





# Department of Primary Industries





## Small Tree - High Productivity Initiative Molecular achievements

11th Annual Mango Conference May 2<sup>nd</sup> - 5<sup>th</sup> 2017





## **Objectives of Molecular Team**

Improve the genetic resources for small trees

Identifying the genes involved

Monitoring gene expression on collected samples

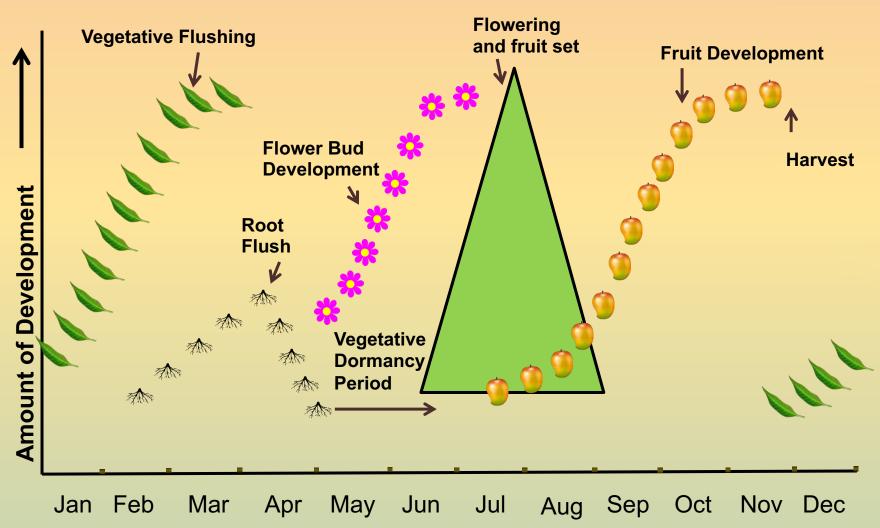
Correlating phenology with physiological switches

To understand the genetic and physiological regulation of:

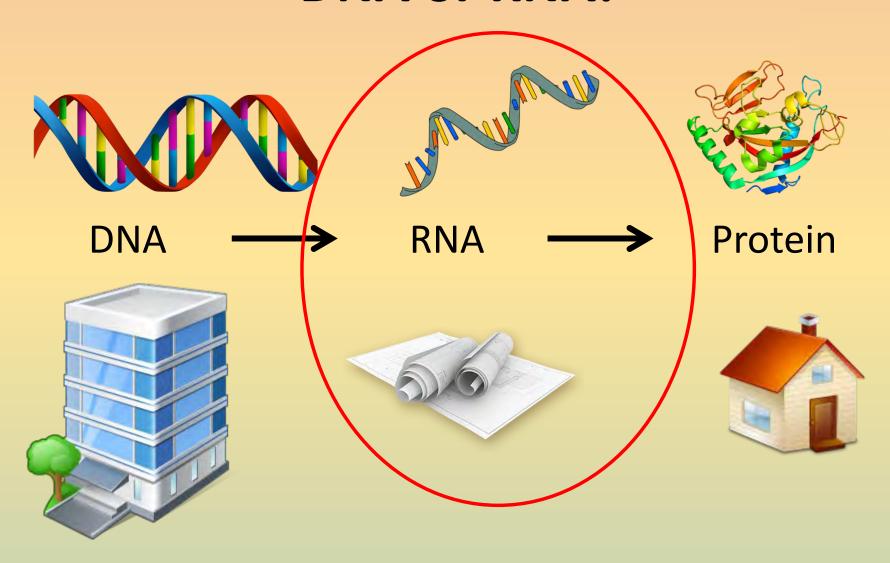
- Floral initiation
- Shoot architecture
- Juvenility

### **Objectives of Molecular Team**

Mango Phenology Cycle



### **DNA or RNA?**



Sample ID	Barcode #	Sample Name	Original Vial size	Sample date	Tissue type	Rosanna's notes (if applicable)	Grinding date
56	24056	Man_S_1243_R34T23_TBS_9.1	8 ml tube	9/2/2014	Terminal bud swelling		
57	24057	Man_S_1243_R34T23_ABD_9.1	8 ml tube	9/2/2014	Axillary bud dormant		-
58	24058	Man_S_1243_R34T23_PE1(preAF)_9.1	8 ml tube	9/2/2014	Panicle elongation Stage 1pre-anthesis flowers		
65	24065	Man_S_1243_R34T23_TBD_10.1	8 ml tube	9/16/2014	Terminal bud dormant	-()-	
66	24066	Man_S_1243_R34T23_ABD_10.1	8 ml tube	9/16/2014	Axillary bud dormant		
76	24076	Man S 1243 R34T23 ABD 11.1	8 ml tube	9/30/2014	Axillary bud dormant		
77	24077	Man_S_1243_R34T23_TBS_11.1	8 ml tube	9/30/2014	Terminal bud swelling		
78	24078	Man_S_1243_R34T23_PE1(PB)_11.1	8 ml tube	9/30/2014	Panicle elongation Stage 1panicle branchlets	-1	
4	24004	Man S 1243 R34T23 YSI 1.1	50 ml tube	2/18/2014	Young stem internode		
5	24005	Man_S 1243_R34T23_MSI_1.1	50 ml tube	2/18/2014	Mature stem internode		
15	24015	Man S 1243 R34T23 MSI 2.1	50 ml tube	3/20/2014	Mature stem internode		
20	24020	Man_S_1243_R34T23_MSI_3.1	50 ml tube	4/29/2014	Mature stem internode		
25	24025	Man_S_1243_R34T23_MSI_4.1	50 ml tube	5/27/2014	Mature stem internode		
30	24030	Man S 1243 R34T23 MSI 5.1	50 ml tube	6/24/2014	Mature stem internode		
35	24035	Man S 1243 R34T23 MSI 6.1	50 ml tube	7/7/2014	Mature stem internode		
47	24047	Man S 1243 R34T23 MSI 8.1	15 ml tube	8/6/2014	Mature stem internode		
64	24064	Man S 1243 R34T23 MSI 10.1	15 ml tube	9/16/2014	Mature stem internode		
74	24074	Man S 1243 R34T23 MSI 11.1	15 ml tube	9/30/2014	Mature stem internode		
79	24079	Man S 1243 R34T23 fruits 5-10mm_11.1	8 ml tube	9/30/2014	Fruits 5-10 mm		
1	24001	Man S 1243 R34T23 MLS 1.1	50 ml tube	2/18/2014	Mature leaf (Sun)		8/20/2015
2	24002	Man S 1243 R34T23 MLSh 1.1	50 ml tube	2/18/2014	Mature leaf (Shade)		8/20/2015
3	24003	Man S_1243 R34T23 YF_1.1	50 ml tube	2/18/2014	Young leaf flush	11	8/20/2015
6	24006	Man S 1243 R34T23 ABD 1.1	15 ml tube	2/18/2014	Axillary bud dormant		8/21/2015
7	24007	Man S 1243 R34T23 ABS 1.1	15 ml tube	2/18/2014	Axillary bud swelling		8/21/2015
8	24008	Man S 1243 R34T23 ABB 1.1	15 ml tube	2/18/2014	Axillary bud burst		8/21/2015
10	24010	Man S 1243 R34T23 TBS 1.1	15 ml tube	2/18/2014	Terminal bud swelling		8/21/2015
13	24013	Man S 1243 R34T23 YF 2.1	50 ml tube	3/20/2014	Young leaf flush		8/20/2015
14	24014	Man S_1243 R34T23 YSI 2.1	15 ml tube	3/20/2014	Young stem internode		8/21/2015
16	24016	Man S 1243 R34T23 ABD 2.1	15 ml tube	3/20/2014	Axillary bud dormant		8/21/2015
17	24017	Man_S_1243_R34T23_TBS_2.1	15 ml tube	3/20/2014	Terminal bud swelling		8/21/2015
18	24018	Man S 1243 R34T23 MLS 3.1	50 ml tube	4/29/2014	Mature leaf (Sun)		8/20/2015
19	24019	Man S 1243 R34T23 MLSh 3.1	50 ml tube	4/29/2014	Mature leaf (Shade)		8/20/2015
22	24022	Man S 1243 R34T23 TBD 3.1	10 ml tube	4/29/2014	Terminal bud dormant		8/21/2015
23	24023	Man S 1243 R34T23 MLS 4.1	50 ml tube	5/27/2014	Mature leaf (Sun)		8/20/2015

### The output

Mango\_assembly - Notepad File Edit Format View Help path=[2367:0-109 3487:110-163 4173:164-232]AAAAAAACAAAATTAATGCAGGTCTTAAACAATTGCATTAATTCTCAAATGGACAAGATACAGATACTCTTGAAATTAAATATAGTGCTCAGTGGACAAGCAGGTTACATAATAGGTATGG TCGGTTAGCTGGTAGCACTGAGTTGGAACAATAGGAGAGACTATCCCATTTGCCATTTGATCACATAATAAGTATGGTCAGTTAGCTGGTAGCATTGAGATCCCGGCCGTAA>comp2 c0 seg1 len=510 path=[1625:0-509] GAACCTCGAAGAGCAAGCCGCTGCTCACCGTGCTAAGAACCAAGCTCGCCGTGAGAGACGTTCAAAGAAGGTCGCTGAGAGAGTTCGCAGAAGATGTCGCTGAGAAGACTCGGCGTGAAGAAGCTCAAGACCCCAAGACCAAGACCCCAAGACCAAGACCCAAGACAATA>comp2 c1 seg1 len=330 path=[2123:0-329] TACCAAGGAGGCCAGAACTCCCCAGAAGATTCTGTGGATCAGAAGACAAAGAGTCCTTAGAAGACTCCTCAGAAAGTTATAGAGCTGCCAAGAAAATCGATAAGCATTTATACCATTACTCTCTCCAGCAAGGGTAACCAATTCAAGAACAAGAGACTCCTGATTGAAGCTATTCA ATTGTTTTCATCTTTTGTTTTATTTTCTCCCCAACATTTCAAATGGAAATGCTGGGGGAAGTTTCACTAAATTGCAGTGAGAATTGTTTTATTGTCAAGGCTTCTATCTGGTAGAATAGATGAAGAATGCATAAAGTTTGAGAATACGTGGGGAAGTTTCACTAAATTGCTC TGCTCCCTCTTGATTTTTTAGGGAGCATCTGACTCTTGGAAC>comp4 c0 seg1 len=249 path=[745:0-59 1768:60-104 1057:105-248]TTTAGAGGTATTATACATGGGAGGAATCAGATTAACAAAATCGTATTCTCAAAAGGTGA AACGCCAACGGGATGAGGGTGGTCGCCTTGAACTTTAGGCCGATGAGGAAGGGCATGACGACGCGTTTCAAGAATTTTCTACTTCTGCCTGTCACTTGACCATCGCCAGCGGCATCCCAATCCGCCAGCGGCATCCCAATCCGCCAGCGGCATCCCAATCCGCCAGCGGCATCCCAATCCGCCAGCGGCAATCTCAATCTCTAGCCCTTGAACTTTCAGCACACTCCAATCCGCCAGCGGCATCCCAATCCGCCAGCGGCATCCCAATCCGCCAGCGGCATCCCAATCCGCCAGCGGCATCCCAATCCGCCAGCGGCAATCTCAATCCTCAATCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCCAATCA GTATTGTAATATTAGTGGAAGGTTTTCTGGTCATGAATTGTTTGCGTTCAATAATTTGACAGAGGTTAAAAATCAGTTACACTATTATTCGCTACAACTTTCTTCAAATGCTTGGAGCCATGAATTCTCTTGAGTCATACAAATATGGGATAGCAACACTCTCAACGACACTCTGTTTGATCA AGAATTGCCTACTTTCAAGAATTTGACATATTTA>comp7 c0 seq1 len=339 path=[5013:0-115 6627:116-139 14372:140-338]CGCGAGAAGCTCAACGCCAAGTCCAAGGGCCATGGGCGGAAAGGAGGTCAAAGGACCA GACGAAGACGACATCGAGCACGCTACCGTTCTTAACAAGGTCAGCAAGGGCTTAGCCTAGCGTAGCCTAGCGTAGCACAAAACACAAATCTAGATAAGCACGTGTTGGA>comp7 c0 seg2 len=716 path=[11341:0-338 6627:339-362 6760:363-715] GTCACCGGATGATGCCGGGTGTTATGGCCAAGATGGTGTACGCCTCCTCAAGGGAAGCCCTCAAGCGATCACTAACTGGCATCACTAACCACCAAGACGACCATGAGTACGACCAAGACGACCATTGAGTACGACCAAGATGGTACGACCAAGGGTCTTGCTTAAGGAATATACCACCAAATCAA TCTATCCCACTACGTGGATTGAAGATGTCATCCACTTTCGTTGGAAACAGCACTGCAATCCAAGCGCTGTTGGTGAC>comp9 c0 sea1 len=286 path=[2030:0-104 2380:105-131 2463:132-155 4669:156-213 2739:214-285] ACTITIGGGCTGGATGTGGACGTTCCGCGAAGGCGCCCTCCGGCTACGATCGGTCTTCTGCAGAGGAATGTTCACTTCCTCCGCGCGAATGAAAGGCTTGTTGAAGACGGAGGGCTGCGAGGACGGTTGTTGCTGCTGCAGGCAACTGAGCTAATGGTCTGAGACTCGG TTGGAAGGATTGTGGCGTTGGTGAAGCCGGTAATGGCCTCGGACGACTACGGTGCCACGTGTGACTGTTGCGACGGGGGTGGACGCTGCTGGAAGCCCGGCGCGTA>comp10 c0 seg1 len=411 path=[4866:0-104 6637:105-410] TCCTTTTTTCCTCATTCGTTAAATTACAGTGTATCTAGTGTTCTGCATGGA>comp11 c0 seq1 len=225 path=[5730:0-114 6132:115-224]TGCCTATGGGCCCTGCTGCAATGGTATTGTCTAAGACGCTCTAGTATGAGTTTATTCTTA [5969:0-95 6279:96-219]GTTTGTTTTTAACAAATTTGATAATCCTTTAACCCCACCATATAGCTCTAAAGCTGCAAAATTATGATCTCTGGTCATTGAAGCAAGTTGTTCAAGTCCGATACCATAATCACCACCAGA TGTTGGTGGCAAAGCAATATTACCTAAGATCAAATAAGTCCTCAACATATAAGAGGTGAAAATTCAATTTATGCAACATCAACGACGATATACAAAATAG>comp13 c0 seq1 len=244 path=[6883:0-243] GTGACGCGGCTCGTAACGTCAAACATGAGAATGGCGCACTGGCCCTAATGTAGCAATCACG>comp14 c0 seq1 len=318 patha ACCCTTGTACTCCATTCCCCACTTCAGCTTGACGATAATCTGCTGTCCGGTCAAGTCGT TCAGGAACGGCTTCGGGTTGACGGGCACGTTCGCGGCCATGCTCGCAGGTTTCTAGCTGCAGCTCCCACGAGAGATCTGAATCGCGCTCC TCAGAGGAATAGCTGGGACGTTATTTCCGTCTACAACGAAGAGAACGACCAAGGCTGAAATCCAGGCTCGA CGAAGTGGTTTGTCAGGCAATTGGTACGGGCGCCTCAGCGACAGGGTGAACGACCACGAACGCCCCCGCGGCCGTAAT>comp16 c0 R95:0-125 10246:126-271]TTACGGCCGCGGGGTTTAGGGCAGAAGACGTACTTTCCTGAGGCCTTAATGTTGCGAGAG CCGCCAAACCCGTGCATGGCGGAGGCCAGGAAGGAGGCTGAGGTGGTGATGTTTGGAGCTATTGATCAGCTGTTGGCGAAAACTGGC CTTATGGTGAATTGCAGCTTGTTTAATCCAACTCCATCTCTGTCCGCCATGATCGTTAATCACTATAAG

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### The genes

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### >AT1G01060 | LHY

MDTNTSGEELLAKARKPYTITKQRERWTEDEHERFLEALRLYGRAWQRIEEHIGTKTAVQIRSHAQKFFTKLEKEAEVKGIPVCQALDIEIPPPRPKRKPNTPYPRKPGNNGTSSSQVSSAKDAKLVSSASSSQLNQAFLDLEKMPFSEKTSTGKENQDENCSGVSTVNKYPLPTKQVSGDIETSKTSTVDNAVQD VPKKNKDKDGNDGTTVHSMQNYPWHFHADITVNGNIAKCPQNHPSGMVSQDFMFHPMREETHGHANLQATTASATTTASHQAFPACHSQDDVRSFLQISSTFSNLIMSTLLQWPAAHAAATFAASVWPYASVGNSGDSSTPMSSSPPSITAIAAATVAAAATAWWASHGLLPVCAPAPITCVPFSTVAVPTPAMTEMD TVENTQPFEKQNTALQDQNLASKSPASSSDDSDETGVTKLNADSKTNDDKIEEVVVTAAVHDSNTAAQKKNLVDRSSCGSNTPSGSDAETDALDKMEKDKEDVKETDENQPDVIELNNRKIKMRDNNSNNNATTDSWKEVSEEGRIAFQALFARERLPQSFSPPQVAENVNRKQSDTSMPLAPNFKSQDSCAADQEG VVMIGVGTCKSLKTRGTGFKPYKRCSMEVKESOVGNINNOSDEKVCKRLRLEGEASTSATIG04400 | ICRY2

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DSETTDVNTKVIYSKLNDLKIDGIQELEAVTSEMVRLIETATVPILAVDSDGLVNGWNTKIAELTGLSVDEAIGKHFLTLVEDSSVEIVKRMLENALEGFEQNVQFEIKTHLSRADAGPISLVVNACASRDLHENVVGVFVAHDLTGQKTVMDKFTRIEGDYKAIIQNPNPLIPPIFGTDEFGWCTEWNFAKK
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TGKPFYAILHRIDVGVYIDLEPARTEDPALSIAGAVQSQKLAVRAISQLQALPGGDIKLLCDTVVESVRDLTGYDRVMYVFHEDEHGEVVAESKRDDLEPYIGLHPPATDIPQASRFLFKQNRVRMIVDCNATPVLVVQDDRLTQSMCLVGSTLRAPHGCHSQYMANMGSIASLAMAVIINGNEDDGSNPRSSGRS
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L A IK

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Mango\_assembly - Notepad File Edit Format Vis

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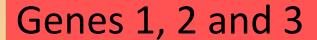
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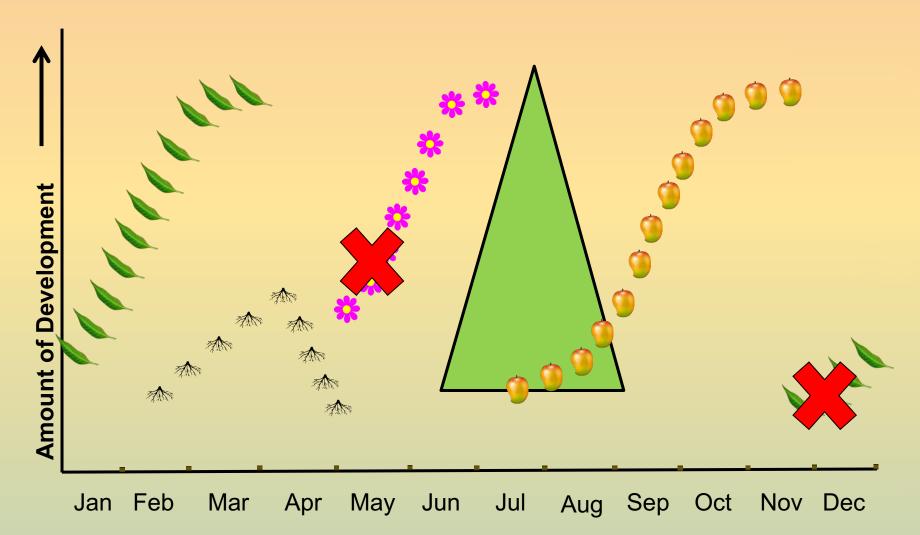
Sample ID	Barcode #	Sample Name	Original Vial size	Sample date	Tissue type	Rosanna's notes (if applicable)	Grinding date
56	24056	Man_S_1243_R34T23_TBS_9.1	8 ml tube	9/2/2014	Terminal bud swelling		
57	24057	Man_S_1243_R34T23_ABD_9.1	8 ml tube	9/2/2014	Axillary bud dormant		
58	24058	Man_S_1243_R34T23_PE1(preAF)_9.1	8 ml tube	9/2/2014	Panicle elongation Stage 1pre-anthesis flowers		
65	24065	Man_S_1243_R34T23_TBD_10.1	8 ml tube	9/16/2014	Terminal bud dormant	1	
66	24066	Man_S_1243_R34T23_ABD_10.1	8 ml tube	9/16/2014	Axillary bud dormant	100	
76	24076	Man_S_1243_R34T23_ABD_11.1	8 ml tube	9/30/2014	Axillary bud dormant		
77	24077	Man_S_1243_R34T23_TBS_11.1	8 ml tube	9/30/2014	Terminal bud swelling		
78	24078	Man_S_1243_R34T23_PE1(PB)_11.1	8 ml tube	9/30/2014	Panicle elongation Stage 1panicle branchlets		
4	24004	Man S 1243 R34T23 YSI 1.1	50 ml tube	2/18/2014	Young stem internode		
5	24005	Man_S_1243_R34T23_MSI_1.1	50 ml tube	2/18/2014	Mature stem internode		
15	24015	Man S 1243 R34T23 MSI 2.1	50 ml tube	3/20/2014	Mature stem internode		
20	24020	Man S 1243 R34T23 MSI 3.1	50 ml tube	4/29/2014	Mature stem internode		
25	24025	Man_S 1243 R34T23 MSI 4.1	50 ml tube	5/27/2014	Mature stem internode		
30	24030	Man S 1243 R34T23 MSI 5.1	50 ml tube	6/24/2014	Mature stem internode		
35	24035	Man S 1243 R34T23 MSI 6.1	50 ml tube	7/7/2014	Mature stem internode		
47	24047	Man S 1243 R34T23 MSI 8.1	15 ml tube	8/6/2014	Mature stem internode		
64	24064	Man S 1243 R34T23 MSI 10.1	15 ml tube	9/16/2014	Mature stem internode		
74	24074	Man S 1243 R34T23 MSI 11.1	15 ml tube	9/30/2014	Mature stem internode		
79	24079	Man S 1243 R34T23 fruits 5-10mm 11.1	8 ml tube	9/30/2014	Fruits 5-10 mm		
1	24001	Man S 1243 R34T23 MLS 1.1	50 ml tube	2/18/2014	Mature leaf (Sun)	()	8/20/2015
2	24002	Man S 1243 R34T23 MLSh 1.1	50 ml tube	2/18/2014	Mature leaf (Shade)		8/20/2015
3	24003	Man S 1243 R34T23 YF 1.1	50 ml tube	2/18/2014	Young leaf flush	11	8/20/2015
6	24006	Man S 1243 R34T23 ABD 1.1	15 ml tube	2/18/2014	Axillary bud dormant		8/21/2015
7	24007	Man S 1243 R34T23 ABS 1.1	15 ml tube	2/18/2014	Axillary bud swelling		8/21/2015
8	24008	Man S 1243 R34T23 ABB 1.1	15 ml tube	2/18/2014	Axillary bud burst		8/21/2015
10	24010	Man S 1243 R34T23 TBS 1.1	15 ml tube	2/18/2014	Terminal bud swelling		8/21/2015
13	24013	Man S 1243 R34T23 YF 2.1	50 ml tube	3/20/2014	Young leaf flush		8/20/2015
14	24014	Man S_1243 R34T23 YSL 2.1	15 ml tube	3/20/2014	Young stem internode		8/21/2015
16	24016	Man_S_1243_R34T23_ABD_2.1	15 ml tube	3/20/2014	Axillary bud dormant		8/21/2015
17	24017	Man_S_1243_R34T23_TBS_2.1	15 ml tube	3/20/2014	Terminal bud swelling		8/21/2015
18	24018	Man S 1243 R34T23 MLS 3.1	50 ml tube	4/29/2014	Mature leaf (Sun)		8/20/2015
19	24019	Man S_1243 R34T23 MLSh_3.1	50 ml tube	4/29/2014	Mature leaf (Shade)		8/20/2015
22	24022	Mai: 0 4243 R34723 TDD 3.4	10 ml tube	4/20/2014	Terminal bod dormant		0/21/2015
23	24023	Man S 1243 R34T23 MLS 4.1	50 ml tube	5/27/2014	Mature leaf (Sun)		8/20/2015



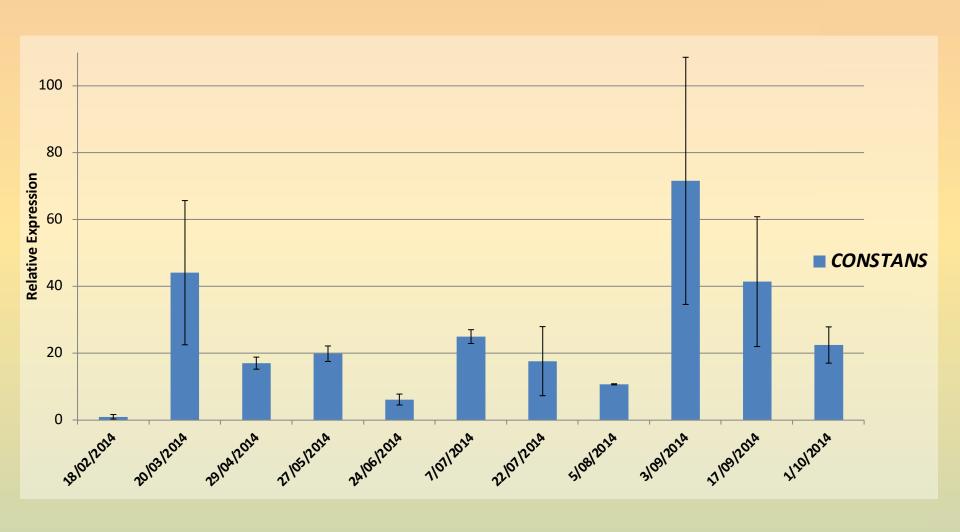


### Genes 4, 5 and 6

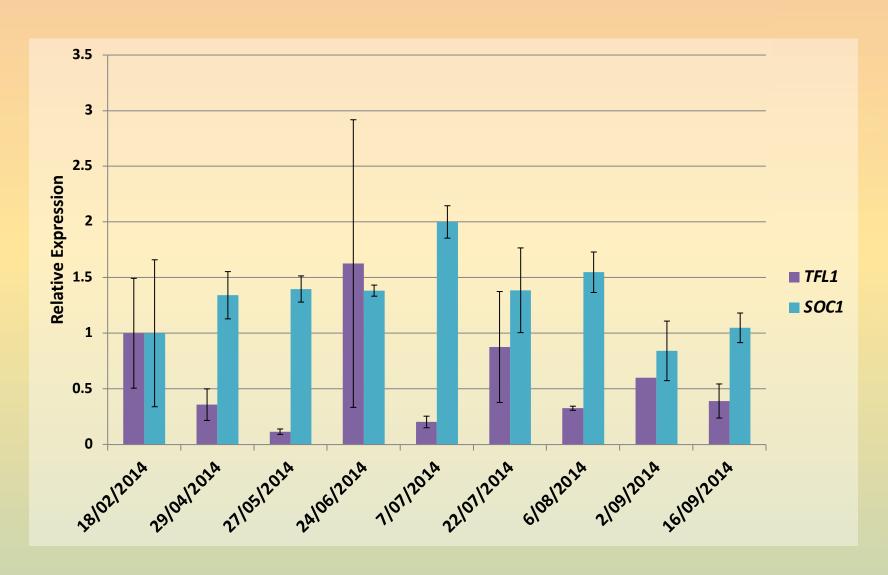




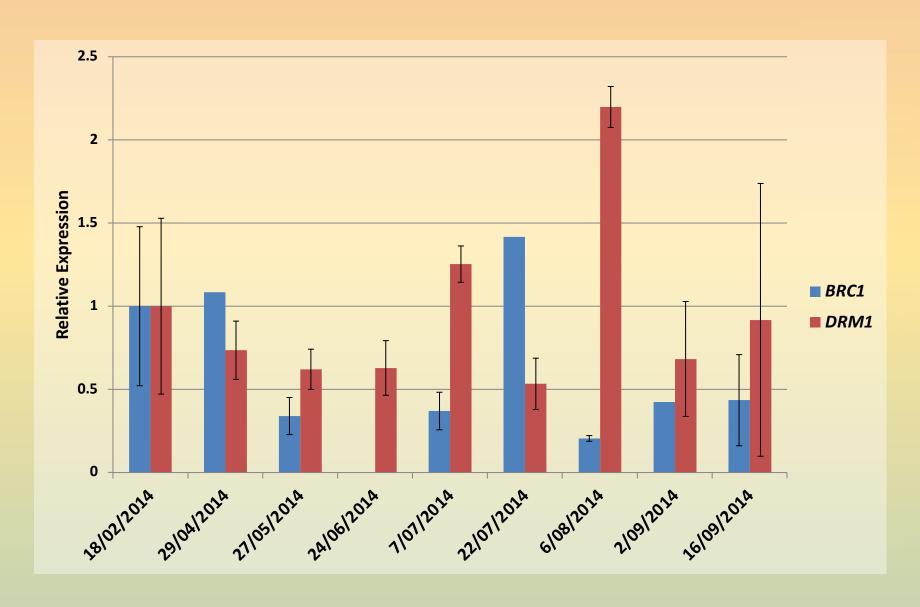
## **Axillary Bud Dormant – Year 1**



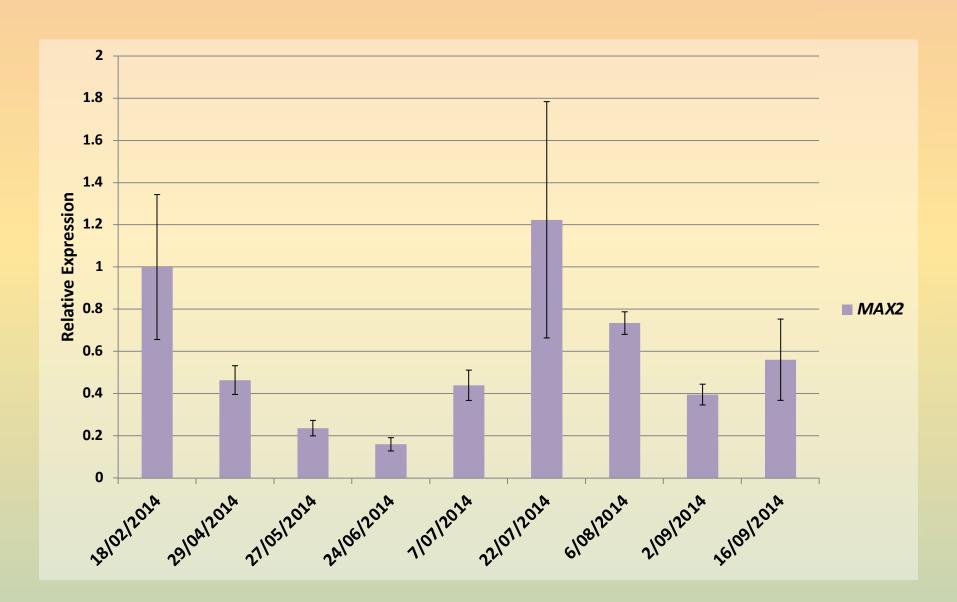
### **Terminal Bud Dormant – Year 2**



### **Terminal Bud Dormant - Year 2**



### Terminal Bud Dormant - Year 2



# Thank you

**Christine Beveridge** 

Neena Mitter
Ralf Dietzgen
Bernie Carroll
Milos Tanurdzic
François Barbier
Alice Hayward
Umair Ahsan
Rosanna Powell

