SUMMARY OF QTL MAPPING EXPERIMENTS

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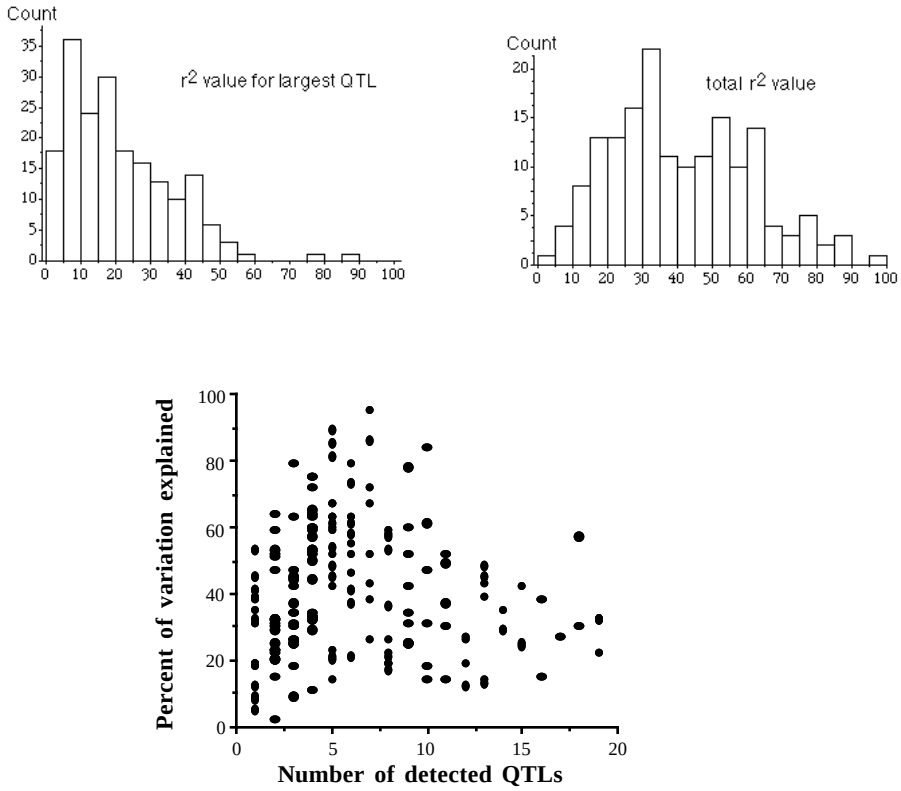

Figure 1. Summary of all the QTL experiments listed in Table 1 plus additional studies on maize (Reiter et al. 1991, Zehr et al. 1992, Sari-Gorla et al. 1992, Freymark et al. 1993, Pè et al. 1993, Schön et al. 1994, Veldboom et al. 1994). **Top Left:** Distribution of r^2 values for the QTL of largest effect. **Top Right:** Distribution of the total effects accounted for by all detected QTLs. **Bottom:** Joint distribution of total effects and QTL number.

Table 1. Estimated QTL effects from inbred line crosses. Sample sizes are given in front of the type of cross. $F_{2:x}$ implies the F_2 was selfed until generation x, RI = recombination inbred lines, NIL = nearly isogenic lines, DH = doubled haploids. For many (but not all) experiments, $F_{2:3}$ implies marker scoring on the F_2 but trait scoring in= selfed families from these individuals. m is the number of markers used. Max, min, and total refer to the percentage of phenotypic variation accounted for by the largest and smallest detected QTL, and the total contribution of all detected QTLs. Depending on the study, these were obtain by either regression/ ANOVA (AN) or ML interval mapping (ML). Values in parenthesis imply these percentages refer to genetic, rather than phenotypic, variance. QTL numbers with * implies that multiple linked markers were used, so that the number of significant marker-trait associations may have counted that same QTL linked to several markers.

Species/Cross Character	Number of QTLs	% Phenotypic Var Max	 Min	 Total	
Tomato (*Lycopersicon esculentum*):	*L. esculentum* × *L. chmielewskii*				
Soluble solids	4			44	Paterson et al. 1988
Fruit mass	6			58	237 $F_1 \times P_1$; m: 70; ML
Fruit pH	5			48	
L. esculentum × *L. cheesmanii*					Paterson et al. 1991
Soluble solids	7	28	6	44	350 $F_{2:3}$; m: 71; ML
Fruit mass	13	42	4	72	
Fruit pH	9	28	4	34	
Soluble solids	7	28	6		Goldman et al. 1995
Fruit mass	13	42	4		97 $F_{2:8}$ RI; m: 132; AN
Fruit pH	9	28	4		
L. esculentum × *L. pennellii*					deVicente and Tanksley 1993
Dry weight	5	7	3	21	432 F_2; m: 98; ML
Leaf shape	9	30	3	60	
height	9	8	3	42	
Days to leaf	3	13	3	18	
Days to Flower	7	8	3	43	
Number of Buds	10	34	3	61	
Number stem internodes	5	7	5	23	
Total number of internodes	9	13	4	52	
Number of branches	8	10	3	53	
Stem diameter	7	6	3	26	
Plant weight	16				Eshed & Zamir 1995
% Green fruit	22				49 NIL; m: 375; AN
Fruit mass	18				
Soluble solids	23				
Yield	11				
Soluble solids yeild	14				
Maize (*Zea mays*):	Maize × Teosinte (*Z. m. mexicana*)				Doebley & Stec 1991
Cupules/rank	6	24	5	52	260 F_2; m: 58; ML
Disarticulation score	4	26	7	60	
Glume score	5	44	5	72	
Internode lenght	5	30	7	63	
Leaf lenght	8	20	5	57	
Number of branches	5	43	11	54	
Pedicellate spikelets	7	46	5	95	
Height	7	43	5	67	
Number of ears	4	20	6	34	
Number of rows of cupules	7	78	5	86	
Staminate score	5	27	8	59	
Kernel weight	4	31	9	69	Doebley et al. 1994

Maize × Teosinte (*Z. m. parviglumis*)					Doebley & Stec 1993
Cupules/rank	6	25	4	61	290 F_2; m: 82; ML
Disarticulation score	6	42	4	60	
Glume score	2	41	8	75	
Internode lenght	5	45	5	63	
Number of branches	4	24	4	42	
Pedicellate spikelets	5	25	8	69	
Number of ears	7	25	4	63	
Number of rows of cupules	6	36	5	87	
Staminate score	5	23	5	52	
Kernel weight	6	34	4	70	Doebley et al. 1994
Ilinois High Protein × Ilinois Low Protein					Goldman et al. 1993
Protein Concent.	10			>84	100 $F_{2:3}$; m: 100; AN
Starch Concentration	9			>78	
Kernel weight	10			>47	Goldman et al. 1994
Oil Concentration	13			>43	100 $F_{2:3}$; m: 100; AN
Ilinois High Oil × Ilinois Low Oil					Berke & Rocheford 1995
Plant Height	8			22	200 $F_{2:3}$; m: 80
Anthesis date	11			49	
Ear Height	8			36	
Kernel weight	11			30	
Protein Concentration	8			19	
Oil Concentration	11			52	
Starch Concentration	13			45	
Elite lines B73 × Mo17					Stuber et al. 1992
Yield	6	18	6	61	264 $F_{2:3}$ × P1; m: 76; ML
Yield	8	14	6	59	264 $F_{2:3}$ × P2; m: 76; ML
T232 × CM37					Edwards et al. 1987
Yeild	18*	5	.3	30	1930 F_2; m: 20; AN
Top ear weight	19*	9	.2	32	
2nd ear weight	12*	7	.3	19	
Ear lenght	19*	4	.3	22	
Number of kernel rows	17*	5	.3	27	
Number of kernels	15*	5	.3	25	
Number of Leaves	15*	10	.4	24	
Leaf weight	14*	6	.4	29	
Silk date	13*	13	.4	39	
Stalk weight	19*	7	.4	32	
Kernel thickness	16*	2	.3		Stuber et al. 1987
Kernel width	13*	3	.3		1930 F_2; m: 20; AN
Kernel volume	13*	3	.5		
Grain index	8*	2	.4		
Pollen tube growth rate	5	27	10	89	Sari-Gorla et al. 1992
Pollen germinability	6	21	10	79	45 RI; m: 200; AN
CO159 × Tx303					Edwards et al. 1987
Yeild	13*	4	.6	14	1776 F_2; m: 17; AN
Top ear weight	13*	5	.7	13	
Second ear weight	11*	4	.4	14	
Ear lenght	10*	4	.4	14	
Number of kernels/rows	12*	4	.5	12	
Number of kernels	16*	4	.4	15	
Number of Leaves	12*	16	.3	26	
Leaf weight	12*	15	.5	27	
Silk date	11*	16	.4	37	
Stalk weight	8*	15	.5	26	
Kernel thickness	13*	2	.5		Stuber et al. 1987
Kernel width	10*	3	.5		1776 F_2; m: 17; AN

Kernel volume	9*	2	.4		
Grain index	9*	3	.4		
BS11(FR)C7 × FRMo17					Zehr et al. 1992
Plant Height	9	7	2	25	220 F_2 × P2; m: 34; AN
Ear height	6	7	2	21	
Grain moisture	13	7	2	48	
Stalk lodging	9	8	2	31	
Root lodging	8	7	2	19	
Plant height	9	7	2	25	
Yeild	15	7	2	42	
Maturity	8	4	2	17	
Ear lenght	10	5	2	31	
Ear diameter	8	11	2	21	
Kernel depth	5	6	2	14	
Kernel rows	3	4	2	9	
Grain weight	10	4	2	18	
100 kernal weight	4	4	2	11	
C7-343 × C7-351					Ragot et al. 1995
Days to pollen shed	2	11	5		387 F_2; m: 46
Ear number	3	35	7		
Ear height	4	14	9		
Yeild	5	27	6		
Grain moisture	3	36	4		
Leaf area	5	13	4		
Leaf number	4	13	5		
Plant height	2	12	7		
B52 (susceptible) × Mo17 (partly resistent)					Freymark et al. 1993
Measures of Northern Corn Blight resistence:					150 $F_{2:3}$; m: 103; ML
Ave. Number of lesions/leaf	3	13	7	30	
Percent leaf infected	5	13	8	45	
Ave. lesion size	2	18	12	29	
Elite lines KW1265 × D146					Schön et al. 1994
Protein content	4	20	4	32	380 $F_{2:3}$ × KW4115; m: 89
Yeild	8	18	4	58	
Plant height	7	18	4	52	
Protein content	5	13	6	42	380 $F_{2:3}$ × KW5361; m: 89
Yeild	6	20	4	55	
Plant height	4	33	5	60	
Elite lines Mo17 × H99					Veldboom et al. 1994
Days to anthesis	6	34	6	63	150 $F_{2:3}$; m: 130; ML
Days to silk emergence	5	53	8	81	
Silk delay	2	18	16	31	
Ear height	5	28	6	61	
Plant height	5	40	6	67	
NY821 (tolerant) × H99 (intolerant)					Reiter et al. 1991
Tolerance to Phosp. stress	6	25		>46	90 $F_{2:3}$; m: 77; AN
Elite lines B73 × 47					Ajmore-Marsan et al. 1995
Yield	2	17	12	22	232 $F_{2:3}$ × Mo17; m: 72
Dry matter content	2	15	12	23	
Test weight	6	17	6	41	
Yeild	3	11	6	25	232 $F_{2:3}$ × A1; m: 72
Dry matter content	2	16	7	23	
Test weight	2	20	9	25	
B73 (susceptible) × B52 (resistant)					Schön et al. 1993
Corn Borer resistence	7	16	3	38	300 $F_{2:3}$; m: 87
Plant Height	3	34	10	63	

NC250A (partially resistant) × B73					Bubeck et al. 1993
Gray Leaf spot resistence	15	15	2		337 $F_{2:3}$; m: 87
B73 × Mo17					Beavis et al. 1991
Plant height	6			73	112 $F_{2:4}$; m: 148; ML
B73 × G35					Beavis et al. 1991
Plant height	4			53	112 $F_{2:4}$; m: 106; ML
K05 × W65					Beavis et al. 1991
Plant height	3			34	144 $F_{2:4}$; m: 78; ML
J40 × V94					Beavis et al. 1991
Plant height	3			45	144 $F_{2:4}$; m: 68; ML
B89 (partly resistent) × 33-16 (susceptible)					Pè et al. 1993
Ear Rot resistance	5	9	4	20	150 $F_{2:3}$; m: 105; ML

Sorghum (*Sorghum bicolor*): *Sorghum bicolor* × *S. propinquum*

Flowering time	3	86	4		Lin et al. 1995
Plant Height	6	55	5		370 F_2; m: 71; ML
Sorghum bicolor bicolor × *S. b. drummondii*					Pereira and Lee 1995
Plant height	4	29	9	63	152 F_2; m: 111; ML

Pearl millet (*Pennisetum glaucum*)

LGD-1-B-10 (susceptible) × ICMP 85410 (resistant)					Jones et al. 1995
Downy mildew resistence:					93-119 $F_{2:4}$; m: 22; ML
India strain	4	40	9	65	
Senegal strain	3	33	12	34	
Niger strain	2	29	8	32	
Nigeria strain	2	47	10	49	

Barley (*Hordeum vulgare*): Igri × Danilo					Backes et al. 1995
Fungal resistence	5			(52)	250 DH; m: 50; ML
Lodging	3			(26)	
Stem breaking	4			(33)	
Ear breaking	3			(44)	
Plant height	4			(33)	
Kernel shape	1			(5)	
Kernel weight	2			(15)	
Kernel yield	3			(25)	
Powdery mildew restistence	1			(9)	
Proctor × Nudinka					Heun 1992
Powdery Mildew restistence	2	12	10	20	113 DH; m: 159; ML
Dicktoo (cold tolerent) × Morex (cold intolerent)					Hayes et al. 1993
Cold tolerance	2	40		51	100 DH; m: 8; AN

Wheat:

NY18 (moderate resistance) × Clark's Cream (susceptible)					Anderson et al. 1993
Rest. to perharvest sprouting	6	10	6	37 (44)	78 RIL; m: 105; AN
NY18 × NY10					138 RIL; m: 32; AN
Rest. to perharvest sprouting	4	11	7	29 (51)	

Rice (*Oryza sativa*): Lemont × Teqing					Li et al. 1995
Height	4	25	8	53	2418 F_4; m: 113; ML
Heading date	3	45	8	79	
Indica × japonica					Champoux et al. 1995
Root thickness	18	33	13	>57	203 RI; m: 127; AN
Root/Shoot ratio	16	22	9	>38	
Dry Root weight/tiller	14	34	21	>35	
Deep Root weight	8	17	6	>19	

Plant height	5	26	5		Xiao et al. 1995
Heading date	3	37	5		195 $F_{2:7}$ × P1; m: 141; ML
Days to maturity	2	42	17		
Panicle length	1	8			
Panicles per plant	1	18			
Spikelets per panicle	1	7			
Grains per panicle	2	9	6		
Percent seed set	1	6			
1000-Grain weight	3	12	6		
Spikelets per plant	3	7	5		
Grains per plant	3	6	6		
Yield	1	7			
Plant height	3	15	8		195 $F_{2:7}$ × P2; m: 141; ML
Heading date	3	13	8		
Days to maturity	2	10	6		
Panicle length	1	7			
Spikelets per panicle	1	7			
Grains per panicle	2	17	17		
Percent seed set	1	5			
1000-Grain weight	4	25	5		
Grains per plant	2	18	8		
Yield	1	6			

Soybean (*Glycine max*): *G. max* × *G. soja* — Keim et al. 1990b

Seed pod maturity date	5	21	18		60 $F_{2:3}$; m: 150; AN
First flower date	3	23	21		
Seed fill	1	18		18	
Stem diameter	3	24	17		
Stem lenght	1	19		19	
Leaf lenght	2	19	18		
Leaf width	3	24	16		
Canopy height	2	20	16		
Total oil	8*	42	12		Diers et al. 1992
Protein	9*	43	18		60 F_2; m: 252; AN

Resistant (M85-1430) × susceptible (M83-15) — Concibdio et al. 1994

Nematode restistance	2	40	21	52	56 F_2; m: 43; ML

Minsoy × Noir 1 — Mansur et al. 1993

Leaf area	2	25	20		69 F_5; m: 132; ML
Flowering date	3	22	18		
Initial seed date	2	25	19		
Seed pod maturity date	1	31		31	
Reproductive period	2	18	17		
Plant height	1	53		53	
Lodging score	1	45		45	
Canopy height	1	19		19	
Yeild	2	24	20		
Oil percentage	2	36	24		

Common bean (*Phaesolus vulgaris*)

BAT92 (low nodules, mod. resist.) × Jalo EEP558 (high nodules, susceptible)

Nodule number	4	17	11	52	Nodari et al. 1993
CCB reistance	4	32	13	75	70 $F_{2:3}$; m: 152; ML

Mung bean (*Vigna radiata*): Cultivar × Native — Fatokun et al. 1992

Seed weight	4	33		50	58 F_2; m: 104; ML

Cowpea (*Vigna unguiculata*): Cultivar × Native — Fatokun et al. 1992

Seed weight	2	37	33	53	58 F_2; m: 84; ML

Pea (*Pisum sativum*): Erygel (resistant) × 61 (susceptable) — Dirlewanger et al. 1994

Height	1	19		19	72 F_2; m: 69
Flowering time	4	42	15	59	
Number of nodes	4	43	10	57	
Number of nodes	4	45	14	75	102 F_2
Ascochyta blight resitance	5	46	13	67	102 $F_{2:3}$
Cucumber (*Cucumis sativus*):	GY14 ×P1432860				Kennard and Harvey 1995
Lenght	5			63	100 $F_{2:3}$; m: 69; ML
Diameter	3			47	
Cavity size	3			42	
Color	2			64	
Lenght/diameter	4			64	
Size/diameter	1	12		12	
Cabbage × **Broccoli** (*Brassica oleracea*)					Kennard et al. 1994
Internode length	3	21		31	90 F_2; m: 72; AN
Vernalization	3	24	12	37	
Days-to-flower	5	39	10	60	
Lamina lenght	3	20	8	26	
Lamina width	4	12	10	32	
Peiole lenght	2	16	12	32	
Cottonwoods: *Populus trichocarpa* × *P. deltoides*					Bradshaw and Stettler 1995
Height at year 2	1	(32)		(32)	55 $F_{2:3}$, m = 343; ML
Year 2 height increment	1	(35)		(35)	
Year 1 basal area	1	(41)		(41)	
Year 2 basal area	1	(38)		(38)	
Year 2 height/diameter ratio	1	(39)		(39)	
Spring bud Flush	5	(53)	(29)	(85)	
Honey bee (*Apis mellifera*):	High-pollen × Low-Pollen				Hunt et al. 1995
Foraging behavior	2	38	33	59	38 F1 × P1; m: 364
Mice: E1 (seizure prone) × ABP (normal)					Rise et al. 1991
Epilepsy	2			50	87 F1 × P1; m: 44; ML
Rats: Hypertensive × Normal					Jacob et al. 1991
Hypertension	2	19	11	30	115 F_2; m: 112; ML