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Association analysis of molecular markers with traits under drought stress in safflower

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Table S1. Origin of safflower genotypes used in this study

Number	Code	Origin	Number	Code	Origin
G1	CTNFR 2	France, Herault	G51	CTNMX 3	Mexico
G2	CTNRO 1	Romania	G52	CTNUS 1	United States, Nebraska
G3	CTNKE 1	Kenya	G53	CTNUS 2	United States, Nebraska
G4	CTNKE 2	Kenya	G54	CTNIN 1	India
G5	CTNTU 1	Turkey	G55	CTNIN 2	India
G6	CTNTU 2	Turkey	G56	CTNCH 1	Chaina
G7	CTNGE 1	Germany	G57	CTNCH 2	Chaina
G8	CTNGE 2	Germany	G58	CTNEG 1	Egypt
G9	CTNAU 1	Austria	G59	CTNEG 2	Egypt
G10	CTNAU 2	Austria	G60	CTNJO 1	Jordan
G11	CTNIT 1	Italy	G61	CTNPA	Palestine
G12	CTNIT 2	Italy	G62	CTNSL	Slowakei
G13	CTNHU	Hungary	G63	CTNGE	Germany
G14	CTNPO 1	Poland	G64	CTNRO	Romanie
G15	CTNPO 2	Poland	G65	CTNUS	USA
G16	CTNDE	Denmark	G66	CART 124	Pakistan
G17	CTNMO	Morocco	G67	CART 70	Libyen
G18	CTNSW	Switzerland	G68	CART 131	Paraguay
G19	CTNIRQ 1	Iraq	G69	CART 126	Belgian
G20	CTNIRQ 2	Iraq	G70	CART 55	Poland
G21	CTNGR	Greece	G71	PI 537652	Mexico
G22	CTNPOR 1	Portugal, Lisboa	G72	CART 70	Libyen
G23	CTNPOR 2	Portugal, Azores	G73	CART 49	Spania
G24	CTNAUL 1	Australia	G74	PI 657820	Jordan
G25	CTNAUL 2	Australia	G75	CART 83	Tajikestan
G26	CTNJP	Japan	G76	CART 132	Germany
G27	CTNKU	Kuwait	G77	CART 103	Canada
G28	CTNER 1	Eritrea	G78	PI 209287	Romania
G29	CTNER 2	Eritrea	G79	PI 532619	Cyprus
G30	CTNAR 1	Argentina	G80	PI 198843	France, Herault
G31	CTNAR 2	Argentina	G81	CART 79	Japan
G32	CTNSU 1	Sudan	G82	C111	Iran
G33	CTNSU 2	Sudan	G83	Iran- Arak 2811	Iran-Arak
G34	CTNIS	Israel	G84	Saffire	Canada
G35	CTNUZ 1	Uzbekistan	G85	AC-Sunset	Canada
G36	CTNUZ 2	Uzbekistan	G86	Koseh	Iran- Isfahan
G37	CTNUZ 3	Uzbekistan	G87	Iran- Kordestan	Iran- Kordestan
G38	CTNUZ 4	Uzbekistan	G88	Iran- Kashan	Iran- Kashan
G39	CTNTJ 1	Tajikestan	G89	Iran- Shiraz	Iran- Shiraz
G40	CTNTJ 2	Tajikestan	G90	Iran- Kerman	Iran- Kerman
G41	CTNUK	Ukraine	G91	M113	Iran- Markazi
G42	CTNSY 1	Syria	G92	M115	Iran- Markazi
G43	CTNSY 2	Syria	G93	S149	Iran- Isfahan
G44	CTNTH 1	Thailand	G94	S144	Iran- Isfahan
G45	CTNTH 2	Thailand	G95	C4110	Iran- Isfahan
G46	CTNBA 1	Bangladesh	G96	Iran- Kermanshah	Iran- Kermanshah
G47	CTNBA 2	Bangladesh	G97	Iran- Darab 2	Iran- Darab
G48	CTNAF 1	Afghanistan	G98	Iran- Khorasan 330	Iran- Khorasan
G49	CTNAF 2	Afghanistan	G99	Iran- Marand	Iran- Marand
G50	CTNMX 2	Mexico	G100	Iran- Hamadan21	Iran- Hamadan

Table S2. Primer combinations used for AFLP analysis in safflower

Name	Primer combination *Mse*I/*Eco*RI	Name	Primer combination *Mse*I/*Eco*RI
M60/E38	CTC/ACT	M51/E41	CCA/AGG
M62/E41	CTT/AGG	M61/E32	CTG/AAC
M47/E37	CAA/ACG	M61/E37	CTG/ACG
M47/E40	CAA/AGC	M61/E40	CTG/AGC
M51/E32	CCA/AAC	M62/E40	CTT/AGC

Table S3. Agro-climatic characteristics of the environments tested in this study

Code	Location	Year	Condition	Latitude (N)		Longitude (E)		Altitude (m)
E1	Lavark- Isfahan	2011	Normal	32	32	52	22	1630
E2	Lavark- Isfahan	2012	Normal	32	32	52	22	1630
E3	Lavark- Isfahan	2012	Drought Stress	32	32	52	22	1630
E4	Jiroft	2013	Normal	28	40	57	44	630
E5	Jiroft	2013	Drought Stress	28	40	57	44	630
E6	Jopar-Kerman	2013	Normal	30	3	57	7	1893
E7	Jopar-Kerman	2013	Drought Stress	30	3	57	7	1893

Table S4. Calculated statistics to detect optimum K in structures analysis of 100 safflower genotypes (Evanno's Δ*K* method) using the program STRUCTURE

K	Reps	Mean LnP (K)[a]	Stdev LnP (K)[b]	Ln' (K)[c]	Ln'' (K)[d]	ΔK[e]
2	5	-22526.160000	66.293650	—	—	—
3	5	-21074.540000	16.569641	1451.620000	810.080000	48.889412
4	5	-20433.000000	17.189386	641.540000	357.620000	20.804699
5	5	-20149.080000	21.278205	283.920000	940.240000	44.187938
6	5	-20805.400000	1264.765156	-656.320000	1256.000000	0.993070
7	5	-22717.720000	5884.570908	-1912.320000	11326.080000	1.924708
8	5	-35956.120000	11816.614466	-13238.400000	23111.680000	1.955863
9	5	-26082.840000	8554.161787	9873.280000	35405.020000	4.138923
10	5	-51614.580000	16149.532131	-25531.740000	—	—

[a] The mean of LnP(D) of repetitions for each K; [b] The standard deviation (STD) of repetitions; [c] $Ln(K)_n - Ln(K)_{n-1}$; [d] $Ln'(K)_n - Ln'(K)_{n-1}$; [e] $|Ln''(K)| /$ stdev LnP(K)

The yellow row is the optimal number of K (K= 3) that occurred at the maximum value of ΔK.

Table S5. Pairwise population PhiPT values for three subpopulations derived from STRUCTURE in 100 safflower genotypes

** $P < 0.01$

	Subpopulation1	**Subpopulation2**	**Subpopulation3**
Subpopulation1	0.000		
Subpopulation2	0.184**	0.000	
Subpopulation3	0.227**	0.399**	0.000

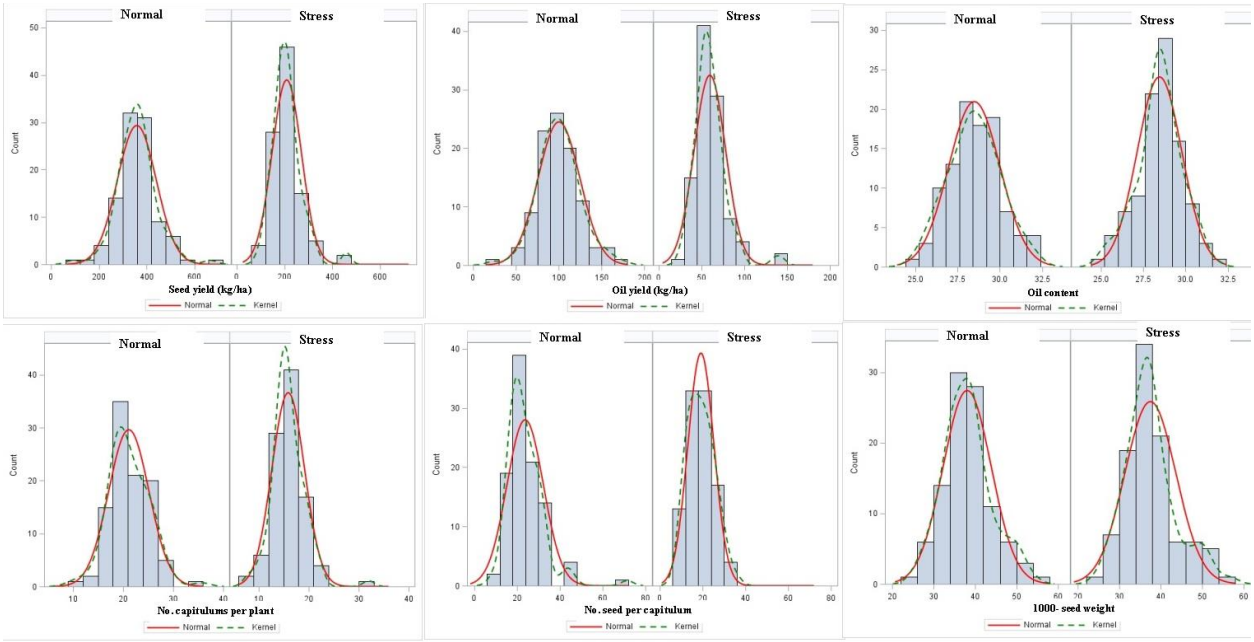

Fig. S1. Distribution histograms for yield- related traits and oil content under normal and drought stress conditions.

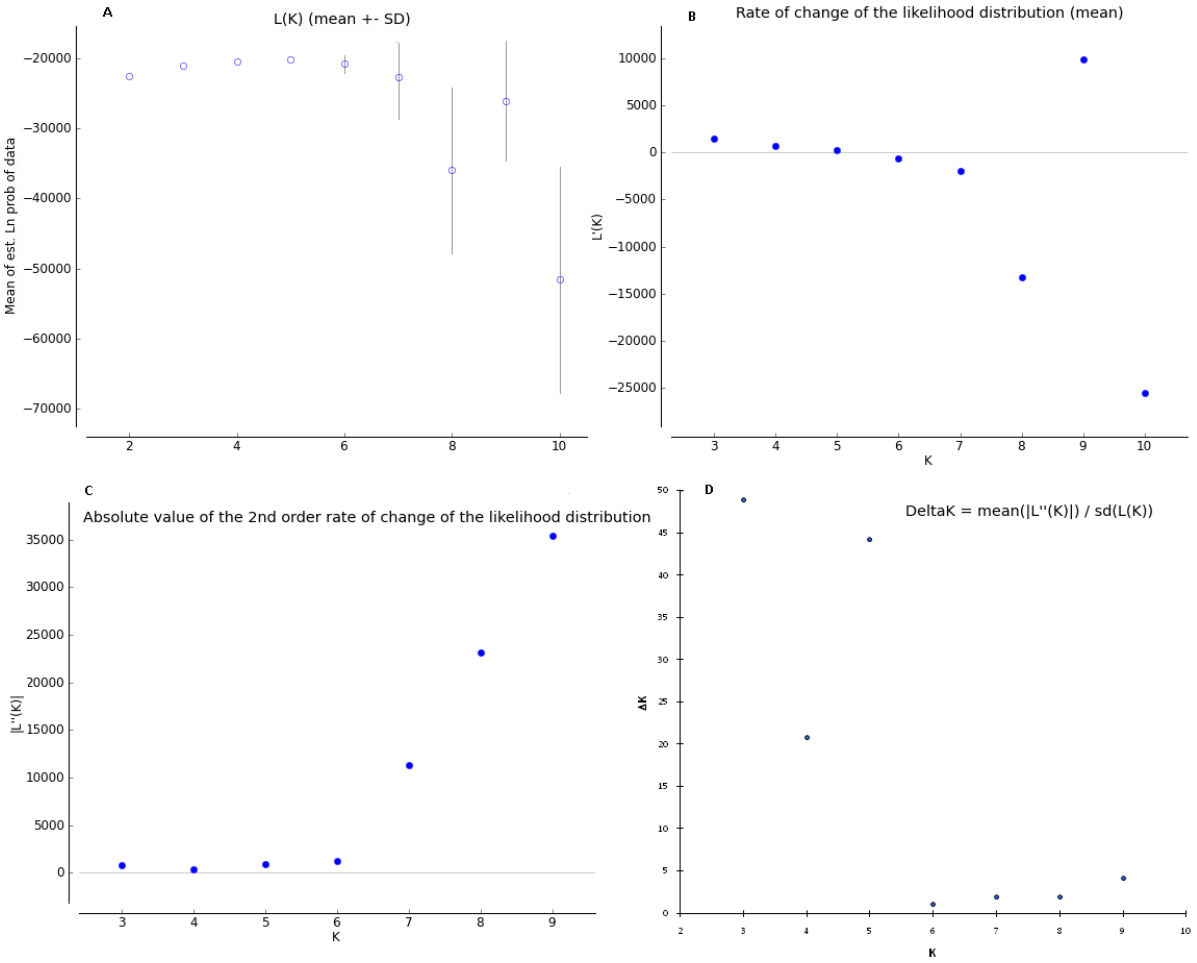

Fig. S2. Description of the four steps for the graphical method allowing detection of the true number of K (Evanno's ΔK method). A) Mean *L(K)* (± SD) over 5 runs for each K value. B) Rate of change of the likelihood distribution (mean ± SD) calculated as *L' (K)= L (K)- L (K-1)*. C) Absolute values of the second order rate of change of the likelihood distribution (mean ± SD) calculated according to the formula: $|L"(K)| = \left|L'(K+1) - L'(K)\right|$. D) ΔK calculated as $\Delta K = m\,|L"(K)|/\mathrm{s}[\mathrm{L(K)}]$.