**Universidade de Lisboa
Instituto Superior de Agronomia**

AGROMETEOROLOGIA
Serviços e Aplicações de Apoio à Tomada de Decisão

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11 06 2024

Importância
Serviços e Aplicações de Apoio à Tomada de Decisão

- "Indústria a céu aberto"
- Elevada incerteza
- Forte impacto (produtividade, qualidade, custos)
- Elevado Risco
  - Ponderação
  - Redução

OBJETIVO: Reduzir o risco, aumentar a eficiência do uso de recursos e fatores, aumentar a sustentabilidade

Níveis de Decisão

Estratégica (longo prazo)

- Escolha de culturas, variedades, parque de máquinas, Sistemas de rega, Adaptação às ACs, etc.

Tática (um ano, uma campanha)

- Escola de culturas, variedade, áreas de cultivo, dotações de rega, data de sementeira, previsão de estados fenológicos, previsão de produtividade, etc.

Operacional (curto prazo, semana, dia)

- Tratamentos fitossanitários, rega, fertilização, logística de fatores, gestão de mão-de-obra, etc.

Serviços Agrometeorológicos

Monitorização meteo em tempo real

Sistemas de avisos de eventos extremos

Previsão meteo (várias escalas temporais)

Análise climática (incluindo as ACs)

Sistemas de suporte à decisão

Ferramentas integradas com **aconselhamento especifico** baseados em dado meteo e climático

E.g. Condução da rega, condições de pulverização, modelos de previsão de doenças, sazão do solo, data de sementeira, fertilização, Fenologia, Produtividade, etc.

http://georgiaweather.net/

1991

Current Conditions >
Current Condition
Yesterday Condition
Graph Current Condition
7-Day Summary

Past Data >
31-Day Summary
Historical
Climate
Seasonal Summary
First Frost
Last Frost
7-Day Summary

Graph >
Graph Current Conditions
Graph Daily Data
Temperature Prediction

Seasonal >
First Frost
Last Frost
Seasonal Summary

Forecast >
Local Forecast
Temperature Prediction

Site Information
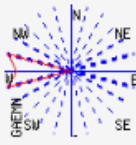
Hardin Farm

Arabi, Crisp County, Georgia

Current Conditions

Today is Tuesday, June 11, 2024. The time is 03:41:45 AM

Graph Weather Data

Conditions at 3:30 AM EDT on June 11, 2024	Data
Temperature	70.7 ºF
Relative Humidity	99.9 %
Dew Point Temperature	70.7 ºF
Wet Bulb	70.7 ºF
Atmospheric Pressure	29.88 in.
Wind Direction	
Wind Speed	0.6 mph
Wind Gust	4.2 mph at 3:30 AM
Heat Index	63.2 ºF
WBGT Index	79.2 ºF
2 Inch Soil	76.5 ºF
4 Inch Soil	78.5 ºF
8 Inch Soil	80.2 ºF
Soil Moisture	20.9 %
Solar Radiation	0 W/m2

Weather Stations

Select a station from drop down list below

Select a Station ▾

Nearest Stations

Enter a GA ZIP Code to check three nearest stations

[   ] Check

Hardin Farm

Arabi, Crisp County, Georgia

Graph Daily Data

From: Apr-12-2024 ▾ To: Jun-10-2024 ▾

Graph

Maximum Temperature, Minimum Temperature

— Maximum Air Temperature — Minimum Air Temperature — Freezing Line

Highcharts.com

Daily Cumulative Rainfall

Highcharts.com

Average Atmospheric Pressure

Highcharts.com
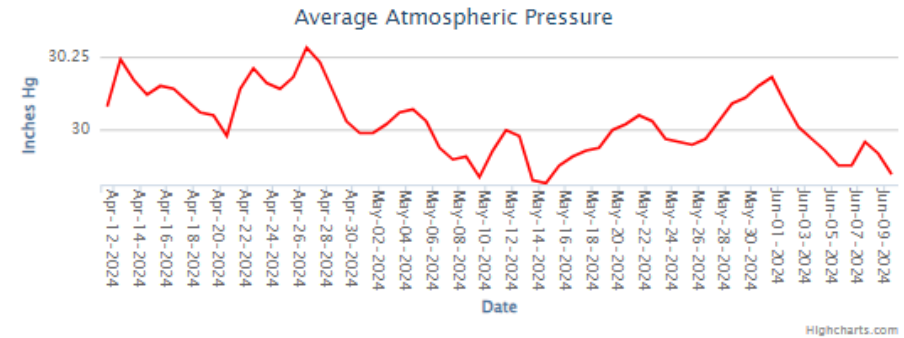
Solar Radiation
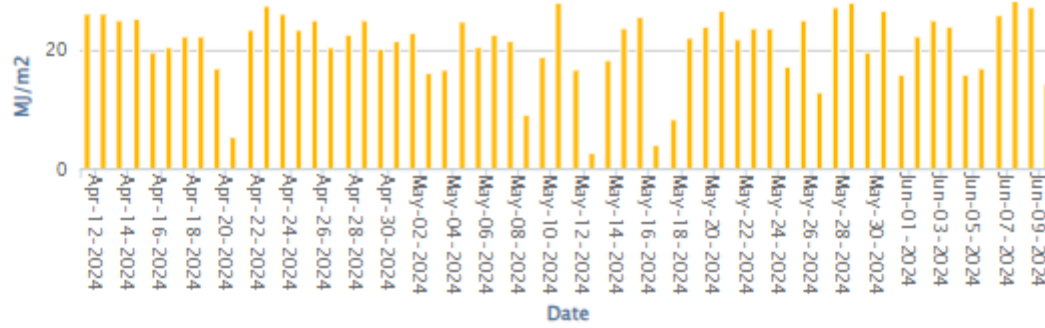
Evapotranspiration
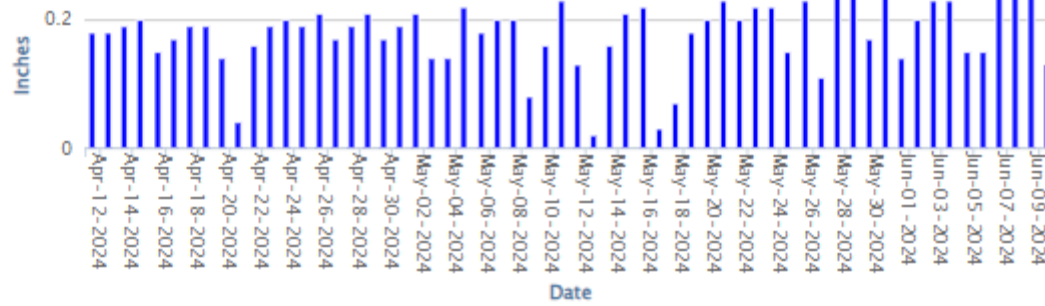
Soil Moisture(12in)
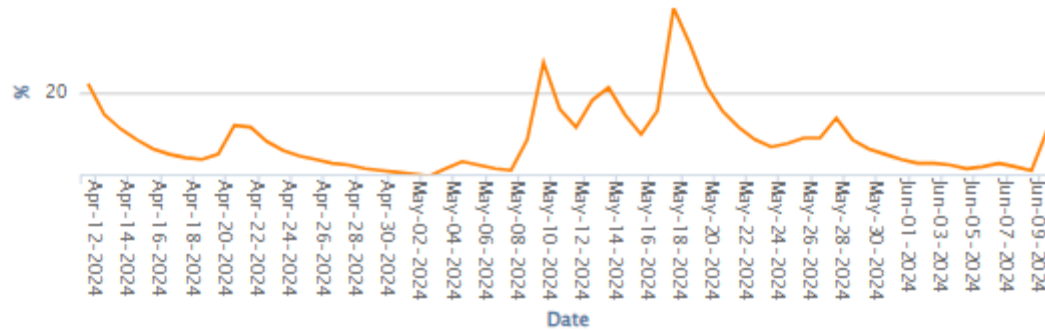
UGA Weather Network

Home   Maps and Summary   Crop Weather   Drought   Calculator   Background Info   Links   Site Map   Contact us

Weather Stations

Select a station from drop
down list below

[Select a Station ▼]

Nearest Stations

Enter a GA ZIP Code to
check three nearest stations

[   ] Check

Air Temperature (°F) for Jun 11 03:32 AM
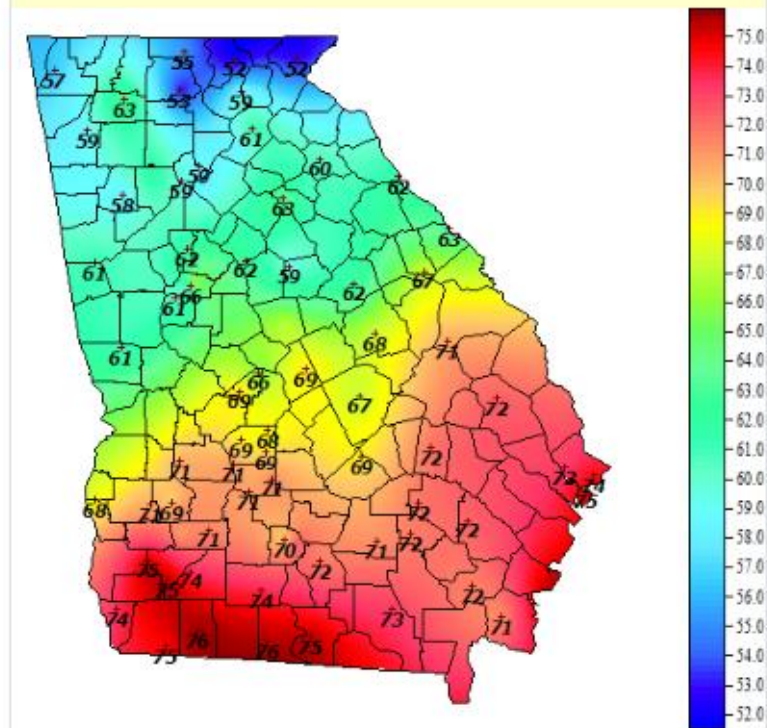
[Atmospheric Pressure][Dew Point Temperature][Relative Humidity][Soil Moisture]

[Solar Radiation][Precipitation][Soil Temperature][Wind][Air Temperature]

UGA Weather Network

Weather Stations

Select a station from drop down list below

Select a Station ▼

Nearest Stations
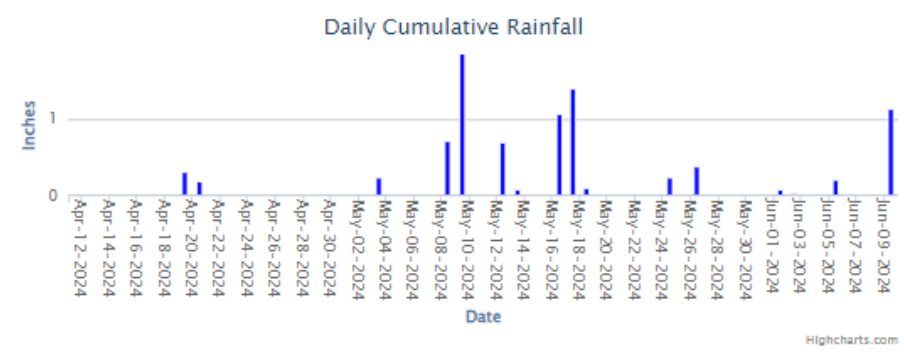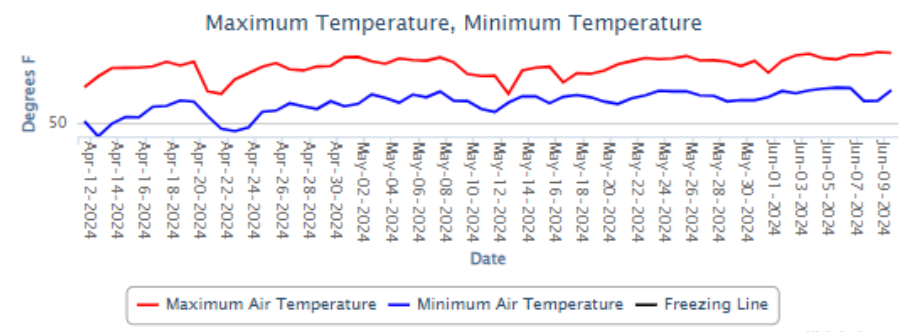
Enter a GA ZIP Code to check three nearest stations

[   ] Check

Heating Degree Day Calculator

Choose a station : Alapaha ▼

From: January ▼ 1 ▼ 2024 ▼

To: June ▼ 10 ▼ 2024 ▼

Base Temperature: 65 ▼

○ **US** ○ **Metric**

Calculate

From January-1	To June-10	Total
2024	2024	1008.47
2023	2023	1778.38
2022	2022	2806.77
2021	2021	3913.45
65 - Temp °F		

1998

Southeast Climate Consortium (SECC): Florida State University, University of Florida, University of Miami, University of Georgia, Auburn University, North Carolina State University, Clemson University and University of Alabama-Huntsville.
Gestão: University of Florida Agricultural & Biological Engineering Department.

Engaging stakeholders in the development of solutions

LEARN MORE

Why use AgroClimate?

Agricultural production is always subjected to risk associated with climate variability. AgroClimate tools can help producers reduce production risk and increase productivity.

Rainfall and Temp. Monitoring

Observed rainfall and temperature

Climatology

Rainfall and temperature climatology (1950-2013)

Weather Stations

Climatology and current observations for selected weather stations in the Southeast USA

Strawberry Advisory System

Risk of Anthracnose and Botrytis fruit rot

Freeze Risk Probabilities

Freeze probabilities based on El Niño Southern Oscillation (ENSO) phases

County Yield Statistics

Crop yield series, trends and residuals at the county level

Blueberry Advisory System

Risk of Anthracnose and Botrytis fruit rot

Citrus Copper Application Scheduler

Copper residue calculator

Planting Date Planner

Probability of low, medium, and high yields based on planting dates

Cooling and Heating Degree Days Calculator

Monitoring and forecasting of cooling and heating degree days

Chill Hours Monitoring

Monitoring maps of chill hours

Growing Degree Days Monitoring

Monitoring maps of growing degree days

Carbon Footprint Calculator

Emission of greenhouse gases to produce, store, and transport strawberry

Chill Hours Calculator

Monitoring and forecasting of chill hours

ARID

Agricultural Reference Index for Drought

LGMI

Lawn and Garden Moisture Index LGMI

Growing Degree Days Calculator

Monitoring and forecast of growing degree days for selected stations

Smart Crop Season

Plan your crop season based on phenological stages date ranges with extreme weather events probabilities.

Heat Stress Monitoring

Accumulated daily maximum temperature above the thresholds of 82°F, 86°F, 90°F, 93°F or 97°F.

Climatology for Caribbean

Rainfall and Temperature Climatology (1979-2017)

ARID Spatial

Agricultural Reference Index for Drought

Fruit & Veg Projections

Fruit and Vegetable Supply Chains – Climate Adaptation & Mitigation Opportunities

Weather Stations

Map	Average	Probability Distribution	Probability of Exceedance	Current

Total Rainfall (Inches) - Mayo Station, Lafayette County (FL)

[Click to see daily data](#)

▸ Find location

▸ Select rainfall or temperature

▾ Select time period

Start date:
01/01/2024

End date:
6/10/2024

Period [Jan 1 - Jun 9]: Current   22.5 in.
                         Neutral years 22.2 in.
                         El Niño years 24.4 in.
                         La Niña years 17.2 in.

■ Current period accumulation   ■ Daily accumulation
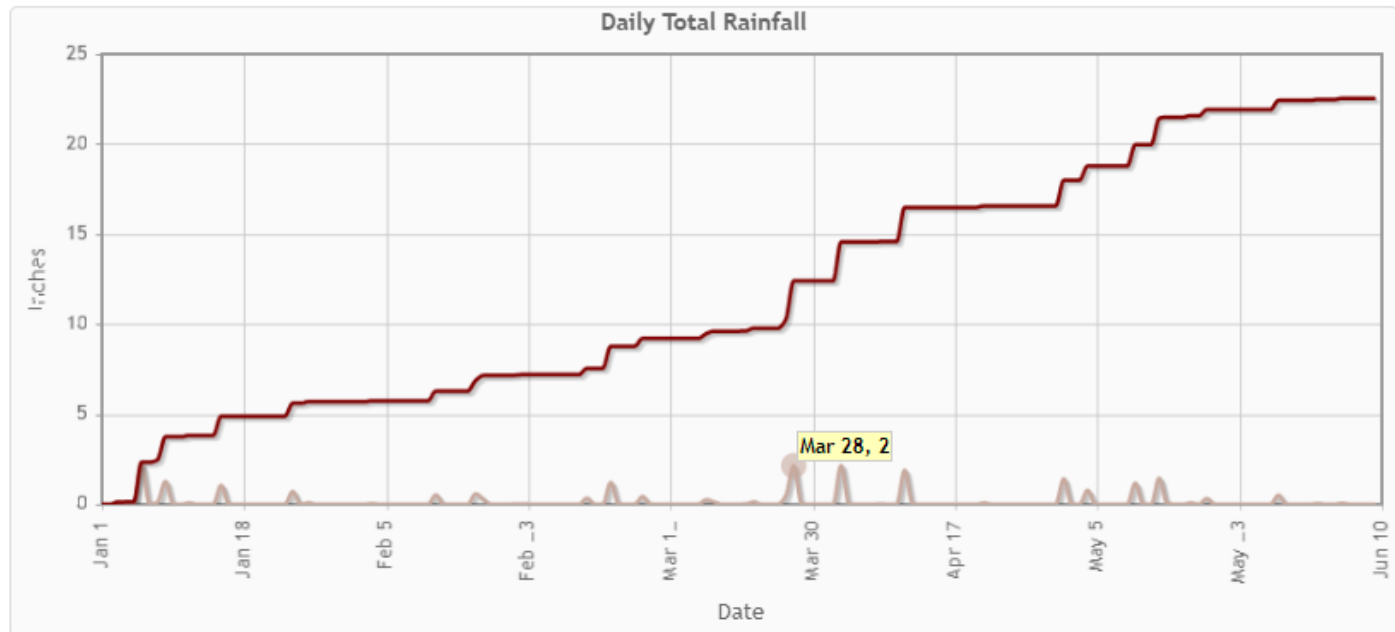
Total Rainfall (inches)

Current   Neutral   El Nino   La Nina

Daily Total Rainfall

Mar 28, 2

Inches

Date

Jan 1 Jan 18 Feb 5 Feb _3 Mar 1_ Mar 30 Apr 17 May 5 May _3 Jun 10

Growing Degree Days Calculator

Map	Total Accumulated and Projected	Accumulated by Period

Model: 50 °F - Marion County (FL)

Period [May 12 - Jun 9]:		
	This season	785 GDD
	Last season	750 GDD
	Historic average	811 GDD

- 🟥 Current accumulation
- 🟧 Historic Average
- 🟩 Last season
- 🟥 El Niño years, long-term climatology

Left sidebar:

▶ Find location

▶ Select base temperature

▶ Select projected period

▼ Graph options

☑ Display average
☑ Display last season

▶ About GDD

Total accumulated and projected

Chart showing GDD (y-axis, 0 to 2000) versus Date (x-axis, May 12, 2024 to Jul 11, 2024). Current accumulation point marked at 785.
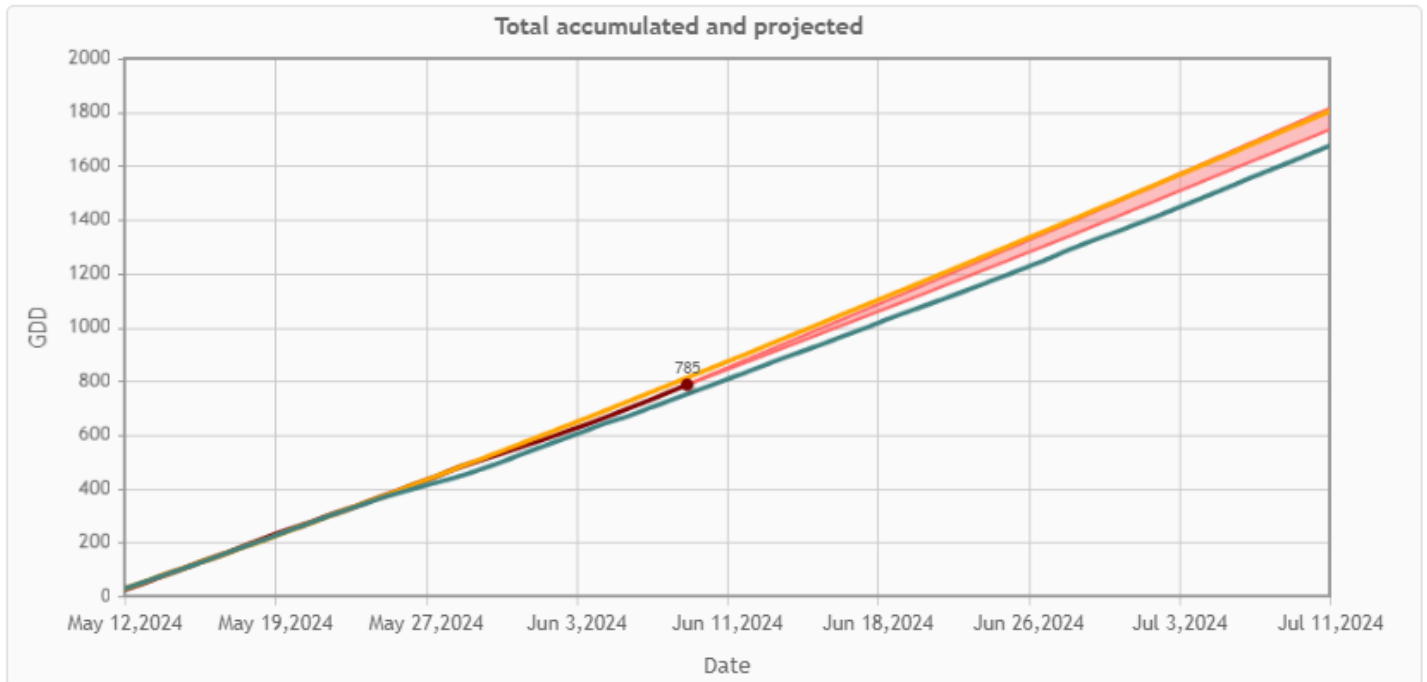
AgroClimate
Tools for Managing Climate Risk in Agriculture

Freeze Risk Probabilities

▼ Risk of Freeze

○ All Season

◉ First Freeze Dates

○ Last Freeze Dates

▶ About Freeze Risk

First Freeze Forecast

Date of First Freeze at 10%, 50%, and 90% probability

First Freeze at 10%

Legend:
- Oct 1-10
- Oct 11-20
- Oct 21-31
- Nov 1-10
- Nov 11-20
- Nov 21-30
- Dec 1-10
- Dec 11-20
- Dec 21-31

First Freeze at 50%

Legend:
- Oct 1-10
- Oct 11-20
- Oct 21-31
- Nov 1-10
- Nov 11-20
- Nov 21-30
- Dec 1-10
- Dec 11-20
- Dec 21-31

First Freeze at 90%

Legend:
- Oct 1-10
- Oct 11-20
- Oct 21-31
- Nov 1-10
- Nov 11-20
- Nov 21-30
- Dec 1-10
- Dec 11-20
- Dec 21-31

Select your State ⇕
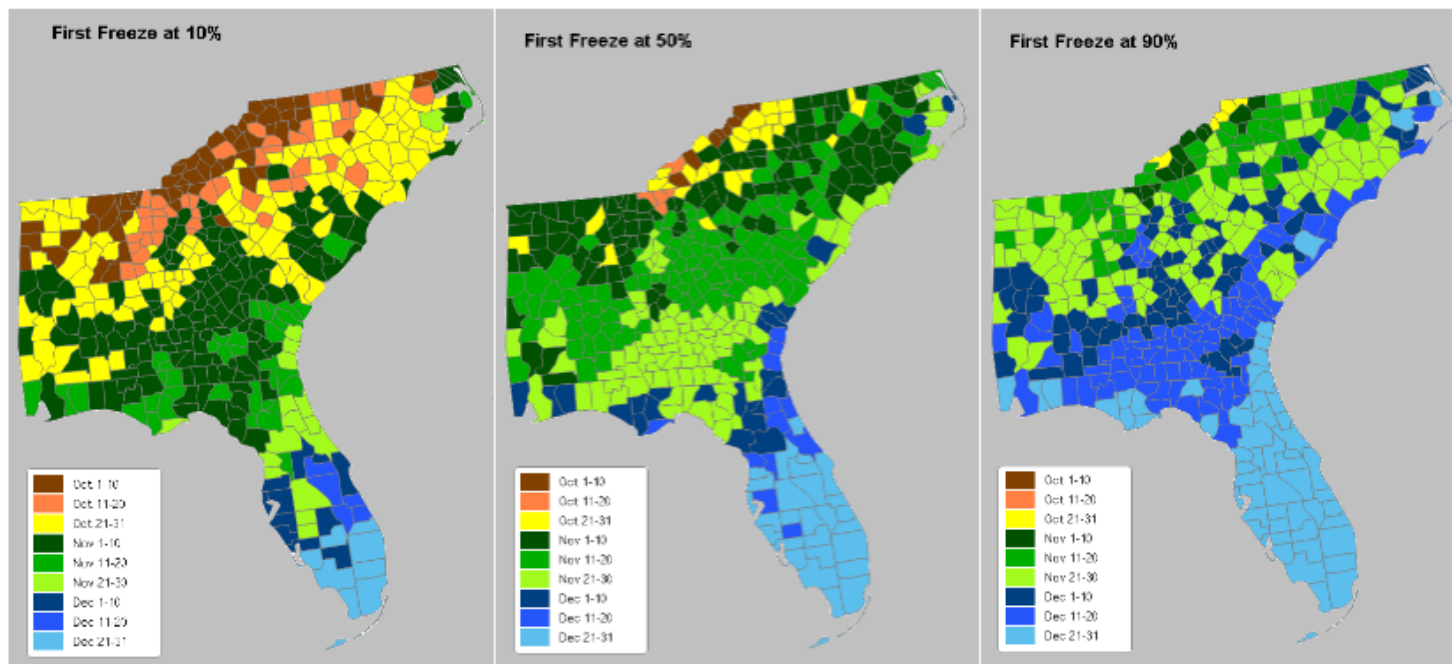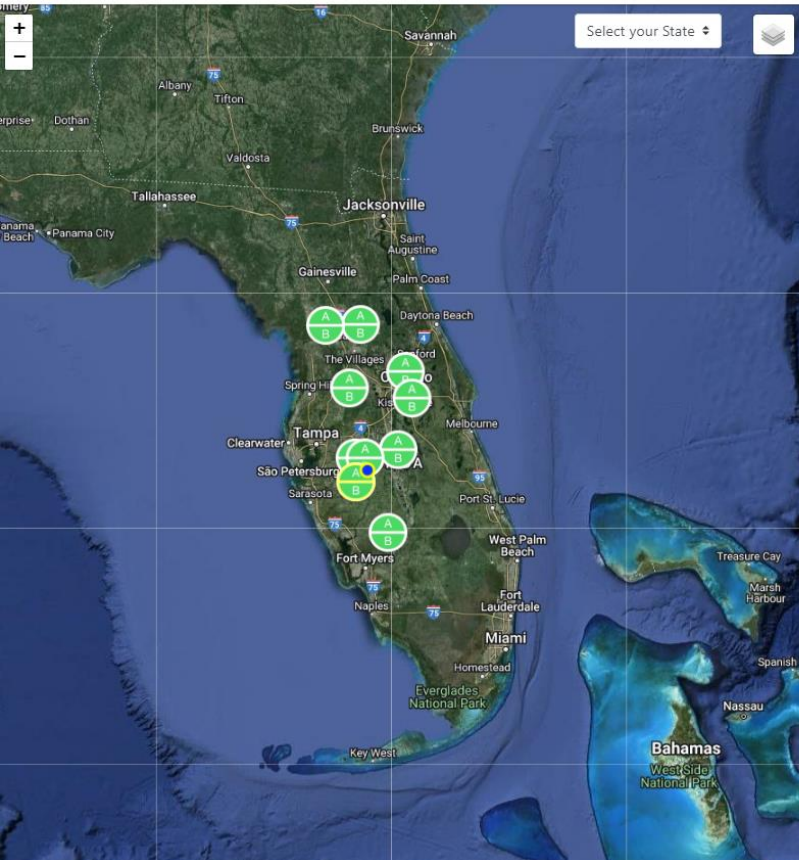
WEATHER STATION INFO

Balm

FAWN

27.760, -82.224
Wimauma, FL
Hillsborough county

Highest risk recorded today
Simulated at: 06/11/2024 03:30

A / B

Anthracnose
Level: Low

Botrytis
Level: Low

DISEASE RISK   **WEATHER**   RECOMMENDATIONS

| Date Interval | 05/12/2024 - 06/11/2024 | | Export Table to CSV |

Weather Table

Time ⌄	Temp (°F)	RH (%)	Rain (in)	Wet	LWD	Avg. Temp. LWD (°F)	AII	BII
2024-06-11 03:30	76	81	0.00	Yes	4.25	76	**0.07** (Low)	**0.05** (Low)
2024-06-11 03:15	76	81	0.00	Yes	4.00	76	**0.07** (Low)	**0.04** (Low)
2024-06-11 03:00	75	82	0.00	Yes	3.75	76	**0.06** (Low)	**0.04** (Low)
2024-06-11 02:45	75	82	0.01	Yes	3.50	76	**0.06** (Low)	**0.04** (Low)
2024-06-11 02:30	75	82	0.01	Yes	3.25	76	**0.06** (Low)	**0.03** (Low)
2024-06-11 02:15	76	82	0.03	Yes	3.00	76	**0.05** (Low)	**0.03** (Low)
2024-06-11 02:00	75	82	0.04	Yes	2.75	76	**0.05** (Low)	**0.03** (Low)
2024-06-11 01:45	75	82	0.06	Yes	2.50	76	**0.05** (Low)	**0.03** (Low)

Citrus Copper Application Scheduler

Simulation Chart   **Contact**

The Citrus Copper Application Scheduler provides an estimated time period of remaining copper residue on various citrus cultivars. The estimate is based on inputs provided below. more... > Help screencast

U.S. Units System ⌄

Select a weather Station:

Apopka ⌄

> Upload your weather data instead

Scion: Grapefruit ⌄

Bloom date: [Click to add]

Days since last spray

Sample Chart

Today

Residual Cu (μg.cm^{-2})

Rain (in)

mm-dd

■ Danger threshold   ■ Warning threshold   ■ Rain event

[Application conditions forecast →]

https://ndawn.ndsu.nodak.edu/

Crop Tools

Barley:	Growing Degree Days / Growth Stages (Help)
Canola:	Growing Degree Days / Growth Stages (Help)
	Sclerotinia Risk
Corn:	Growing Degree Days (Help)
Potato:	Early Blight, Late Blight, & PDays (NDSU Potato Late Blight Hotline)
Soybeans:	Growing Degree Days (Help)
Sugarbeet:	Growing Degree Days / Growth Stages (Help)
	Multiple-Planting Date Degree Days
	Herbicide Timing Using Growing Degree Days (Help)
	Cercospora Infection Values (Help)
	Cercospora Infection Value Summaries
	Root Maggot (Help)
Sunflower:	Growing Degree Days / Growth Stages (Help)
Wheat:	Growing Degree Days, Growth Stages, and Midge Degree Days (Help)
	Multiple Planting Dates (Help)
Wheat/ Small Grains:	Scab, Rust, and Tan Spot Small Grains Disease Forecaster

General Agriculture and Other Tools

Irrigation Scheduler for Various Crops

Daily Estimated Crop Water Use

Insect Development

Heating/Cooling Degree Days related to building energy use

Sidebar navigation

NDAWN

HELP

WEATHER DATA

APPLICATIONS

- List of Ag Tools
- Barley GDD
- Canola GDD
- Canola Sclerotinia
- Corn GDD
- Potato Late Blight, Early Blight, and P-Days
- Soybean GDD
- Sugarbeet Cercospora
- Sugarbeet Cercospora Summaries
- Sugarbeet Herbicide Timing Using GDD
- Sugarbeet Root Maggot
- Sugarbeet GDD
- Sugarbeet GDD Multiple Planting Dates
- Sunflower GDD
- Wheat GDD/Midge DD
- Wheat GDD Multiple Planting Dates
- Wheat & Small Grain Disease Forecaster
- Crop Water Use
- Irrigation Scheduler
- Insect DD
- Heating/Cooling DD

ACCOUNT

Ficha caracterização Agro Climática

Instituto Superior de Agronomia

Elvas

Localização: LAT 38º53' LONG 7º9' ALT 208m Período: 1958-1988
Classificação climática de Köppen: Csa - Clima temperado com Verão seco e quente
Classificação climática de Thornthwaite: C1B'2sa' - Clima sub-húmido seco, mesotérmico, com moderado excesso de água no Inverno, com nula ou pequena concentração da eficiência térmica

Classificação Papadakis Inverno citrus G **Verão** cotton V

Temperatura

Temperaturas mínimas, médias e máximas

	OUT	NOV	DEZ	JAN	FEV	MAR	ABR	MAI	JUN	JUL	AGO	SET	ANO
Temp. mínima	11.4	7.2	4.5	4.2	5.1	6.2	8.1	10.6	14.0	16.2	15.9	14.7	9.8
Temp. média	17.3	12.1	9.1	8.8	9.9	11.6	13.9	17.2	21.5	24.6	24.2	22.2	16.0
Temp. máxima	23.2	17.0	13.7	13.4	14.8	17.0	19.7	23.9	28.9	33.0	32.6	29.6	22.2

Análise de risco para temperaturas mínimas e máximas

		OUT	NOV	DEZ	JAN	FEV	MAR	ABR	MAI	JUN	JUL	AGO	SET
Temp. mínima	p=0.1	9.9	4.9	1.9	1.6	3.2	4.6	6.8	9.1	12.5	14.6	14.5	13.0
	p=0.2	10.4	5.7	2.8	2.5	3.8	5.1	7.3	9.6	13.0	15.1	15.0	13.6
Temp. máxima	p=0.8	25.1	18.1	14.6	14.3	15.7	18.5	21.0	25.9	30.6	34.1	33.9	31.5
	p=0.9	26.1	18.7	15.2	14.7	16.1	19.2	21.7	26.9	31.4	34.7	34.7	32.5
Geada	50%	0	4	10	10	6	1	0	0	0	0	0	0
	90%	0	13	22	16	9	5	1	0	0	0	0	0

Temperaturas mínimas, médias e máximas
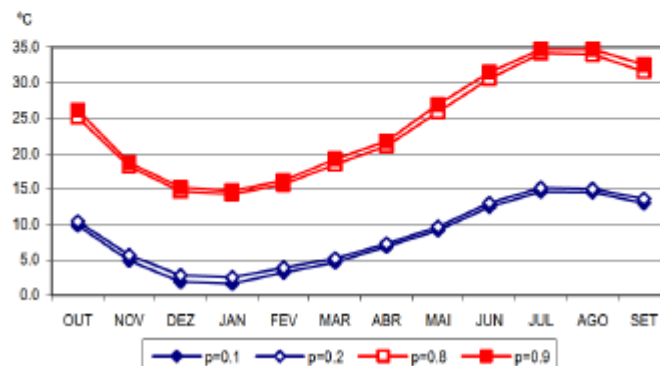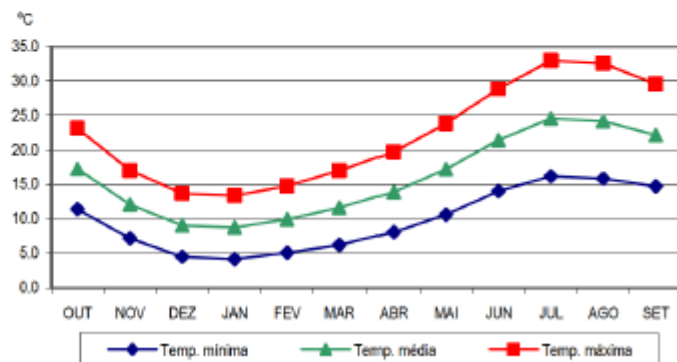
Ficha caracterização Agro Climática

Análise estocástica do integral térmico dos períodos Abril-Setembro e Maio-Setembro

	p=0.05	p=0.10	p=0.20	p=0.50
ABR-SET	2083	2173	2283	2493
MAI-SET	1929	2008	2103	2286

Matriz de integrais térmicos de Outubro a Julho

°C.dia	OUT	NOV	DEZ	JAN	FEV	MAR	ABR	MAI	JUN	JUL	AGO	SET
OUT	319	472	536	591	674	817	1023	1341	1775	2320	2854	3309
NOV		153	218	273	355	498	705	1022	1456	2001	2535	2991
DEZ			65	120	202	345	552	869	1303	1848	2382	2838
JAN				55	138	280	487	804	1238	1784	2317	2773
FEV					83	225	432	749	1183	1729	2262	2718
MAR						143	349	667	1100	1646	2180	2635
ABR							207	524	958	1503	2037	2493
MAI								317	751	1297	1830	2286
JUN									434	980	1513	1969
JUL										546	1079	1535
AGO											534	989
SET												456

Diagrama de integrais térmicos
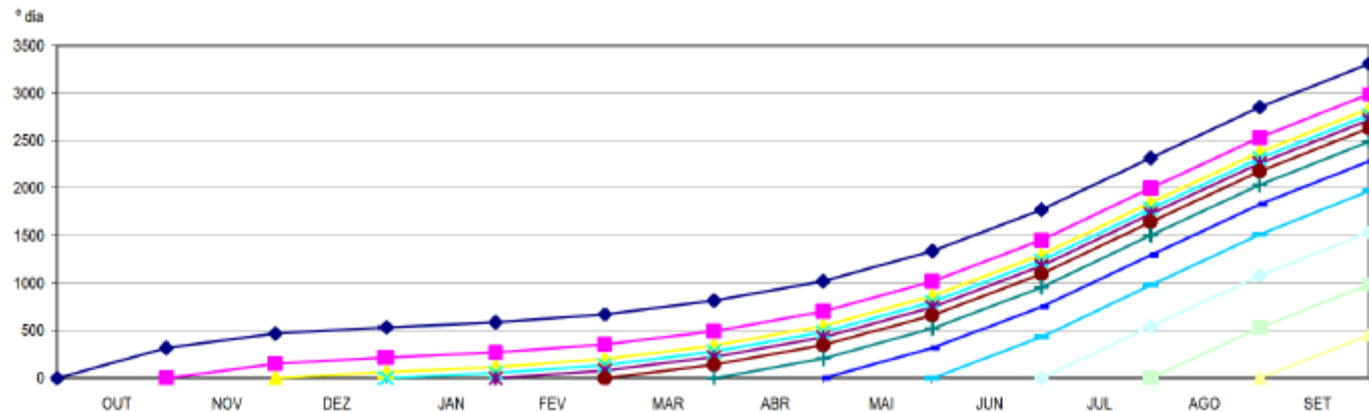
Balanço hídrico de Thornthwaite com capacidade utilizável (U) de 100.0 mm

	Unidades	JAN	FEV	MAR	ABR	MAI	JUN	JUL	AGO	SET	OUT	NOV	DEZ	TOTAL
ETP	mm/mês	18.28	22.16	35.18	50.67	81.10	117.68	148.77	135.61	104.33	63.58	30.78	18.89	827.04
R	mm	83.18	82.51	66.50	48.09	37.07	28.02	4.83	2.00	27.07	60.52	76.10	77.61	593.50
R-ETP	mm	64.90	60.34	31.31	-2.59	-44.03	-89.66	-143.93	-133.62	-77.25	-3.06	45.32	58.72	-233.55
A	mm	100.00	100.00	100.00	97.41	53.38	0.00	0.00	0.00	0.00	0.00	45.32	100.00	596.11
vA	mm	0.00	0.00	0.00	-2.59	-44.03	-53.38	0.00	0.00	0.00	0.00	45.32	54.68	0.00
ETR	mm	18.28	22.16	35.18	50.67	81.10	81.40	4.83	2.00	27.07	60.52	30.78	18.89	432.90
D	mm	0.00	0.00	0.00	0.00	0.00	36.27	143.93	133.62	77.25	3.06	0.00	0.00	394.14
S	mm	64.90	60.34	31.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.03	160.59

Balanço hídrico de Thornthwaite-Mather com capacidade utilizável (U) de 100.0 mm

	Unidades	JAN	FEV	MAR	ABR	MAI	JUN	JUL	AGO	SET	OUT	NOV	DEZ	TOTAL
ETP	mm/mês	18.3	22.2	35.2	50.7	81.1	117.7	148.8	135.6	104.3	63.6	30.8	18.9	827.0
R	mm	83.2	82.5	66.5	48.1	37.1	28.0	4.8	2.0	27.1	60.5	76.1	77.6	593.5
R-ETP	mm	64.9	60.3	31.3	-2.6	-44.0	-89.7	-143.9	-133.6	-77.3	-3.1	45.3	58.7	
L					-2.6	-46.6	-136.3	-280.2	-413.8	-491.1	-494.1			
λ					0.0	0.5	1.4	2.8	4.1	4.9	4.9			
α					1.0	0.6	0.3	0.1	0.0	0.0	0.0			
A	mm	100.0	100.0	100.0	97.4	62.7	25.6	6.1	1.6	0.7	0.7	46.0	100.0	
ΔA	mm	0.0	0.0	0.0	-2.6	-34.7	-37.1	-19.5	-4.5	-0.9	0.0	45.3	54.0	
ETR	mm	18.3	22.2	35.2	50.6	71.8	65.2	24.4	6.5	27.9	60.5	30.8	18.9	432.2
D (défice)	mm	0.0	0.0	0.0	0.0	9.3	52.5	124.4	129.1	76.4	3.0	0.0	0.0	394.9
S (excesso)	mm	64.9	60.3	31.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	161.3

Défice e excesso de água ao longo do ano
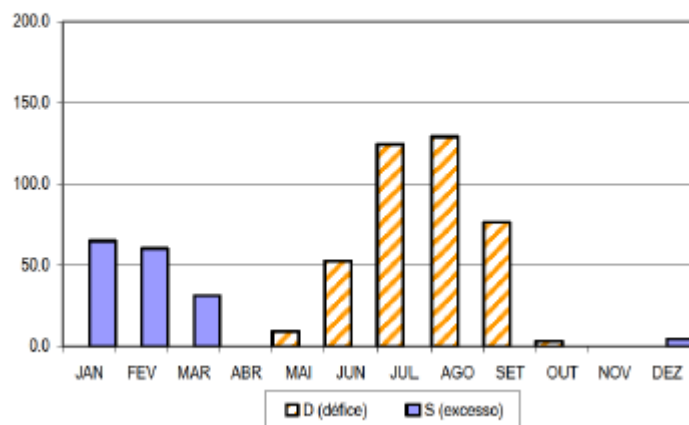
Diagrama ombrotérmico de Gaussen

Outras páginas

- https://www.fao.org/giews/earthobservation/index.jsp
- https://www.syngenta.pt/service/previsao-do-tempo
- https://www.cotr.pt/

AGROMETEOROLOGIA

SERVIÇOS E APLICAÇÕES DE APOIO À TOMADA DE DECISÃO

Ricardo Braga

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ricardobraga@isa.ulisboa.pt

962554056

https://linktr.ee/ricardo_braga

11 06 2024