

AGROTUR II

SIMPOZIJ O TERANU IN KRAŠKIH PRODUKTIH/ SIMPOSIO DEL TERRANO E PRODOTTI CARSICI

Grad Štanjel/Il castello Štanjel

8. 11. 2019

Letnik 2019 in dozorevanje refoška v letu 2019 / Annata 2019 e la maturazione del Refosco nel 2019

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* Università degli studi di Trieste

<https://e-karst.eu/sl>

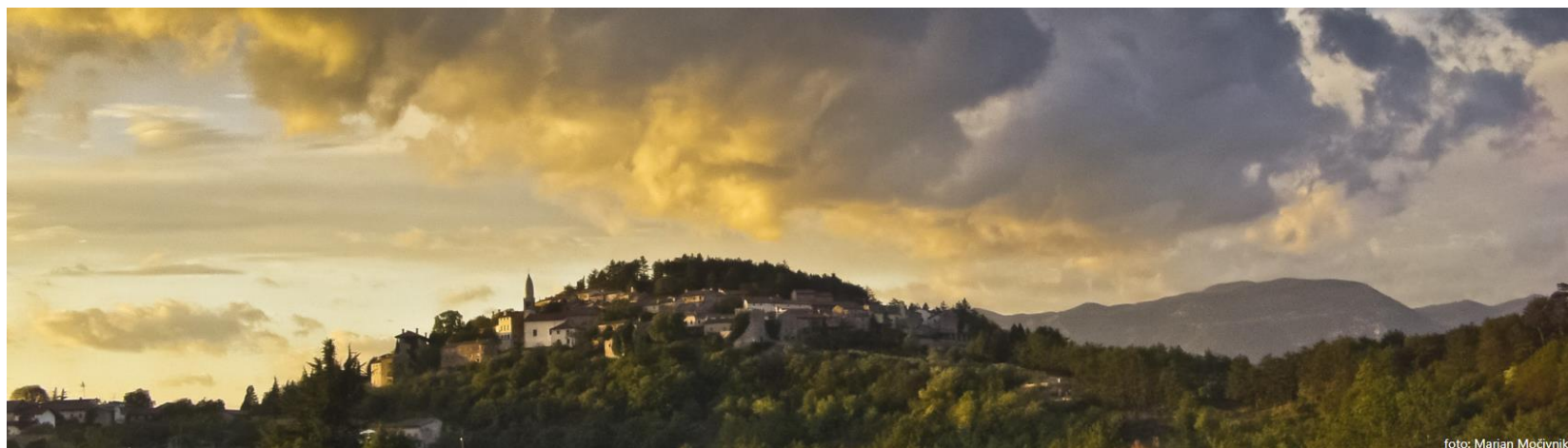


foto: Marjan Močivnik

Dobrodošli na platformi eKarst

Moj vinograd

Voda & klima

Zatiranje škodljivcev

e-Karst je spletna aplikacija, namenjena vinogradnikom na čezmejnem Krasu, ki omogoča celostni pregled stanja v vinogradih. Prikazuje razvoj bolezni in škodljivcev, stanje vodnega stresa, klimatske dejavnike ter daje natančen vpogled v tehnološke parametre posameznih vinogradov.

Uporabniki vnašajo podatke v sistem neposredno na terenu, preko povezave na mobilnem telefonu ali tabličnem oz. prenosnem računalniku. Obenem aplikacija e-Karst omogoča povezavo z laboratorijem vinske kleti ali inštituta, kjer se opravlja fizikalno-kemijske analize grozdja. Cilj aktivnosti je spodbujati vinogradnike k vse boljši kakovosti vinogradov po zgledu dobre prakse.

Meteo: April – September 2019

<https://e-karst.eu>

Vremenske postaje / Godnje

Godnje ▾

Zgonik ▾

< 2019 2018 >



1. 4. 2019

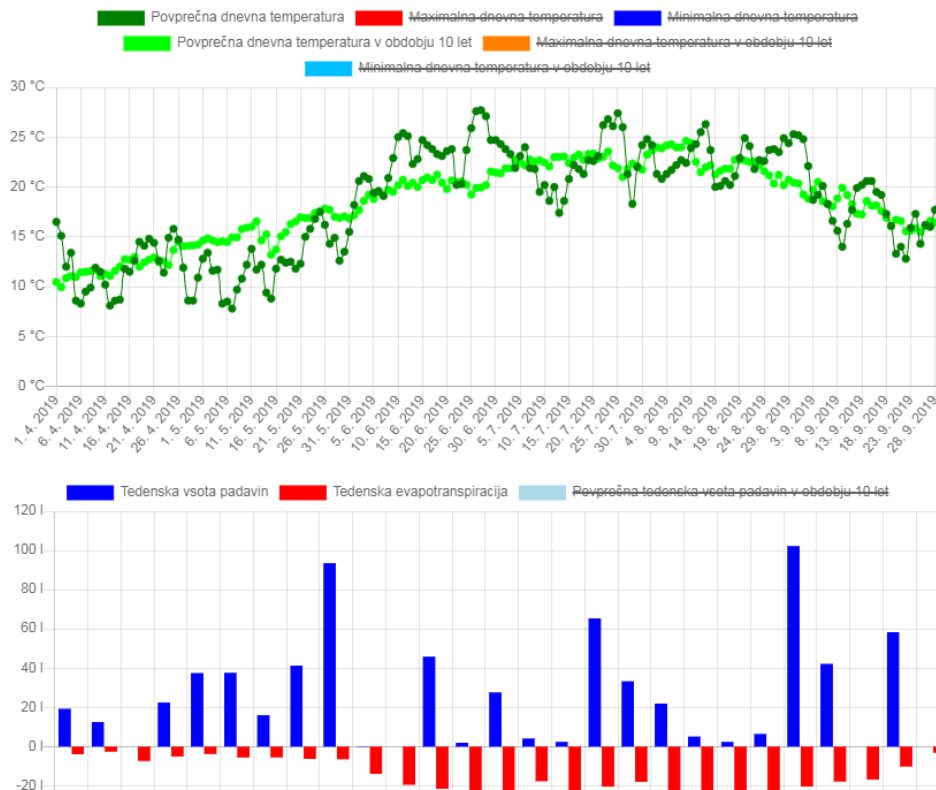
30. 9. 2019

Meteo podatki za izbrano časovno obdobje

Σpadavine = 697,5 l
Σetc = 390,54 l
Σobsevanje = 3491 MJ/m²
(= 970 kWh)
Σaktivne ure = 3872,4 h
Tmin = 1,9 °C
Tmax = 34,9 °C
Tmean = 18,44 °C

10 letna povprečja za izbrano časovno obdobje

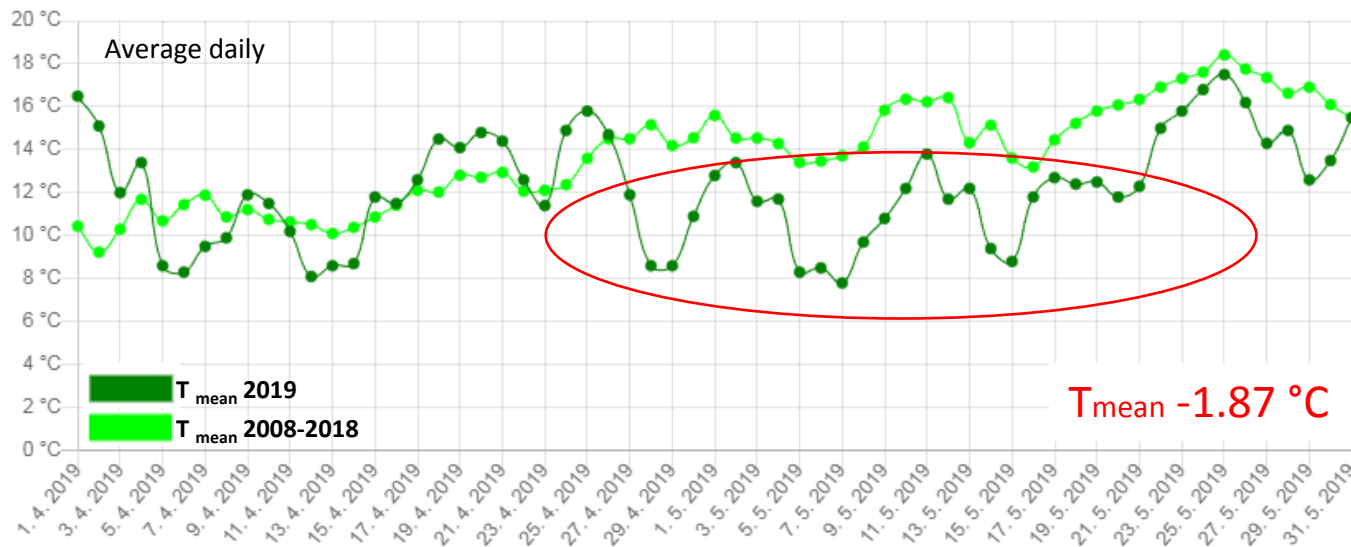
Σpadavine = 686,29 l
Tmin = 13,26 °C
Tmax = 24,85 °C
Tmean = 18,43 °C



Temperature: April – May 2019

<https://e-karst.eu>

SLOVENIJA: GODNJE / GODIGNANO



1.4. -31.5.2019 (Godnje)

Meteo podatki za izbrano časovno obdobje

Σpadavine = 279,4 l

Σetc = 43,74 l

Σobsevanje = 894 MJ/m²
(= 248 kWh)

Σaktivne ure = 1033,8 h

T_{min} = 1,9 °C

T_{max} = 24,1 °C

T_{mean} = 12,19 °C

10 letna povprečja za izbrano časovno obdobje

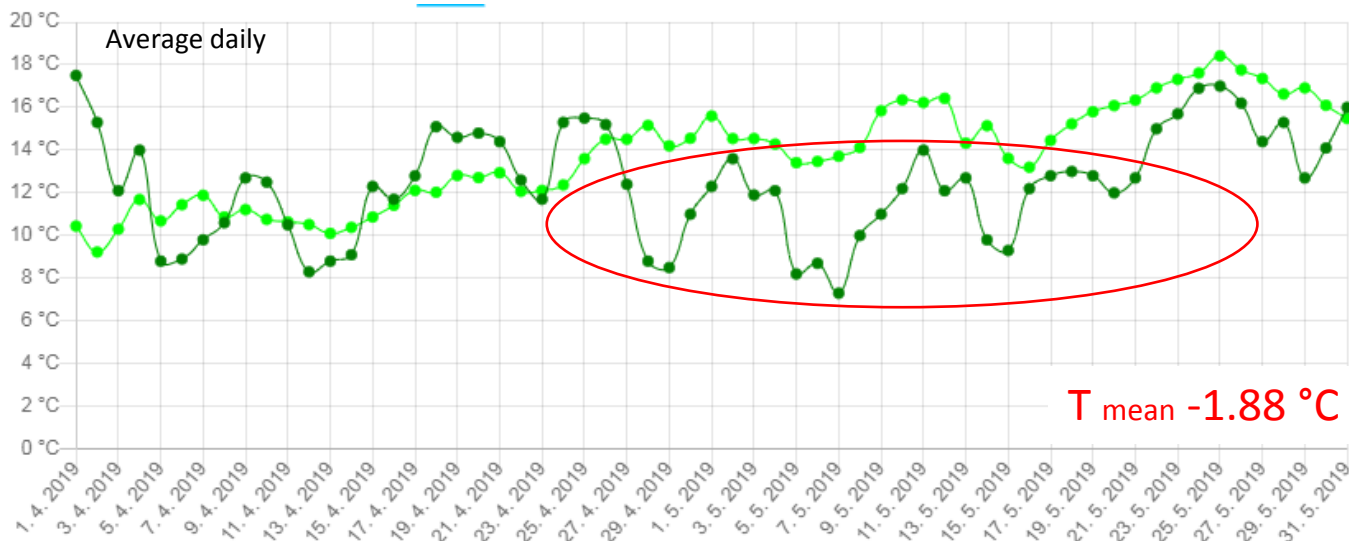
Σpadavine = 187,3 l

T_{min} = 9,13 °C

T_{max} = 20,29 °C

T_{mean} = 14,06 °C

ITALIJA: SGONICO / ZGONIK



1.4. -31.5.2019 (Sgonico)

Dati meteo per il periodo selezionato

Σpioggia = 255 l

Σetc = 44,17 l

Σradiazione = 922 MJ/m²
(= 256 kWh)

Σore attive = 1073 h

T_{min} = 0,7 °C

T_{max} = 22,9 °C

T_{mean} = 12,45 °C

10 letna povprečja za izbrano časovno obdobje

Σpioggia = 196,6 l

T_{min} = 9,44 °C

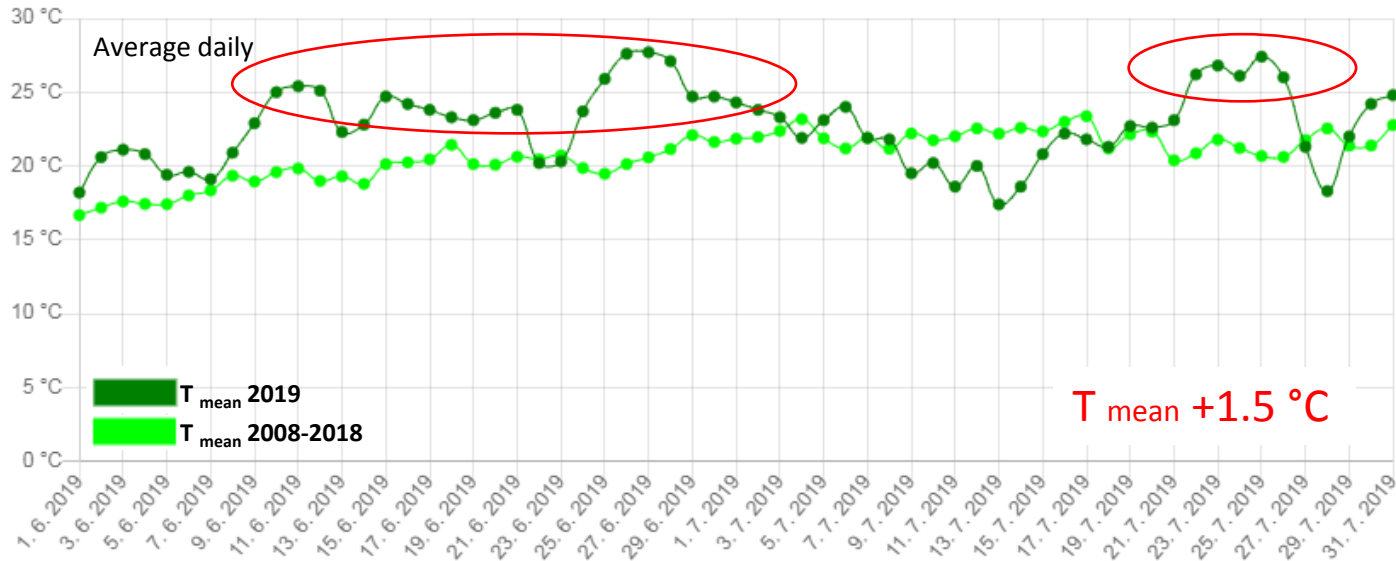
T_{max} = 20,37 °C

T_{mean} = 14,33 °C

Temperature: June – July 2019

<https://e-karst.eu>

GODNJE



1.6. -31.7.2019 (Godnje)

Meteo podatki za izbrano časovno obdobje

Σpadavine = 168,1 l

Σetc = 176,89 l

Σobsevanje = 1469 MJ/m²
(= 408 kWh)

Σaktivne ure = 1392,1 h

Tmin = 9,4 °C

Tmax = 34,9 °C

Tmean = 22,75 °C

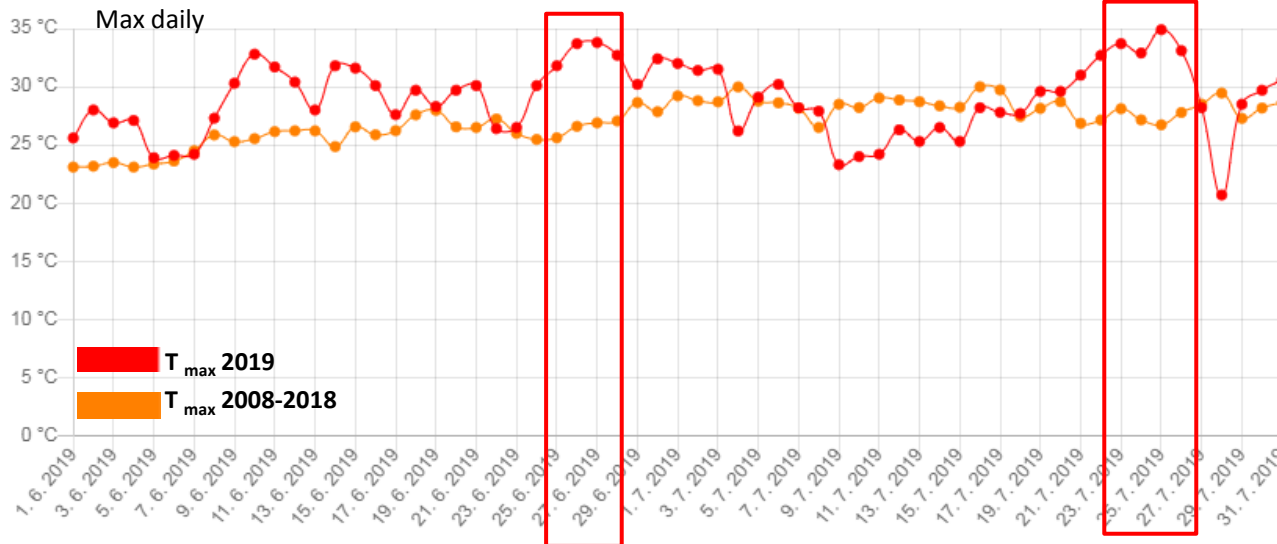
10 letna povprečja za izbrano časovno obdobje

Σpadavine = 222,02 l

Tmin = 15,61 °C

Tmax = 27,62 °C

Tmean = 21,25 °C



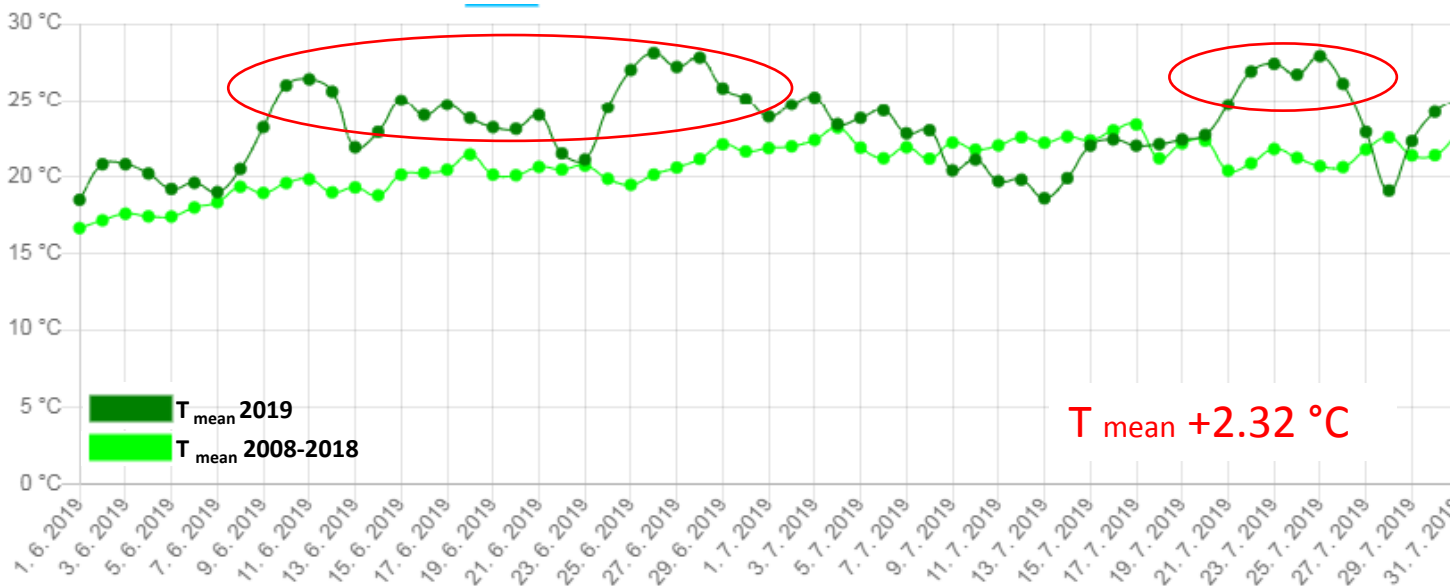
1st heat wave: 25.-29.6.2019
(33.8 °C - 27.6.2019)

2nd heat wave: 22.-26.7.2019
(34.9 °C - 25.7.2019)

Temperature: June – July 2019

SGONICO / ZGONIK

1.6. -31.7.2019 (Sgonico)

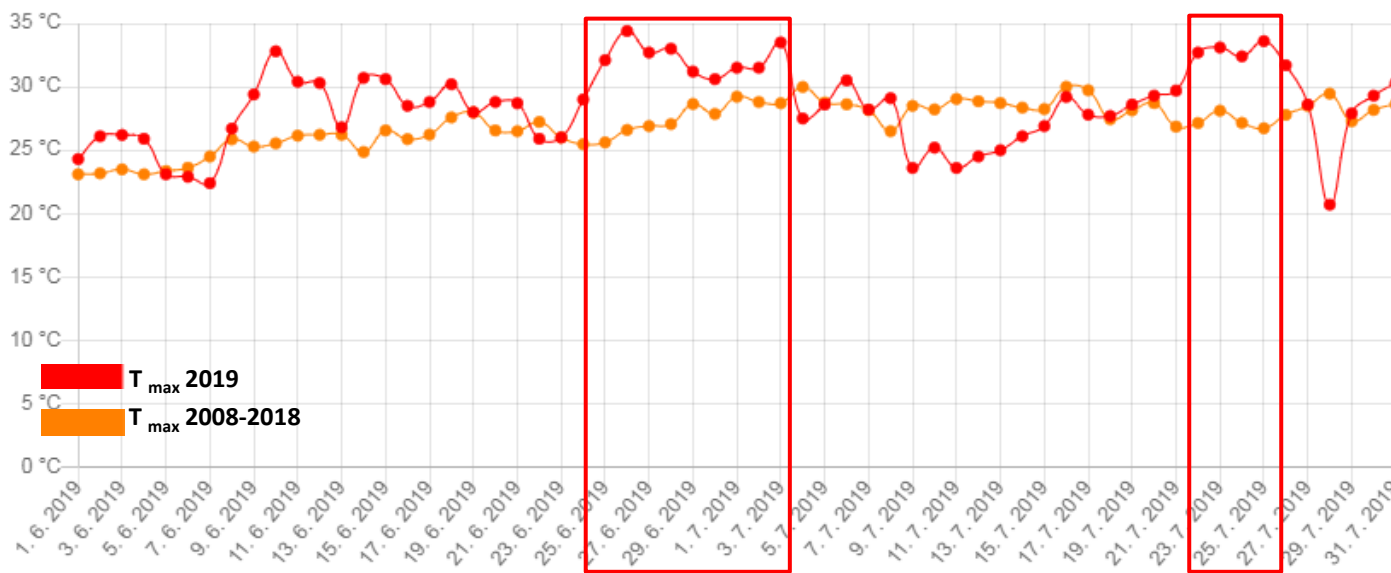


Dati meteo per il periodo selezionato

Σpioggia = 130 l
 Σetc = 212,86 l
 Σradiazione = 1572 MJ_{m²}
 (= 437 kWh)
 Σore attive = 1461 h
 Tmin = 9.6 °C
 Tmax = 34.4 °C
 Tmean = 23,25 °C

10 letna povprečja za izbrano časovno obdobje

Σpioggia = 237,17 l
 Tmin = 15,56 °C
 Tmax = 27,08 °C
 Tmean = 20,93 °C



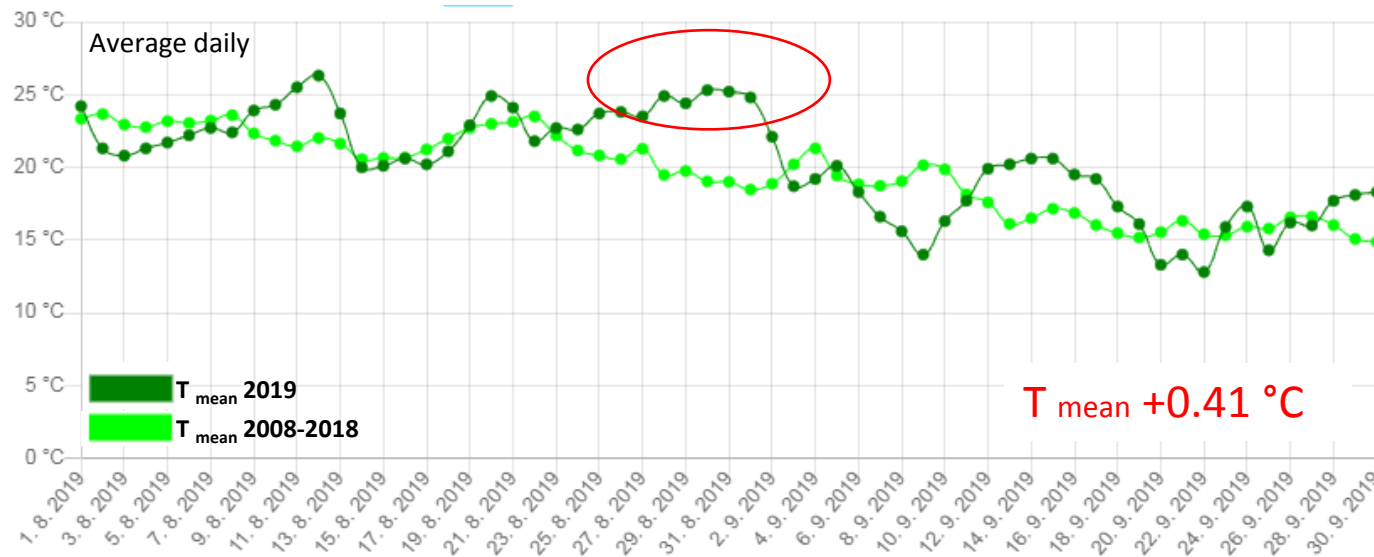
1st heat wave: 25.6.-5.7.2019
 (34.4 °C - 26.6.2019)

2nd heat wave: 22.-26.7.2019
 (33.6 °C - 25.7.2019)

Temperature: August – September 2019

<https://e-karst.eu>

GODNJE



1.8. -30.9.2019 (Godnje)

Meteo podatki za izbrano časovno obdobje

Σpadavine = 250 l

Σetc = 169,91 l

Σobsevanje = 1127 MJ/m²
(= 313 kWh)

Σaktivne ure = 1446,5 h

Tmin = 7.3 °C

Tmax = 32.1 °C

Tmean = 20,37 °C

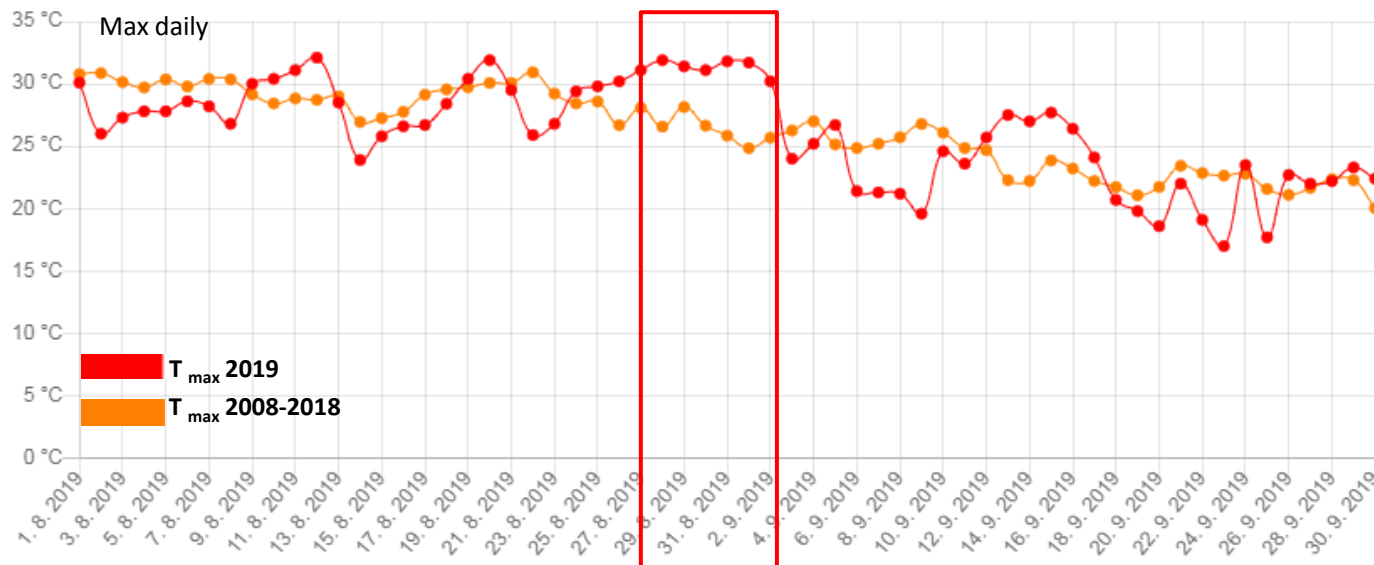
10 letna povprečja za izbrano časovno obdobje

Σpadavine = 276,97 l

Tmin = 15,04 °C

Tmax = 26,64 °C

Tmean = 19,96 °C



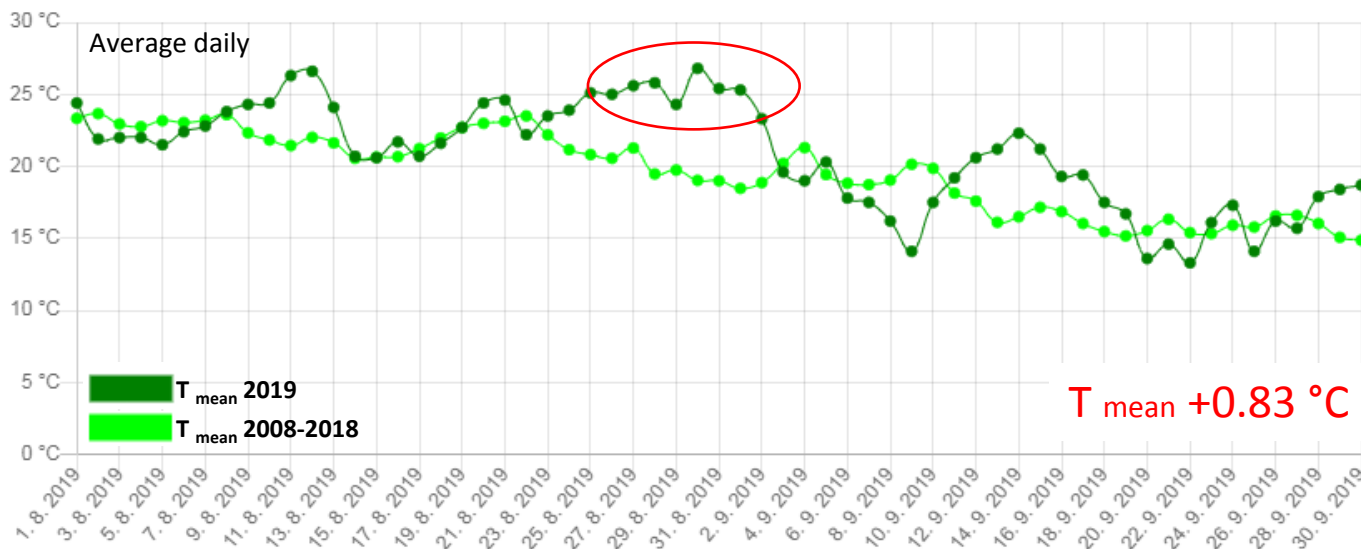
3rd heat wave: 26.8.-2.9.2019

(31.9 °C - 28.8.2019)

Temperature: August – September 2019

SGONICO / ZGONIK

1.8. -30.9.2019 (Sgonico)

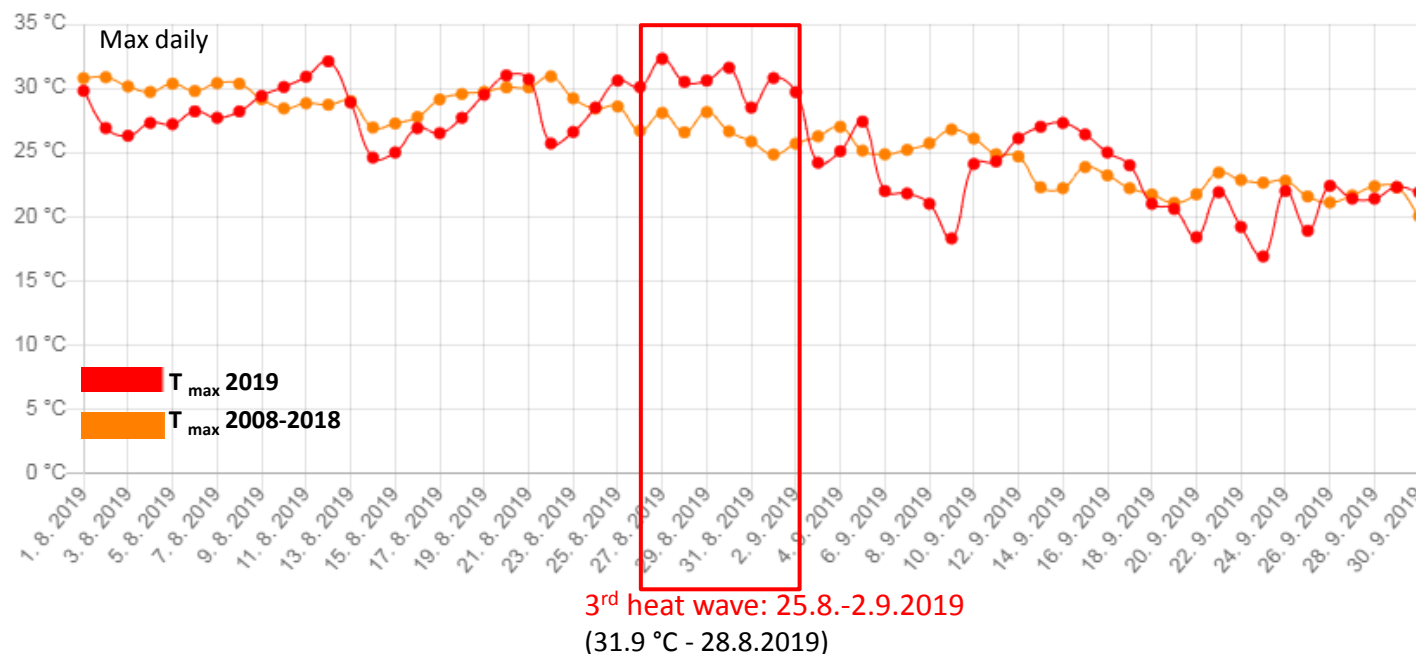


Dati meteo per il periodo selezionato

Σpioggia = 271 l
 Σetc = 178,98 l
 Σradiazione = 1134 MJ/m²
 (= 315 kWh)
 Σore attive = 1410 h
 Tmin = 7.1 °C
 Tmax = 32.3 °C
 Tmean = 20,9 °C

10 letna povprečja za izbrano časovno obdobje

Σpioggia = 264,57 l
 Tmin = 15,24 °C
 Tmax = 26,61 °C
 Tmean = 20,07 °C



Temperature & Climate indexes

<https://e-karst.eu>

	Vintage	Temperature (°C) 1.4. – 30.9.	Huglin index 1.4. – 30.9.	Winkler index 1.4. – 31.10.	Active hours 1.4. – 31.10.	Number days max temperatures ≥ 30 °C	Solar radiation (MJ/m2) 1.4. – 30.9.
Godnje	2019	18.44 ↓ -1.3°C	2148	1685	4482 ↓ -7.7%	41	3491 ~
	2018	19.7	2454	1928	4856	31	3499
Sgonico	2019	18.8 ↓ -1.4°C	2157	1761	4499 ↓ -8.7%	34	3627 ↓ -5.8%
	2018	20.2	2457	2056	4931	24	3853

Heliothermal index, HI

Very warm $H > 3000$

Warm $>2400 \leq 3000$

Temperate warm $>2100 \leq 2400$

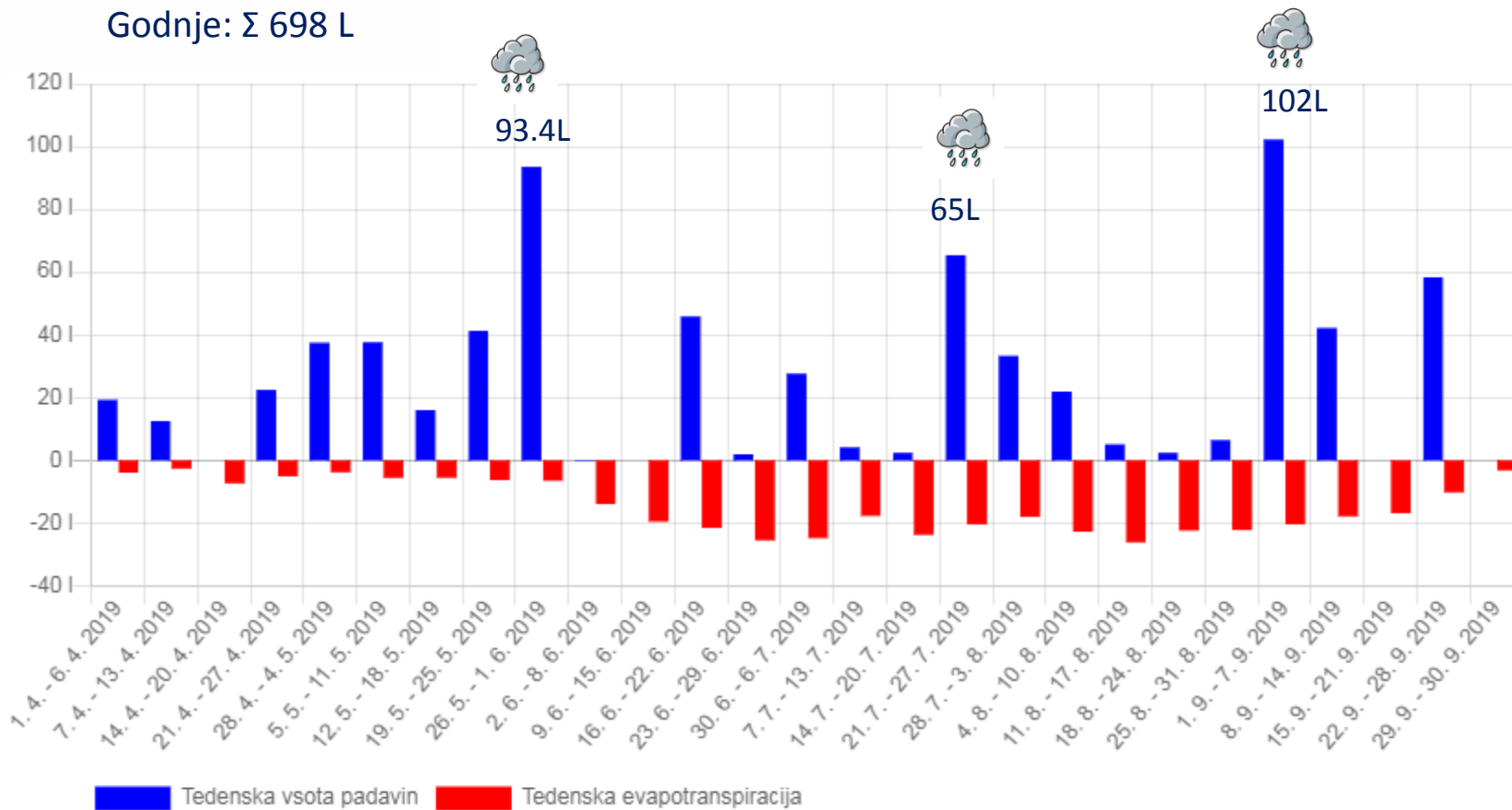
Temperate $>1800 \leq 2100$

Cool $>1500 \leq 1800$

Very cool ≤ 1500

Rainfalls (1.4.-30.9.2019)

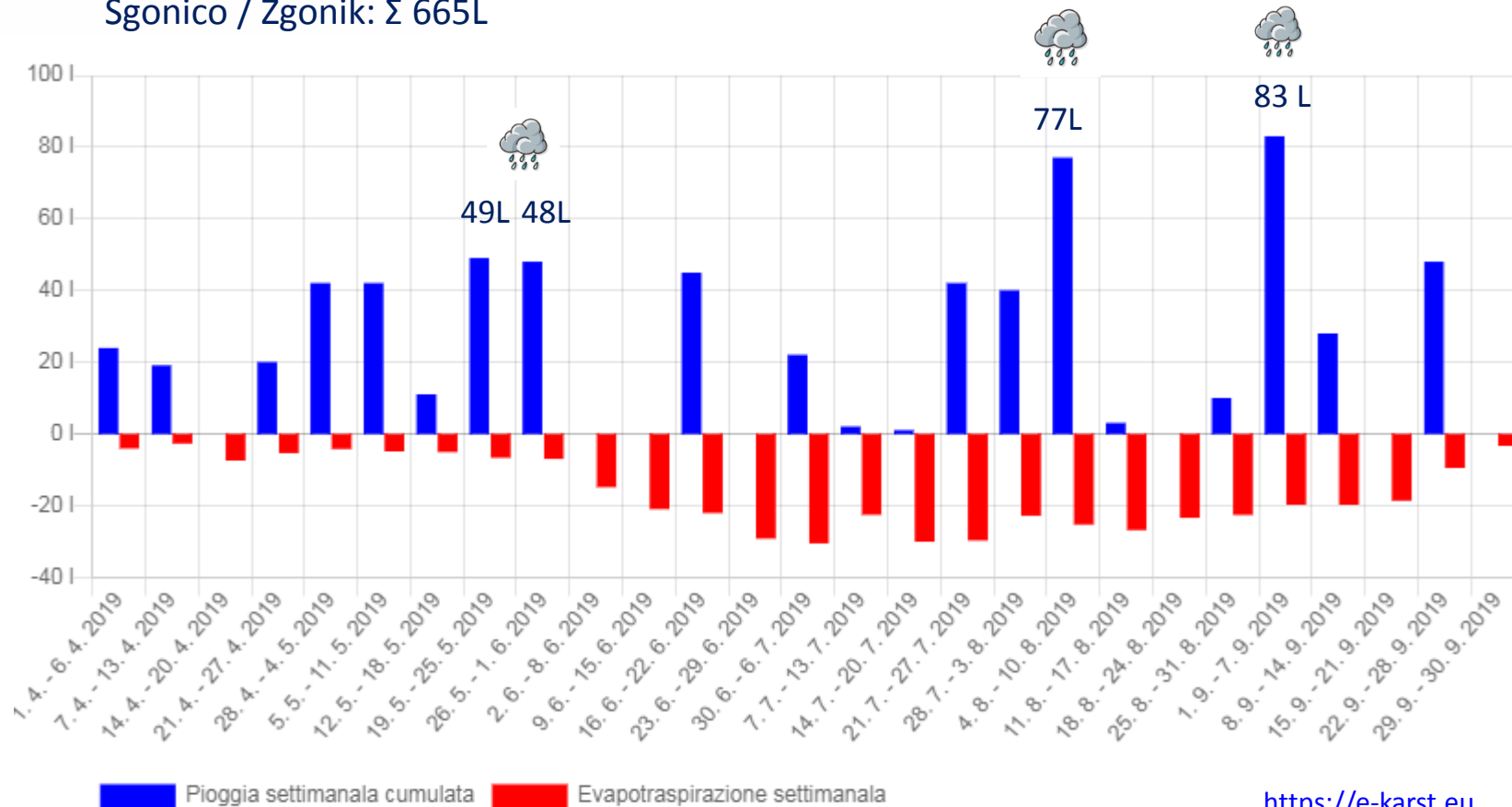
Godnje: Σ 698 L



<https://e-karst.eu>

Rainfalls (1.4.-30.9.2019)

Sgonico / Zgonik: Σ 665L



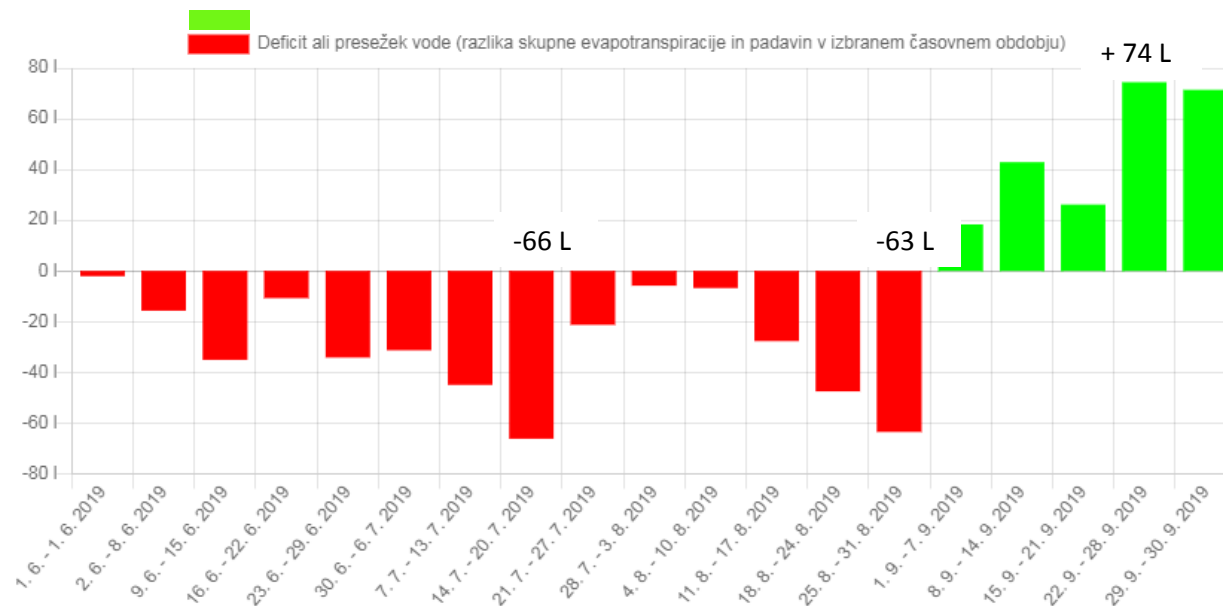
<https://e-karst.eu>

Rainfalls in 2019 (1.4. -30.9.2019)

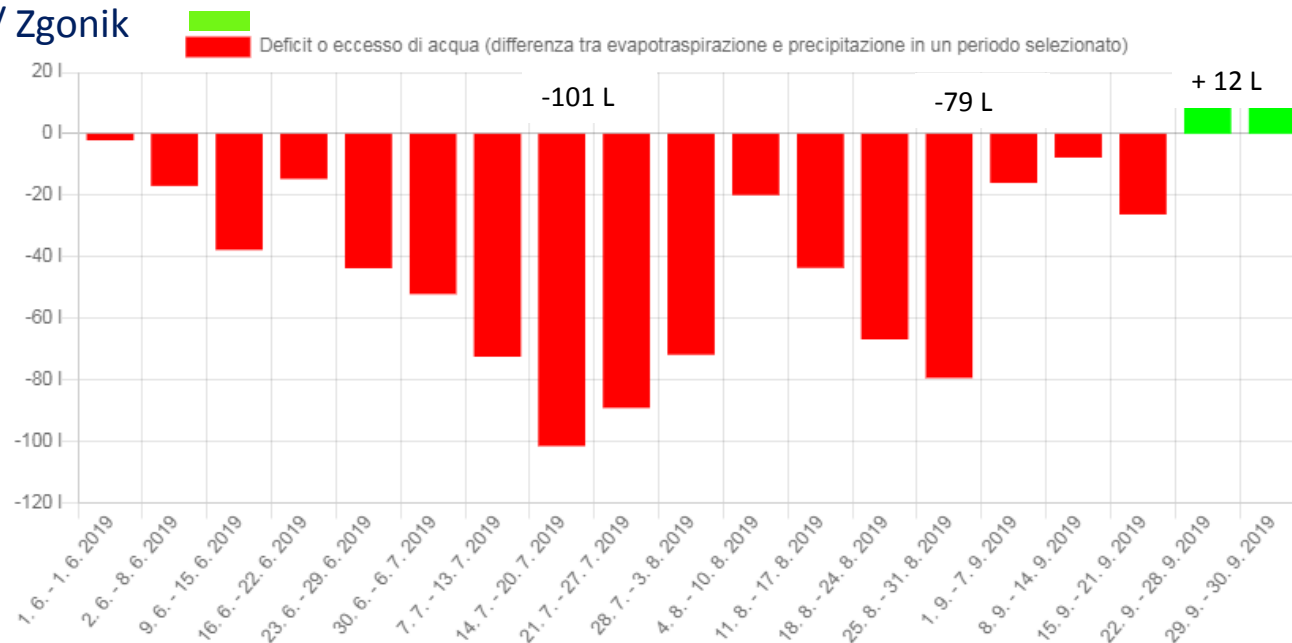
	Godnje (L)	Sgonico/Zgonik (L)
April	76	90
May	204	165
June	49	45
July	120	85
August	47	112
September	202	159
SUM (2019)	698 (+41.3% versus 2018; +1.7% versus 10 years average)	656 (+85 % versus 2018)
<i>SUM (2018)</i>	<i>483</i>	<i>345</i>
<i>SUM (2008-2018)</i>	<i>686</i>	-

Water deficit/suficit

Godnje

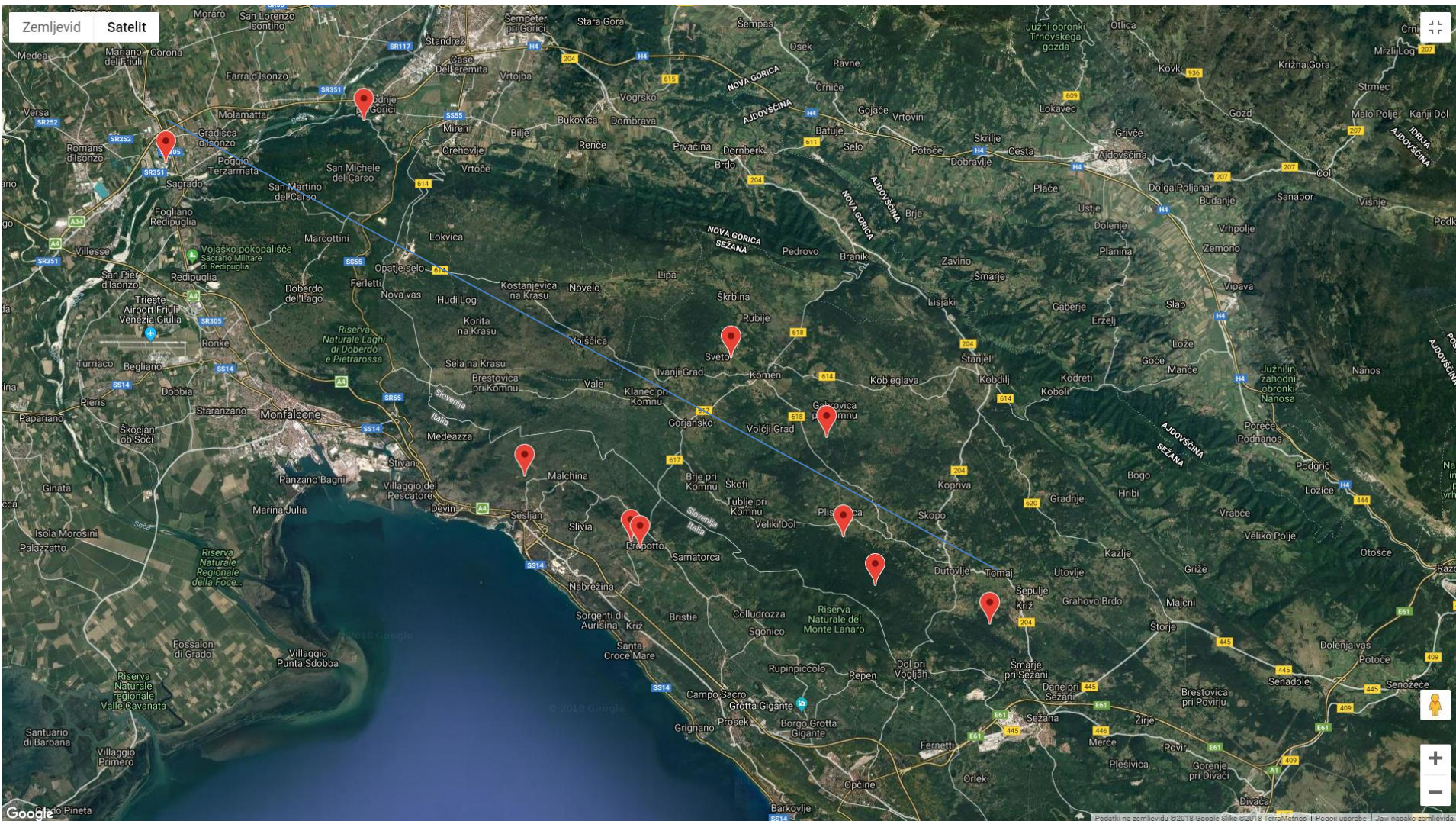


Sgonico / Zgonik



Vine water stress

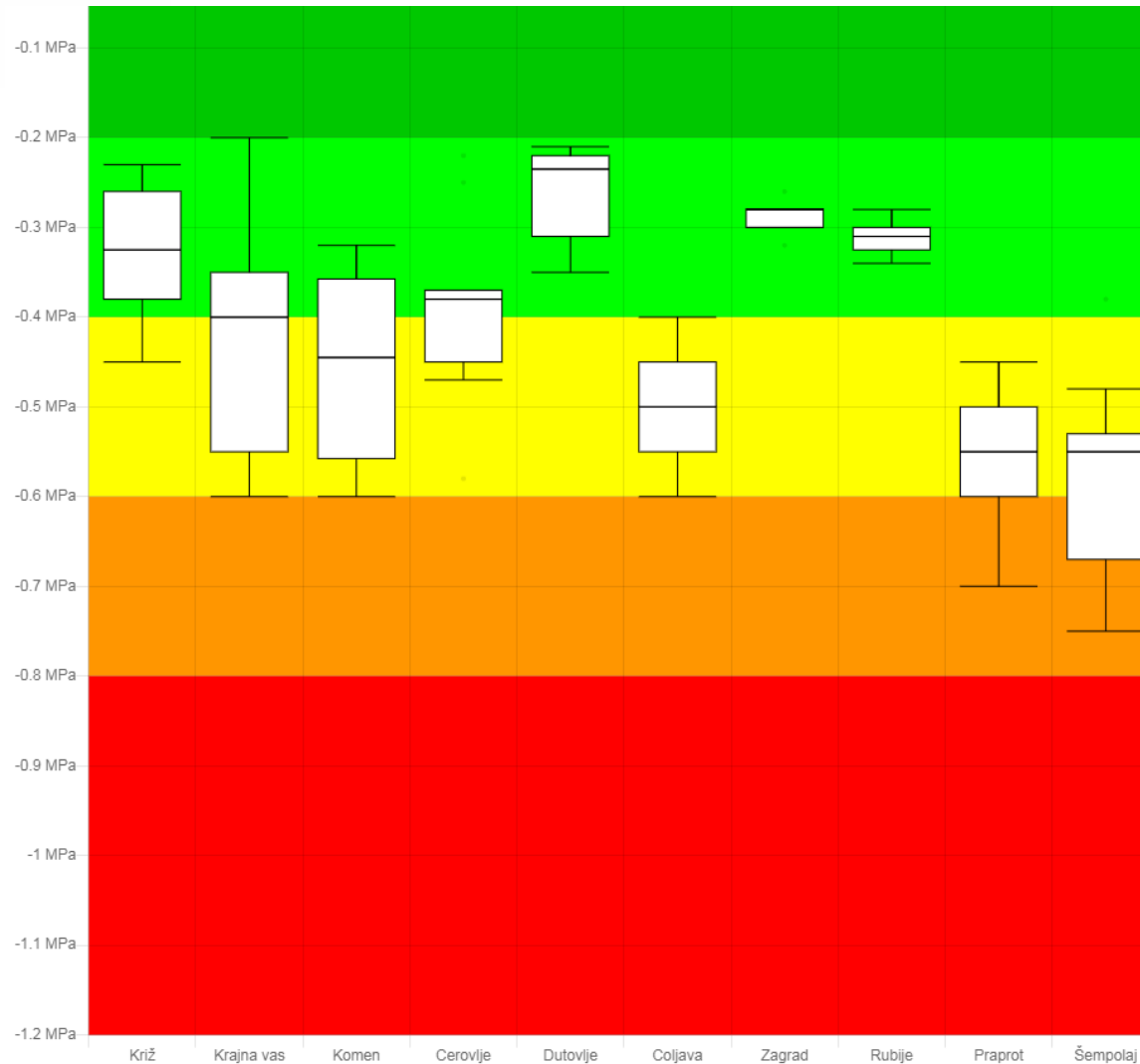
10 representative vineyards, 5 SLO, 5 ITA (2 from ,Gorica Kras'): Monitoring of water stress (5x in season, pre down, midday leaf water stress)



Vine water stress (24.7.2019)

Meritve vodnega potenciala pred zoro Ψ_{pd}
Misura del potenziale idrico prima dell'alba Ψ_{pd}

- Brez stresa
 - Blag stres
 - Zmeren stres
 - Močan stres
 - Pretiran stres
-
- No stress
 - Stress lieve
 - Stress medio
 - Stress forte
 - Stress accessivo



Refošk phenology at Karst in 2019

From flowering to harvest



Flowering



2019: 95 – 111 days (avg 104 days)

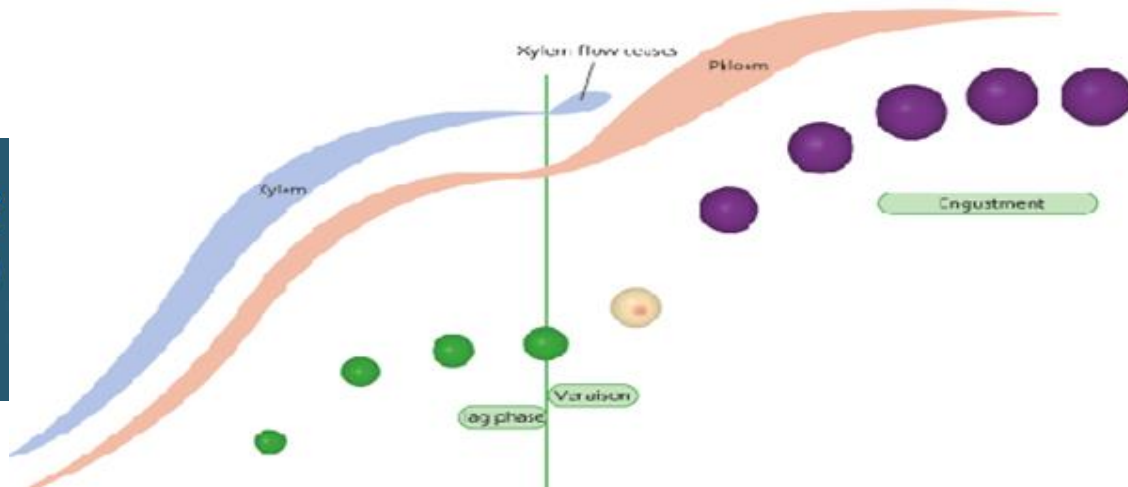
2018: 112 – 120 days (avg 117 days)

Harvest



2018: 50 – 55 days (AVG 53 days)





Flowering
(13.6.2019
versus
20.5.2018)

616 kWh (2019) versus 686 kWh (2018) (- 10.2 %)

Veraison
13.8.2019
versus
1.8.2018

218 kWh (2019) versus 241 kWh (2018) (-9.5 %)

Harvest
24.9.2019
versus
18.9.2018



	FLOWERING		VERAISON		SAMPLING/HARVEST		FLOWERING-HARVEST (DAYS)	VERAISON-HARVEST (DAYS)
2019	MAY	JUN	JUL	AVG	SEP	OKT		
San Pelagio/ Šempolaj		9		12	1		84	20
Rubbia/Rubije		8		12	24		108	43
Sagrado/Zagrad		5	30		24		111	56
Prepotto/Praprot		7		8	24		109	47
Ceroglie/Čerovlje		12		8	24		104	47
Coljava /Zollava		14		12	24		102	43
Krajna vas /V. Cargna		14		13	17		95	35
Komen / Comeno		13		12	30		109	49
Križ / Santa Croce		14		20	24		102	35
Dutovlje / Duttogliano		13		13	17		96	35
					AVG 2019		104	43
					AVG 2018		117	53

2019

Vineyard	Average No. bunches/vine	Mass of bunch (g)	Yield estimation (kg)
San Pelagio	9.3	/	/
Rubbia	13	348	4.5
Sagrado	8.5	195	1.7
Prepotto	9.2	292	2.7
Ceroglie	26.1	281	7.3
Coljava	9.4	257	2.4
Krajna Vas	9.8	301	2.9
Komen	8.5	445	3.8
Kriz	9.8	308	3.0
Dutovlje	9.9	310	3.1
MIN	8.4	195	1.7
MAX	26.1	445	7.3
MEAN	11.4	304	3.4

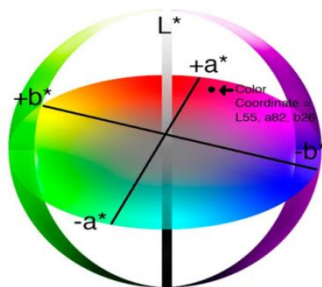


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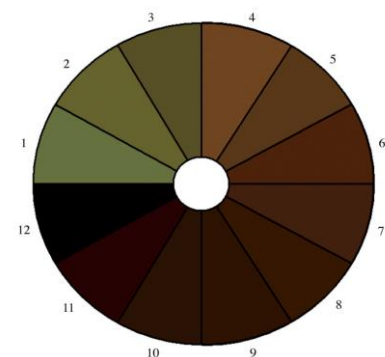


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Datum/Data di campionamento	Lokacija/Località	°Brix	°Oe	Acohol potencial (vol.%)*	pH	Skupne kisline (g/L vinska) / Acidità totale (g/L tartarico)	Jabolčna kislina (g/L) / Acido malico (g/L)	**Skin color_L*	**Skin color_a*	**Skin color_b*	***Seed color
24/09/19	RUBIJE / RUBBIA	18.8	77.7	10.2	3.07	11.8	8.28	23.30	0.65	-0.87	4.1
24/09/19	ZAGRAD / SAGRADO	19.0	78.6	10.3	3.27	8.8	5.04	23.18	0.66	-0.85	5.3
24/09/19	PRAPROT / PREPOTTO	19.7	81.7	10.8	3.05	9.5	4.28	23.23	0.79	-0.81	4.6
24/09/19	CEROVLJE / CEROGIE	18.1	74.6	9.7	2.98	11.1	6.00	23.60	0.63	-0.85	4.0
24/09/19	COLJAVA / ZOLLAVA	19.7	81.7	10.8	3.05	12.6	8.48	23.12	0.44	-0.79	3.7
17/09/19	KRAJNA VAS / VILLA CARGNA	15.8	64.6	8.3	2.91	14.3	10.04	24.12	0.61	-0.94	2.7
24/09/19	KOMEN / COMENO	19.1	79.0	10.8	3.17	9.5	6.36	23.67	0.81	-0.88	4.5
24/09/19	KRIŽ / SANTA CROCE	19.0	78.6	10.3	2.93	13.2	9.20	23.47	0.42	-0.75	3.2
17/09/19	DUTOVLJE / DUTTOGLIANO	16.4	67.2	8.6	2.96	15.2	10.48	23.85	0.61	-0.78	2.5



**Evalvacija barve jagode /
Valutazione del colore di buccia



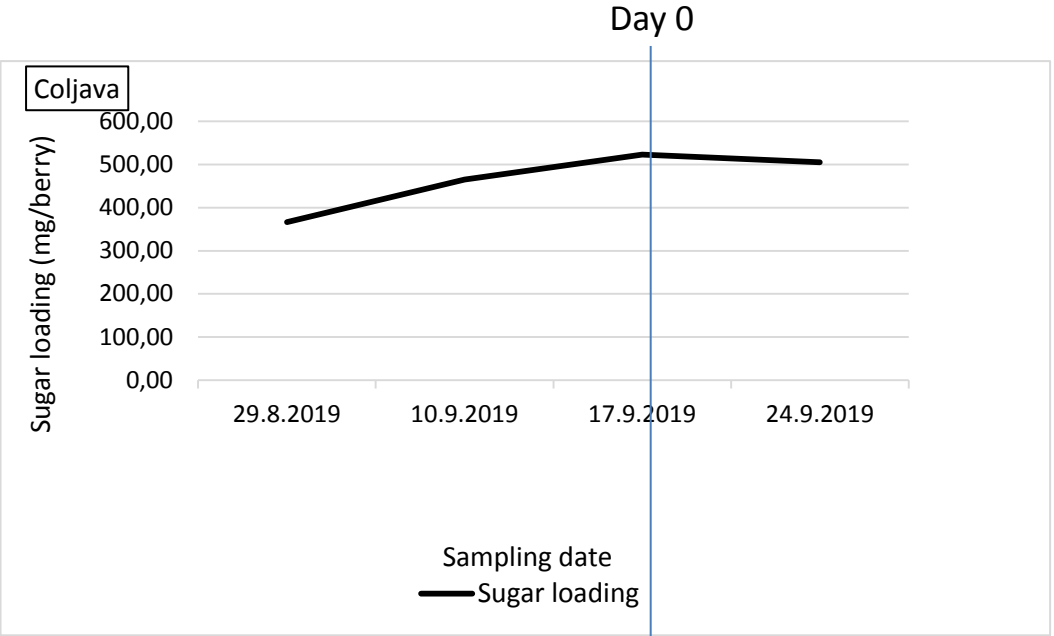
***Evalvacija barve pesk /
Valutazione del colore di vinacciolo

Fredes et al. (ChileanJAR, 2010, 70(3))

Sugar loading

Coljava

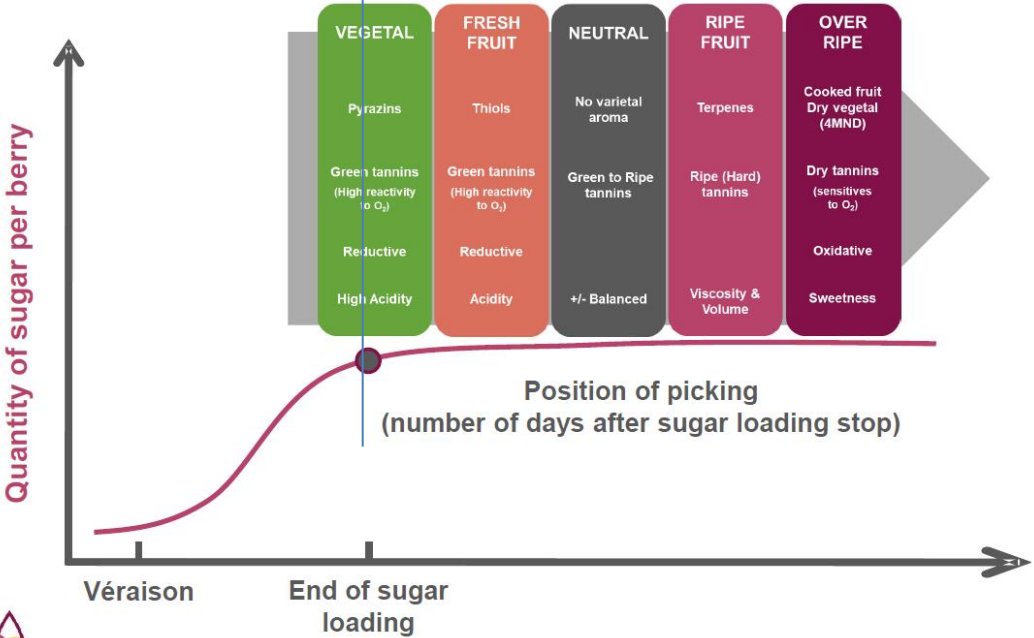
Sugar load till: 17.9.2019



Fresh fruit aroma expected
(no model for Refošk/Teran)

Cycle	Variety	FRESH FRUIT	RIPE FRUIT
Short	Syrah, Merlot, Pinot Noir, Gamay	10 / 12	20 / 25
Medium	Grenache, Tempranillo, Tannat, Cabernet Franc	15 / 20	25 / 30
Long	Cabernet Sauvignon, Malbec	25 / 30	45 / 50

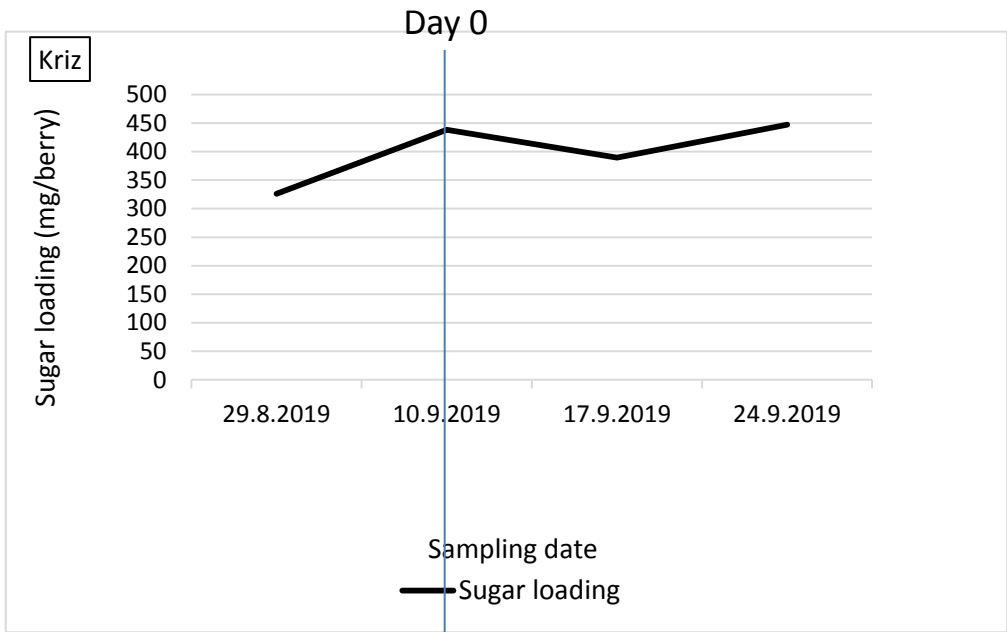
Harvest position
(number of days after the sugar load stop)



Sugar loading

Križ

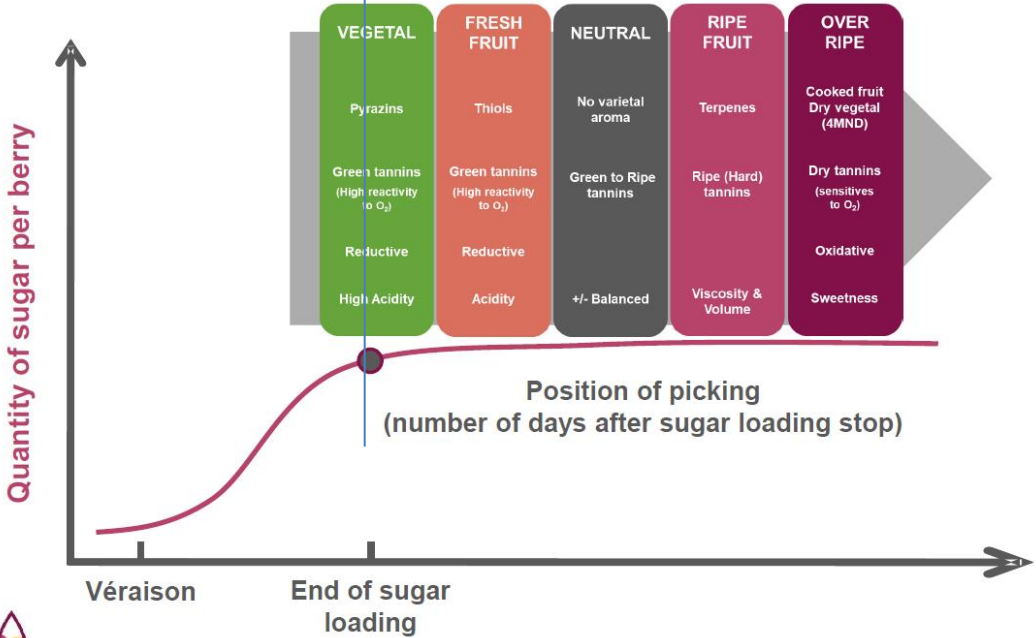
Sugar load till: 10.9.2019



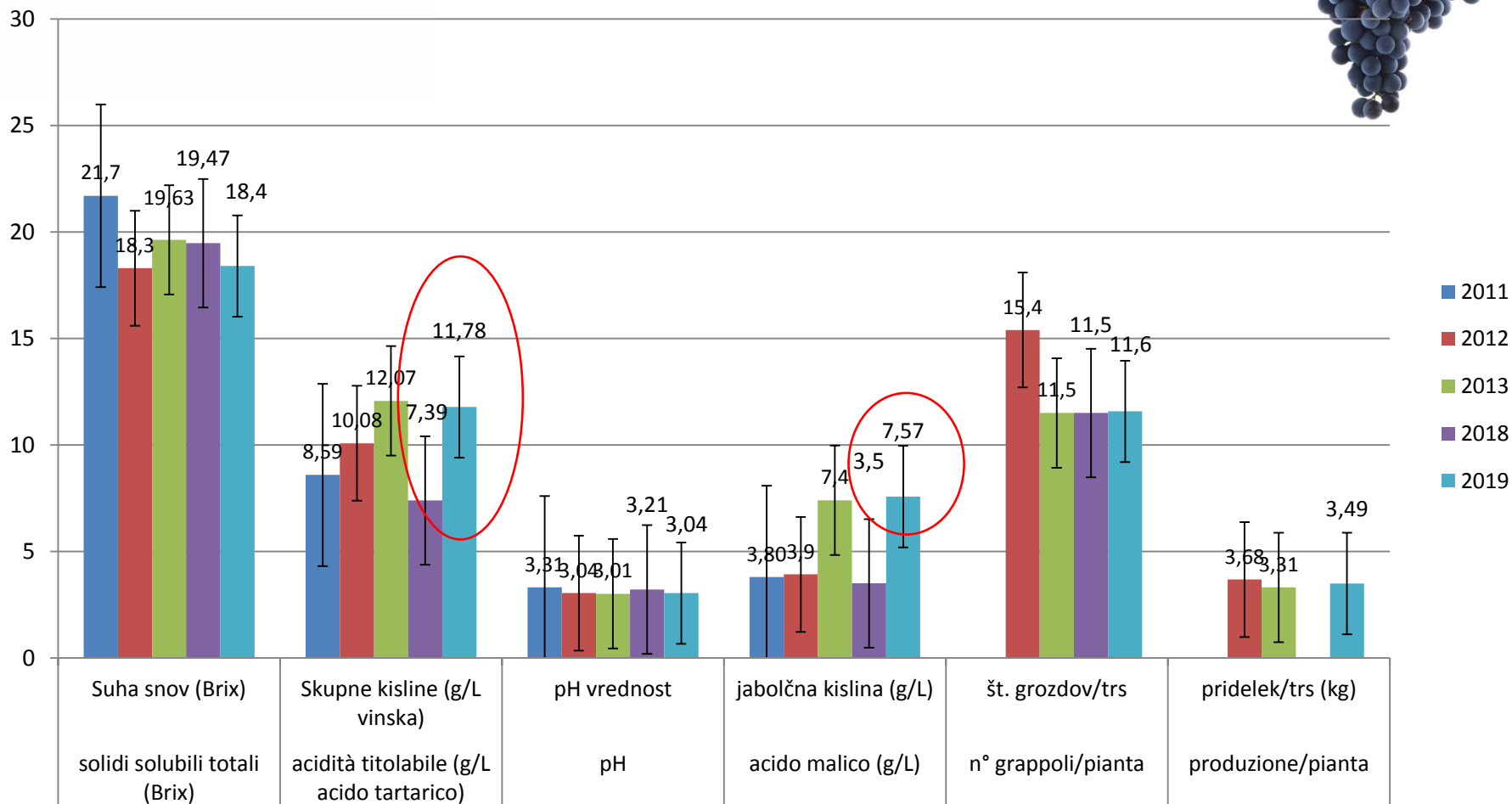
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Harvest position
(number of days after the sugar load stop)



REFOŠK GRAPES: BASIC ANALYSES

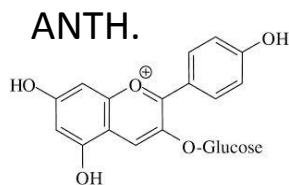


GRAPE POLYPHENOL PROFILES OF 2019

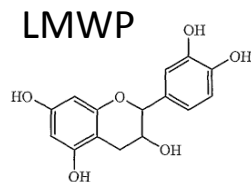


POLIPHENOL PROFILE

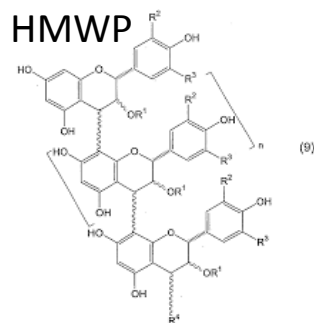
Polyphenols are highly bioactive compounds, which impact the nutritional value of wines through their positive health effects (prevention of chronic diseases).



ANTHOCYANINS: red colour, positive effect on health



Low molecular weight proanthocyanidins (tannins): taste of bitterness, aging potential



High molecular weight proanthocyanidins (tannins): mouthfeel of astringency, body of wine, aging potential

EXTRACTABLE TANNINS

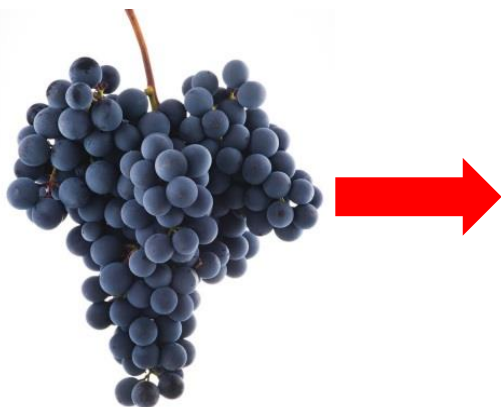
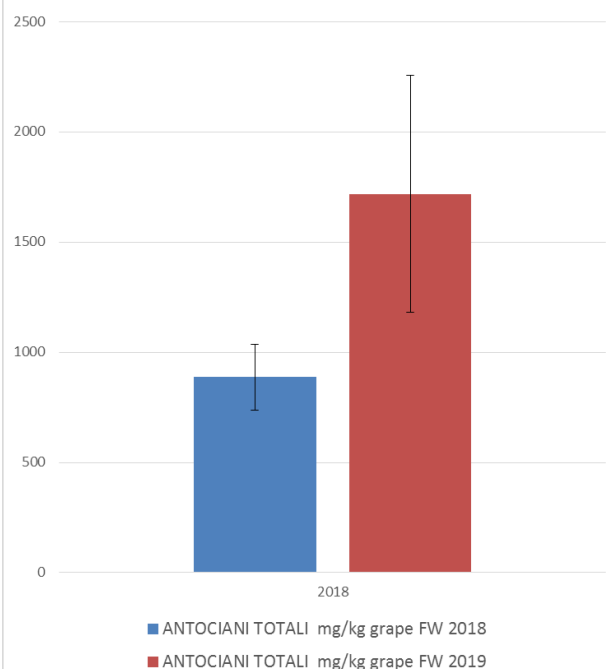


foto: Marijan Močivnik, www.studio-ajd.si

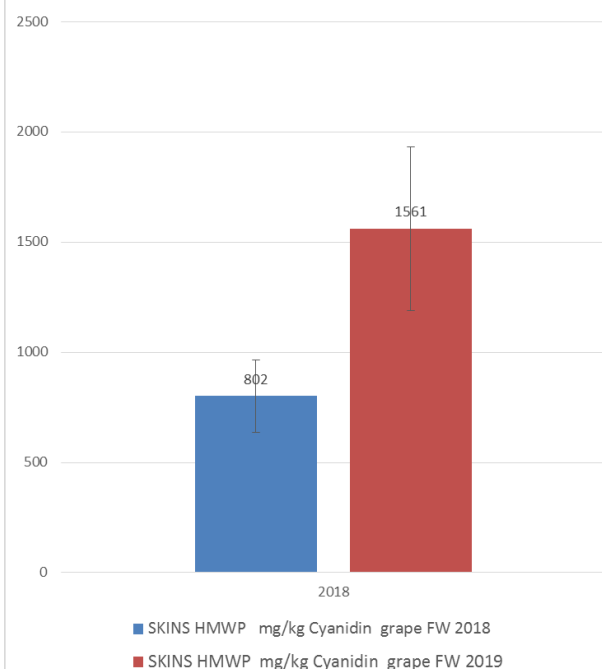
Extractable anthocyanins and tannins 2019 versus 2018



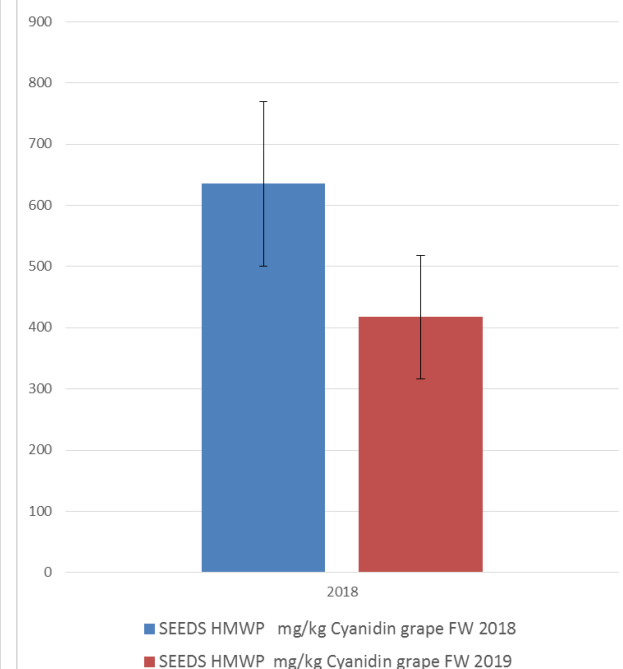
ANTOCIANI TOTALI mg/kg grape FW



SKINS HMWP mg/kg grape FW



SEEDS HMWP mg/kg grape FW

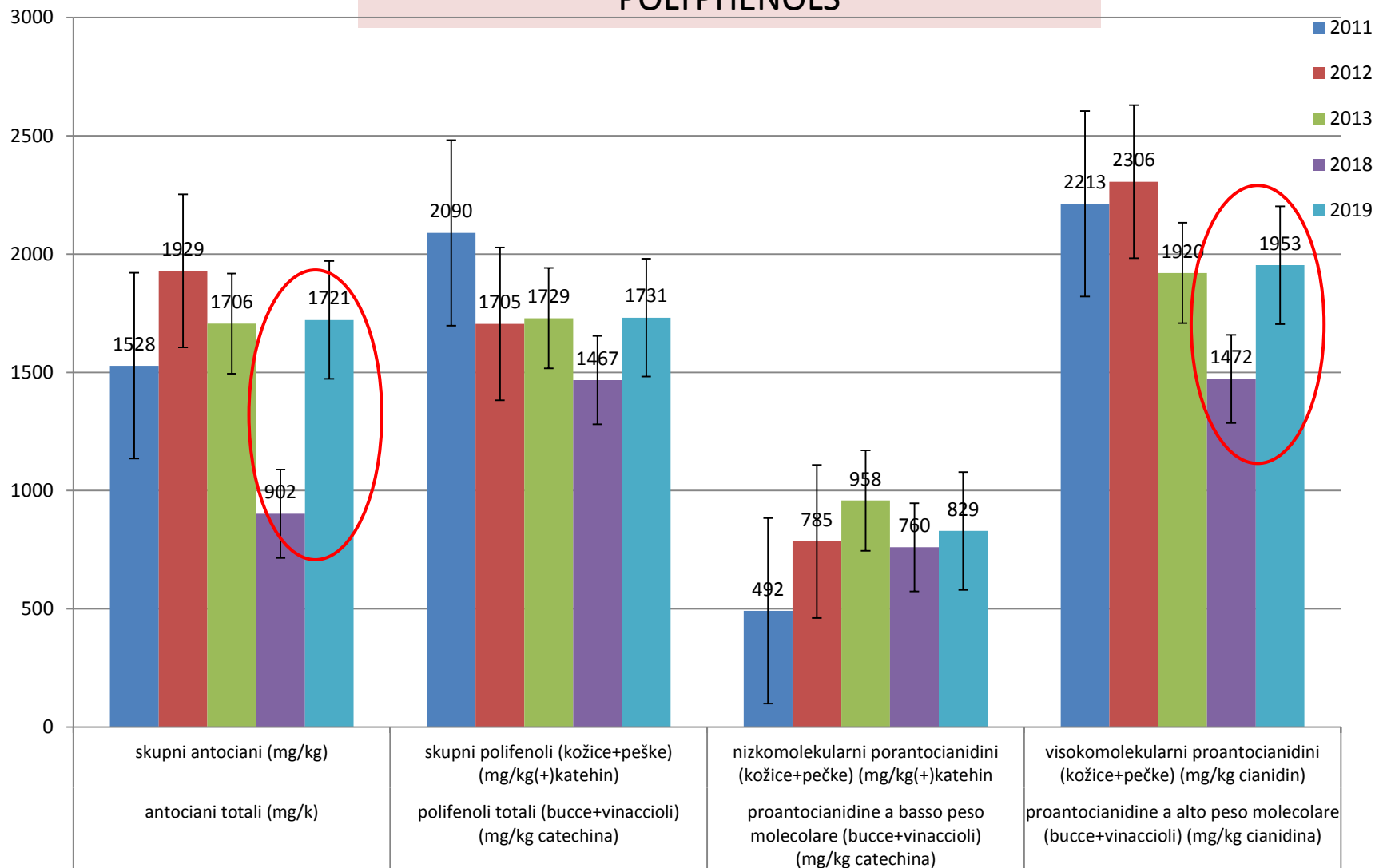


MASS PERCENTAGE OF SEEDS AND SKINS PER BERRY IN REFOŠK

Letnik / anno	Pečke (%) / vinaccioli (%)	Kožice (%) / bucce (%)
2011*	4.04±0.51**	15.56±2.23
2012	4.46±1.40	15.16±2.52
2013	4.61±0.98	22.48±4.03
2018	3.58±0.35	22.76±2.32
2019	4.96±0.44	12.06±6.67
*Masni delež v odstotkih (na 100 g jagod) / Massa percentuale (per 100 g di acini)		
**Standardni odklon / Deviazione standard		



REFOŠK: PROFILE OF EXTRACTABLE POLYPHENOLS



GIS system for vineyard monitoring (e-Karst)

← Ocena vinograda

Uravnoteženost rasti

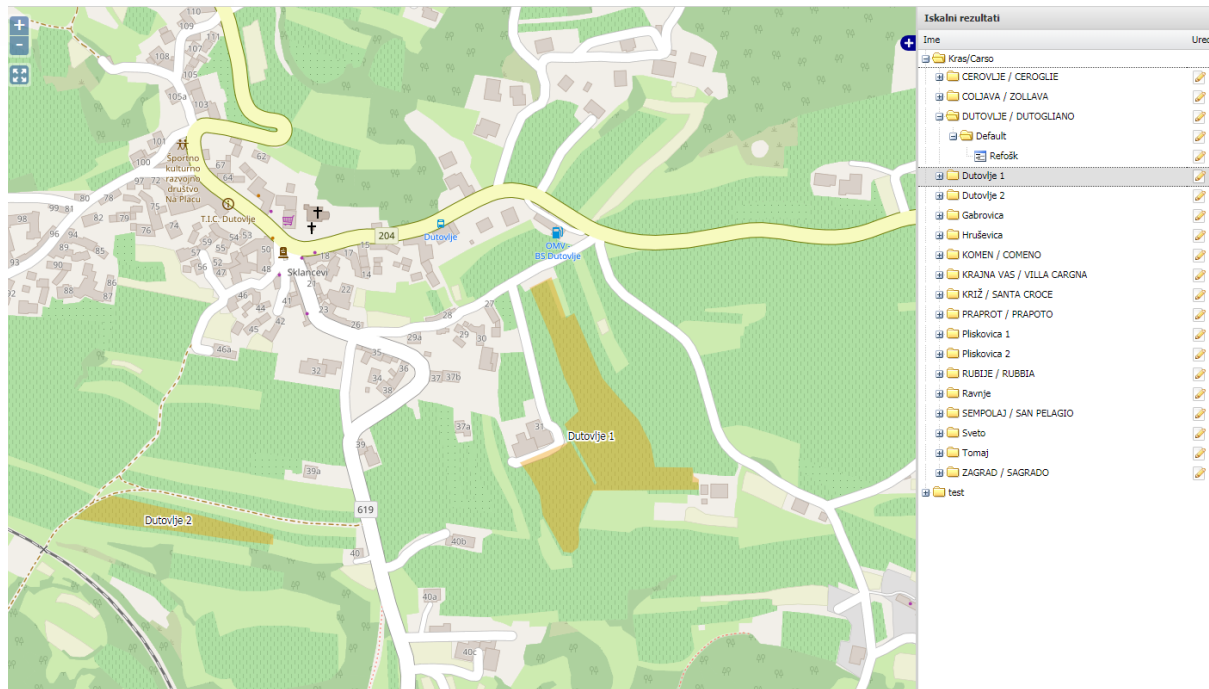
Preveč listne mase ☐ 5
 Povečana količina listne mase ☐ 10
 Uravnotežena listna masa ☐ 20
 Zmanjšana količina listne mase ☐ 10
 Omejena listna masa ☐ 5

Velikost lista

Premajhen ☐ 5
 Povprečen ☐ 4
 Prevelik ☐ 3
 Zelo velik (>180 mm) ☐ 2
 Zelo majhen (<180 mm) ☐ 1

Barva lista (celotnega grma)

Zelen, zdrav, nekoliko bled in medel ☐ 10
 Temno zelen, svetleč in zdrav ☐ 5



Conclusions for Refosk grape - vintage 2019

Temperature: - April, May (mean daily T 1,8 °C lower than in 2018);

- June and July (mean daily T 2.3 °C higher);

- 41 days $T_{max} \geq 30$ °C, 3 heat waves (June, July, August).

❖ **Rainfall:** - a lot of rain in May, dry July

- total rain in vegetation period: 698 L; **41% more than in 2018**, 102 L in first week of September.

❖ **Phenology of grape vine:** - **flowering started two weeks later** than in 2018 (cold and rainy May)

- **two weeks difference in grape maturation** between ITA and SLO Karst (same in 2018)

- 95 -111 days from flowering till harvest, 35-56 days from veraison to harvest (**10 days shorter than in 2018**)

Conclusions for Refosk grape - vintage 2019

- ❖ **Sugar loading:** until 17.9.2019
- ❖ **Basic grape analyses:** standard vintage for sugars (18.4 Brix), high total acidity (11.8 g/L), low pH (3.04), very high malic acid (7.6 g/L)
- ❖ **Normal crop vintage:** average 11.4 bunch per vine, 304 g/bunch, 3.4 kg/vine
- ❖ **Polyphenols :** -higher total anthocyanin content than in 2018 (**more color**)
 - more high molecular weight tannins in skins and seeds (**good wine aging potential**)
 - higher ratio between high and low molecular weight tannins
 - **better tannin maturity than in 2018 - more structured****Teran** is expected.

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