

Supplementary Material

Table 1: GenBank accession numbers

Table 2: Genes down regulated at least 4-times (MAS) in *jaw-D*

Table 3: Expression values of *TCP* genes estimated from Affymetrix arrays and RT-qPCR

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Table 6: RT-qPCR results for *35S:TCP* transgenic plants

Figure 1: Additional *jaw-D* phenotypes

Figure 2: Alignment of TCP amino acid sequences

Figure 3: Alignment of miR-JAW target sequences in *TCP* genes from different species

Figure 4: Complementation of *jaw-D* by a weakly active *TCP:mTCP4* transgene

Figure 5: Sequence properties of miR-JAW targets from different species

Figure 6: Secondary structure and alignment of *MIR-JAW* precursors from different species

Table 1 GenBank accession numbers

Accession number	Gene	Species
CAA76176.1	<i>CYC</i>	<i>Antirrhinum majus</i>
AF199465	<i>DICH</i>	<i>Antirrhinum majus</i>
BI931391, BI932503, BG128549	<i>CYC</i> (ESTs)	<i>Lycopersicon esculentum</i>
CAD19990.1	<i>TCP1</i>	<i>Lupinus albus</i>
AF161252	<i>CYC</i>	<i>Linaria vulgaris</i>
D87260.1	<i>PCF1</i>	<i>Oryza sativa</i>
BAB92952.1	<i>PCF5</i>	<i>Oryza sativa</i>
BAB92953.1	<i>PCF6</i>	<i>Oryza sativa</i>
BAB92954.1	<i>PCF7</i>	<i>Oryza sativa</i>
BAC01119.1	<i>PCF8</i>	<i>Oryza sativa</i>
AY043215.1	<i>TB1</i>	<i>Oryza sativa</i>
AF309094	<i>TB1</i>	<i>Populus deltoides</i>
AF464738	<i>ZmTB1</i>	<i>Zea mays</i>
BQ630503	<i>JAW homolog 1</i>	<i>Glycine max</i>
BE475558	<i>JAW homolog 2</i>	<i>Glycine max</i>
BH714840	<i>JAW homolog</i>	<i>Brassica oleracea</i>
AP001800	<i>JAW homolog</i> (PAC clone)	<i>Oryza sativa</i>
CA483944	<i>JAW homolog</i>	<i>Triticum aestivum</i>

Table 2 Genes down regulated at least 4 times in *jaw-1D* plants (values from duplicate Affymetrix GeneChip arrays analyzed with MAS v 5.0)

Rank	Gene	Locus ID	Columbia	<i>jaw-1D</i>
1	TCP4	At3g15030	1.0 (1.0 - 1.19)	0.03 (0.03 - 0.03)
2	lipoxygenase AtLOX2	At3g45140	20.0 (16.7 - 24.3)	0.7 (0.4 - 1.2)
3	cinnamyl-alcohol dehydrogenase	At3g45140	2.9 (2.7 - 3.0)	0.1 (0.1 - 0.1)
4	unknown protein	At3g16670	17.9 (17.3 - 18.4)	0.9 (0.8 - 1.0)
5	copper amine oxidase	At1g31680	1.8 (1.5 - 2.1)	0.1 (0.06 - 0.16)
6	unknown protein	At4g14400	10.0 (9.9 - 10.1)	1.0 (1.0 - 1.0)
7	unknown protein	At3g60420	1.7 (1.5 - 1.9)	0.2 (0.2 - 0.2)
8	unknown protein	At3g25760	17.7 (15.8 - 19.8)	2.0 (1.6 - 2.4)
9	copper amine oxidase	At1g31690	6.0 (5.9 - 6.)	0.7 (0.7 - 0.7)
10	tropinone reductase	At2g29290	9.5 (9.3 - 9.7)	1.2 (1.2 - 1.2)
11	Csf-2-related	At1g23130	6.2 (6.0 - 6.4)	0.8 (0.6 - 1.1)
12	unknown protein	At5g57760	1.5 (1.2 - 1.7)	0.2 (0.16 - 0.29)
13	acyl-CoA oxidase like protein	At4g16760	8.0 (7.8 - 8.2)	1.2 (1.0 - 1.3)
14	jasmonate inducible protein	At1g54040	2.6 (2.6 - 2.6)	0.4 (0.3 - 0.4)
15	glutaredoxin -like	At5g18600	7.7 (7.5 - 7.9)	1.2 (1.1 - 1.2)
16	two-component response regulator	At2g40670	5.3 (4.9 - 5.7)	0.8 (0.8 - 0.9)
17	TCP3	At1g53230	2.7 (2.7 - 2.7)	0.4 (0.4 - 0.4)
18	unknown protein	At2g32160	1.5 (1.4 - 1.7)	0.2 (0.2 - 0.2)
19	unknown protein	At3g05730	27.1 (26.9 - 27.3)	4.5 (4.5 - 4.6)
20	putative protein	At4g17470	2.0 (2.0 - 2.0)	0.3 (0.3 - 0.3)
21	serine/threonine kinase	At4g23300	1.1 (1.0 - 1.1)	0.2 (0.2 - 0.2)
22	TCP2	At4g18390	2.7 (2.7 - 2.8)	0.5 (0.3 - 0.7)
23	glutaredoxin	At4g15660	1.1 (1.0 - 1.2)	0.2 (0.1 - 0.3)
24	unknown protein	At4g19430	8.2 (7.8 - 8.5)	1.5 (1.2 - 1.9)
25	unknown protein	At1g13650	0.8 (0.7 - 0.9)	0.2 (0.1 - 0.2)
26	putative auxin-regulated protein	At2g21210	7.5 (7.5 - 7.6)	1.5 (1.5 - 1.5)
27	putative tropinone reductase	At2g29300	1.1 (1.0 - 1.3)	0.2 (0.2 - 0.2)
28	glycosyl hydrolase family 19	At2g43590	3.2 (3.2 - 3.3)	0.6 (0.6 - 0.7)
29	hydroperoxide lyase	At4g15440	2.0 (1.9 - 2.1)	0.4 (0.3 - 0.5)
30	unknown protein	At2g14560	8.7 (8.0 - 9.5)	1.8 (1.8 - 1.8)
31	TCP24	At1g30210	2.4 (2.2 - 2.7)	0.5 (0.4 - 0.5)
32	Squamosa binding protein 3	At2g33810	1.6 (1.6 - 1.7)	0.3 (0.3 - 0.3)
33	polyneuridine aldehyde esterase	At5g58310	0.6 (0.4 - 0.8)	0.1 (0.1 - 0.1)
34	unknown protein	At1g19180	1.2 (1.1 - 1.4)	0.3 (0.2 - 0.4)

Table 3 Expression values of *TCP* genes in wild type and *jaw-1D* mutants

Gene†	Locus ID	Complementary to miR-JAW	Affymetrix Values (MAS)*			RT-qPCR§ Ratio wild type/ <i>jaw-1D</i>
			Columbia (wild type)	<i>jaw-1D</i>	Ratio	
<i>TCP2</i>	At4g18390	YES	2.79 (2.70-2.88)	0.51 (0.36-0.72)	5.5	6.3 ± 2.3
<i>TCP3</i>	At1g53230	YES	2.74 (2.72-2.77)	0.46 (0.44-0.48)	6.0	15.6 ± 6.1
<i>TCP4</i>	At3g15030	YES	1.09 (1.00-1.19)	0.03 (0.03-0.03)	>10 ^{¶¶}	15.7 ± 2.6
<i>TCP5</i>	At5g60970	NO	1.02 (1.01-1.03)	1.23 (1.23-1.23)	0.8	N.D.
<i>TCP8</i>	At1g58100	NO	2.45 (2.27-2.65)	3.22 (3.17-3.26)	0.8	N.D.
<i>TCP9</i>	At2g45680	NO	0.85 (0.71-1.02)	0.59 (0.57-0.60)	1.4	N.D.
<i>TCP10</i>	At2g31070	YES	1.94 (1.80-2.09)	0.82 (0.75-0.90)	2.4	3.4 ± 1.3
<i>TCP11</i>	At2g37000	NO	N.P.	N.P.	-	N.D.
<i>TCP13</i>	At3g02150	NO	1.08 (1.07-1.08)	1.16 (1.15-1.17)	0.9	0.7 ± 0.2
<i>TCP14</i>	At3g47620	NO	5.22 (4.70-5.79)	7.40 (7.10-7.70)	0.7	N.D.
<i>TCP15</i>	At1g69690	NO	2.76 (2.52-3.03)	3.63 (3.44-3.83)	0.8	0.7 ± 0.2
<i>TCP17</i>	At5g08070	NO	0.76 (0.73-0.79)	0.91 (0.80-1.04)	0.8	N.D.
<i>TCP19</i>	At5g51910	NO	1.74 (1.67-1.82)	1.89 (1.79-1.98)	0.9	N.D.
<i>TCP20</i>	At3g27010	NO	0.75 (0.58-0.96)	0.75 (0.58-0.96)	1.0	N.D.
<i>TCP21</i>	At5g08330	NO	4.62 (4.06-5.25)	4.67 (4.43-4.91)	1.0	N.D.
<i>TCP23</i>	At1g35560	NO	0.42 (0.34-0.53)	0.44 (0.35-0.56)	1.0	N.D.
<i>TCP24</i>	At1g30210	YES	2.46 (2.20-2.76)	0.53 (0.48-0.58)	4.6	4.7 ± 1.3

N.P. not called “present” by MicroArray Suite (MAS); N.D. not determined

†*TCP1*, *TCP6*, *TCP7*, *TCP12*, *TCP16* and *TCP18* are not present on the Affymetrix ATH1 array and were not further analyzed

*Average of two independent experiments, with the individual values shown in parentheses

§Average of at least four independent experiments

¶¶Signal was below detection threshold in *jaw-1D*

Table 4 Affymetrix expression values and changes in *jaw-D* and wild type, calculated by RMA (top 500 genes; NCBI-GEO series GSE518)

Affymetrix ID	RMA values (log2)				fold change
	<i>jaw-1D A</i>	<i>jaw-1D B</i>	wild type A	wild type B	
252618_at	7.66930965	6.76318128	11.6906413	11.348539	-18.94
258419_at	8.19661164	8.27947538	11.6291125	11.5429087	-10.18
246603_at	6.84149955	6.73697411	10.1432267	10.0846473	-10.01
245265_at	7.78703648	7.55530414	10.8996387	10.7952137	-9.02
266078_at	6.72060371	6.76068477	9.75870542	9.72931117	-8.02
257641_s_at	8.57912584	8.27821527	11.2949847	11.5683706	-8.01
266279_at	7.62634586	7.67880833	10.5787004	10.4974182	-7.39
264899_at	7.7227259	6.68548411	10.1123865	10.2204289	-7.32
252983_at	6.4523584	6.54448803	9.33630463	9.28988419	-7.03
267460_at	5.6638728	5.70193792	8.32193809	8.38550441	-6.37
245249_at	7.62449562	7.7646332	10.2425788	10.4018035	-6.18
247878_at	5.07402306	5.28417998	7.76746586	7.78184233	-6.03
263174_at	6.14688486	6.20107437	8.74510726	8.78512826	-6.03
258897_at	9.24631985	9.19179393	11.7932525	11.7676301	-5.90
260618_at	6.10256329	6.0158224	8.63229623	8.56121768	-5.81
254574_at	7.57713889	7.68527285	10.1174205	10.1760155	-5.72
246573_at	6.01044603	6.17050496	8.42952731	8.75510485	-5.69
249996_at	7.922136	7.69418097	10.3866008	10.1635423	-5.53
265837_at	8.48973108	8.41186813	10.7180325	10.7978157	-4.95
265698_at	6.09873906	5.63398741	8.06136032	8.08507929	-4.56
245422_at	6.73072527	6.59753927	8.85690423	8.63799324	-4.25
254670_at	6.52493075	6.55109612	8.45457729	8.63176486	-4.02
264014_at	8.32804593	8.4389959	10.4078131	10.3408245	-3.97
246340_s_at	4.9427526	4.81061768	7.00044167	6.56941812	-3.79
247684_at	6.0486196	5.72860693	7.80733402	7.80222936	-3.75
254818_at	9.882643	10.3297348	8.31341873	8.23236255	3.60
256617_at	10.7012685	10.5721808	12.5397264	12.381869	-3.54
251400_at	6.70822065	6.72562114	8.60196631	8.45959609	-3.52
264636_at	8.21235419	8.22548569	10.1007427	9.93284487	-3.48
257267_at	6.80982384	6.91924484	8.61889585	8.65658568	-3.42
256017_at	6.57170476	6.1024854	8.31955822	7.86262363	-3.37
263406_at	6.3123048	6.24892718	8.10965364	7.89996846	-3.31
245275_at	5.63237011	5.5104858	7.36225527	7.23466931	-3.31
266989_at	6.46997935	6.4328821	8.33053151	8.00662454	-3.31
254251_at	5.27763121	5.30171306	7.01946344	7.00809837	-3.30
263776_s_at	6.497551	6.43650723	8.1602431	8.19289486	-3.27
262226_at	5.85219911	5.77844836	7.32767023	7.64308874	-3.20
248566_s_at	8.9621227	8.74452374	10.6190414	10.3573693	-3.11
265471_at	9.08338742	9.23994403	7.49660195	7.59353385	3.07
254217_at	7.98014812	8.05981245	6.40486353	6.41208864	3.06
249052_at	5.7993935	5.70526618	7.53132034	7.17182875	-3.05
254250_at	4.90027191	4.81257734	6.51473501	6.39304261	-3.03
260146_at	7.0048922	7.00608422	8.53025083	8.64721795	-3.00
252916_at	6.7517442	6.55474521	8.23360883	8.2465527	-3.00

267076_at	10.3892692	10.4298208	11.9333608	12.0298161	-2.97
256096_at	6.32959706	6.15660967	7.88554624	7.7297996	-2.96
253305_at	8.56412601	8.47618755	10.0947748	10.0702695	-2.95
245928_s_at	8.07562219	7.84814571	9.85161323	9.06903237	-2.92
245253_at	6.61033836	6.53458364	8.19885625	8.02336513	-2.91
255786_at	8.69771131	8.87350205	10.488451	10.1307411	-2.89
252417_at	4.82694317	4.91873571	6.46716716	6.33111403	-2.88
255016_at	7.12668134	7.10530766	8.61701773	8.64737057	-2.86
249021_at	5.54794111	5.46022185	7.01932378	7.01491292	-2.85
260560_at	7.43791007	7.38420451	9.03689081	8.78412983	-2.84
251017_at	7.40349573	7.43886168	8.95201504	8.87325496	-2.81
245504_at	5.49483796	5.38707157	7.24709233	6.51731966	-2.80
248460_at	7.22936526	7.22535819	8.85069502	8.54605372	-2.79
255298_at	7.74702477	8.02369333	9.44470837	9.29302237	-2.79
253943_at	6.65602457	6.6480343	8.19484583	8.05930558	-2.78
252863_at	8.85673294	9.03692933	10.4463185	10.397587	-2.78
252482_at	6.65037764	6.63987817	7.98527576	8.23659502	-2.77
265539_at	7.11536396	7.17752835	8.58418149	8.64640435	-2.77
249777_at	7.38204592	7.38350496	8.94394915	8.75108756	-2.77
257625_at	5.60806085	5.24096655	6.76733238	7.02143176	-2.76
249208_at	7.6625651	7.40767259	9.02350419	8.97376989	-2.75
265722_at	10.1530286	10.1314009	11.6460968	11.5241432	-2.72
252076_at	7.21491248	7.16892427	8.55178531	8.70833981	-2.71
258727_at	8.66352215	8.40439138	10.0488382	9.90704881	-2.71
266142_at	6.02689847	5.92088289	7.67421108	7.07357337	-2.69
255344_s_at	6.61484353	6.4304086	7.9571775	7.92723839	-2.67
245383_at	7.55654883	7.58907069	9.02432278	8.9529482	-2.67
264343_at	9.13610608	9.37407296	10.5416053	10.7782689	-2.65
253268_s_at	5.98547942	5.84406637	7.1426327	7.45406818	-2.62
254954_at	7.61304984	7.74627409	6.14752234	6.45174759	2.59
254305_at	6.50706566	6.53818647	7.85759039	7.88119965	-2.54
256766_at	10.1804066	10.0440315	11.4697822	11.4332646	-2.53
244977_at	8.47350121	8.23265885	10.1296414	9.03585977	-2.51
245774_at	7.20510099	7.0157171	8.43396809	8.44042127	-2.50
260837_at	10.1011525	10.2179449	11.5058408	11.4326172	-2.48
249774_at	7.91611224	7.97868676	9.37792975	9.12267823	-2.48
253971_at	10.2159484	10.3319179	11.5918406	11.5648316	-2.47
250613_at	7.59761545	7.3700101	8.77021624	8.80691316	-2.46
254145_at	6.50013311	6.2118374	7.51524425	7.79763911	-2.46
262612_at	9.99056778	9.94426157	11.3144753	11.1784853	-2.43
257008_at	11.6245175	11.6366413	12.9562987	12.8606887	-2.43
267307_at	6.5251987	6.59452941	5.21732218	5.34873573	2.42
260883_at	9.38452059	9.19226962	7.94929161	8.0985058	2.40
263829_at	5.3498129	5.3825404	6.55261202	6.70490973	-2.40
245319_at	8.52727995	8.52630205	9.72428052	9.85261168	-2.40
245005_at	7.91801652	7.69406757	9.54552724	8.33610544	-2.38
252199_at	7.99265289	7.93398331	9.19980886	9.23194553	-2.38
255065_s_at	7.63174099	7.6623265	8.84384613	8.94198387	-2.37
266516_at	8.52972336	8.42239911	9.71803578	9.72571065	-2.37
262693_at	9.05947311	9.21016673	10.2367768	10.4930391	-2.35

246620_at	6.32552164	6.32024322	7.6362415	7.46478178	-2.35
265511_at	10.3762459	10.4739106	9.12638038	9.27594074	2.33
254520_at	6.40765485	6.24011502	7.53719866	7.54461593	-2.32
256599_at	6.93558222	7.00079308	8.1486835	8.21545276	-2.32
248540_at	8.11156464	7.99272346	9.26800457	9.25935863	-2.31
264843_at	7.78332308	7.7018235	8.94151994	8.95992527	-2.31
247848_at	6.15359372	6.08484672	7.42958366	7.21021678	-2.30
257763_s_at	5.55676534	5.46444141	6.71520778	6.71309575	-2.30
263083_at	9.72558942	9.72558942	8.47939489	8.58266632	2.29
253161_at	10.258072	10.2671134	8.96794092	9.17081465	2.28
261033_at	6.1370247	6.02425311	7.48397668	7.01718709	-2.28
250500_at	7.09860462	7.09574221	5.67663663	6.11039172	2.28
265701_at	5.54077602	5.40708618	6.70308173	6.61310388	-2.27
252984_at	6.1873208	6.12220664	7.41868763	7.25233465	-2.27
262745_at	7.8329729	7.94240355	9.22253067	8.89977038	-2.27
250960_at	7.8091686	7.63434455	8.98356298	8.80575729	-2.25
254910_at	9.11478708	8.84969812	10.1419601	10.1778624	-2.25
253174_at	10.0787964	9.9571045	11.4178111	10.9161624	-2.25
260773_at	6.88458316	7.15943363	5.86076646	5.86347076	2.24
267178_at	7.42897737	7.71263949	6.46737298	6.35892915	2.24
265611_at	12.2969243	12.0492819	13.3361875	13.3425766	-2.24
254783_at	7.82321823	7.81360405	8.94731404	9.00875107	-2.23
256681_at	7.22755688	7.10294965	8.30502982	8.34447532	-2.23
254572_at	7.96339886	7.95257425	6.8142154	6.78870351	2.23
255088_at	7.25672831	7.23694419	8.51309921	8.27930522	-2.23
262278_at	8.06123206	7.9561557	6.90434459	6.80727014	2.22
244994_at	8.08887847	8.0101294	9.55010349	8.73530434	-2.22
267336_at	8.01035496	7.98164954	9.20690481	9.07124071	-2.21
254283_s_at	7.71179309	7.57504776	8.79097441	8.78190366	-2.21
263287_at	8.80848669	8.73458661	9.95606647	9.86896275	-2.21
257793_at	7.64876718	7.4825634	8.69446709	8.71773556	-2.20
247943_at	9.55118906	9.35429967	10.6292645	10.5547885	-2.20
257670_at	6.41068716	6.54687232	5.46998588	5.2118613	2.19
262314_at	7.16355984	7.1557509	8.19094417	8.38740886	-2.19
259346_at	7.85022722	7.63211624	6.60062324	6.62833527	2.19
249727_at	5.76633418	5.85290653	6.92168756	6.93950633	-2.17
266481_at	7.13728089	7.08900399	8.22809831	8.22880962	-2.17
263515_at	6.78597279	6.68296576	7.72511783	7.96482042	-2.17
259793_at	5.96218474	5.89896279	6.92524677	7.15386953	-2.16
257264_at	7.03170358	7.04237522	8.14027382	8.15784066	-2.16
250595_at	6.54535934	6.33226914	7.73835271	7.33629176	-2.16
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251218_at	11.1704569	11.0221594	12.1968602	12.20652	-2.15
266483_at	9.16052303	9.07436807	10.3136099	10.1198695	-2.15
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250304_at	8.37765882	8.43711274	9.52853936	9.47563779	-2.14
261782_at	7.75485868	7.4843461	8.7828204	8.65196029	-2.13
259384_at	9.13534937	9.27147352	8.06094381	8.16709992	2.13
263374_at	5.10539444	5.27333773	6.23919732	6.31980051	-2.13
251457_s_at	5.83952247	5.62068264	6.91838443	6.71404502	-2.12

261407_at	5.56004025	5.6530388	6.66621479	6.705996	-2.11
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262878_at	9.73265271	9.63130682	10.8093116	10.7072163	-2.11
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256548_at	7.21322748	7.47905123	8.49181485	8.3068747	-2.07
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252173_at	8.45236949	8.56690923	7.45299947	7.51641265	2.04
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262344_at	5.93731449	5.95452505	6.97910187	6.95742012	-2.03
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257101_at	5.98659832	5.70012301	6.86213254	6.87322554	-2.02
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247694_at	8.99421086	8.86588666	9.82132088	9.73820287	-1.80
248377_at	10.7917925	10.6999518	11.5658483	11.6232475	-1.80
248064_at	6.18296808	6.21170634	7.12371469	6.95946825	-1.80
265988_at	5.92137345	5.96697697	6.88761199	6.68558557	-1.80
256431_s_at	5.9472706	5.86099286	6.629027	6.85952688	-1.80
264280_at	6.01299695	6.17317306	5.13515959	5.36241241	1.79
262661_s_at	6.83760408	6.68128243	7.76707133	7.41916127	-1.79
258223_at	10.7846646	10.8381963	11.6551301	11.6520194	-1.79
247816_at	10.217067	10.2048354	11.076903	11.0278149	-1.79
251727_at	8.49768343	8.31534929	9.41490999	9.06061973	-1.79
258322_at	6.17922113	6.28246853	7.10389548	7.03438116	-1.79
262791_at	9.02689471	9.03805094	9.88990768	9.85009613	-1.79
261084_at	9.22562279	9.19023063	10.0824195	10.0070128	-1.79
262126_at	6.189612	6.10938882	7.03353813	6.93690244	-1.79
250498_at	11.7600872	11.7989573	12.6919347	12.5344498	-1.78
267238_at	9.15052469	9.32934087	8.27643592	8.52732007	1.78
258349_at	6.00712816	5.81039496	6.8200726	6.67029605	-1.78
261339_at	6.7968694	6.36306971	7.5722315	7.27354263	-1.78
249918_at	9.03289386	9.17668805	10.0119994	9.86590995	-1.78
253791_at	6.69775122	6.82643528	7.49131706	7.69643219	-1.78
261046_at	5.18340062	5.11448742	6.00598521	5.95824717	-1.78
260904_at	6.21665781	6.24149781	7.05834592	7.06545507	-1.78
255422_at	7.41715159	7.30945591	6.5114333	6.55322793	1.78
258851_at	7.04935619	7.44252573	7.96137367	8.20917278	-1.78
260916_at	9.77672082	9.8239603	10.6495029	10.6138578	-1.78
261793_at	9.8615516	9.82750086	10.7329949	10.6155888	-1.78
267262_at	9.59695834	9.78587922	10.4962489	10.552781	-1.78
260410_at	7.72075455	7.50739513	8.52420493	8.36793477	-1.78
244999_at	7.90898127	7.85723397	8.94213986	8.43582034	-1.77
258038_at	8.59499162	8.75232005	7.75230348	7.93966502	1.77
253186_at	6.26697301	6.24593625	7.2666824	6.87268942	-1.77
258143_at	7.12228617	7.22322679	5.9706724	6.64591646	1.77
245736_at	8.28939437	8.50173315	7.5849828	7.56355356	1.77
247359_at	6.96397947	7.0739086	6.19547327	6.19645795	1.77
256983_at	11.1647952	11.0912502	12.0032956	11.8944021	-1.77
250697_at	6.00990936	6.02424013	5.24663936	5.14467629	1.77
258253_at	8.29547254	8.36365878	7.3850316	7.62452822	1.77
263161_at	6.176528	6.22831966	7.35693585	6.58300828	-1.76
262550_at	8.0226852	7.91776164	7.13861475	7.16653964	1.76
250563_at	11.2901434	11.2327528	12.1431457	12.0126362	-1.76
263597_at	8.87046705	8.82718633	9.63171925	9.69873575	-1.76
266329_at	9.35402007	9.26974687	10.0977356	10.1597321	-1.76
249120_at	10.3615048	10.3510492	11.1878052	11.1551644	-1.76
250891_at	9.81178439	10.1205229	9.13561156	9.18341126	1.76
263549_at	8.00757034	7.77225789	8.7890149	8.62411253	-1.76
262865_at	5.61544689	5.65094506	6.43829679	6.45440571	-1.76
267591_at	9.28364918	9.10128889	8.27147096	8.48673844	1.76
252501_at	7.25660842	7.18653888	6.41892026	6.40105416	1.76

257539_at	5.72395571	5.60603587	6.49687063	6.45807875	-1.75
245451_at	7.72864771	7.48105735	8.44906048	8.39287083	-1.75
260481_at	12.2993298	12.3095217	13.1263024	13.1044212	-1.75
247592_at	7.72441285	7.64280159	6.88291601	6.86348782	1.75
267123_at	6.56016014	6.5557421	7.39345247	7.34241998	-1.75
249065_at	6.54412656	6.63674021	7.34284665	7.45757712	-1.75
246549_at	8.34552312	8.34552312	9.12513779	9.18293514	-1.75
249296_at	5.97240746	5.97525846	6.83660295	6.72447288	-1.75
255153_at	5.9350362	5.77085055	6.75678572	6.56207604	-1.75
267359_at	6.52451465	6.44543698	7.28125403	7.30414387	-1.75
256015_at	11.0659543	11.0667953	11.9306903	11.8138619	-1.75
248585_at	5.61531194	5.78467948	4.84865109	4.94078472	1.75
251815_at	9.98246806	10.0031296	10.8284967	10.7705521	-1.75
264748_at	8.58887244	8.36589142	9.30711452	9.26979515	-1.75
245460_at	7.3540131	7.57463278	8.2053702	8.34141277	-1.75
247554_at	6.21612639	6.30280696	7.07067804	7.06118458	-1.75
261981_at	9.14124871	9.48597585	10.1796896	10.0774264	-1.75
253217_at	7.27797946	7.56474476	6.50288838	6.73585614	1.75
247474_at	5.35267538	5.21591295	5.89524392	6.26177575	-1.75
260983_at	8.30240178	8.2505559	9.0516352	9.10952482	-1.75
258161_at	9.96423935	9.8602098	10.6031181	10.8226112	-1.75
259331_at	6.24650312	6.3405756	5.51755443	5.46485997	1.74
257647_at	8.98612533	8.99208748	9.79162551	9.79039573	-1.74
252345_at	5.26238469	5.43553825	6.01832137	6.2738185	-1.74
252044_at	8.87892518	8.66348684	9.5226332	9.62605794	-1.74
267057_at	8.95913142	8.81490158	9.80748576	9.55951215	-1.74
265891_at	5.89059209	6.06172646	5.20210459	5.15531722	1.74
244991_s_at	8.40088442	8.38809454	9.57384167	8.67310333	-1.74
252448_at	5.35577893	5.27421439	6.12850346	6.09845758	-1.74
258418_at	8.13159772	8.27239465	8.9919012	9.01072691	-1.74
260353_at	8.21713744	8.19687095	7.36249077	7.45589226	1.74
249610_at	8.99467086	9.06475622	9.81691631	9.83570366	-1.74
252678_s_at	11.4451795	11.5964719	12.2905836	12.345695	-1.74
252285_at	7.30122942	7.2230965	8.06963244	8.0446107	-1.73
245875_at	6.56563016	6.37267199	5.76969403	5.58361579	1.73
261409_at	7.23388511	7.14567868	8.06846056	7.89220614	-1.73
260685_at	9.7234097	9.61912174	10.4908727	10.4379226	-1.73
259002_at	8.10953985	8.04462854	7.27219205	7.2993145	1.73
253790_at	10.5554253	10.4452419	11.2809248	11.3045926	-1.73
262253_s_at	8.6059411	8.58979156	9.36081475	9.41667388	-1.73
254642_at	8.28112904	8.31264077	9.14959479	9.02284967	-1.73
258621_at	8.881487	8.87294154	9.74582417	9.58524448	-1.73
248582_at	10.1693844	9.93008839	10.9401009	10.7430015	-1.73
261638_at	8.59281818	8.64514094	9.42703421	9.39064891	-1.73
245035_at	9.1779177	8.86645082	9.77061917	9.86831644	-1.73
259943_at	7.37682791	7.44907531	8.17895976	8.22584963	-1.73
248897_at	6.48285286	6.54477047	7.32587089	7.27873821	-1.73
258128_at	10.2234425	10.0684586	10.9314879	10.9406087	-1.73
262194_at	7.94860935	8.06541906	8.72326326	8.86423475	-1.73
260266_at	9.58865509	9.62193393	10.3915482	10.3934468	-1.73

266259_at	8.85901058	8.93519799	8.10025363	8.1208069	1.73
246600_at	6.58643609	6.56084516	7.33664283	7.38405744	-1.73
247951_at	7.71458624	7.86696732	6.96774059	7.04484088	1.72
255116_at	8.4851535	8.32452058	9.2244121	9.1596724	-1.72
259460_at	10.3227164	10.2753675	11.068809	11.0981222	-1.72
260234_at	6.51343854	6.56384794	5.80418058	5.70347988	1.72
262086_at	8.83725256	8.84426219	9.62456194	9.62516042	-1.72
246226_at	9.23170024	9.23194019	9.99921381	10.0317596	-1.72
258472_at	7.84232642	7.97657167	8.54754951	8.82807841	-1.72
262566_at	11.1433704	11.1615086	11.9633372	11.9072986	-1.72
250043_at	6.29089783	6.47901833	7.03902584	7.29114474	-1.72
255046_at	11.3978769	11.471626	12.2125469	12.2224399	-1.72
249850_at	9.34414345	9.31354378	10.0899913	10.1309337	-1.72
260745_at	10.5386256	10.6205632	11.3096021	11.4116745	-1.72
247793_at	8.25846501	8.19405554	8.86270188	9.13893936	-1.72
250075_at	9.46037182	9.43562325	10.2697141	10.1865955	-1.72
251941_at	8.68939286	8.65488566	9.39384207	9.50839951	-1.72
246944_at	6.32789056	6.36802149	7.24112306	7.00530724	-1.72
258781_at	6.20946491	6.40515894	7.12861808	7.05023773	-1.72
260324_at	10.5343412	10.5446331	11.3058594	11.3288019	-1.71
260676_at	9.21018331	9.22508595	9.95321893	10.0364028	-1.71
258025_at	8.14066627	8.12044903	9.04785808	8.75368485	-1.71
264442_at	8.87202136	8.90575574	9.66744507	9.66565001	-1.71
262151_at	9.12044287	9.23464365	9.91347531	9.99701461	-1.71
250076_at	10.2574291	10.3754588	10.998917	11.1843306	-1.71
250496_at	11.5155518	11.5017782	12.1987783	12.3659992	-1.71
250083_at	6.83575451	6.74731563	7.49560375	7.63704188	-1.71
265644_at	6.05087385	5.86224882	6.8310541	6.63243489	-1.71
264228_at	7.0560792	7.0999613	7.90378687	7.800488	-1.71
259489_at	5.46936398	5.22962049	6.083889	6.17273627	-1.71
248962_at	10.9369591	10.9330572	11.7582589	11.6577159	-1.71
267054_at	8.57458023	8.48241511	7.61590822	7.88257993	1.71
251304_at	6.79059668	6.90614354	5.9543607	6.18848161	1.71
259179_at	8.09597559	7.96672544	8.83080018	8.78099557	-1.71
256049_at	8.24341014	8.14236035	9.03510873	8.89526416	-1.71
247351_at	8.07119204	8.02347494	8.86282694	8.7770947	-1.71
251673_at	6.05311862	6.02855371	6.7522825	6.87264914	-1.71
259327_at	10.1557895	10.3452925	9.41743243	9.54282833	1.71
247899_at	9.01976484	8.9548264	9.82708847	9.68915364	-1.71
246943_at	6.90519667	6.85765551	7.715908	7.58863616	-1.71
259382_s_at	10.7548423	11.07653	10.0154994	10.2784274	1.71
254067_at	7.29118159	7.49319142	8.18231677	8.1515749	-1.71
257122_at	8.75837809	8.65609809	7.78118729	8.07774914	1.71
246687_at	9.74312712	10.2091589	9.13516238	9.30821931	1.71
257021_at	8.89735944	9.24972867	9.80889961	9.89939102	-1.71
249288_at	8.21339368	8.21850171	8.96846318	9.00323838	-1.71
255676_at	8.9898043	9.06474093	9.78303578	9.81161238	-1.70
252462_at	8.85517871	8.81361961	9.58729386	9.62010409	-1.70
256304_at	7.87780675	7.90093375	8.61671282	8.69786044	-1.70
262638_at	8.53207727	8.60286122	9.31363226	9.35850191	-1.70

265704_at	10.1931817	10.0726782	10.939861	10.8637661	-1.70
264021_at	7.14332092	7.27011695	6.2696185	6.59335367	1.70
265628_at	9.30100796	9.2724074	10.064668	10.0438372	-1.70
254659_at	9.4771734	9.419111	10.2410486	10.1902154	-1.70
255718_at	9.59536044	9.56794308	10.2763711	10.417431	-1.70

Table 5 RT-qPCR measurements of *MIR-JAW* precursor RNAs in transgenic plants containing either the wild-type recapitulation construct (XW74) or mutant derivatives

Line	Jaw leaf phenotype	<i>MIR-JAW</i> level relative to wild type
Wild type	-	1
<i>jaw-D</i>	+++	>30
XW74-1	+++	23
XW74-2	+	6
<i>jaw-m1-1</i>	-	17
<i>jaw-m1-2</i>	-	>30
<i>jaw-m1-3</i>	-	15
<i>jaw-m1-4</i>	-	1
<i>jaw-m1-5</i>	-	20
<i>jaw-m1-6</i>	-	>30
<i>jaw-m2-1</i>	-	>30
<i>jaw-m2-2</i>	-	>30
<i>jaw-m2-3</i>	-	12
<i>jaw-m2-4</i>	-	14

Table 6 RT-qPCR measurements of transgenic *TCP* transcripts in wild-type and *jaw-1D* backgrounds*

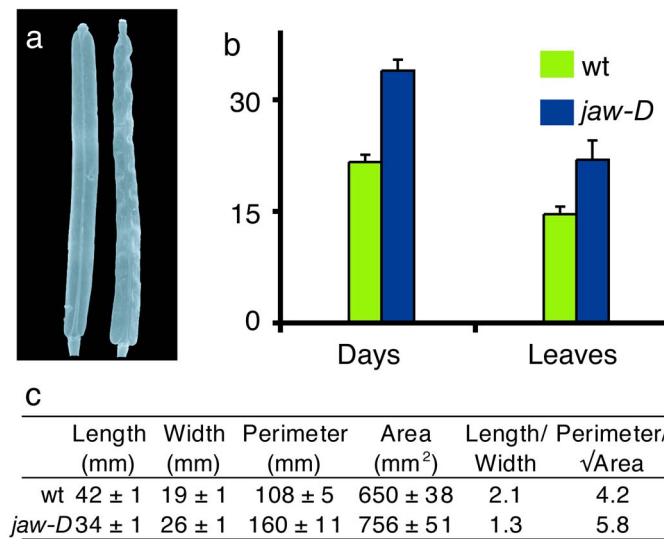
Background	Transgene	Line	Level relative to wild type			Phenotype
			TCP2	TCP3	TCP4	
<i>jaw-1D</i>	-		<0.2	<0.1	<0.1	
wild type	35S: <i>TCP2</i>	70-5	2.5	ND	ND	wild type
wild type	35S: <i>TCP2</i>	70-21	3.4	ND	ND	wild type
wild type	35S: <i>TCP2</i>	70-25	2.8	ND	ND	wild type
wild type	35S: <i>TCP2</i>	70-26	2.8	ND	ND	wild type
<i>jaw-1D</i>	35S: <i>TCP2</i>	70-1	1.8	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>TCP2</i>	70-7	0.6	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>TCP2</i>	70-13	0.9	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>TCP2</i>	70-20	0.8	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>TCP2</i>	70-22	2.0	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>TCP2</i>	70-23	1.0	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>TCP2</i>	70-24	1.4	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>TCP2</i>	70-27	1.9	<0.1	<0.1	partial complementation
wild type	35S: <i>mTCP2</i>	75-30	16.2	N.D.	N.D.	<i>mTCP2</i> gain of function
wild type	35S: <i>mTCP2</i>	75-31	31.7	N.D.	N.D.	<i>mTCP2</i> gain of function
wild type	35S: <i>mTCP2</i>	75-32	1.0	N.D.	N.D.	wild type
wild type	35S: <i>mTCP2</i>	75-33	27.9	N.D.	N.D.	<i>mTCP2</i> gain of function
wild type	35S: <i>mTCP2</i>	75-5	1.6	N.D.	N.D.	wild type
wild type	35S: <i>mTCP2</i>	75-6	5.0	N.D.	N.D.	<i>mTCP2</i> gain of function
wild type	35S: <i>mTCP2</i>	75-27	1.2	N.D.	N.D.	wild type
wild type	35S: <i>mTCP2</i>	75-9	1.4	N.D.	N.D.	wild type
<i>jaw-1D</i>	35S: <i>mTCP2</i>	75-20	8.3	<0.1	<0.1	complete complementation†
<i>jaw-1D</i>	35S: <i>mTCP2</i>	75-21	1.6	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>mTCP2</i>	75-22	0.6	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>mTCP2</i>	75-24	0.8	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>mTCP2</i>	75-25	6.8	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>mTCP2</i>	75-26	11.5	<0.1	<0.1	complete complementation†
<i>jaw-1D</i>	35S: <i>mTCP2</i>	75-4	5.0	<0.1	<0.1	complete complementation†
<i>jaw-1D</i>	35S: <i>mTCP2</i>	75-7	1.6	<0.1	<0.1	partial complementation
<i>jaw-1D</i>	35S: <i>mTCP2</i>	75-2	10.0	<0.1	<0.1	complete complementation†
wild type	35S: <i>TCP4</i>	75-4	N.D.	N.D.	2.0	wild type
wild type	35S: <i>TCP4</i>	75-1	N.D.	N.D.	3.5	long hypocotyl
wild type	35S: <i>TCP4</i>	75-2	N.D.	N.D.	3.8	long hypocotyl
<i>jaw-1D</i>	35S: <i>TCP4</i>	71-9	<0.2	N.D.	1.6	partial complementation
<i>jaw-1D</i>	35S: <i>TCP4</i>	71-4	<0.2	N.D.	1.9	partial complementation
<i>jaw-1D</i>	35S: <i>TCP4</i>	71-8	<0.2	N.D.	1.5	partial complementation
<i>jaw-1D</i>	35S: <i>TCP4</i>	71-6	<0.2	N.D.	1.4	partial complementation
<i>jaw-1D</i>	35S: <i>TCP4</i>	71-22	<0.2	<0.1	3.1	partial complementation
<i>jaw-1D</i>	35S: <i>TCP4</i>	71-23	<0.2	<0.1	2.3	partial complementation

N.D. not determined

*Transformation of *jaw-1D* plants with vectors carrying 35S promoters caused co-suppression of the 35S enhancers at the *JAW* locus in some of the lines. Therefore, lines

that showed an increase in all three *TCPs* were considered the result of co-suppression and not further analyzed.

†Complete complementation also resulted in 35S:*mTCP2* gain of function phenotype. In fully complemented plants, the level of mutated *TCP2* mRNA, as detected by RT-qPCR, was at least 6 times higher than the endogenous transcript in Columbia wild-type plants (and 36 times with respect to the level in *jaw-1D* plants). Partial complementation was achieved by a two-fold increase with respect to wild-type levels (and 12-fold with respect to *jaw-1D* plants), suggesting that moderate overexpression of *TCP2* can compensate for reduced expression of other *TCP* genes in *jaw-1D* plants. Among 15 independent transformants overexpressing the wild-type version of *TCP2*, none had more than a two-fold increase in mRNA levels compared to *jaw-1D*, indicating that the miRNA limits accumulation of *TCP2* mRNA.

Figure 1 Additional *jaw-D* phenotypes

a, Wild-type (top) and *jaw-1D* fruits (siliques). **b**, Flowering time measured in days (inflorescence stem reaches 1 cm) and leaf number. **c**, Parameters of the sixth leaf in wild type and *jaw-1D*.

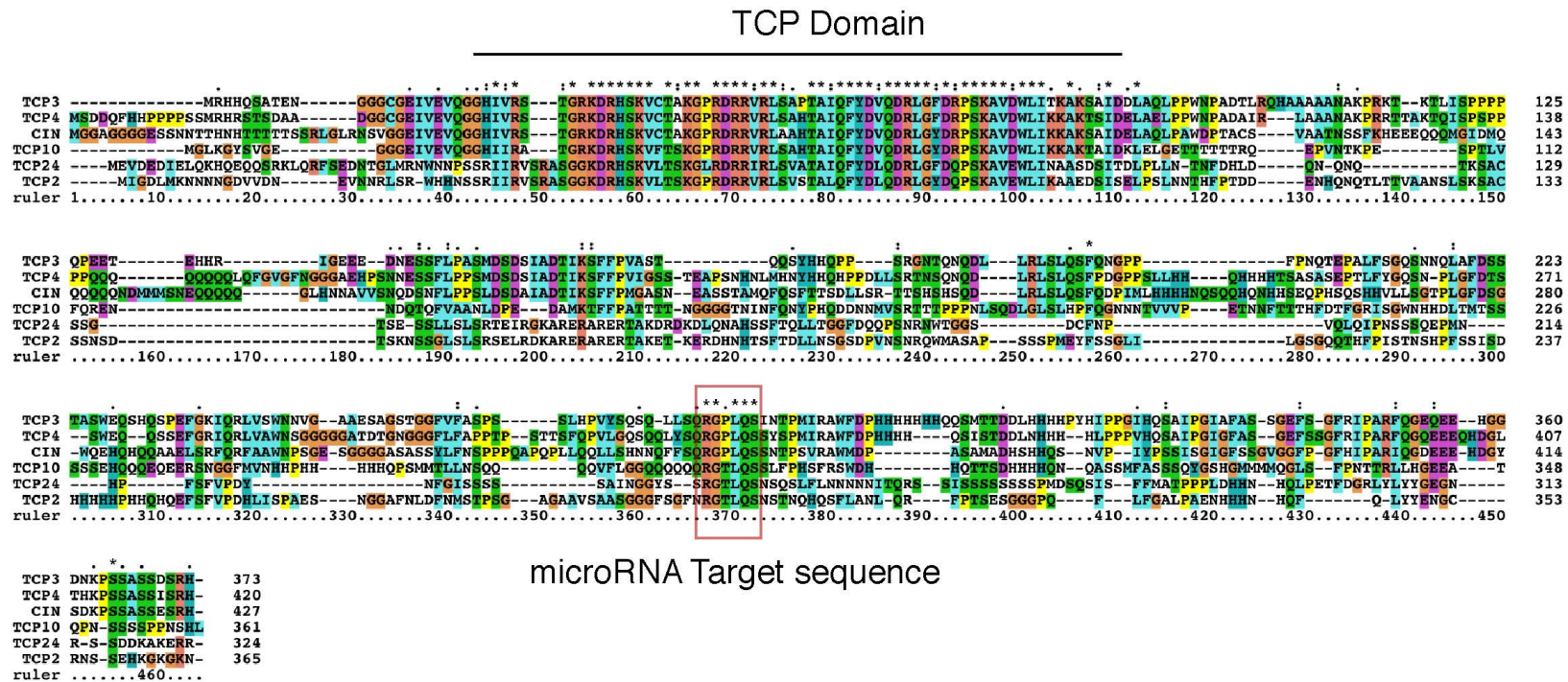
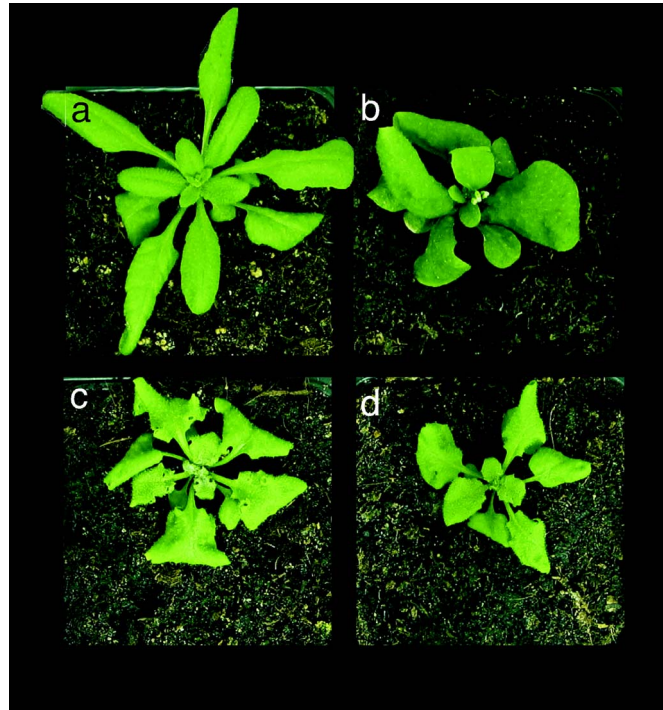
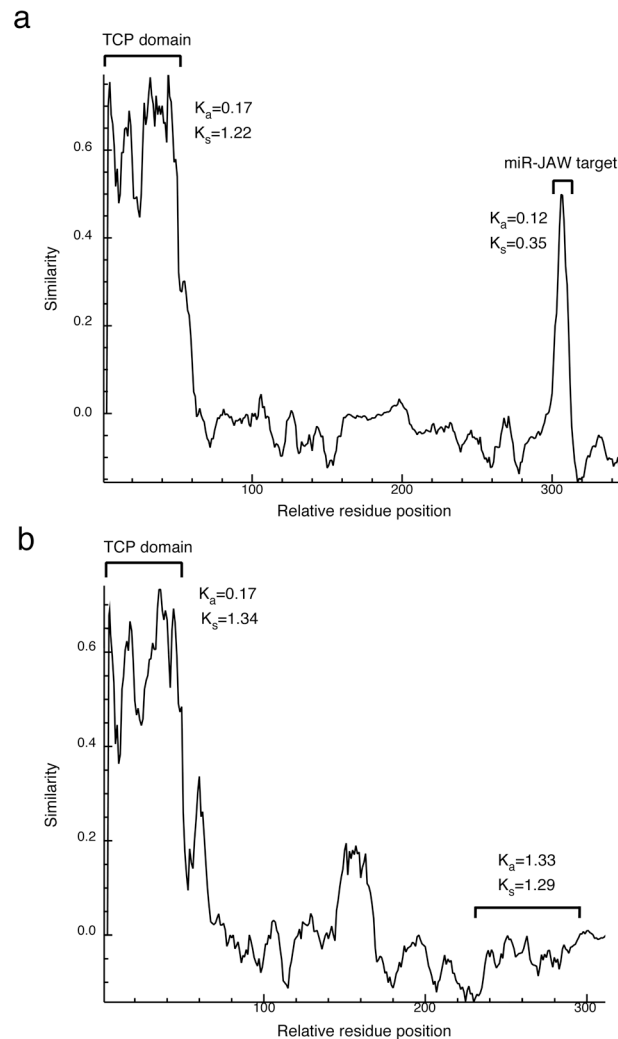
Figure 2 Alignment of TCP amino acid sequences, highlighting TCP domain and region encoded by microRNA target sequence

Figure 3 Alignment of MIR-JAW target sequences in *TCP* genes from different species

Accession Number	Plant	R G P L Q S S I N						
At4g18390	<i>At_TCP2</i>	G G T G G C T T C A G T G G T T T C A A C A G G G G G A C C C T T C A G T C C A A T T C A A C A A A T C A G C A T C A G T C A						
At5g53230	<i>At_TCP3</i>	C A A A G T C A G C T T T T A T C A C A G A G G G G T C C C C T T C A G T C C A T T A A C A C A C C T A T G A T T C G T G C T						
At3g15030	<i>At_TCP4</i>	A G C C A A C A G C T T T A T T C T C A G A G G G G T C C C C T T C A G T C C A G T T A C A G T C C C A T G A T C C G T G C T						
At1g30210	<i>At_TCP24</i>	A T T A A T G G T G G T T A C A G T A G T A G G G G G A C C C T T C A G T C C A A T T C A C A A T C T C T C T T T C T G A A T						
At2g31070	<i>At_TCP10</i>	G G C C A A C A A C A A C A A C A A C A A A G G G G T A C C C T T C A G T C C A G T T T A T T C C C T C A T T C G T T T C G T						
CAD19990	<i>Lupinus albus_TCP1</i>	C A T G G C C A G T A T T T T T C T C A G A G G G G A C C C C T T C A G T C C A G T A A C A C T C C T T C G A T T C G T G C A						
AY205603	<i>Antirrhinum majus_CIN</i>	A A T A A C C A G T T C T T T T C A C A G A G G G G A C C C C T T C A G T C C A G T A A C A C A C C T T C A G T T C G T G C T						
BAB92952	<i>Oryza sativa_PCF5</i>	C A G A G C C A G T T C T T C T T C C A G A G G G G A C C C C T T C A G T C C A G T A A C C A G C C C T C C G A G C G A G G A						
AP006146	<i>Lotus japonicus</i>	C A T G G C C A G T A T T T T T C T C A G A G G G G A C C C C T T C A G T C C A G T A A C A C C C C T T C C A T T C G T G C T						
AW037628	<i>Lycopersicon esculentum</i>	C A A A A T C A G T T T T T G T C T C A G A G G G G A C C C C T T C A G T C C A G T T A C T C A C C T T C G A T T C G T G C A						
CA730259	<i>Triticum aestivum</i>	C A G A G C C A G T T C T T C T T C C A G A G G G G T C C C C T T C A G T C C A G T A A C C A G C C C T C C G A C C G A G G A						
BJ566087	<i>Ipomea nil</i>	A A C C A G T T T T T T C C T T C T C A G A G G G G A C C C C T T C A G T C C A G T T A C T C G C C T T C G G T T C G T G C T						
BU010999	<i>Lactuca sativa</i>	C A G T T A T T C A A C A A T T C T C A G A G G G G A C C C C T T C A G T C C A G T A A C G C A C C T T C G T T T C G T G C T						
BU014113	<i>Lactuca sativa</i>	T T G T T T A A T A A C A A T T C T C A G A G G G G A C C C C T T C A G T C C A G T A A C A C A T C T T C A G T T C G T G C T						
BU582215	<i>Zea mays</i>	C A G A G C C A G T T C T T C T T C C A G A G G G G A C C C C T T C A G T C C A G T A A C C A G C C C T C C G A G C G A G G A						
BU863060	<i>Populus hybrid</i>	C C A A A C C A G T T T T T T T C A C A G A G G G G A C C C C T T C A G T C C A G T A A C A C G C C T T C A G T T C G T G C T						
BU091238	<i>Glycine max</i>	T T T G G C C A G T T T T T T T C T C A G A G G G G A C C C C T T C A G T C C A G T A A C A C C C C T T C G A T T C G T G C T						
BM436880	<i>Vitis vinifera</i>	C A A G G C T C A G A A T T T T C A C A G A G G G G A C C C C T T C A G T C C A G T T T G C T C C T G C T G T T C G T G C T						
BQ481514	<i>Phaseolus vulgaris</i>	C A A G G C C A G T A T T T T T C T C A G A G G G G A C C C C T T C A G T C C A G T A A C A C C C C G T C C G T T C G T G C G						
BQ116909	<i>Solanum tuberosum</i>	C A A A A T C A G T T T T T T T C T C A G A G G G G A C C C C T T C A G T C C A G T A A C A C A T C C T T C G G T T C G A G C						
BF270210	<i>Gossypium arboreum</i>	A A C G G C C A G T T T T T C T T T C A G A G G G G A C C C C T T C A G T C C A G T A A C A C G C C C T T G G T T C G T G C T						
BG587093	<i>Medicago truncatula</i>	C A G A A T C A G T A T C T T T C A C A G A G G G G A C C C C T T C A G T C C A G T T A C A A T C C T T C A G T T C G T G C T						
BM066399	<i>Capsicum annuum</i>	T C A T C T G C T T C T G G T T T C A A T A G G G G G A C C C T T C A G T C C A A T T C T T C C T C T T C G C A G T C T A C T						
BQ623589	<i>Citrus sinensis</i>	T C T T C C A G C C T T G G T T T C A A T A G G G G G A C C C T T C A G T C C A A T T C A T C A C C G T C T G T T T T C C C T						
BF274094	<i>Gossypium arboreum</i>	T C C G G C A T T G C T G G T T T C A A C A G G G G G A C C C T T C A G T C C A A T T C T C C T C C T T T T T T G C C T C A T						
JAW		G G G A G C T C C C T T C A G T C C A A						
JAW_h		G G G A G C T C C C T T C A G T C C A A						

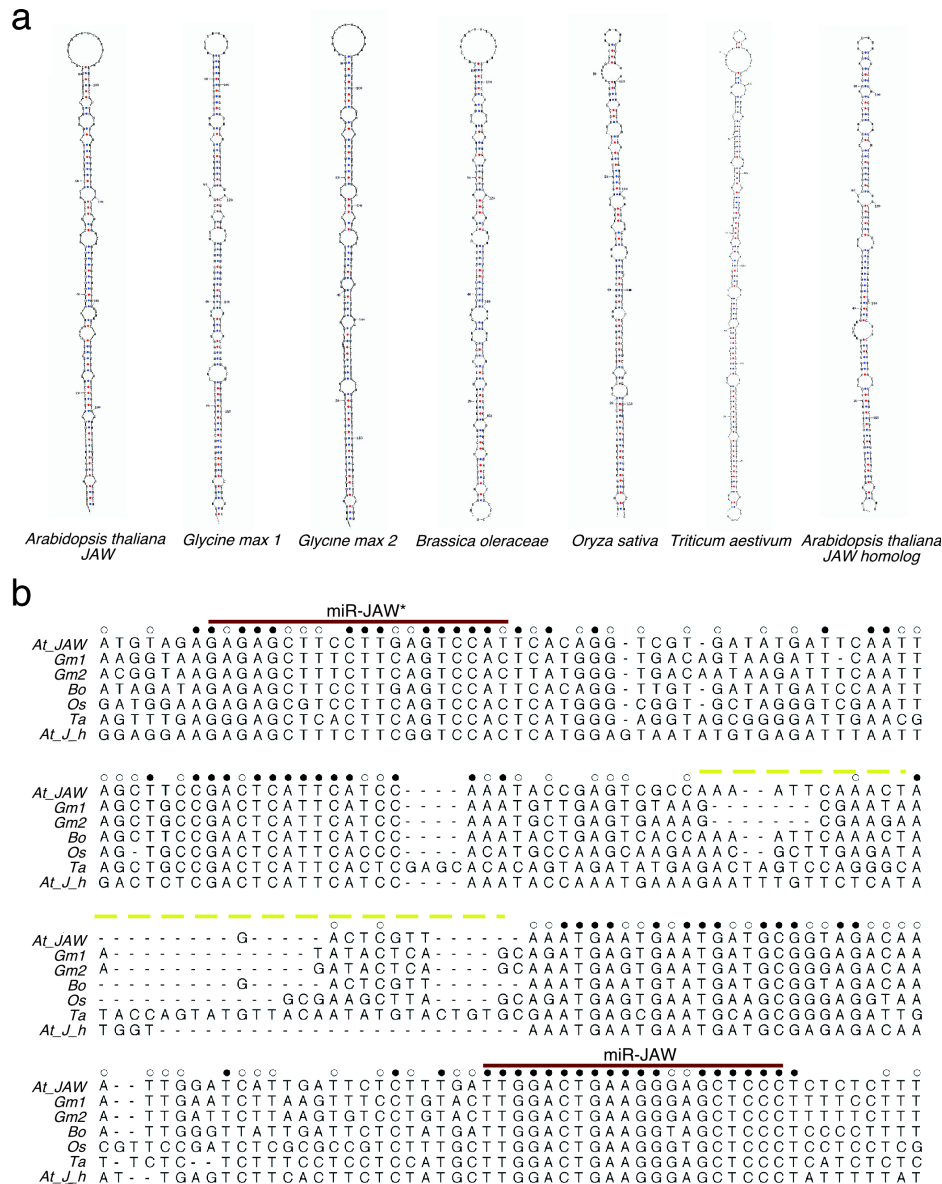
Figure 4 Complementation of *jaw-D* by a weakly active *TCP4:mTCP4* transgene

a, Columbia wild type. **b**, MiRNA-resistant *TCP4* (*mTCP4*) under control of *TCP4* promoter in *jaw-1D*. **c**, *jaw-1D*. **d**, *TCP4:mTCP4* in *jaw-3D*.

Figure 5 Sequence properties of miR-JAW targets from different species

Sliding-window analyses (window size seven) of TCP proteins with **(a)** and without **(b)** miR-JAW target sequence. The average rates of synonymous changes per synonymous site (K_s) and non-synonymous changes per non-synonymous site (K_a) are shown for the TCP domain and the miR-JAW target sequence. Within the TCP domain of both groups, the ratios of non-synonymous changes are much lower than the ratios of synonymous changes, confirming that the amino acid sequence of the TCP domain is under purifying selection. A high level of amino acid sequence conservation outside the TCP domain was detected only in the region encoded by the miR-JAW target sequence. However, the similarly low K_a and K_s ratios for the miR-JAW target sequence indicate that different selective forces act on the miR-JAW target motifs.

Figure 6 Secondary structure and alignment of *MIR-JAW* precursors from different species



a, Predicted fold back structures of *MIR-JAW* precursors. The unpaired ends of some of the precursors reflect that the entire sequence shown in **(b)** was included for the secondary structure prediction (M. Zuker, *Nucleic Acids Res.* **31**, 3406-15, 2003). **b**, Alignment of the stem loop region of *MIR-JAW* precursors. Shaded nucleotides are involved in base pairing. Dark circles indicate invariant positions, open circles indicate positions identical in 5 or 6 out of the 7 sequences shown. The miR-JAW and miR-JAW* (Lau et al., *Science* **294**, 858-62, 2001) sequences are indicated. The *JAW* homologs seem to differ from putative, related miRNA precursors previously described for *Arabidopsis* and rice (Reinhart et al., *Genes Dev.* **16**, 1616-26, 2002) in that the sequence between the miRNA and the miRNA* sequence is conserved as well.