horticulturae

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Article

Unveiling the Predisposing Factors for the Development of Branch Canker and Dieback in Avocado: A Case of Study in Chilean Orchards

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Table S1. Data analysis of information collected for 76 variables from 16 orchards in two growing seasons (2014 and 2015) included in this study.

Variable[a]	Units[b]	Range	Statistics[c]
Climate variables (spring, sp)			
ATsp	°C	15.96-18.59	16.99 ± 0.72
MAXTsp	°C	29.60-35.80	32.44 ± 1.67
MINTsp	°C	1.40-5.6	3.62 ± 1.04
RADsp	Wm^{-2}	307.88-377.04	349.92 ± 19.72
Rhsp	%	59.10-72.73	69.26 ± 4.64
Ppsp	mm	0.00-127. 10	64.85 ± 37.44
Climate variables (summer, su)			
ATsu	°C	16.06-21.36	19.58 ± 0.99
MAXTsu	°C	30.20-37.80	34.68 ± 2.08
MINTsu	°C	0.0-9.60	6.97 ± 1.77
RADsu	Wm^{-2}	247.38-382.35	312.59 ± 40.67
Rhsu	%	46.61-77.90	69.54 ± 6.40
Ppsu	mm	0.00-12.20	1.47 ± 2.99
Climate variables (autumn, au)			
ATau	°C	10.13-18.98	15.83 ± 2.92
MAXTau	°C	28.50-37.70	32.60 ± 3.10
MINTau	°C	-2.00-9.80	4.40 ± 3.99
RADau	Wm^{-2}	95.03-226.14	166.12 ± 46.19

Rhau	%	67.18-88.25	77.78 ± 6.84
Ppau	mm	0.00-269.6	112.72 ± 109.39
Climate variables (winter, wi)			
ATwi	°C	8.43-14.29	11.70 ± 2.15
MAXTwi	°C	20.60-30.70	25.34 ± 3.24
MINTwi	°C	-0.70-6.00	2.97 ± 2.02
RADwi	Wm^{-2}	52.35-236.58	151.52 ± 55.81
Rhwi	%	39.37-91.59	81.03 ± 7.25
Ppwi	mm	28.70-247.5	135.11 ± 66.76
Planting features			
Lat	DD	31.59597-32.892146	32.89 ± 0.65
Long	DD	71.07928-71.212440	71.09 ± 0.15
Alt	m	71-741	339.00 ± 207.49
Zone	SDS	1 = Inner valley with high coastal influence	2
		3 = Inner valley with low coastal influence	8
		5 = Inner valley	16
		7 = Premountain valley	6
Row	grade	71-741	92.31 ± 83.14
Plants/ha	units ha^{-1}	178-1656	721.52 ± 451.54
PlantAge	number	2-26	12.62 ± 7.29
Yield	kg ha^{-1}	1157-40972	12263.80 ± 8446.06
VolumeC	m^3	6.24-164.30	52.97 ± 45.90
DiameterT	m	0.3-75	19.34 ± 29.55
Rstock	SDS	1 = Zutano	6
		3 = Nabal	4
		5 = Mexicola	22
LAI	-	0.44-2.66	1.56 ± 0.62
Soil features			
Texture	SDS	5 = Slit clay loam	6
		6 = Sandy clay loam	8
		7 = Loamy clay	10
		9 = Slit loam	4
		11 =Sandy loam	4
Bd	g cm^{-3}	1.47-3.07	2.35 ± 0.51
pHS	-	5.72-7.68	6.41 ± 0.68
ECS	mS cm^{-1}	0.04-0.45	0.12 ± 0.09
OMS	%	1.33-4.98	2.42 ± 0.92
NS	mg kg^{-1}	3.0-129	26
PS	mg kg^{-1}	2.0-53.0	21
KS	mg kg^{-1}	66.0-411.0	194.37 ± 97.91

CECS	meq/100 g	10.0-26.0	16.84 ± 4.68
Foliar nutrient content			
NF	%	1.75-2.92	2.52 ± 0.31
PF	%	0.11-0.21	0.15 ± 0.02
KF	%	0.63-1.33	1.04 ± 0.18
CaF	%	1.48-2.39	1.92 ± 0.25
MgF	%	0.32-0.82	0.53 ± 0.13
CuF	mg kg^{-1}	3.0-16.0	8.38 ± 2.91
MnF	mg kg^{-1}	23.0-605.0	259.62 ± 182.36
ZnF	mg kg^{-1}	5.0-538	80.08 ± 129.00
Management variables.			
Irrigation conditions			
ETcsp	mm	80.55-401.60	191.54 ± 77.12
ETcsu	mm	85.66-481.90	221.82 ± 87.47
ETcau	mm	25.77-167.07	76.68 ± 32.12
ETcwi	mm	20.00-79.79	37.87 ± 14.32
Isystem	SDS	1 = microsprinkler	24
		3 = drip	8
Pruning management			
DateP	SDS	1 = spring	12
		3 = summer	8
		5 = autumn	6
		7 = winter	2
		9 = spring and summer	4
FrP	SDS	6 = semi annual	2
		12 = annual	22
		24 = biannnual	8
IP	SDS	1 = small branches	22
		3 = medium branches	6
		5 = main branches	4
PasteP	BS	0 = No	10
		1 = Yes	22
Agrochemical applications			
FungicideP	BS	0 = No	24
		1 = Yes	8
UN/ha	units ha^{-1}	0.0-1411.00	404.92 ± 315.84
Ca+	BS	0 = No	24
		1 = Yes	8
HumicA	BS		
		0 = No	16
		1 = Yes	16
GR	L ha^{-1}	0-15	4.34 ± 4.11

GRsite	SDS	0 = without GR	4
		1 = foliage	8
		3= soil	4
		5 = Foliage and soil	16
Grdate	SDS	0 = without GR	4
		1 = spring	16
		3= summer	6
		5 = autumn	6
		7 = winter	0
Stress abiotic and biotic			
Frost	BS	0 = No	24
		1 = Yes	8
$H_2OETcsu$	%	38-285	1.35 ± 0.66
Pests	SDS	0 = without pests	2
		1 = black scales	8
		3= mites	12
		5 = white scales	27
		7 = thrips	12
		9 = snails	2
Diseases	SDS	0 = healthy trees	22
		1 = *Verticillium* wilt	2
		3 = *Phytophthora* canker	5
		5 = Anthracnose	3
Distribution	SDS	0 = healthy trees	14
		1 = uniform	14
		3 = random	2
		5 = aggregate	2
Icd	%	0.0-1.0	0.38 ± 0.39
SCD	SDS	0 = healthy trees	14
		1 = low dieback, without branch canker	4
		3 = low dieback, low branch canker	4
		5 = low dieback, moderate branch canker	2
		7 = high dieback, low branch canker	2
		9 = low dieback, high branch canker	6

[a] AT = average air temperature; MAXT = maximum air temperature MINT = minimum air temperature; RAD = Average solar radiation; Rh = average relative air humidity; Pp = accumulated precipitation; Lat = Latitude; Long = longitude; Alt = altitude; Zone = agroclimatic zone; Row = row orientation; Plants/ha

= plantation density; PlantAge = age of each plant; yield = yield previous season; VolumeC = volume of the canopy; DiameterT = diameter of the trunk; Rstock = rootstock variety; LAI = leaf area index; Texture = USDA texture classes; Bd = bulk density; pHS = soil pH; ECS = soil electric conductivity; OMS = soil organic matter; NS = soil nitrogen; PS = soil phosphorus; KS = soil potassium, CECS = soil cationic exchange capacity; NF = foliar nitrogen; PF = foliar phosphorus; KF= foliar potassium; CaF = foliar calcium; MgF = foliar magnesium; CuF = foliar copper; MnF = foliar manganese; ZnF = foliar zinc; ETcsp, ETcsu, ETcau and Etcwi = crop evapotranspiration in each year season; Isystem = Irrigation system; DateP = date of pruning; FrP = frequency of pruning; IP = intensity of pruning; PasteP = pruning sealed of wounds; FungicideP = application of fungicide; UN/ha = Applied dosage of nitrogen; Ca+ = applied dosage of calcium; HumicA = application of humic acids; GR = annual doses of growth regulator applied; GRsite = site of growth regulator application; Grdate = date of growth regulator application; Frost = Risk of frost by orchard; H_2OETcsu = water applied in summer; Pest = pest reported in each orchard; Diseases = diseases reported in each orchard; Distribution = Distribution of symptomatic trees; Icd = incidence of branch canker and dieback; SCD = severity of branch canker and dieback

[b] DD= decimal degrees, SDS=structured discrete scale, and BS=binary scale

[c] Statistics included averages ± standard deviations and included absolute frequencies of variables with a structured discrete scale and binary scale for a better understanding of the analysis

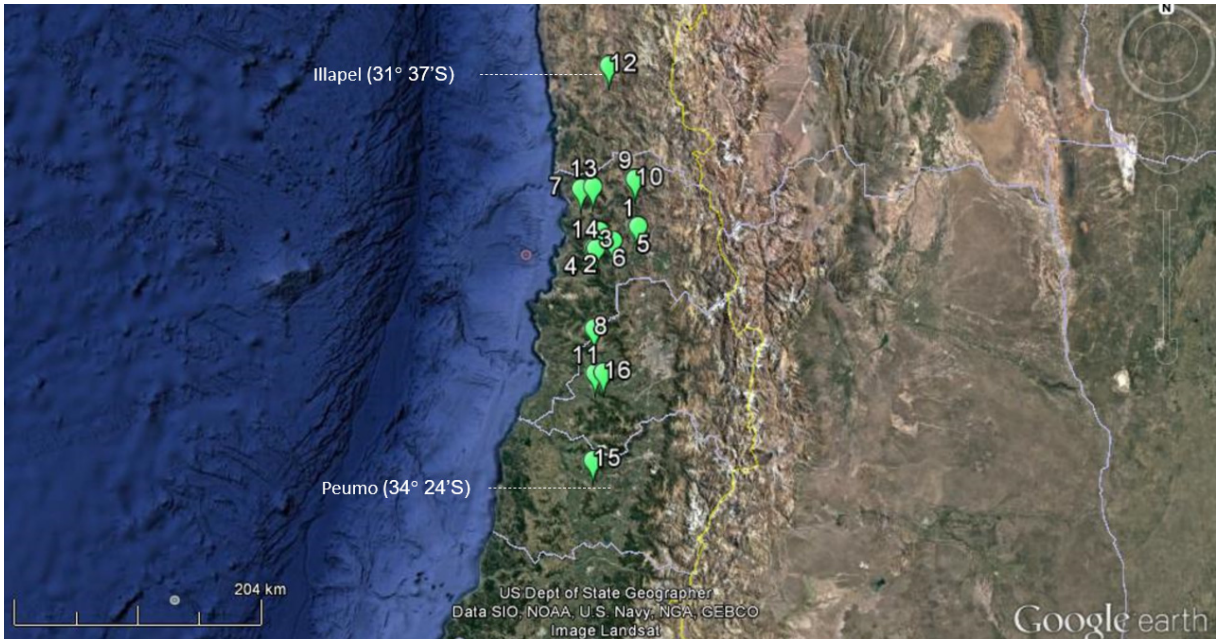

Figure S1. Map of sixteen 'Hass' avocado orchards in study. All sites corresponded to irrigated orchards of the main Chilean avocado production, located in an area of 428.97 kilometers between Illapel (31° 37'S) and Peumo (34° 24'S).

Figure S2: Biplot of the principal component analysis of predisposing factors associated with the incidence of branch canker and dieback in Chilean orchards prospected in the 2014 season; 16 observations (a).

Figure S3: Biplot of the principal component analysis of predisposing factors associated with the incidence of branch canker and dieback in Chilean orchards prospected in the 2015 season; 16 observations (b).