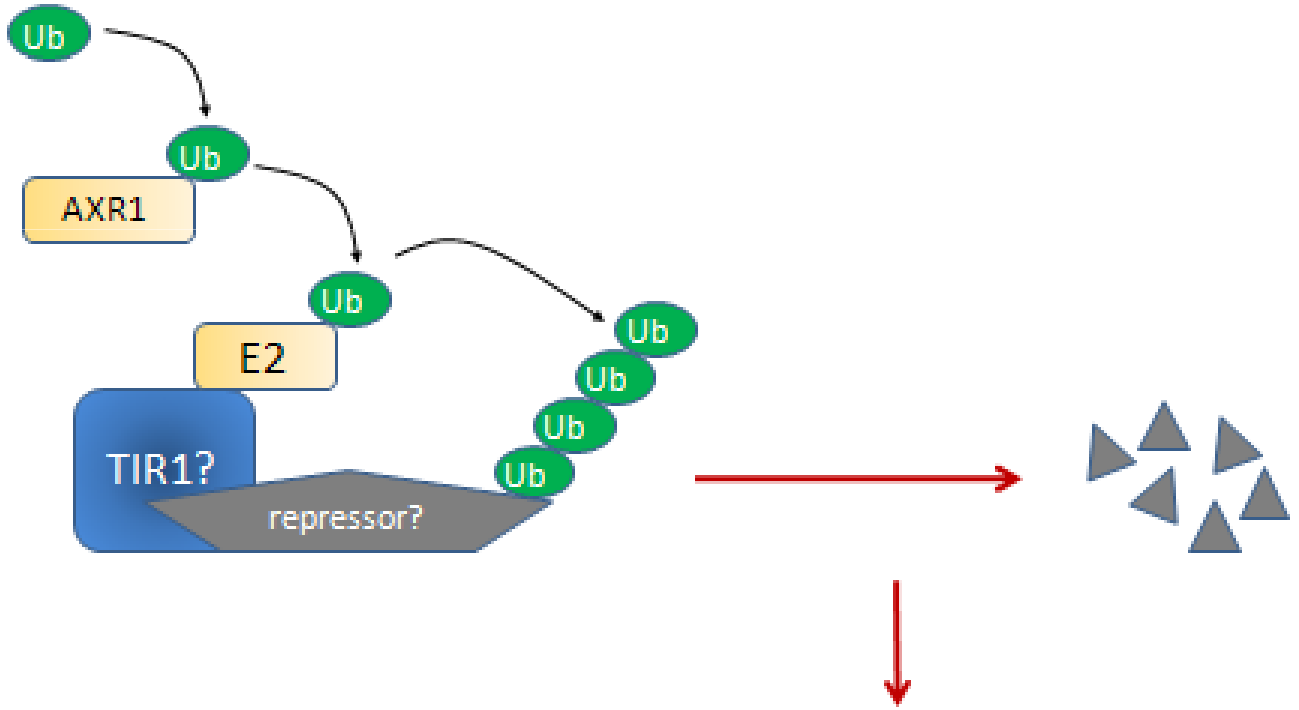


Figure 8. The TIR1 protein has an F box and 16 LRRs. (*A*)

Vergleich ähnlicher Proteinstrukturen in anderen Organismen mittels Datenbank

Zusammenfassung

preliminary model (1993)



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auxin response