Supplemental information for

Severity Assessment of Cotton Canopy Verticillium Wilt by Machine Learning Based on Feature Selection and Optimization Algorithm Using UAV Hyperspectral Data

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Table S1 Spectral indices (SIs) included in this study and their formulations

Type	Index	Short	Formulation
Chlorophyll	Reciprocal Reflectance	RR	$1/R_{700}$
	Modified Red-edge Ratio	mSR	$(R_{750}-R_{445})/(R_{705}-R_{445})$
	Pigment Specific Simple Ratio	PSSRa	R_{800}/R_{675}
		PSSRb	R_{800}/R_{650}
	Normalized Difference Vegetation Index	NDVI	$(R_{NIR}-R_R)/(R_{NIR}+R_R)$
	Red-edge NDVI	mNDVI	$(R_{750}-R_{705})/(R_{750}+R_{705})$
	Green NDVI	gNDVI	$(R_{750}-R_G)/(R_{750}+R_G)$
	Pigment Specific Normalized Difference	PSNDa	$(R_{800}-R_{675})/(R_{800}+R_{675})$
		PSNDb	$(R_{800}-R_{650})/(R_{800}+R_{650})$
		PSNDc	$(R_{800}-R_{470})/(R_{800}+R_{470})$
	Macc01	Macc01	$(R_{780}-R_{710})/(R_{780}-R_{680})$
	The MERIS terrestrial chlorophyll ind	MTCI	$(R_{754}-R_{709})/(R_{709}-R_{681})$
	DATT	DATT	$(R_{850}-R_{710})/(R_{850}-R_{680})$
	Modified DATT	MDATT	$(R_{721}-R_{744})/(R_{721}-R_{714})$
	Vogelmann indices	VOG1	R_{740}/R_{720}
		VOG2	$(R_{734-747})/(R_{715-726})$
		VOG3	$(R_{734}-R_{747})/(R_{715}+R_{720})$
	Gitelson & Merzlyak indices	GM1	R_{750}/R_{550}
		GM2	R_{750}/R_{700}
	Transformed Chlorophyll Absorption in Reflectance Index	TCARI	3×[(R700-R670)-0.2×(R700-R550)× (R700/R670)]
	Chlorophyll Index Red Edge	CI	R_{750}/R_{710}
	Simple Ratio Pigment Index	SRPI	R_{430}/R_{680}
	Normalized Pigments Index	NPCI	$(R_{680}-R_{430})/(R_{680}+R_{430})$
	Carter indices	CTRI1	R_{695}/R_{420}
		CAR	R_{695}/R_{760}
	Reflectance band ratio indices	DCabCxc	R672/(R550×3R708)
		NDIRCabCxc	$R_{860}/(R_{550}\times R_{708})$

	Structure-Intensive Pigment Index	SIPI	$(R_{800}-R_{445})/(R_{800}+R_{680})$
	ChlRE opt	ChlRE opt	$(1/R_{680-730}-1/R_{780-800})\times R_{755-780}$
	$RI_{708,775}$	$RI_{708,775}$	R_{708}/R_{775}
	$ND_{780,712}$	$ND_{780,712}$	$(R_{780}-R_{712})/(R_{780}+R_{712})$
	Chl_green	Chl_green	Rnir/Rgreen-1
	Chl_red edge	Chl_red edge	Rnir/Rred_edge-1
	Chlorophyll/carotenoid Index	CCI	$(R_{531}-R_{645})/(R_{531}+R_{645})$
	Ratio Analysis of Reflectance Spectra	RARSc	R_{760}/R_{500}
	Pigment Specific Simple Ratio	PSSRc	R_{800}/R_{470}
	Modified Carotenoid Reflectance Index	$mCRI_G$	$(R_{510-520}^{-1} - R_{560-570}^{-1})\times R_{NIR}$
		$mCRI_{RE}$	$(R_{510-520}^{-1} - R_{690-710}^{-1})\times R_{NIR}$
	Photochemical Reflectance Index	PRI	$(R_{531}-R_{570})/(R_{531}+R_{570})$
Carotenoid	Carotenoid Reflectance Index	CRI_{550}	$(1/R_{510})-(1/R_{550})$
		CRI_{700}	$(1/R_{510})-(1/R_{700})$
		$CRI_{515,550}$	$(1/R_{515})-(1/R_{550})$
		$CRI_{515,700}$	$(1/R_{515})-(1/R_{700})$
		PNIR× CRI_{700}	$(1/R_{510})-(1/R_{550})\times R_{770}$
		PNIR× CRI_{770}	$(1/R_{510})-(1/R_{700})\times R_{770}$
		$Car_{\mathrm{RE\ opt}}$	$(1/R_{510-530}-1/R_{680-730})\times R_{760-780}$
		$RI_{530,800}$	R_{530}/R_{800}
		$ND_{800,530}$	$(R_{800}-R_{530})/(R_{800}+R_{530})$
		Car_green	$(R_{510-520}^{-1} - R_{560-570}^{-1}) \times R_{NIR}$
		Car_red edge	$(R_{510-520}^{-1} - R_{590-710}^{-1}) \times R_{NIR}$
Anthocyanin	Anthocyanin Reflectance Index	ARI	$R_{550}^{-1} - R_{700}^{-1}$
	Modified Anthocyanin Reflectance Index	mARI	$(R_{530-570}^{-1} - R_{690-710}^{-1}) \times R_{NIR}$
	Red:Green Ratio	RGR	R/G
Xanthophyll	Photochemical Refl. Index (515)	PRI_{515}	$(R_{515}-R_{531})/(R_{515}+R_{531})$
	Photochemical Refl. Index (512)	PRI_{m1}	$(R_{512}-R_{531})/(R_{512}+R_{531})$

	Photochemical Refl. Index (600)	PRI_{m2}	$(R_{600}-R_{531})/(R_{600}+R_{531})$
	Photochemical Refl. Index (670)	PRI_{m3}	$(R_{670}-R_{531})/(R_{670}+R_{531})$
	Photochemical Refl. Index (670 and 570)	PRI_{m4}	$(R_{570}-R_{531}-R_{670})/(R_{570}+R_{531}+R_{670})$
	Carotenoid/Chlorophyll Ratio Index	PRI×CI	$(R_{570}-R_{530})/(R_{570}+R_{530})\times((R_{760}/R_{700})-1)$
	Water index	WI	R_{900}/R_{970}
	Redness Index	R	R_{700}/R_{670}
	Greenness Index	G	R_{570}/R_{670}
	Blue Index	B	R_{450}/R_{490}
	Blue/green index	BGI1	R_{400}/R_{550}
	Blue/green index	BGI2	R_{450}/R_{550}
	Blue/red index	BRI1	R_{400}/R_{690}
	Blue/red index	BRI2	R_{450}/R_{690}
	BF1	BF1	R_{400}/R_{410}
	BF2	BF2	R_{400}/R_{420}
R/G/B color	BF3	BF3	R_{400}/R_{430}
	BF4	BF4	R_{400}/R_{440}
	BF5	BF5	R_{400}/R_{450}
	Red/green index	RGI	R_{690}/R_{550}
	Ratio Analysis of Reflectance Spectra	RARS	R_{746}/R_{513}
	Lichtenthaler Index	LIC1	$(R_{800}-R_{680})/(R_{800}+R_{680})$
		LIC2	R_{440}/R_{690}
		LIC3	R_{440}/R_{740}
	Health-index (534,698,704)	HI_2013	$(R_{534}-R_{698})/(R_{534}+R_{698})-0.5\times R_{704}$
	Health-index (739,402,403)	HI_2014	$(R_{739}-R_{402})/(R_{739}+R_{402})-0.5\times R_{403}$
	Plant Senescence Reflectance Index	PSRI	$(R_{680}-R_{500})/R_{750}$
Plant stress	Normalized Phaeophytinization Index	NPQI	$(R_{415}-R_{435})/(R_{415}+R_{435})$
	Reflectance Curvature Index	CUR	$(R_{675}\times R_{690})/R_{683}^2$
	Simple Ratio	RR	R_{695}/R_{420} R_{695}/R_{670} R_{695}/R_{760} R_{710}/R_{760}