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Table S1. Overview on equations from the literature or developed here for the calculation of chlorophyll ratios from leaf reflectance data c1 and c2 are arbitrary constants

Author	**Purpose**	**Function**	**Squared correlation barley**		**Squared correlation grasses**	
			Chl *a* : *b*	**Chl *b* : *a***	**Chl *a* : *b***	**Chl *b* : *a***
Nicotra *et al*. (2003)	Chl *a* : *b*		0.42	0.42	n.s.	n.s.
Yoder and Daley (1990)	Chl *a* : *b*	c1 δδ [log(1–R_{643})] + c2 δδ [log(1–R_{652})]	0.81 c1 = 800 c2 = 1192	0.92 c1 = 376 c2 = 1473	0.6 c1 = 1244 c2 = 897	0.61 c1=1685 c2=1139
Richardson *et al*. (2002)	Chl *a* : *b*	d(R_{681})	0.40	n.s.	n.s.	n.s.
Found with special pair method	Chl *b* : *a*	$R_{628}/R_{(635\ to\ 639)}$		0.977	0.45	0.49
	C_4/C_3 separation	$R_{(696\ to\ 709)}/R_{(545\ to\ 567)}$		0.80	0.61	0.66
Found in analogy with (Clark and Roush 1984), but simplified	Chl *b* : *a*	(R_{626} – c1 R_{603} + (c1–1) R_{647}) /(R_{552}–R_{626}) (with c1 = 0.48)	0.81	0.98	0.70	0.77
		Same equation but c1 optimised	0.90 c1 = 0.55	0.98 c1 = 0.52	0.74 c1 = 0.54	0.78 c1=0.54

Table S2. Overview of equations from the literature or developed here for calculation of chlorophyll content from leaf reflectance data
The squared sensitivity for the relationship between the index and measured data is given. Also the sensitivity of the equation to chlorophyll *b* versus chlorophyll *a* is given ([Slope index *v.* chl*b*/slope index *v.* chl*a*]/slope chl*a v.* chl*b*) (compare Gitelson *et al*. 2002) for the indicated sample sub-set, respectively. Sensitivity above 1 means the index is more sensitive to a change in chlorophyll *b* than *a*. Below 1 means the opposite. **P* <0.0001 for all shown correlations

Author	**Index name**	**Purpose**	**Function**	**Squared correlation barley**			**Sensitivity Chl *b* *v.* Chl *a***			**Squared correlation grasses**			**Sensitivity Chl *b* *v.* Chl *a***			
				TotChl	**Chl *a***	**Chl *b***	**all**	**f104**	**wt**	**TotChl**	**Chl *a***	**Chl *b***	**all**	**C_3**	**NAD**	**NADP**
Blackburn (1998)	PSSRa2	Chl a ^{const}	R_{800}/R_{673}		0.40						n.s.					
	PSNDa1	Chl a ^{const}	$(R_{800}-R_{673})/(R_{800}+R_{673})$		0.40						n.s.					
	PSSRb1	Chl b ^{const}	R_{800}/R_{635}			0.72	0.73	0.85	1.00			n.s.				
	PSSRb2	Chl b ^{const}	R_{800}/R_{651}			0.77	0.83	0.86	0.98			n.s.				
	PSNDb1	Chl b ^{const}	$(R_{800}-R_{635})/(R_{800}+R_{635})$			0.75	0.75	0.87	1.02			n.s.				
	PSNDb2	Chl b ^{const}	$(R_{800}-R_{651})/(R_{800}+R_{651})$			0.79	0.86	0.88	1.00			n.s.				
Datt (1998)			R_{860}/R_{550}	0.92	0.85	0.86	1.23	1.01	1.00	0.59	0.61	0.42	0.93	0.94	0.99	1.17
			R_{860}/R_{708}	0.91	0.90	0.71	1.09	1.01	0.98	0.47	0.52		0.75	0.85	0.98	1.12
			$R_{860}/(R_{550}*R_{708})$	0.91	0.87	0.77	1.15	1.00	0.99	0.43	0.47		0.82	0.90	1.01	1.21
Datt (1999)			$(R_{849}-R_{712})/(R_{849}-R_{681})$	0.88	0.87	0.70	1.10	1.04	1.01	0.42	0.48		0.69	0.93	1.00	1.08
Nicotra *et al*. (2003)		Chl a, tot Chl	R_{726}/R_{770}	0.90	0.86	0.80	1.18	1.04	1.00	0.57	0.63	0.31	0.79	0.95	0.99	1.09
		Chl b	R_{731}/R_{770}	0.90	0.85	0.80	1.19	1.04	1.00	0.60	0.65	0.33	0.80	0.96	0.99	1.08
Gitelson and	$NDVI_{690..710}$	exp(−totChl/27)	$[R_{NIR}-R_{(540\ to\ 570)}]^A$	0.92			1.21	1.02	1.01	0.48			0.94	0.95	1.00	1.19
Merzlyak (1997) (see			$/[R_{NIR}+R_{(540\ to\ 570)}]^A$													
also 1996)		tot Chl	$R_{NIR}/R_{700}{}^A$	0.89	0.90	0.63	1.02	0.99	0.97	0.36	0.40	0.17	0.72	0.77	0.96	1.16
		tot Chl	$R_{NIR}/R_{550}{}^A$	0.92	0.85	0.86	1.23	1.01	1.00	0.59	0.61	0.42	0.93	0.93	0.99	1.17
Sims and Gamon	SR_{705}	tot Chl	R_{750}/R_{705}	0.91			1.05	1.00	0.97	0.42			0.73	0.81	0.97	1.13
(2002), (see also	mSR_{705}	tot Chl	$(R_{750}-R_{445})/(R_{705}-R_{445})$	0.90			1.06	1.01	0.96	0.52			0.76	0.81	0.99	1.10
Gamon and	ND_{705}	tot Chl	$\underline{(R_{750}-R_{705})/(R_{750}+R_{705})}$	0.90			1.06	1.00	0.96	0.54			0.92	0.77	0.99	1.14
Surfus1999)		rect. hyperbolic fit	(fit parameter not shown)													
	mND_{705}	tot Chl	$\underline{(R_{750}-R_{705})/(R_{750}+R_{705}-2R_{445})}$	0.90			1.06	1.00	0.96	0.56			0.89	0.78	0.99	1.14
		rect. hyperbolic fit	(fit parameter not shown)													
Vogelmann *et al*. (1993)		tot Chl	$(R_{734}-R_{747})/(R_{715}+R_{726})$	0.90	0.85	0.81	1.19	1.03	0.98	0.63	0.68	0.36	0.81	0.92	0.99	1.10

Best fit to our data		Chl a (barley)	$(R_{850\ to\ 860})/(R_{704\ to\ 713})$	0.91	<u>0.89</u>	0.72	1.09	1.01	0.98	0.49	0.56	n.s.	0.75	0.85	0.98	1.12
		Chl a (barley)	$(R_{850\ to\ 860})/(R_{733\ to\ 738})$	0.68	0.62	0.69	1.29	1.06	1.02	0.64	<u>0.70</u>	0.36	0.83	1.00	0.99	1.08
		Chl b, tot Chl	$(R_{850\ to\ 860})/(R_{552\ to\ 556})$	<u>0.92</u>	0.85	<u>0.86</u>	1.23	1.01	1.00	0.64	0.68	<u>0.39</u>	0.93	0.94	0.99	1.17
		tot Chl (grasses)	$(R_{850\ to\ 860})/(R_{733\ to\ 738}+R_{552\ to\ 556})$	0.90	0.83	0.85	1.24	1.02	1.01	<u>0.67</u>	<u>0.72</u>	0.39	0.89	0.97	0.99	1.13
Influence of the chl *b*:*a* ratio		tot Chl	$(R_{850\ to\ 860})/(R_{733\ to\ 738}+R_{552\ to\ 556}) + c1 \times (R_{626} - 0.5\ (R_{603} + R_{647}))/(R_{552}-R_{626})$	0.92 c1=-0.12	0.91 c1=-0.21	0.90 c1=0.25	0.73[C]	0.91 [C]	1.07 [C]	0.81 c1=1.8	0.81 c1=1.4	0.81 c1=3	1.11 [C]	1.00 [C]	1.01 [C]	0.93 [C]

[A]We used mean (750–900) for NIR.

[B]c1 as for total chlorophyll.

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