Supplementary File 1: List of vegetation indices used in this work.

Vegetation indices used in the study (adapted from (Main et al., 2011; Agapiou et al., 2012; Lehnert et al., 2016))

No.	Abbreviation	Name	Formula	Reference
1	ARI	Anthocyanin Reflectance Index	$(1/R_{550}) - (1/R_{700})$	(Gitelson et al., 2001)
2	ARI2	Anthocyanin Reflectance index 2	$R_{800}(1/R_{550}) - (1/R_{700})$	(Gitelson et al., 2001)
3	BGI	Blue Green Pigment Index	R_{450}/R_{550}	(Zarco-Tejada et al., 2005)
4	SB703	Single Band 703 Boochs	D_{703}	(Boochs et al., 1990)
5	SB720	Single Band 720 Boochs 2	D_{720}	(Boochs et al., 1990)
6	BRI	Browning Reflectance Index	R_{450}/R_{690}	(Zarco-Tejada et al., 2005)
7	CARI	Chlorophyll Absorption Ratio Index	$R_{700} * abs(a * 670 + R_{670} + b)/R_{670} * (\alpha^2 + 1)^{0.5}$ $\alpha = (R_{700} - R_{550})/150$ $b = R_{550} - (550 * \alpha)$	(Kim et al., 1994)
8	Ctr	Carter	R_{695}/R_{420}	(Carter, 1994)
9	Ctr2	Carter 2	R_{695}/R_{760}	(Carter, 1994)
10	Ctr3	Carter 3	R_{605}/R_{760}	(Carter, 1994)
11	Ctr4	Carter 4	R_{710}/R_{760}	(Carter, 1994)
12	Ctr5	Carter 5	R_{695}/R_{670}	(Carter, 1994)
13	Ctr6	Carter 6	R_{550}	(Carter, 1994)
14	CI	Coloration Index	$R_{675} * R_{690}/R^2_{683}$	(Zarco-Tejada et al., 2003)
15	CI2	Coloration Index 2	$R_{760}/R_{700} - 1$	(Gitelson et al., 2003)
16	ClAInt	-	$\int_{600nm}^{735nm} R$	(Oppelt and Mauser, 2004)

17	CRI	Carotenoid Reflectance Index	$(1/R_{510}) - (1/R_{550})$	(Gitelson et al., 2002)
18	CRI1	Carotenoid Reflectance Index 1	$1/R_{515} - 1/R_{550}$	(Gitelson et al., 2003)
19	CRI2	Carotenoid Reflectance Index 2	$1/R_{515} - 1/R_{770}$	(Gitelson et al., 2003)
20	CRI3	Carotenoid Reflectance Index 3	$1/R_{515} - 1/R_{550} * R_{770}$	(Gitelson et al., 2003)
21	CRI4	Carotenoid Reflectance Index 4	$1/R_{515} - 1/R_{700} * R_{770}$	(Gitelson et al., 2003)
22	D1	Derivative index	D_{730}/D_{706}	(Zarco-Tejada et al., 2003)
23	D2	Derivative index	D_{705}/D_{722}	(Zarco-Tejada et al., 2003)
24	Datt	Datt	$(R_{850} - R_{710})/(R_{850} - R_{680})$	(Datt, 1999)
25	Datt2	Datt 2	R_{850}/R_{710}	(Datt, 1999)
26	Datt3	Datt 3	D_{754}/D_{704}	(Datt, 1999)
27	Datt4	Datt 4	$R_{672}/(R_{550} * R_{708})$	(Datt, 1998)
28	Datt5	Datt 5	R_{672}/R_{550}	(Datt, 1998)
29	Datt6	Datt 6	$R_{860}/(R_{550} * R_{708})$	(Datt, 1998)
30	DD	Double Difference Index	$(R_{749} - R_{720}) - (R_{701} - R_{672})$	(le Maire et al., 2004)
31	DDn	new Double Difference Index	$2 * (R_{710} - R_{660} - R_{760})$	(le Maire et al., 2008)
32	DPI	Double Peak Index	$(D_{688} - D_{710})/D^2_{697}$	(Zarco-Tejada et al., 2003)
33	DWSI4	Disease water stress index 4	R_{550}/R_{680}	(Apan et al., 2004)
34	EGFN	Edge green first derivative normalized difference	$(\max(D_{650:750}) - \max(D_{500:550}))/ (\max(D_{650:750}) + \max(D_{500:550}))$	(Peñuelas et al., 1994)
35	EGFR	Edge green first derivative ratio	$\max(D_{650:750})/ \max(D_{500:550})$	(Peñuelas et al., 1994)
36	EVI	Enhanced Vegetation Index	$2.5 * ((R_{800} - R_{670})/(R_{800} - (6 * R_{670}) - (7.5 * R_{475}) + 1))$	(Huete et al., 1997)
37	GDVI2	Green Difference Vegetation Index 2	$(R^2_{800} - R^2_{680})/(R^2_{800} + R^2_{680})$	(Wu, 2014)
38	GDVI3	Green Difference Vegetation Index 3	$(R^3_{800} - R^3_{680})/(R^3_{800} + R^3_{680})$	(Wu, 2014)

39	GDVI4	Green Difference Vegetation Index 4	$(R^4_{800} - R^4_{680})/(R^4_{800} + R^4_{680})$	(Wu, 2014)
40	GI	Greenness Index	R_{554}/R_{677}	(Smith et al., 1995)
41	-	Gitelson	$1/R_{700}$	(Gitelson et al., 1999)
42	-	Gitelson 2	$(R_{750} - R_{800})/(R_{695} - R_{740}) - 1$	(Gitelson et al., 2003)
43	GMI1	Gitelson and Merzlyak Index 1	R_{750}/R_{550}	(Gitelson and Merzlyak, 1998)
44	GMI2	Gitelson and Merzlyak Index 2	R_{750}/R_{700}	(Gitelson and Merzlyak, 1998)
45	Green NDVI	Green Normalized Difference Vegetation Index	$(R_{800} - R_{550})/(R_{800} + R_{550})$	(Gitelson et al., 1996)
46	GVI	Greenness Vegetation Index	$(R_{682} - R_{553})/(R_{682} + R_{553})$	(Gandia et al., 2004)
47	LIC	Lichtenthaler indices	R_{440}/R_{690}	(Lichtenthaler et al., 1996)
48	LRDSI1	Leaf Rust Disease Severity Index 1	$6.9*(R_{605}/R_{455})-1.2$	(Ashourloo et al., 2014)
49	LRDSI2	Leaf Rust Disease Severity Index 2	$4.2 * (R_{695}/R_{455}) - 0.38$	(Ashourloo et al., 2014)
50	-	Maccioni	$(R_{780} - R_{710})/(R_{780} - R_{680})$	(Maccioni et al., 2001)
51	MCARI	Modified Chlorophyll Absorption in Reflectance Index	$((R_{700} - R_{670}) - 0.2 * (R_{700} - R_{550})) * (R_{700}/R_{670})$	(Daughtry et al., 2000)
52	MCARI2	Modified Chlorophyll Absorption in Reflectance Index 2	$((R_{750} - R_{705}) - 0.2 * (R_{750} - R_{550})) * (R_{750}/R_{705})$	(Wu et al., 2008)
53	MCARI2/OSAVI2	MCARI2/OSAVI2	MCARI2/OSAVI2	(Wu et al., 2008)
54	MCARI/OSAVI	MCARI2/OSAVI	MCARI2/OSAVI	(Daughtry et al., 2000)
55	mNDVI	Modified NDVI	$(R_{800} - R_{680})/(R_{800} + R_{680} - 2 * R_{445})$	(Sims and Gamon, 2002)
56	mNDVI2	Modified NDVI 2	$(R_{750} - R_{705})/(R_{750} + R_{705} - 2 * R_{445})$	(Sims and Gamon, 2002)
57	MPRI	Modified Photochemical Reflectance Index	$(R_{515} - R_{530})/(R_{515} + R_{530})$	(Hernández-Clemente et al., 2011)
58	mREIP	Modified Red-Edge Inflection Point	Modified REIP with inverted Gaussian fit on reflectance	(Miller et al., 1990)
59	mSAVI	Modified Soil Adjusted Vegetation Index	$0.5 * (2 * R_{800} + 1 - ((2 * R_{800} + 1)^2 - 8 * (R_{800} - R_{670}))^{0.5})$	(Qi et al., 1994)
60	mSR	Modified Simple Ratio	$(R_{800} - R_{445})/(R_{680} - R_{445})$	(Sims and Gamon, 2002)

61	mSR2	Modified Simple Ratio 2	(R_{750}/R_{705}) -1/(R_{750}/R_{705}) + 1)$^{0.5}$	(Chen and Cihlar, 1996)
62	mSR3	Modified Simple Ratio 3	$(R_{800}/(R_{670}$ - 1))/ $(R_{800}/(R_{670}$ + 1))$^{0.5}$	(Chen and Cihlar, 1996)
63	mSR705	Modified Simple Ratio 705	$(R_{750}$ - $R_{445})/(R_{705}$-$R_{445})$	(Sims and Gamon, 2002)
64	MTCI	MERIS Terrestrial Chlorophyll Index	$(R_{754}$ - $R_{709})/(R_{709}$ - $R_{681})$	(Dash and Curran, 2004)
65	mTVI	Modified Triangular Vegetation Index	1.2 * (1.2 * (R_{800} - $R_{550})$ - 2.5 * (R_{670} - R_{550}))	(Haboudane et al., 2004)
66	MVSR	Modified Vegetation Stress Ratio	R_{723}/R_{700}	(White et al., 2008)
67	NBNDVI	Narrow-Band Normalised Difference Vegetation Index	$(R_{850} - R_{680})/(R_{850} + R_{680})$	(Thenkabail et al., 2000)
68	NDVI	Normalized Difference Vegetation Index	$(R_{800}$ - $R_{680})/(R_{800}$ + $R_{680})$	(Tucker, 1979)
69	NDVI2	Normalized Difference Vegetation Index 2	$(R_{750}$ - $R_{705})/(R_{750}$ + $R_{705})$	(Gitelson and Merzlyak, 1994)
70	NDVI3	Normalized Difference Vegetation Index 3	$(R_{682}$ - $R_{553})/(R_{682}$ + $R_{553})$	(Gandia et al., 2004)
71	NPCI	Normalized Pigment Chlorophyll Index	$(R_{680}$ - $R_{430})/(R_{680}$ + $R_{430})$	(Peñuelas et al., 1994)
72	NRI	Nitrogen Reflectance Index	$(R_{570}$ - $R_{670})/(R_{570}$ + $R_{670})$	(Filella et al., 1995)
73	OSAVI	Optimized Soil Adjusted Vegetation Index	(1 + 0.16) * (R_{800}-$R_{670})/(R_{800}$ + R_{670} + 0.16)	(Rondeaux et al., 1996)
74	OSAVI2	Optimized Soil Adjusted Vegetation Index 2	(1 + 0.16) * (R_{750}-$R_{705})/(R_{750}$ + R_{705} + 0.16)	(Wu et al., 2008)
75	RARS	Ratio Analysis of Reflectance Spectra	R_{746}/R_{513}	(Chappelle et al., 1992)
76	PhRI	Physiological Reflectance Index	$(R_{550} - R_{531})/(R_{550}$ + $R_{531})$	(Gitelson et al., 2001)
77	PRI	Photochemical Reflectance Index	$(R_{531}$ - $R_{570})/(R_{531}$ + $R_{570})$	(Gamon et al., 1997)
78	PRI2	Photochemical Reflectance Index 2	$(R_{570}$ - $R_{539})/(R_{570}$ + $R_{539})$	(Filella et al., 1996)
79	PRI*CI2	PRI*CI2	PRI*CI2	(Garrity et al., 2011)
80	PRI_norm	Normalized PRI	PRI * (-1)/(RDVI * R_{700}/R_{670})	(Zarco-Tejada et al., 2013)
81	PSND	Pigment specific normalised difference	$(R_{800}$ - $R_{470})/(R_{800}$ + $R_{470})$	(Blackburn, 1998)
82	PSRI	Plant Senescence Reflectance Index	$(R_{678}$ - $R_{500})/R_{750}$	(Merzlyak et al., 1999)
83	PSSR	Pigment specific simple ratio	R_{800}/R_{635}	(Blackburn, 1998)

84	PWI	Plant Water Index	R_{900}/R_{970}	(Peñuelas et al., 1997)
85	RDVI	Renormalized Difference Vegetation Index	$(R_{800} - R_{670})/SQRT(R_{800} + R_{670})$	(Roujean and Breon, 1995)
86	REP	Red-Edge Position	$700 + 40((R_{670} + R_{780})/2 – R_{700})/(R_{740} – R_{700}))$	(Guyot et al., 1988)
87	REP_LE	-	Red-edge position through linear extrapolation	(Cho and Skidmore, 2006)
88	REP_Li	-	$R_{re} = (R_{670} + R_{780})/2$ $700 + 40 * ((R_{re} - R_{700})/(R_{740} - R_{700}))$	(Guyot et al., 1988)
89	RGI	Red/Green Index	R_{690}/R_{550}	(Zarco-Tejada et al., 2005)
90	SAVI	Soil Adjusted Vegetation Index	$(1 + L) * (R_{800} - R_{670})/(R_{800} + R_{670} + L)$	(Huete, 1988)
91	SIPI	Structure Intensive Pigment Index	$(R_{800} - R_{445})/(R_{800} - R_{680})$	(Peñuelas et al., 1995b)
92	SIPI2	Structure Intensive Pigment Index 2	$(R_{800} - R_{440})/(R_{800} - R_{680})$	(Peñuelas et al., 1995b)
93	SIPI3	Structure Intensive Pigment Index 3	$(R_{800} - R_{445})/(R_{800} - R_{680})$	(Peñuelas et al., 1995a)
94	SPVI	Spectral Polygon Vegetation Index	$0.4 * (3.7 * (R_{800} - R_{670}) -1.2 * ((R_{530} - R_{670})^2)^{0.5}$	(Vincini et al., 2006)
95	SR	Simple Ratio	R_{800}/R_{680}	(Jordan, 1969)
96	SR1	Simple Ratio 1	R_{750}/R_{700}	(Gitelson and Merzlyak, 1997)
97	SR2	Simple Ratio 2	R_{752}/R_{690}	(Gitelson and Merzlyak, 1997)
98	SR3	Simple Ratio 3	R_{750}/ R_{550}	(Gitelson and Merzlyak, 1997)
99	SR4	Simple Ratio 4	R_{700}/ R_{670}	(McMurtrey et al., 1994)
100	SR5	Simple Ratio 5	R_{675}/R_{700}	(Chappelle et al., 1992)
101	SR6	Simple Ratio 6	R_{750}/R_{710}	(Zarco-Tejada and Miller, 1999)
102	SR7	Simple Ratio 7	$R_{440}/R690$	(Lichtenthaler et al., 1996)
103	SR705	Simple Ratio 705	R_{750}/ R_{705}	(Castro-Esau et al., 2006)
104	SR8	Simple Ratio 8	R_{515}/R_{550}	(Hernández-Clemente et al., 2012)
105	SRPI	Simple Ratio Pigment Index	R_{430}/R_{680}	(Peñuelas et al., 1995a)

106	Sum_Dr1	-	$\sum_{i=626}^{795} D1i$	(Elvidge and Chen, 1995)
107	Sum_Dr2	-	$\sum_{i=680}^{780} D1i$	(Filella and Penuelas, 1994)
108	TCARI	Transformed Chlorophyll Absorbtion Ratio	$3 * ((R_{700} - R_{670}) - 0.2 * (R_{700} - R_{550}) * (R_{700}/R_{670}))$	(Haboudane et al., 2002)
109	TCARI2	Transformed Chlorophyll Absorbtion Ratio 2	$3 * ((R_{750} - R_{705}) - 0.2 * (R_{750} - R_{550}) * (R_{750}/R_{705}))$	(Wu et al., 2008)
110	TCARI2/OSAVI2	TCARI2/OSAVI2	TCARI2/OSAVI2	(Wu et al., 2008)
111	TCARI/OSAVI	TCARI/OSAVI	TCARI/OSAVI	(Haboudane et al., 2002)
112	TGI	Triangular greenness index	$-0.5 * (190 * (R_{670} - R_{550}) - 120 * (R_{670} - R_{480}))$	(Hunt et al., 2013)
113	TVI	Transformed Vegetation Index	$0.5 * (120 * (R_{750} - R_{550}) - 200 * (R_{670} - R_{550}))$	(Broge and Leblanc, 2001)
114	Vog	Vogelmann indices	R_{740}/R_{720}	(Vogelmann et al., 1993)
115	Vog2	Vogelmann indices 2	$(R_{734} - R_{747})/(R_{715} + R_{726})$	(Vogelmann et al., 1993)
116	Vog3	Vogelmann indices 3	D_{715}/D_{705}	(Vogelmann et al., 1993)
117	Vog4	Vogelmann indices 4	$(R_{734} - R_{747})/(R_{715} + R_{720})$	(Vogelmann et al., 1993)
118	VS	Vegetation Stress ratio	R_{725}/ R_{702}	(White et al., 2008)
119	WI	Water Index	R_{900}/R_{970}	(Peñuelas et al., 1993)

R_x - reflectance at wavelength x nm.

D_x - derivative of the reflectance spectrum at wavelength x nm.

- No original index name or abbreviation found

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