

Electronic Supporting Information

Number of Pages: 16

Number of Supporting Figures: 3

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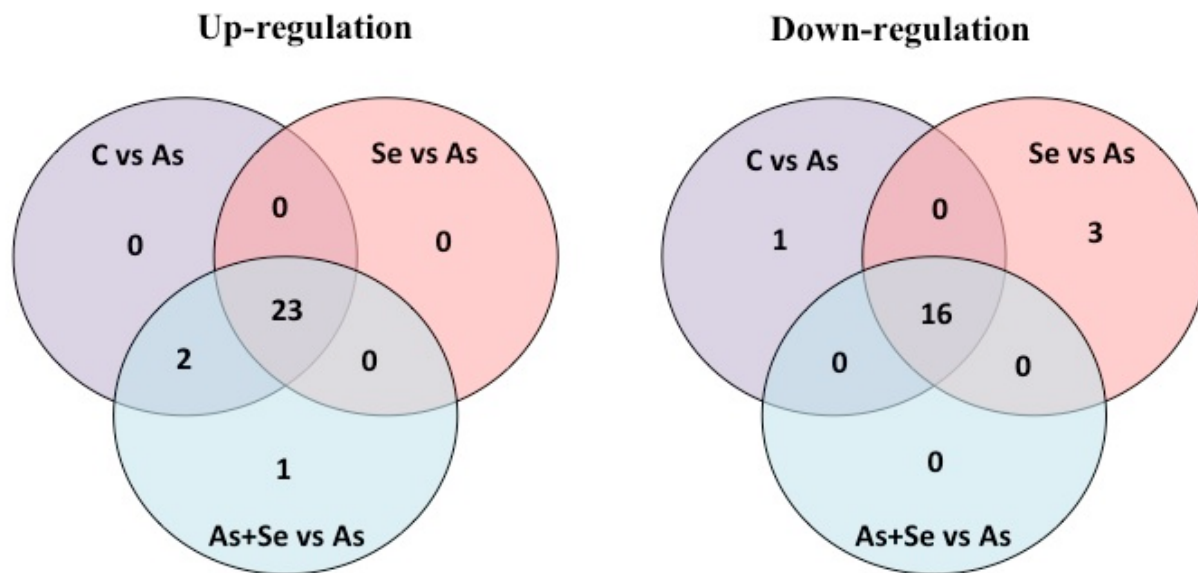


Figure S1: Venn-diagrams representing the number of unique and common miRNAs in Control (C), Se and As+Se treated rice seedlings with respect to As treated seedlings.

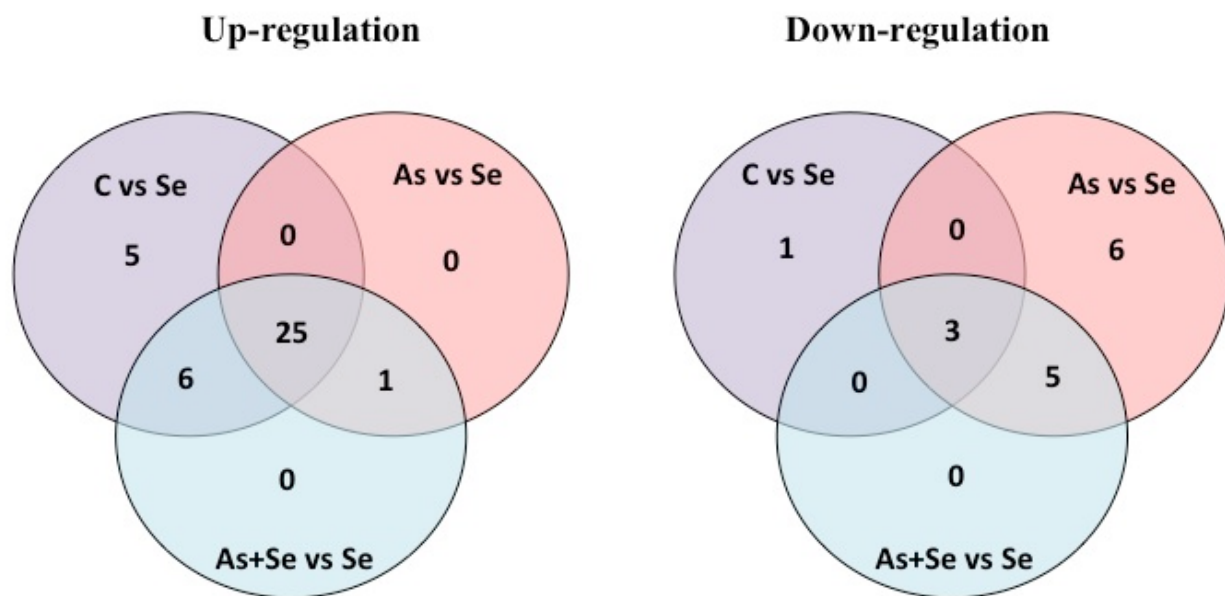


Figure S2: Venn-diagrams representing the number of unique and common miRNAs in Control (C), As, and As+Se treated rice seedlings with respect to Se treated seedlings.

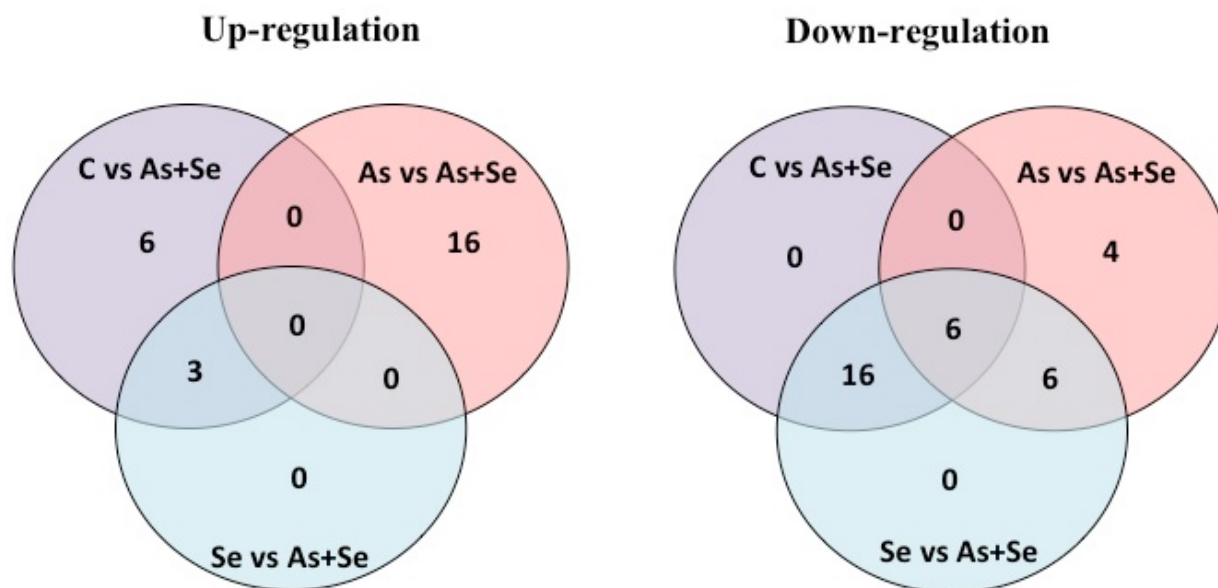


Figure S3: Venn-diagrams representing the number of unique and common miRNAs in Control (C), As and Se treated rice seedlings with respect to As+Se treated seedlings

Table S1 Effect of As, Se and As+Se on percentage seed germination, shoot and root length in *Oryza sativa* var. IR-64

Treatment	Seed germination (%)	Shoot length (cm)	Root length (cm)
C	100	5	5.2
As	72	2.7	2.1
Se	98	4.8	4.6
As+Se	82	3.6	3.4

Table S2: The relative difference between up- and down-regulated microRNAs expression on different metal treatments.

Sample treatments	Up-regulated miRNAs				Sample treatments	Down-regulated miRNAs			
	C	As	Se	As+Se		C	As	Se	As+Se
C	0	25	36	9	C	0	17	4	22
As	17	0	26	16	As	27	0	14	16
Se	4	23	0	3	Se	40	19	0	28
As+Se	17	26	32	0	As+Se	27	16	8	0

Table S3: List of differentially regulated heavy metal responsive miRNAs in rice with fold change ≥ 1.5 of all treatments versus control.

miRNAs	(As) vs Control		(As+Se) vs Control		(Se) vs Control	
	(Regulated Pattern)	Fold change	(Regulated Pattern)	Fold change	(Regulated Pattern)	Fold change
osa-miR159a.2	down	-0.84129095	down	-0.3262503	down	-0.68267345
osa-miR171a	down	-0.76108146	down	-0.4443817	down	-0.3688686
osa-miR171g	down	-0.5982175	down	-0.4981761	up	0.07747865
osa-miR395b	up	0.60868955	up	0.4756267	down	-0.26544785
osa-miR395d	up	0.69188976	up	0.5554223	down	-0.19072104
osa-miR395e	up	0.61932015	up	0.49447274	down	-0.35959315
osa-miR395g	up	0.62966204	up	0.48687243	down	-0.37389565
osa-miR395h	up	0.64785147	up	0.5009029	down	-0.3320856
osa-miR395i	up	0.5957351	up	0.44673777	down	-0.41087818
osa-miR395j	up	0.59902906	up	0.46880817	down	-0.34375334
osa-miR395k	up	0.6342635	up	0.50152683	down	-0.34116006
osa-miR395l	up	0.67688894	up	0.53532696	down	-0.348938
osa-miR395m	up	0.59991384	up	0.4827714	down	-0.23398423
osa-miR395p	up	0.63341594	up	0.493706	down	-0.31357694
osa-miR395q	up	0.64203787	up	0.52022576	down	-0.18694377
osa-miR395r	up	0.7339015	up	0.5902815	down	-0.09326553
osa-miR395s	up	0.6116288	up	0.47158694	down	-0.33738422
osa-miR395t	up	0.3510015	up	0.6515517	up	0.016808748
osa-miR395y	up	0.63598895	up	0.4938364	down	-0.27920198
osa-miR396e-3p	down	-0.94108176	down	-0.2966783	down	-0.70158887
osa-miR398b	down	-0.6468065	down	-0.36145067	down	-0.5874021
osa-miR399a	down	-0.7124498	down	-0.30188203	down	-0.09060812
osa-miR399b	down	-0.70583344	down	-0.28414917	down	-0.02046442
osa-miR399c	down	-0.78027344	down	-0.3484931	down	-0.10091925
osa-miR399d	down	-0.7824919	down	-0.15728545	up	0.01725626
osa-miR399i	down	-0.7792897	down	-0.19262052	down	-0.17455816
osa-miR399j	down	-0.73247147	down	-0.14712572	down	-0.02384305
osa-miR415	down	-0.76597357	down	-0.62127376	down	-0.6353698
osa-miR811a	down	-0.69292617	down	-0.09843493	down	-0.53266096
osa-miR811b	down	-0.6292727	down	-0.16847682	down	-0.4110651
osa-miR811c	down	-0.6346855	down	-0.1389916	down	-0.47607088
osa-miR812f	down	-0.6132102	down	-0.21347928	down	-0.46365428
osa-miR812g	down	-0.66686463	down	-0.21975636	down	-0.5299456
osa-miR812h	down	-0.672441	down	-0.20943642	down	-0.39537048

osa-miR815a	down	-0.93101335	down	-0.18764138	down	-0.94066286
osa-miR815b	down	-0.92975354	down	-0.16540504	down	-0.87581754
osa-miR815c	down	-0.84225035	down	-0.07807851	down	-0.8972962
osa-miR821c	down	-0.5512011	down	-0.13845444	down	-0.63169205
osa-miR1433	up	0.55943465	up	0.3739779	up	0.66590047
osa-miR1875	down	-0.8126676	down	-0.60152006	down	-0.6567335
osa-miR3980a-5p	down	-0.6440861	down	-0.44147134	down	-0.38467145
osa-miR3980b-5p	down	-0.70143104	down	-0.5603564	down	-0.43439817
osa-miR5076	down	-0.62423515	down	-0.14216161	down	-0.14460278
osa-miR5082	down	-0.36975265	down	-0.08356857	down	-0.5878849

Table S4: List of differentially regulated heavy metal responsive miRNAs in rice with fold change ≥ 1.5 of all treatments versus As treatment.

miRNAs	(Control) vs As		(As+Se) vs As		(Se) vs As	
	(Regulated Pattern)	Fold change	(Regulated Pattern)	Fold change	(Regulated Pattern)	Fold change
osa-miR159a.2	up	0.84129095	up	0.51504064	up	0.1586175
osa-miR171a	up	0.76108146	up	0.31669974	up	0.39221287
osa-miR171g	up	0.5982175	up	0.10004139	up	0.67569613
osa-miR395a	down	-0.51668835	up	0.039749146	down	-0.7759664
osa-miR395b	down	-0.60868955	down	-0.13306284	down	-0.8741374
osa-miR395d	down	-0.69188976	down	-0.13646746	down	-0.8826108
osa-miR395e	down	-0.61932015	down	-0.12484741	down	-0.9789133
osa-miR395g	down	-0.62966204	down	-0.1427896	down	-1.0035577
osa-miR395h	down	-0.64785147	down	-0.14694858	down	-0.9799371
osa-miR395i	down	-0.5957351	down	-0.1489973	down	-1.0066133
osa-miR395j	down	-0.59902906	down	-0.13022089	down	-0.9427824
osa-miR395k	down	-0.6342635	down	-0.13273668	down	-0.9754236
osa-miR395l	down	-0.67688894	down	-0.14156199	down	-1.0258269
osa-miR395m	down	-0.59991384	down	-0.11714244	down	-0.83389807
osa-miR395n	down	-0.5794616	down	-0.15033364	down	-0.95766306
osa-miR395p	down	-0.63341594	down	-0.13970995	down	-0.9469929
osa-miR395q	down	-0.64203787	down	-0.121812105	down	-0.82898164
osa-miR395r	down	-0.7339015	down	-0.14362001	down	-0.82716703
osa-miR395s	down	-0.6116288	down	-0.14004183	down	-0.949013
osa-miR395y	down	-0.63598895	down	-0.14215255	down	-0.91519094
osa-miR396e-3p	up	0.94108176	up	0.64440346	up	0.2394929
osa-miR398b	up	0.6468065	up	0.2853558	up	0.059404373
osa-miR399a	up	0.7124498	up	0.41056776	up	0.62184167
osa-miR399b	up	0.70583344	up	0.42168427	up	0.685369
osa-miR399c	up	0.78027344	up	0.43178034	up	0.6793542
osa-miR399d	up	0.7824919	up	0.6252065	up	0.7997482
osa-miR399i	up	0.7792897	up	0.5866692	up	0.60473156
osa-miR399j	up	0.73247147	up	0.58534575	up	0.7086284
osa-miR415	up	0.76597357	up	0.14469981	up	0.13060379
osa-miR811a	up	0.69292617	up	0.59449124	up	0.1602652
osa-miR811b	up	0.6292727	up	0.46079588	up	0.2182076
osa-miR811c	up	0.6346855	up	0.49569392	up	0.15861464
osa-miR812f	up	0.6132102	up	0.39973092	up	0.14955592
osa-miR812g	up	0.66686463	up	0.44710827	up	0.13691902

osa-miR812h	up	0.672441	up	0.4630046	up	0.27707052
osa-miR815a	up	0.93101335	up	0.74337196	down	-0.00964952
osa-miR815b	up	0.92975354	up	0.7643485	up	0.053936005
osa-miR815c	up	0.84225035	up	0.76417184	down	-0.05504584
osa-miR1875	up	0.8126676	up	0.21114755	up	0.1559341
osa-miR3980a-5p	up	0.6440861	up	0.20261478	up	0.25941467
osa-miR3980b-5p	up	0.70143104	up	0.14107466	up	0.26703286
osa-miR5076	up	0.62423515	up	0.48207355	up	0.47963238

Table S5: List of differentially regulated heavy metal responsive miRNAs in rice with fold change ≥ 1.5 of all treatments versus Se treatment.

miRNAs	(Control) vs Se		(As+Se) vs Se		(As) vs Se	
	(Regulated Pattern)	Fold change	(Regulated Pattern)	Fold change	(Regulated Pattern)	Fold change
osa-miR159a.2	up	0.68267345	up	0.35642314	down	-0.1586175
osa-miR171g	down	-0.07747865	down	-0.57565475	down	-0.67569613
osa-miR395a	up	0.25927806	up	0.81571555	up	0.7759664
osa-miR395b	up	0.26544785	up	0.74107456	up	0.8741374
osa-miR395d	up	0.19072104	up	0.74614334	up	0.8826108
osa-miR395e	up	0.35959315	up	0.8540659	up	0.9789133
osa-miR395g	up	0.37389565	up	0.8607681	up	1.0035577
osa-miR395h	up	0.3320856	up	0.8329885	up	0.9799371
osa-miR395i	up	0.41087818	up	0.85761595	up	1.0066133
osa-miR395j	up	0.34375334	up	0.8125615	up	0.9427824
osa-miR395k	up	0.34116006	up	0.8426869	up	0.9754236
osa-miR395l	up	0.348938	up	0.88426495	up	1.0258269
osa-miR395m	up	0.23398423	up	0.7167556	up	0.83389807
osa-miR395n	up	0.37820148	up	0.8073294	up	0.95766306
osa-miR395p	up	0.31357694	up	0.8072829	up	0.9469929
osa-miR395q	up	0.18694377	up	0.70716953	up	0.82898164
osa-miR395r	up	0.09326553	up	0.683547	up	0.82716703
osa-miR395s	up	0.33738422	up	0.80897117	up	0.949013
osa-miR395t	down	-0.016808748	up	0.634743	up	0.33419275
osa-miR395y	up	0.27920198	up	0.7730384	up	0.91519094
osa-miR396e-3p	up	0.70158887	up	0.40491056	down	-0.2394929
osa-miR398b	up	0.5874021	up	0.22595143	down	-0.059404373
osa-miR399a	up	0.09060812	down	-0.21127391	down	-0.62184167
osa-miR399b	up	0.02046442	down	-0.26368475	down	-0.685369
osa-miR399c	up	0.10091925	down	-0.24757385	down	-0.6793542
osa-miR399d	down	-0.01725626	down	-0.17454171	down	-0.7997482
osa-miR399i	up	0.17455816	down	-0.018062353	down	-0.60473156
osa-miR399j	up	0.02384305	down	-0.12328267	down	-0.7086284
osa-miR415	up	0.6353698	up	0.014096022	down	-0.13060379
osa-miR815a	up	0.94066286	up	0.7530215	up	0.009649515
osa-miR815b	up	0.87581754	up	0.7104125	down	-0.053936005
osa-miR815c	up	0.8972962	up	0.8192177	up	0.055045843
osa-miR821c	up	0.63169205	up	0.4932376	up	0.08049095
osa-miR1433	down	-0.66590047	down	-0.29192257	down	-0.10646582
osa-miR1846a-	up	0.54790545	up	0.7513802	up	0.25523138

5p						
osa-miR1846b-5p	up	0.4744935	up	0.6855047	up	0.3750906
osa-miR1846c-5p	up	0.45130944	up	0.76313615	up	0.28081584
osa-miR1875	up	0.6567335	up	0.05521345	down	-0.1559341
osa-miR2919	up	0.57423735	up	0.59035516	up	0.12011194
osa-miR5082	up	0.5878849	up	0.50431633	up	0.21813226
osa-miR5082	up	0.5878849	up	0.50431633	up	0.21813226

Table S6: List of differentially regulated heavy metal responsive miRNAs in rice with fold change ≥ 1.5 of all treatments versus As+Se treatment.

miRNAs	(Control) vs As+Se		(As) vs As+Se		(Se) vs As+Se	
	(Regulated Pattern)	fold change	(Regulated Pattern)	fold change	(Regulated Pattern)	fold change
osa-miR395a	down	-0.5564375	down	-0.039749146	down	-0.8157156
osa-miR395b	down	-0.4756267	up	0.13306284	down	-0.7410746
osa-miR395d	down	-0.5554223	up	0.13646746	down	-0.7461433
osa-miR395e	down	-0.49447274	up	0.12484741	down	-0.8540659
osa-miR395g	down	-0.48687243	up	0.1427896	down	-0.8607681
osa-miR395h	down	-0.5009029	up	0.14694858	down	-0.8329885
osa-miR395i	down	-0.44673777	up	0.1489973	down	-0.857616
osa-miR395j	down	-0.46880817	up	0.13022089	down	-0.8125615
osa-miR395k	down	-0.50152683	up	0.13273668	down	-0.8426869
osa-miR395l	down	-0.53532696	up	0.14156199	down	-0.884265
osa-miR395m	down	-0.4827714	up	0.11714244	down	-0.7167556
osa-miR395n	down	-0.42912793	up	0.15033364	down	-0.8073294
osa-miR395p	down	-0.493706	up	0.13970995	down	-0.8072829
osa-miR395q	down	-0.52022576	up	0.121812105	down	-0.7071695
osa-miR395r	down	-0.5902815	up	0.14362001	down	-0.683547
osa-miR395s	down	-0.47158694	up	0.14004183	down	-0.8089712
osa-miR395t	down	-0.6515517	down	-0.30055022	down	-0.634743
osa-miR395y	down	-0.4938364	up	0.14215255	down	-0.7730384
osa-miR396e-3p	up	0.2966783	down	-0.64440346	down	-0.4049106
osa-miR399d	up	0.15728545	down	-0.6252065	up	0.1745417
osa-miR399i	up	0.19262052	down	-0.5866692	up	0.0180624
osa-miR399j	up	0.14712572	down	-0.58534575	up	0.1232827
osa-miR415	up	0.62127376	down	-0.14469981	down	-0.014096
osa-miR811a	up	0.098434925	down	-0.59449124	down	-0.434226
osa-miR815a	up	0.18764138	down	-0.74337196	down	-0.7530215
osa-miR815b	up	0.16540504	down	-0.7643485	down	-0.7104125
osa-miR815c			down	-0.76417184		
osa-miR1846a-5p	down	-0.20347476	down	-0.49614882	down	-0.7513802
osa-miR1846b-5p	down	-0.21101117	down	-0.31041408	down	-0.6855047
osa-miR1846c-5p	down	-0.3118267	down	-0.4823203	down	-0.7631362
osa-miR1875	up	0.60152006	down	-0.21114755	down	-0.0552135
osa-miR2919	down	-0.016117811	down	-0.47024322	down	-0.5903552

Table S7: Distribution pattern of *Cis*-acting element in the promoter of the eight identified metal stress miRNAs.

miRNA	Putative cis-element
miR159	ABRE(-1289), ARE(-153), CGTCA(-168), HSE(-397), MBS(+689, +825), Skn-1 motif(-167, +1254), Sp-1(-283), TCA element(+547), TGACG(+168)
miR171	ARE(-450, -1265, -713), CGTCA(-590), HSE(-1350), Sp1(+126, -630), TCA element(-386, -1250), TGACG(+590)
miR395	ARE(-1415), CGTCA(-1101), GARE(+1156), O ₂ site(-200), Skn-1motif(+204, -1100, +281), Sp1(+1396), TCA element(-1239), TGACG(+1101)
miR396	ARE(-20), GARE(+341), HSE(-914, -1158, -1095, 1198), MBS(+1255), O ₂ site(+30), Skn-1(-36), Sp-1, TCA element(-779, -1149)
miR398	ARE(-952), GARE(-903), HSE(+421, -498), O ₂ site(-1356), Skn-1(-735, +1233), Sp1(-1006), TCA element(+67, +100)
miR399	ABRE(-1277, -1429, 1427), ARE(-925, -1151), CGTCA(-181, -1367, +973, -297, +1046), MBS(+310, -443), O ₂ site(-58), Skn-1(-1092), Sp-1, TGACG(+181, +1367, -973, +297, -1046)
miR415	ABRE(+258, +1493, -1351), ARE (-865), GARE(-759), MBS(-369, +926), Skn-1(+162, +402, -165), Sp-1(-456, -1464),
miR1875	ARE(+501, -1136), CGTCA(+153, +266), MBS(-72, +1233, +526, -315, +737), O ₂ site(-520), Skn-1(+267), Sp-1(-345), TGACG(-153, -266)

ABRE, ABA responsive element; ARE, anaerobic responsive element; CAAT, common cis-acting element in promoter and enhancer regions; CGTCA_motif, involved in the MeJA-responsiveness; GARE_motif, gibberellin-responsive element; HSE, heat stress responsive element; MBS, MYB binding site involved in drought-inducibility; Skn-1_motif, regulatory element required for endosperm expression; Sp1, light responsive element; TATA, core promoter element around -30 of transcription start; TCA-element, salicylic acid-responsive element; MBS, MYB binding site, involved in drought-inducibility; TGACG, motif, MeJA-responsive element.

Table S8- List of Primer sequences used for RT-PCR.

	Stem-loop backbone:	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAAC
	UVRP	GTGCAGGGTCCGAGGT
Sl. No.	miRNAs	Primer sequences
1	miR159-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACCTGCA
2	miR159-FP	GAATTTGCATGCCCCAGGA
3	miR171-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACGATA
4	miR171-FP	ATTATGATTGAGCCGCGCC
5	miR395-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACGAGT
6	miR395-FP	ATGTGTGAAGTGCTTGGGG
7	miR396-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACCTTC
8	miR396-FP	ATTGATGGTTCAAGAAAGCCCA
9	miR398-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACCAGG
10	miR398-FP	ATACTATTGTGTTCTCAGGTCG
11	miR399-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACCAGG
12	miR399-FP	GAATTGCTGCCAAAGGAGAATT
13	miR415-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACCTGC
14	miR415-FP	TAGTGACAACAGAACAGAAGCA
15	miR811-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACACGT
16	miR811-FP	GATCACCGTTAGATCGAGAAAT
17	miR812-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACCCGT
18	miR812-FP	AGACACGGATGATTAAAGTTGG
19	miR815-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACCCCA
20	miR815-FP	GCATAAGGGGATTGAGGAG
21	miR1433-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACGGTA
22	miR1433-FP	TATTATATGGCAAGTCTCCTCG
23	miR1875-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACCTCT

24	miR1875-FP	ATGTACAATGGAGTGAAGTGCA
25	miR3980-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACCCCT
26	miR3980-FP	ATATATTAATCGACGGCCTCAG
27	miR5076-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAACAAAC
28	miR5076-FP	ATCGAAATGGGAGCAGAGC
29	miR5082-SL	GTTGGCTCTGGTGCAGGGTCCGAGGTATTCGCACCAGAGCCAAGTAA
30	miR5082-FP	TGCGATGATGGCCGCGCG
	Target gene	Primer sequences
1	MYB-TF	GCCAGACGCTACAGCAGATTC
2	MYB-TR	CGGGCAATAGAGATGACAAAAAG
3	GRAS-TF	TCATGATTCCTACACCATTTGCA
4	GRAS-TR	CATACCAAGATTGCCAAATCCA
5	CYTB-TF	ACACTCCAGTAATCCCCATTGC
6	CYTB-TR	GGGAATAAACCCAGGTGATC
7	GRF-TF	TGAGCATTTACCTCGGTGCTT
8	GRF-TR	GCCACAATGGAGTACCAAATCC
9	ZSD-TF	TTCGCTCGTATGGATGTTGAAA
10	ZSD-TF	TGTTCGGACAGGAGTATAGCACATAT
11	UCE-TF	TGTGTATGTACTGTATATGTGCAAGCTTT
12	UCE-TR	TAACTGACCACAAACCCAACCA
13	RP-TF	TTGATCGGGACGGAGCATAT
14	RP-TR	AACACAGCCATGTCTAGAACAACCT
15	CDP-TF	GGCATGTCTGAAGAAAATATTCCA
16	CDP-TR	CCTCAAATACATCTGATCTCTCTCTT