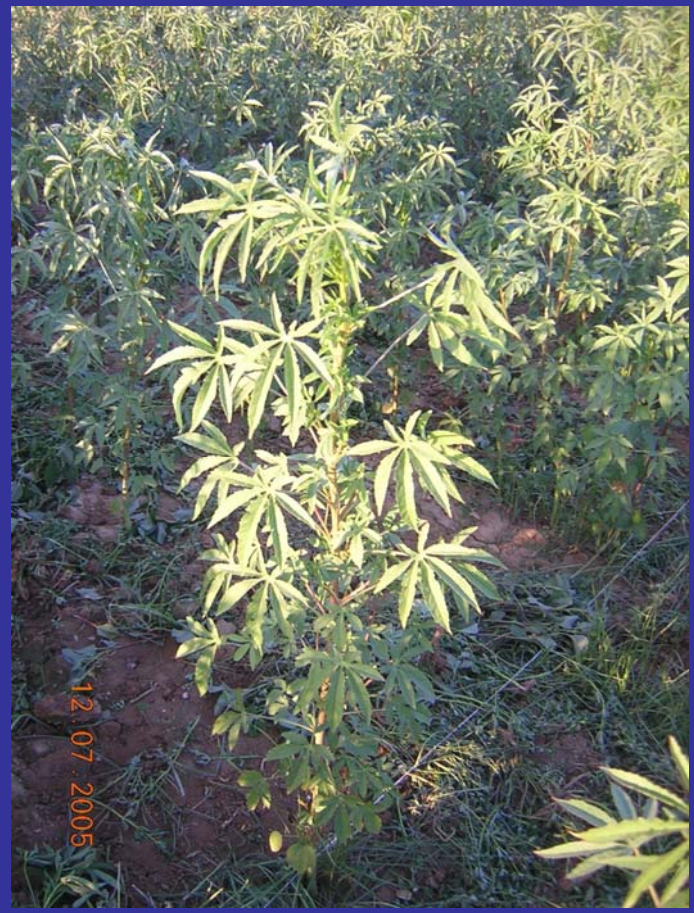
University of Thessaly
Dept. of Agriculture, Crop Production & Agric. Environment

BIOKENAF

QLK5-CT-2002-01729

6th technical meeting
Volos, Greece, 21-22/11/2005



Experimental year 2005

WP2 (tasks 2.2 and 2.3)

Adaptability and Productivity field experiments

Responsible:	*Danalatos N.G.*
Research group:	*Archontoulis S.V.* *Gintsioudis I.*
Scientific group:	*Giannoulis K.* *Chatzidimopoulos M.* *Gournazakis G.*
Technical group:	*Papavassiliou S.* *Papavassiliou V.*

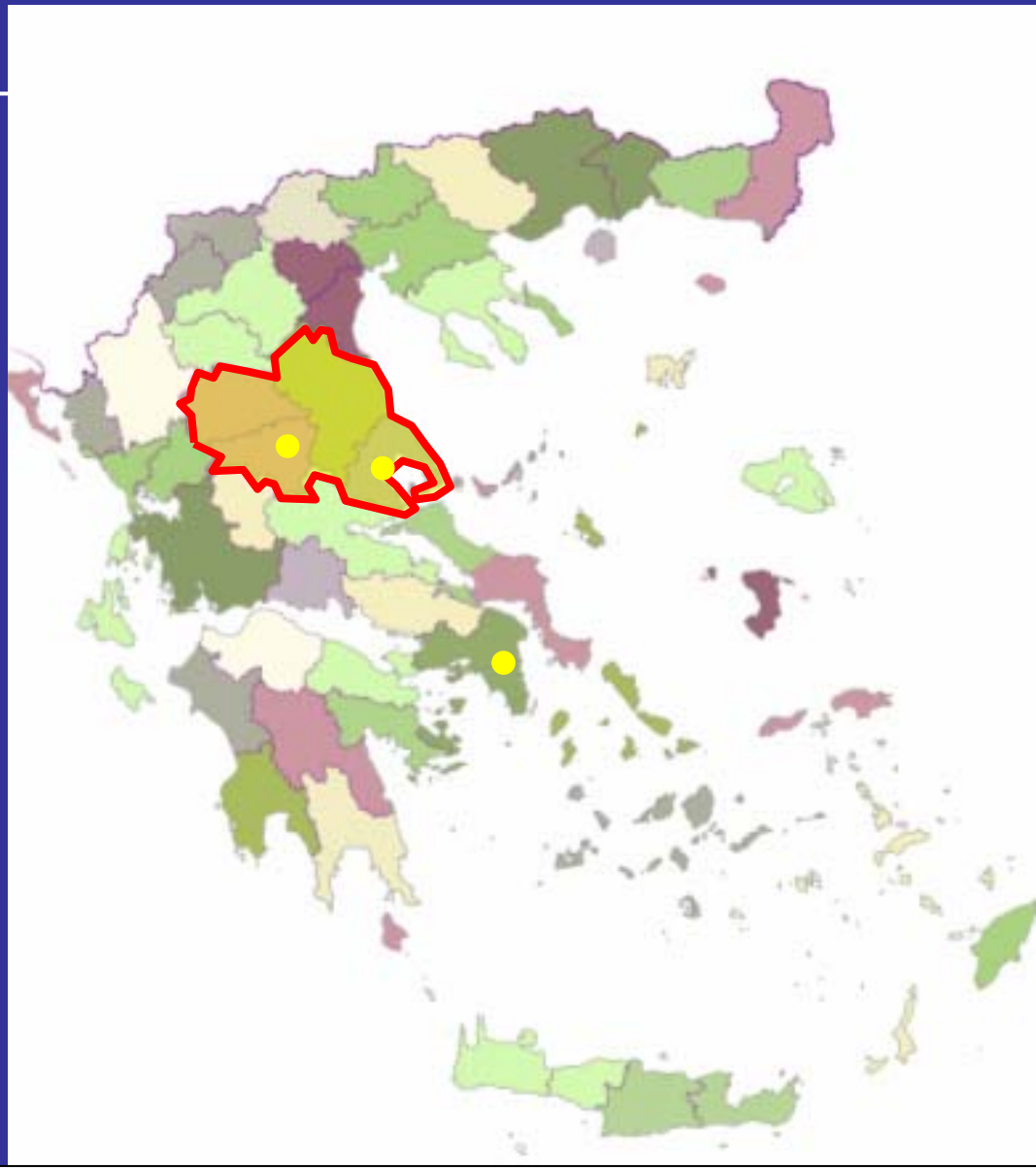
Map of Greece

Field trials was conducted in the prefecture of Karditsa, Palamas, central Greece

39°25’43.4’’ N

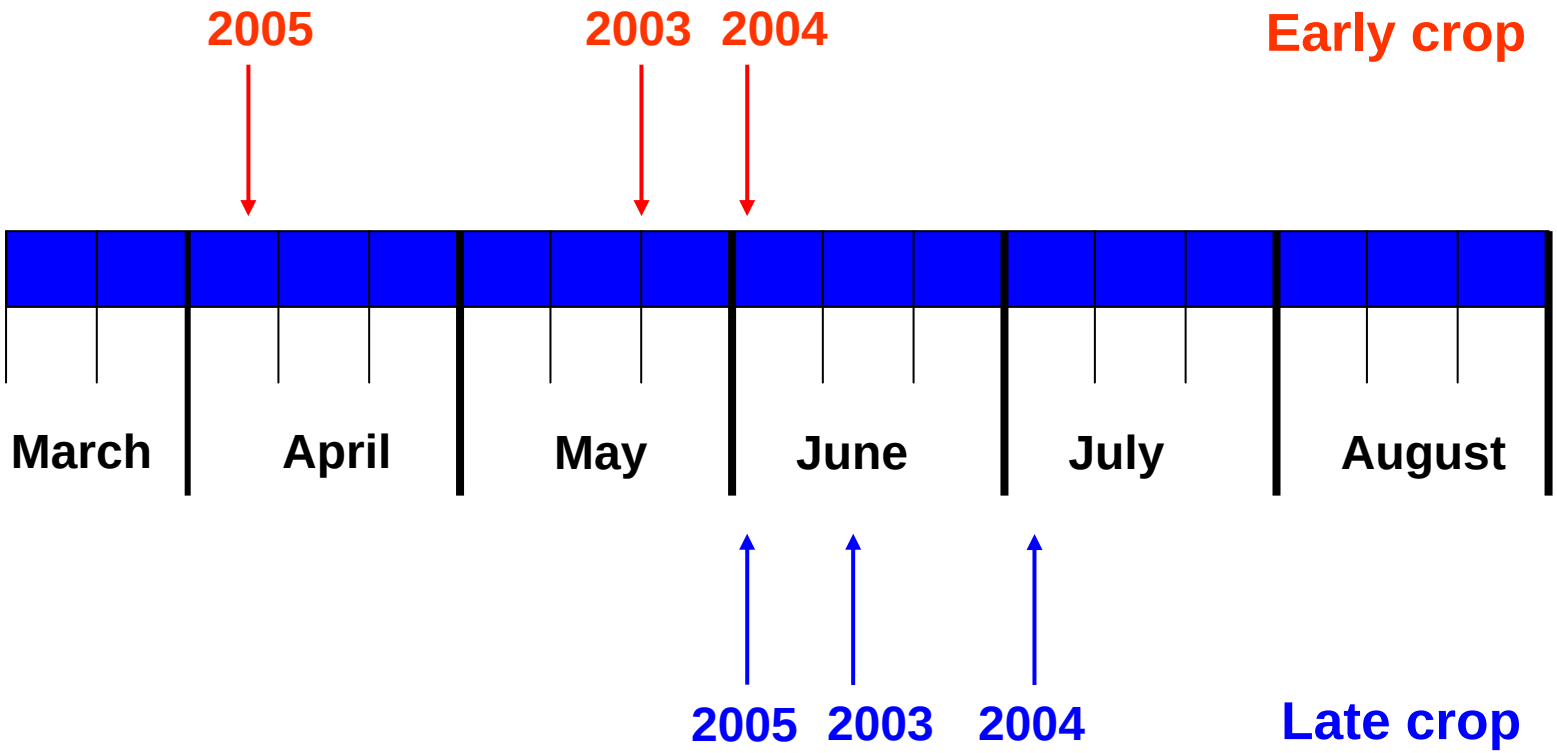
22°05’09.7’’ E

altitude 107.5 m



Contents 2005

Experimental year 2005



According to our results (2003-4)

the earlier sowing the better

Is that proved in 2005 ?

Task 2.2 [1]

RCBD (2x2x2) in 3 blocks

Factors:

Variety: V_1 = Tainnung 2
V_2 = Everglades 41

Sowing date: S_1 = 05/04/05 (50% emergence: 13/4/05)
S_2 = 02/06/05 (50% emergence: 06/6/05)

Plant density: D_1 = 20 pl m^{-2}
D_2 = 40 pl m^{-2}

real plant density was much lower

Task 2.2 [2]

- No basal dressing
- Top dressing of 100 kg N ha^{-1} (plant height 50 cm)
- Drip irrigation; from 12/5 till 14/9; total amount 500 mm
- Measurements: plant height, number of nodes per plant, fresh & dry biomass productivity (leaves, stems, storage organs)
- Destructive harvests: 4/7; 24/7; 16/8; 14/9; 30/9; 17/10; 5/11
- Daily records on photosynthesis, transpiration, respiration, ect.

Task 2.3 [1]

Spit-plot (3x4) factorial in 3 blocks.

Factors: I = Irrigation

I_1 = 25% (200 mm)
I_2 = 50% (300 mm)
I_3 = 100% (500 mm)

N = Fertilization

N_0 = control
N_1 = 50
N_2 = 100
N_3 = 150 kg N ha^{-1}

- Sowing time: 11/4/05 (50% emergence 24/4/05); (support)
- Weed control : 4 times by hand + 2 times by machine
- No basal dressing; Top dressing when plant was 50 cm tall
- Destructive harvests: 4/7, 24/7, 16/8, 13/9, 27/9, 18/10, 6/11

A new member of the BioKenaF group

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03.08.2005


15.10.2005

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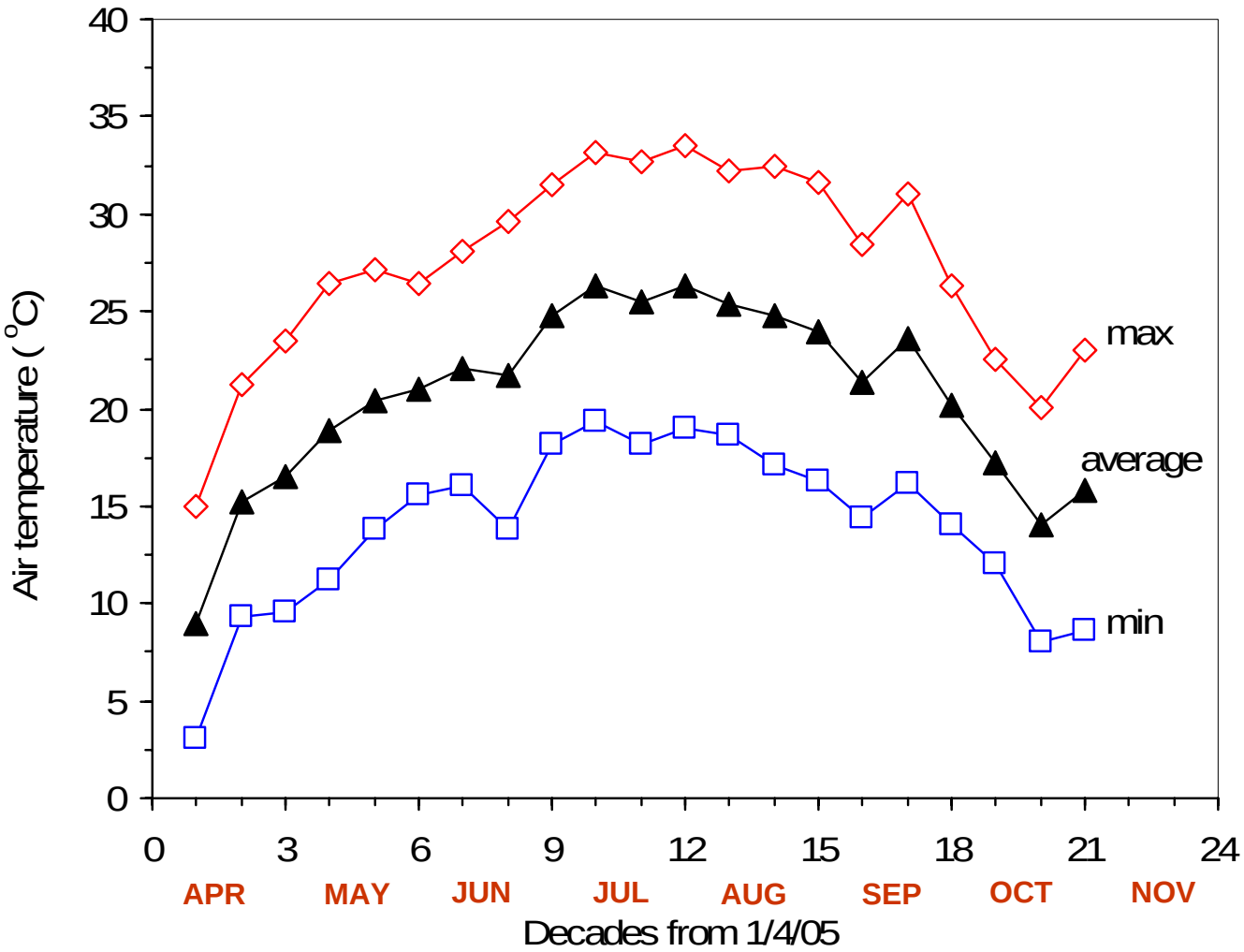
Conclusions

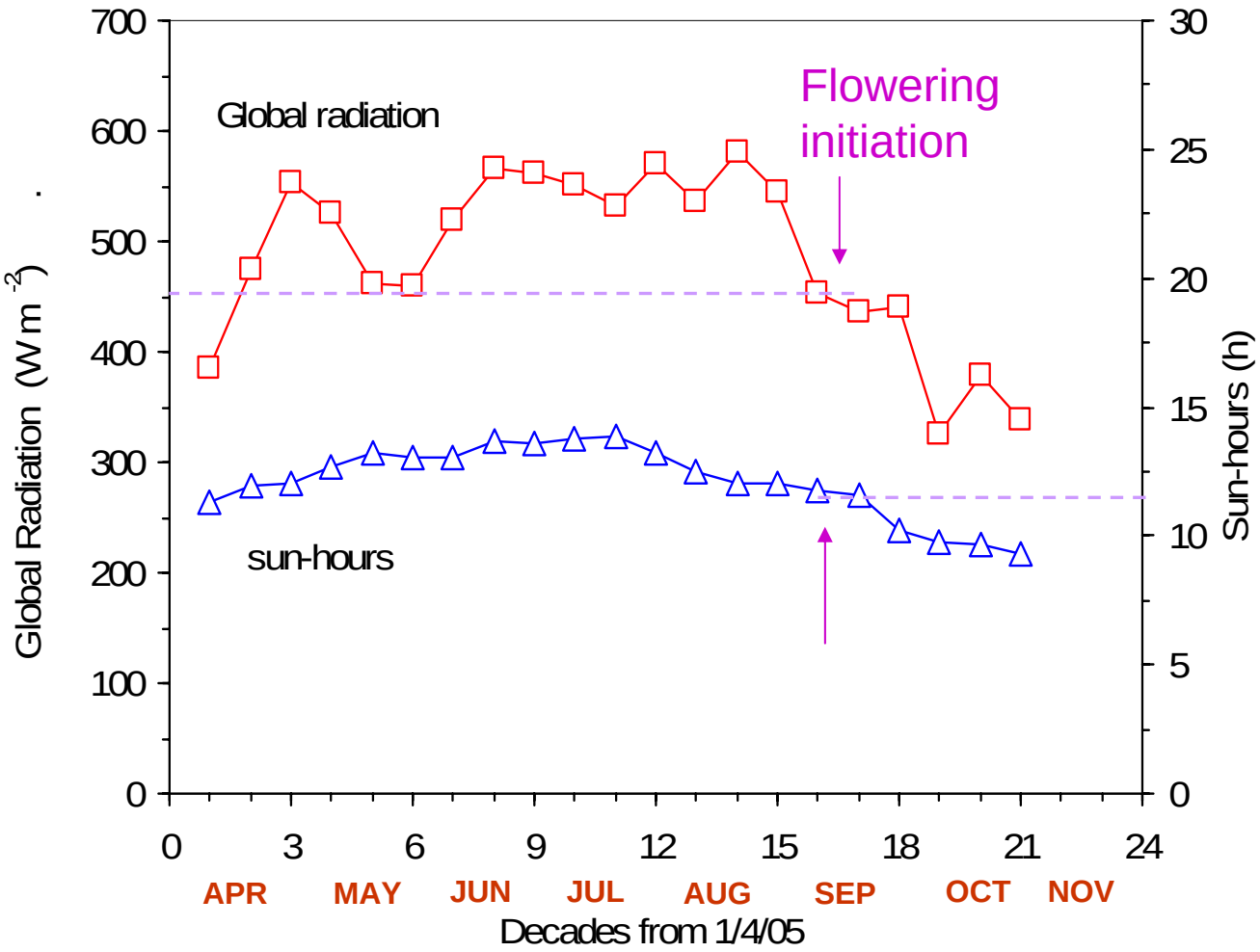
Weather conditions 2005 / temperature



Low temperatures during early crop establishment

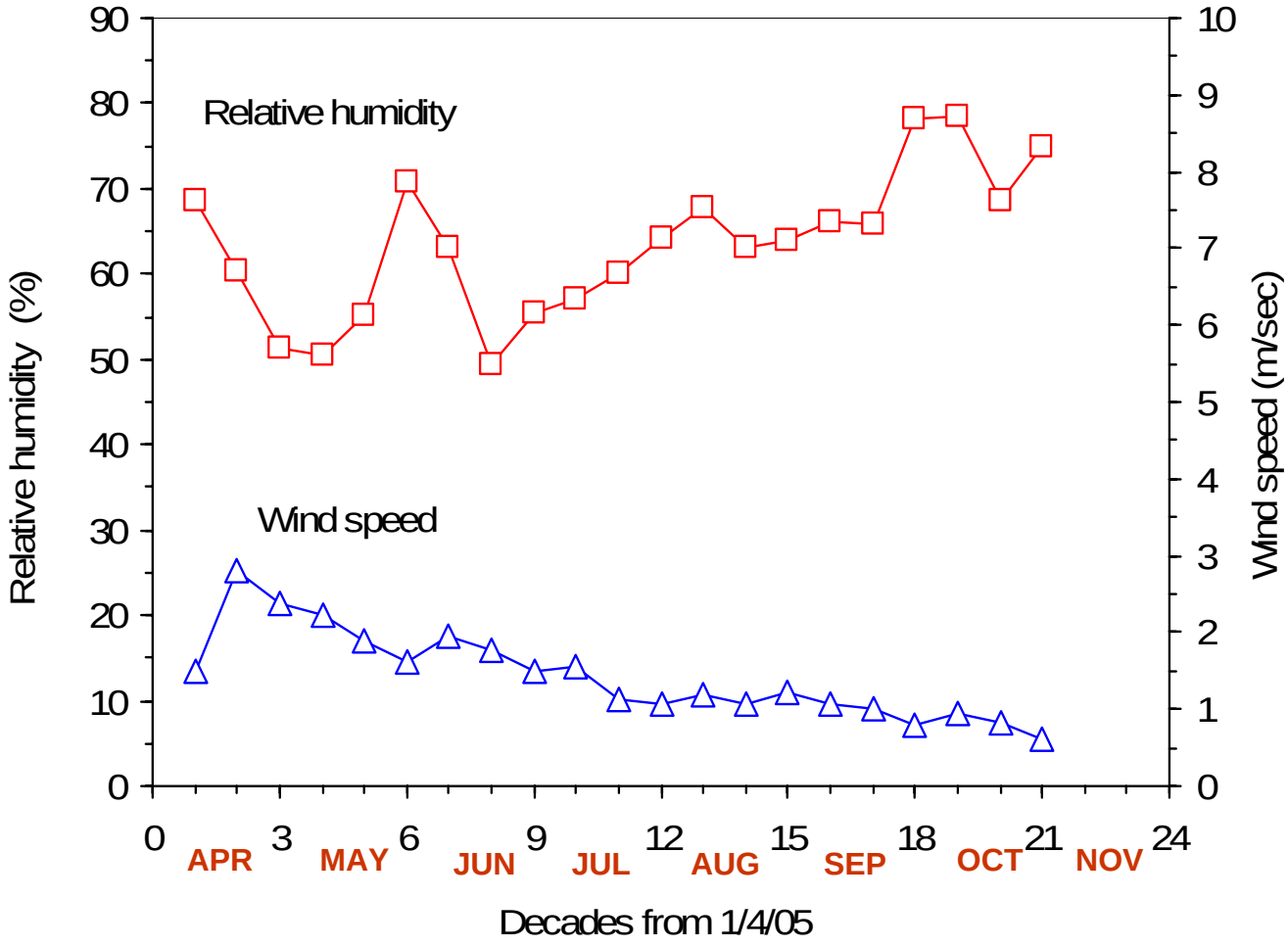
Summer months temperature was > 22 °C

Weather conditions 2005 / Global Radiation



Radiation and sun-hours above 50 W m^{-2}

Weather conditions 2005 / RH & W. speed

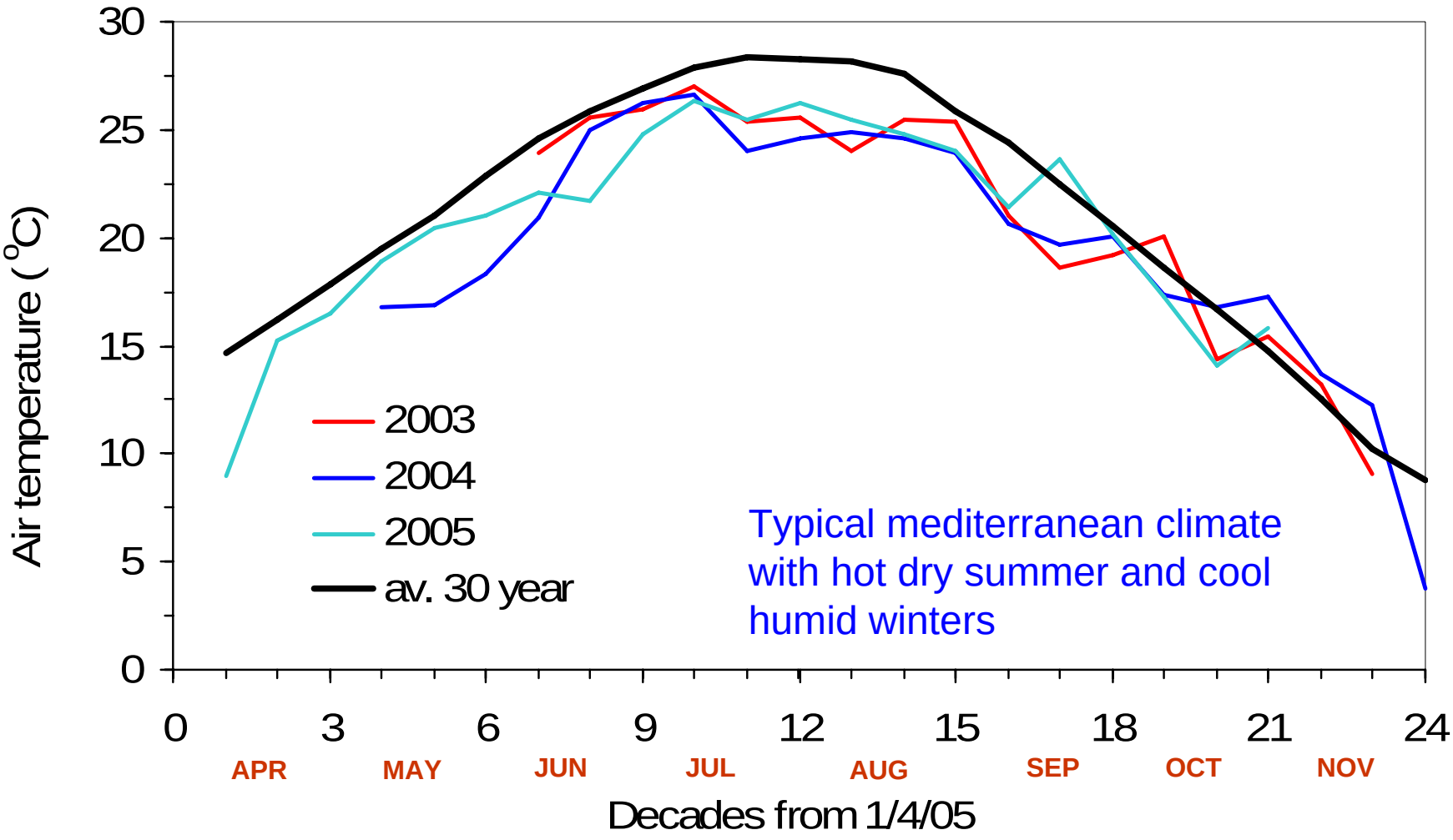


Weather conditions 2005 / Rainfall

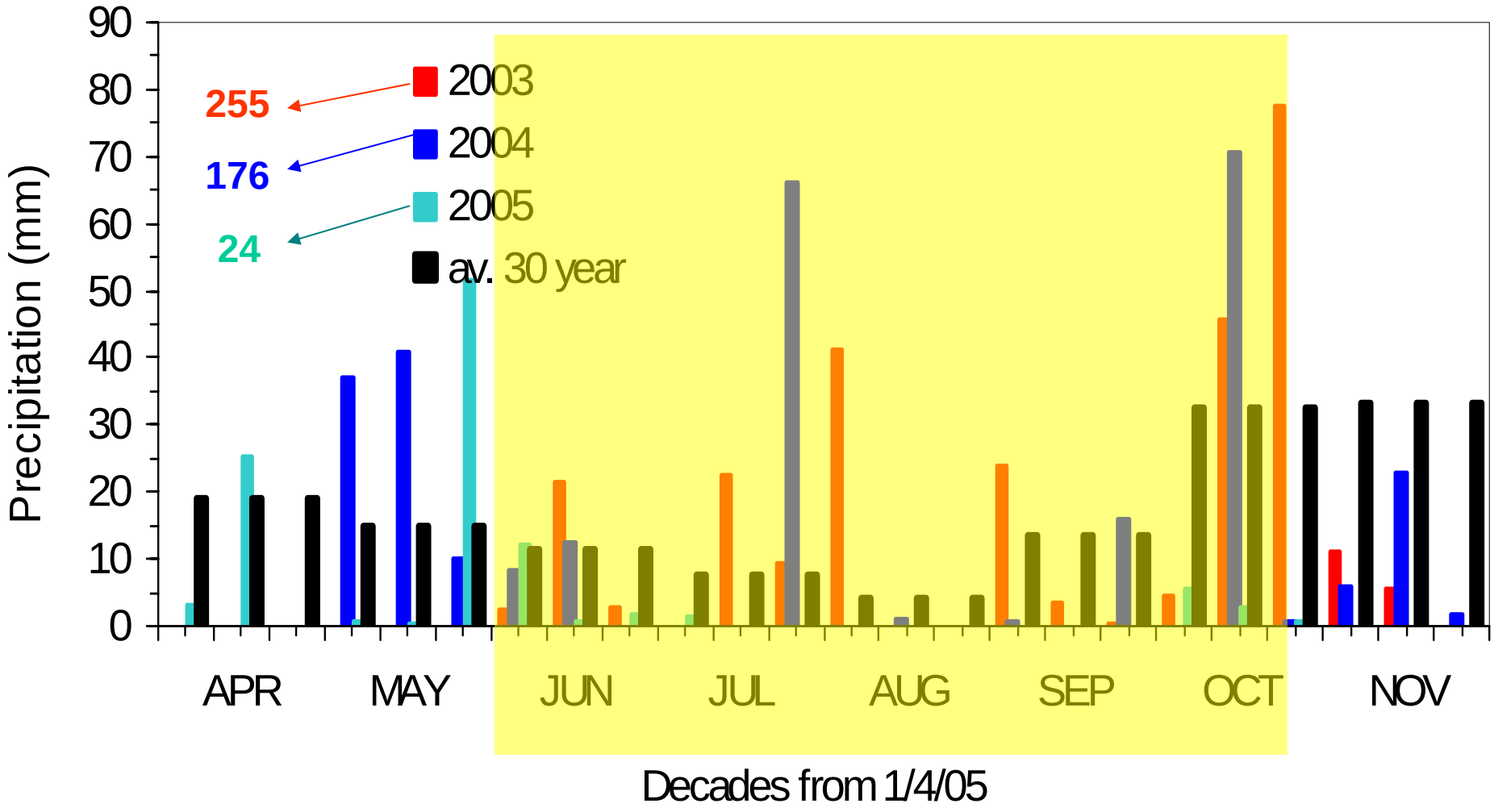
Precipitation	mm
APR	28.2
MAY	52.6
JUN	14.4
JUL	1.4
AUG	0
SEP	0
OCT	8.6
TOTAL	108.2

The driest year the last 5 years in Palamas

Temperature (°C) 2003-2004-2005



Precipitation (mm) 2003-2004-2005



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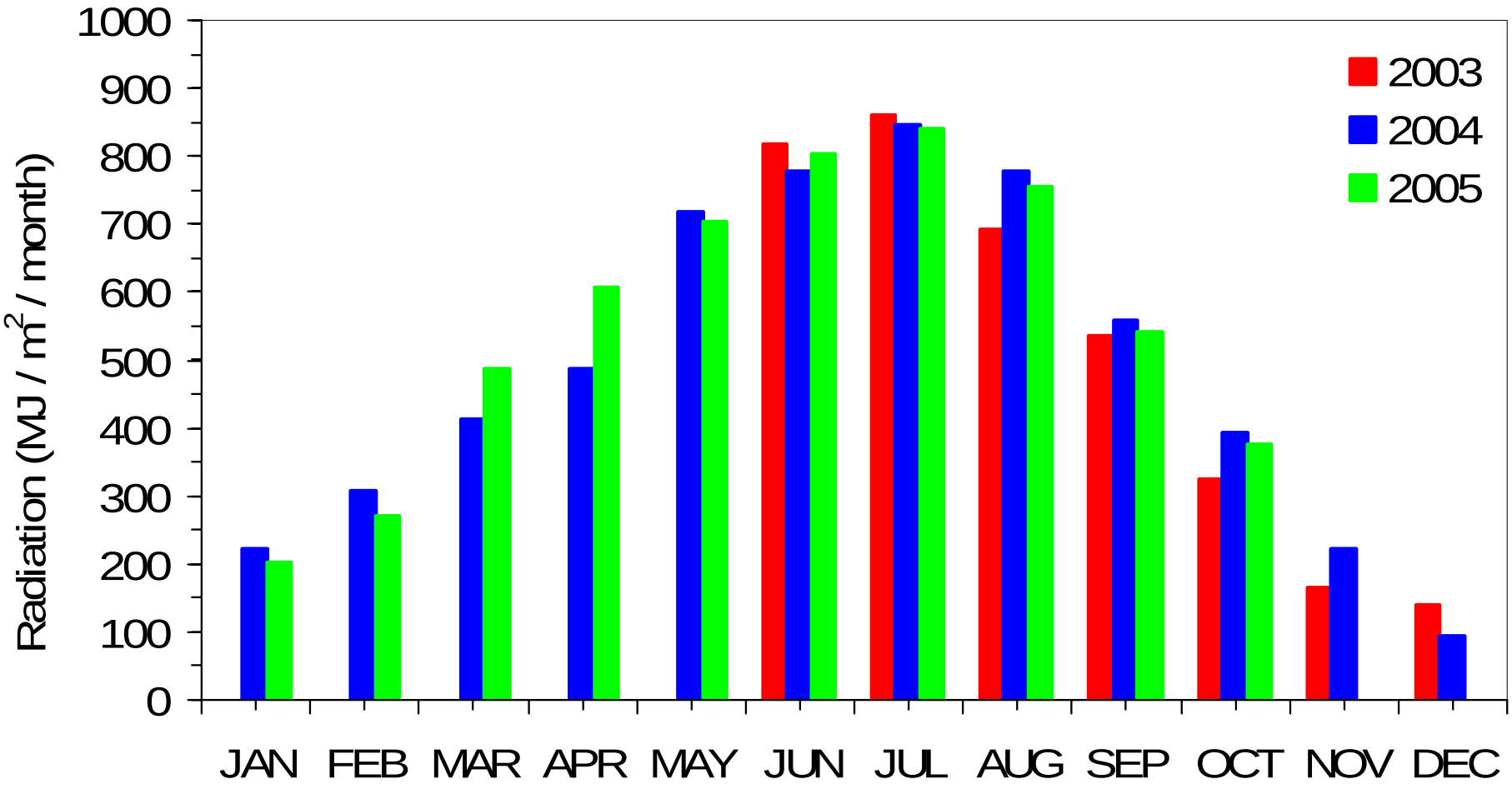
Radiation (MJ m^{-2} $month^{-1}$) 2003;04;05



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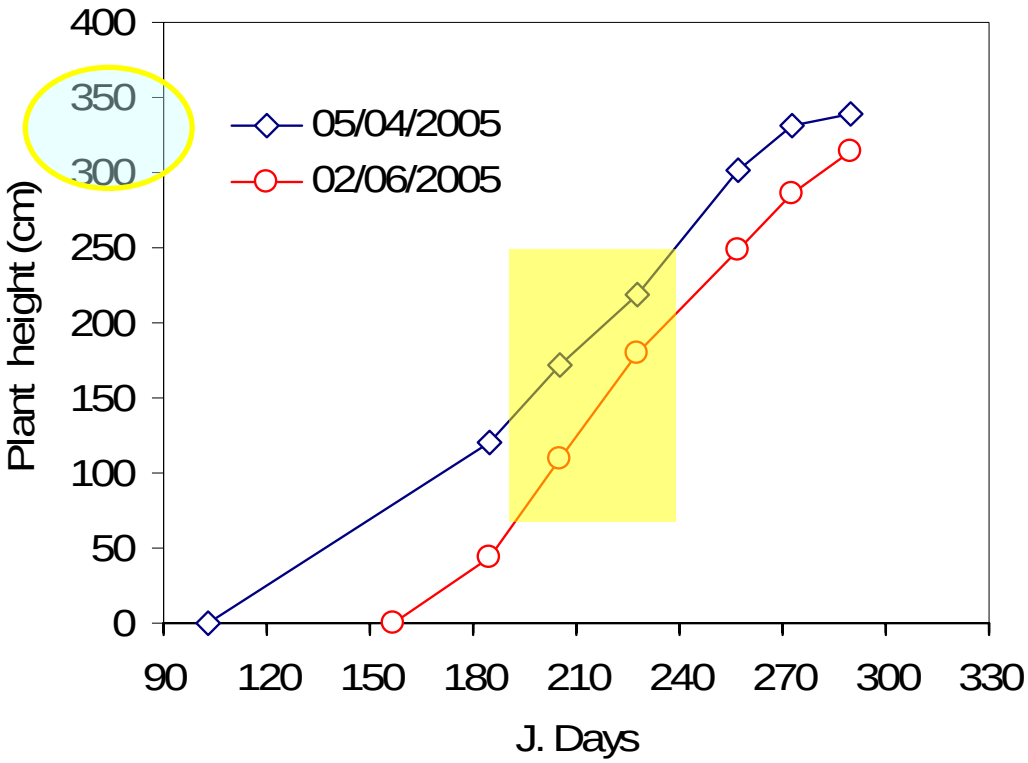
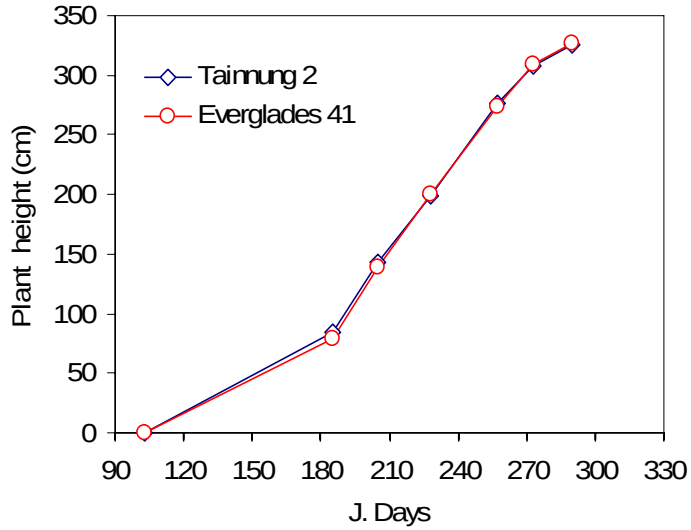
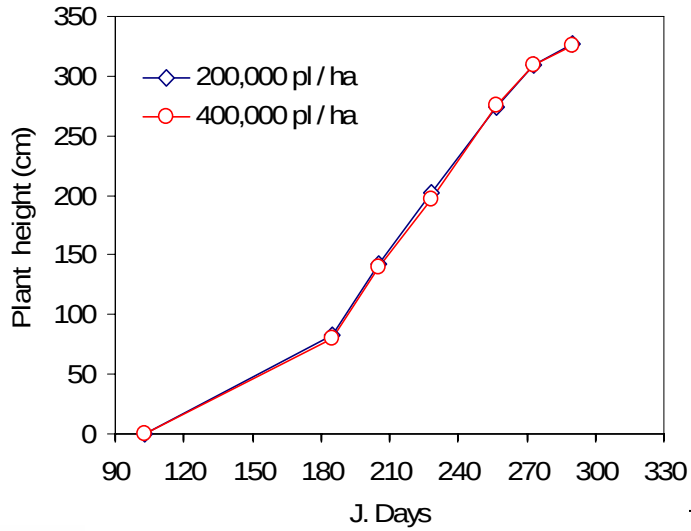
Plant height (cm)

task 2.2



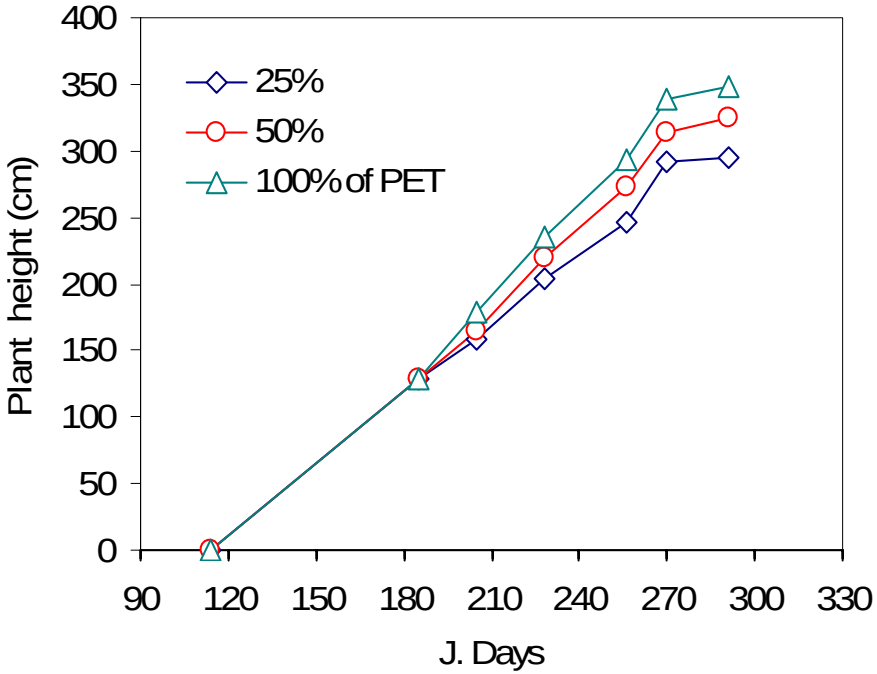


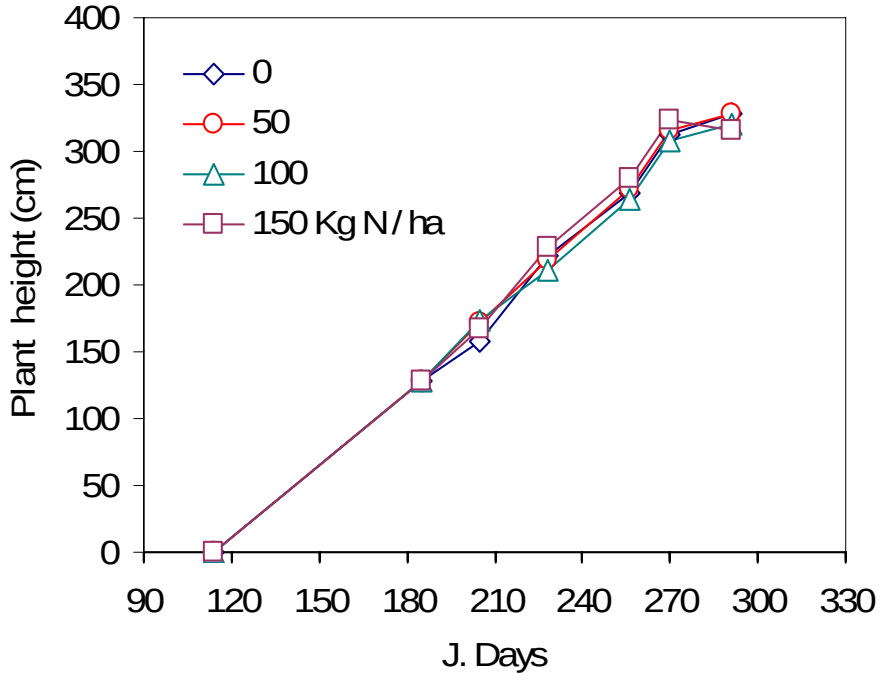


- Max rate of increase around 3.4 cm d^{-1}
- Coincides with temp. + radiation rise
- Parallel increase

Plant height (cm)

task 2.3

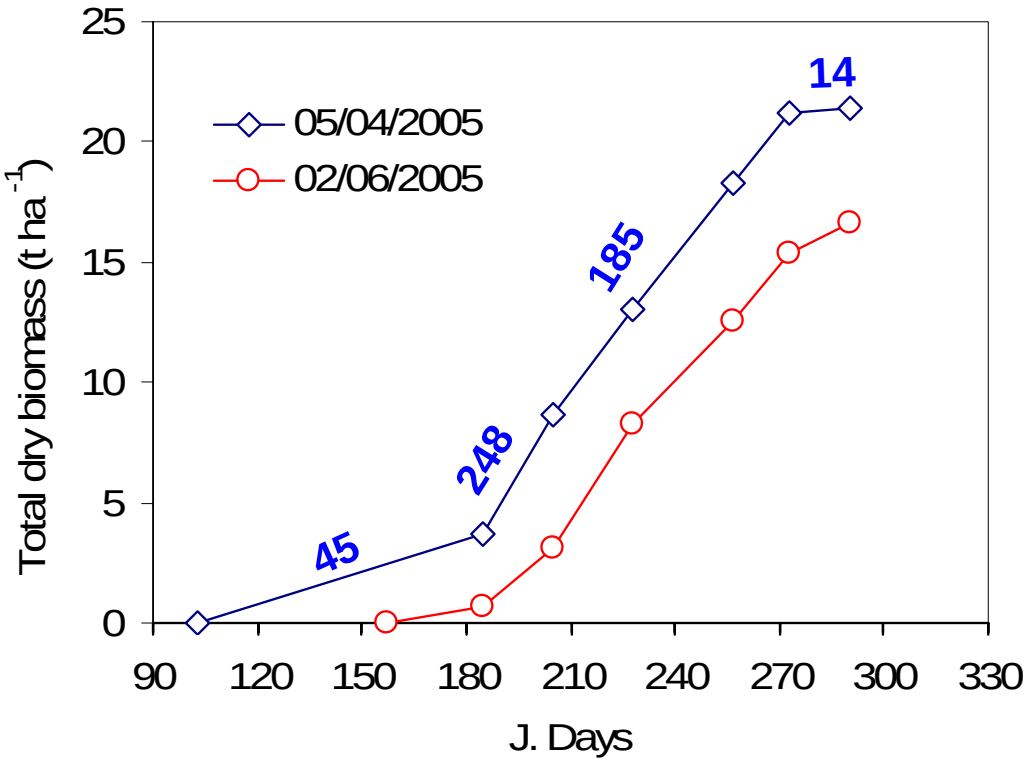




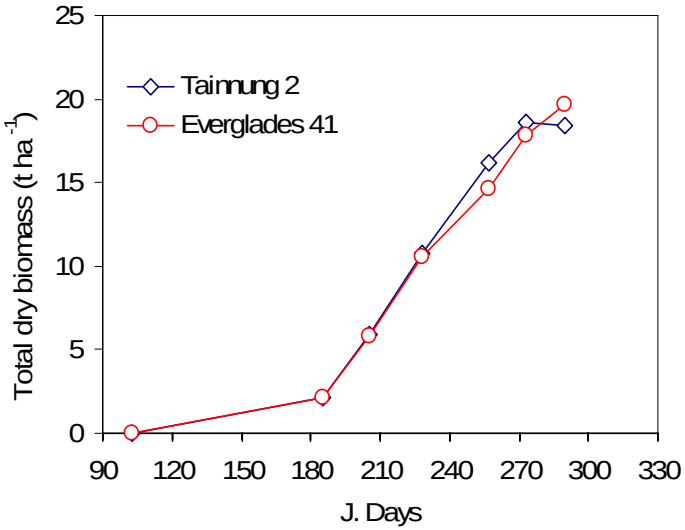
- Full irrigated plants reached only a 6.5% higher height than ½ full irrig. plants
- Influence of ground water table
- Max rate of increase = 3.24 cm d^{-1}

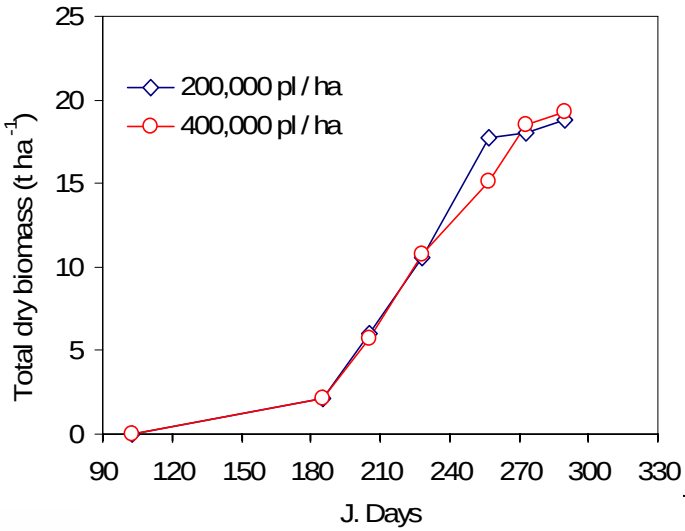
Total dry biomass (t ha^{-1})

task 2.2



- Superiority of early crop
- Similar rates for varieties
- No effect of plant density





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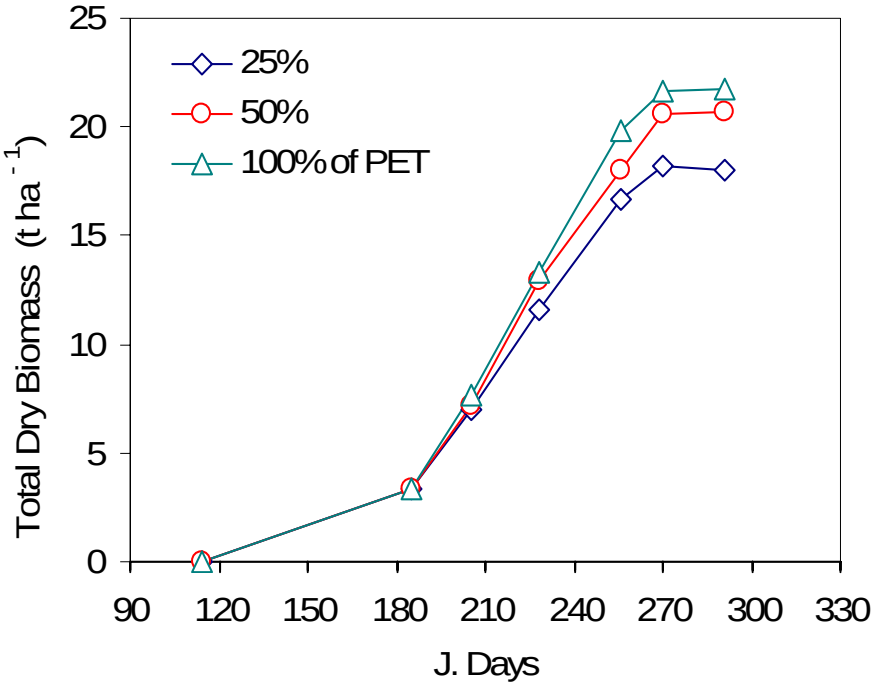
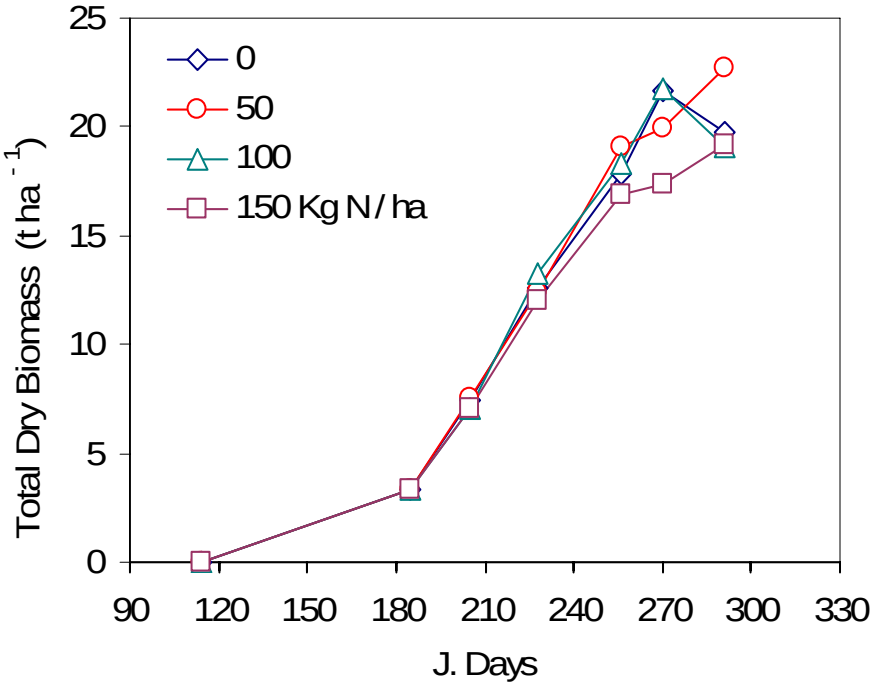
Total dry biomass (t ha^{-1})

task 2.3

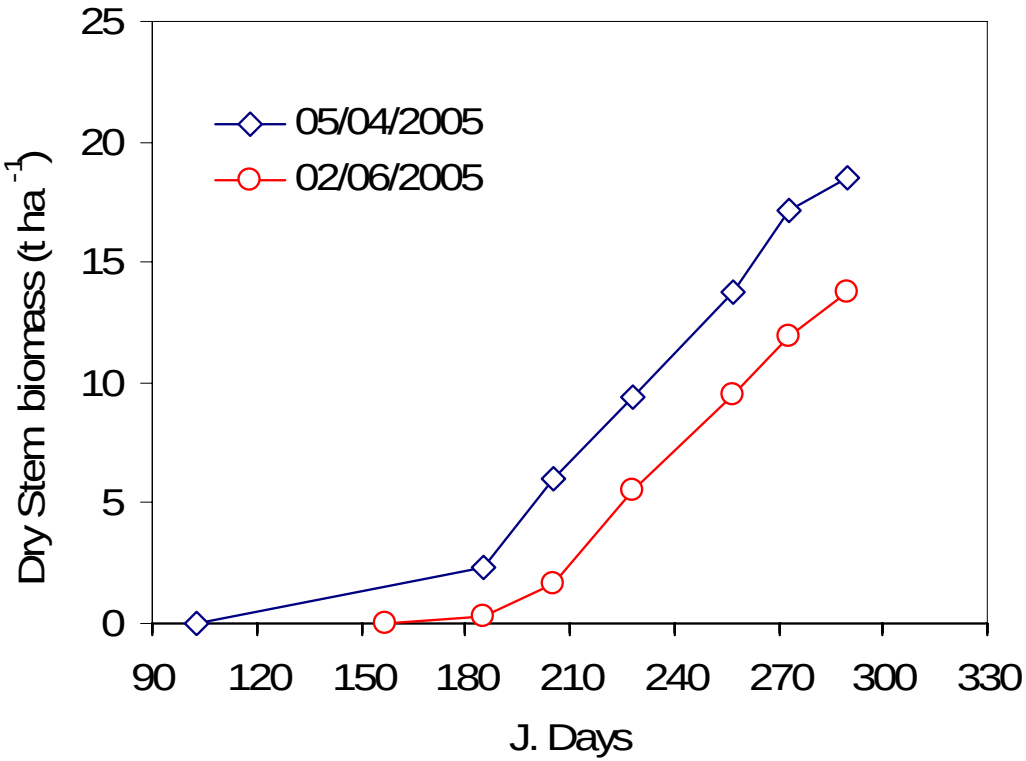


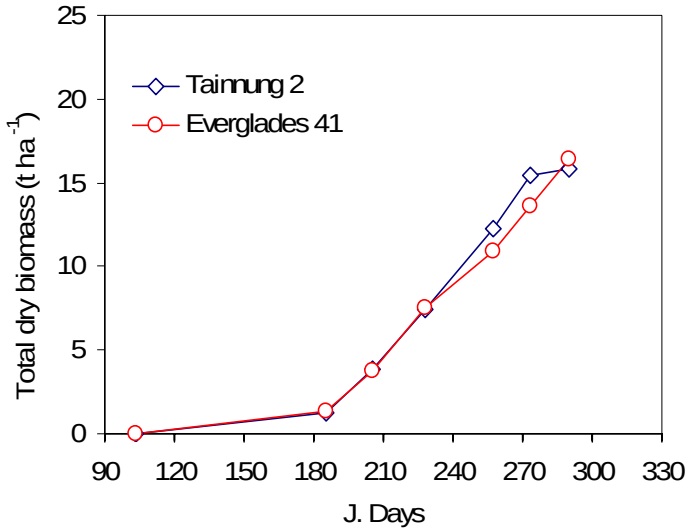


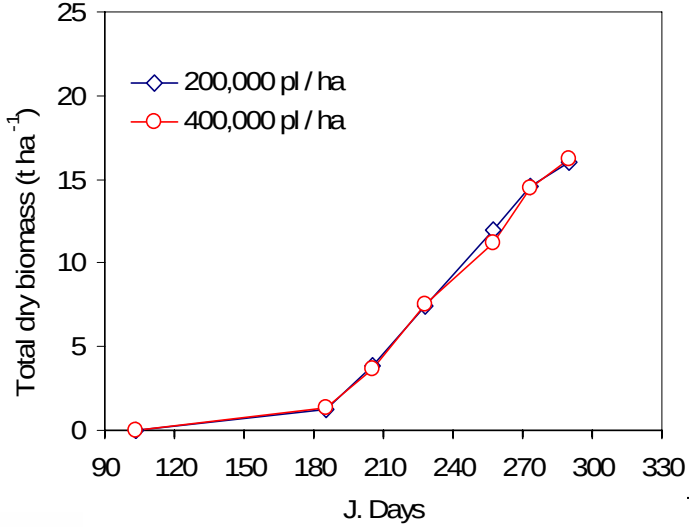
- Initial lag period due to low temperatures and radiation regimes
- Potential biomass production (GR = 250 DM Kg ha d^{-1})
- I_3 vs. I_2 = 4.9% and I_3 vs. I_1 = 15.9%

Dry stem biomass (t ha^{-1})

task 2.2

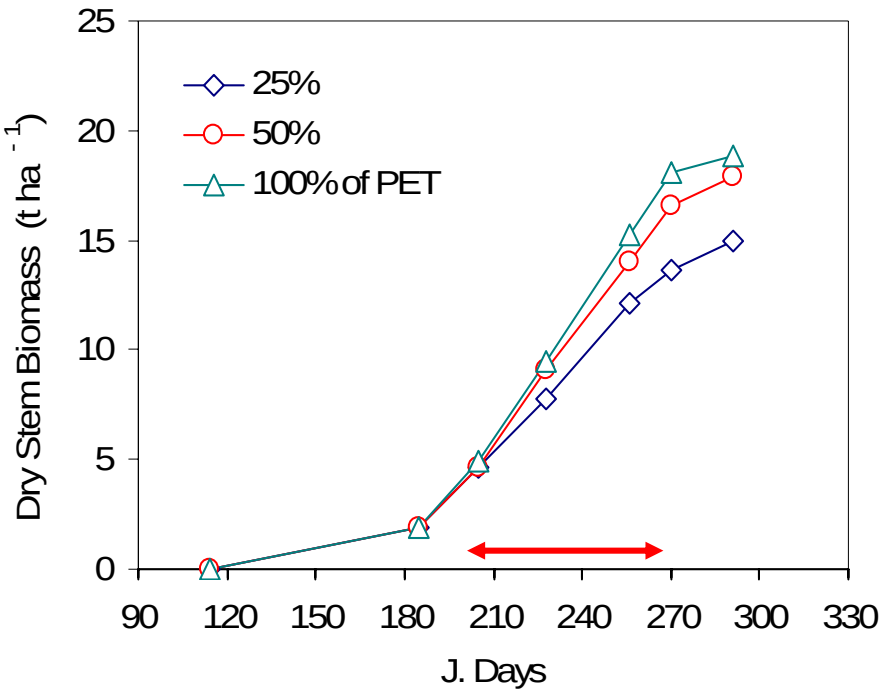


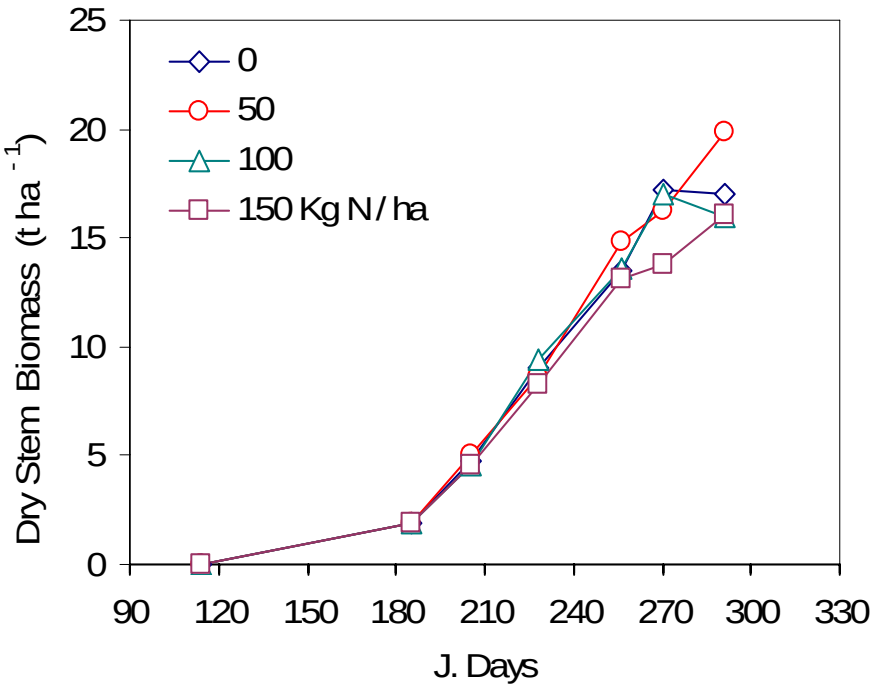




- Parallel growth, rates of about 170 kg ha^{-1} d^{-1}

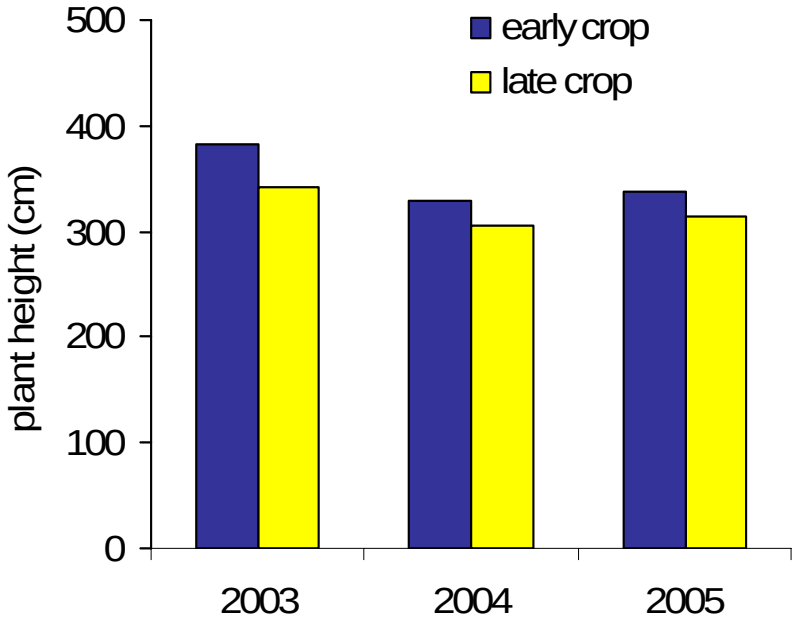
Dry stem biomass (t ha^{-1}) task 2.3

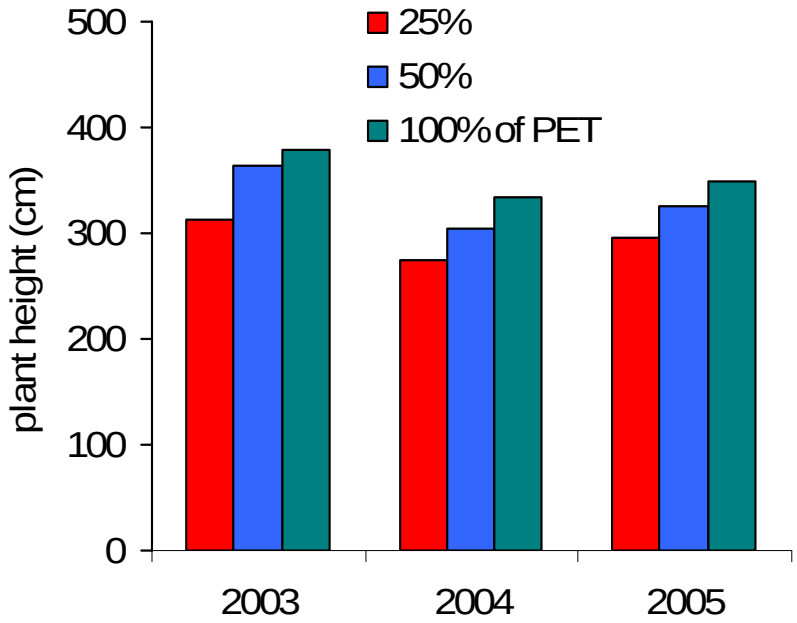




- 75 DAE stem comprise the 55% of TDW, 170 DAE stem comprise 85%
- Average rates 133, 171, 188 Kg ha^{-1} d^{-1} for I_1, I_2, I_3 respectively
- No effect of N-Fertilization

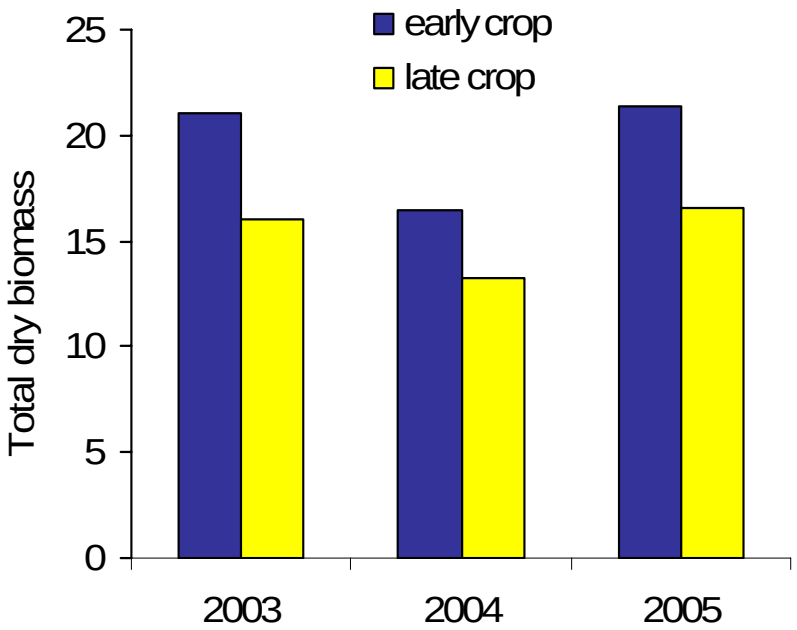
Assessment height (cm)

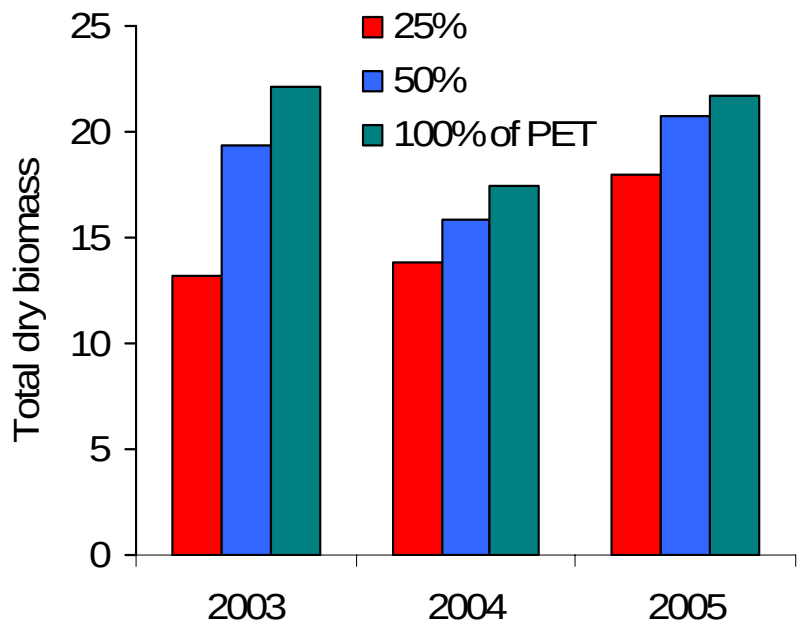




- Significant higher plant height of the of early crop
- Small differences among irrigation applications due to groundwater table
- Superiority of 2003 experimental year

Assessment Total dry biomass (t ha^{-1})



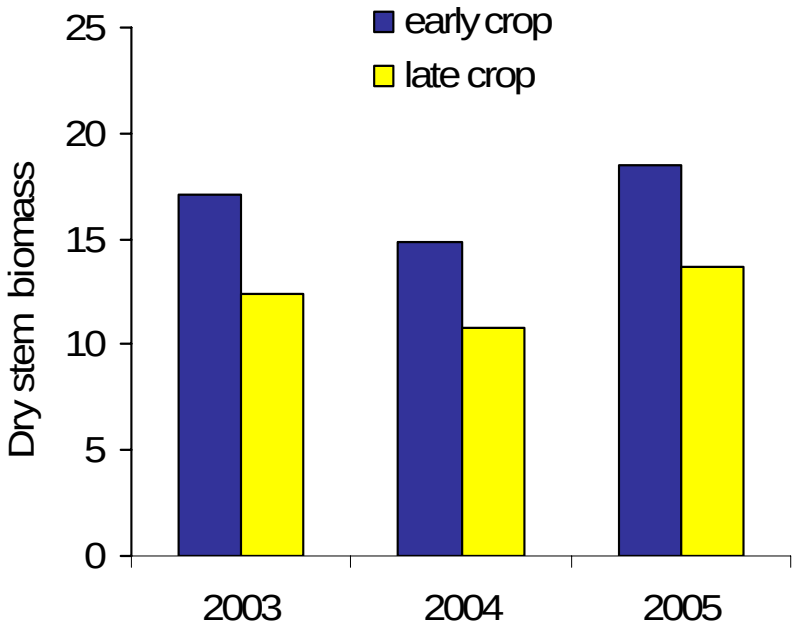


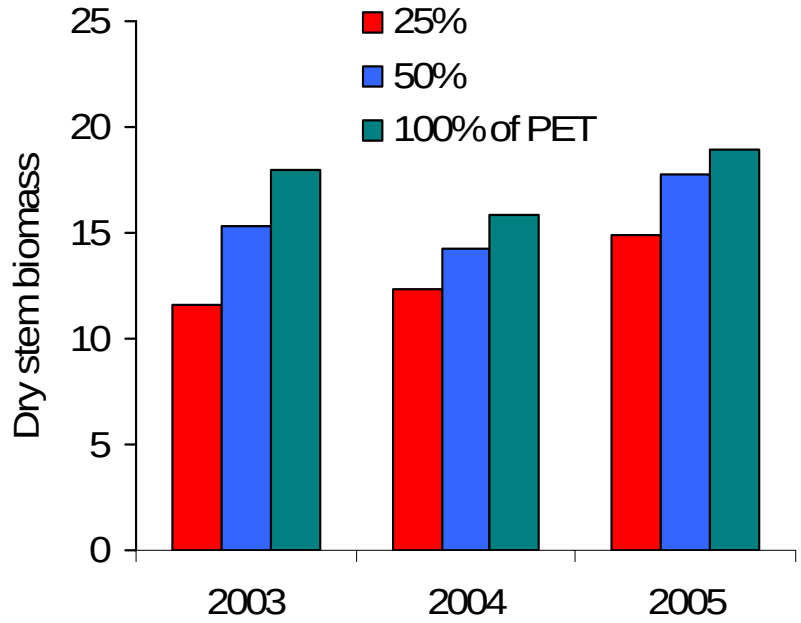
- Despite our expectation in 2005 TDW does not exceed 22 t ha^{-1}

this is potential production and the max possible production in Thessaly

Potential biomass production in all years

Assessment Dry stem biomass (t ha^{-1})





- Significant superiority of early crop
- Sowing during summer → 35-45% less production
- Kenaf is a determinate crop species → after flowering stop growth

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Temperature response curve

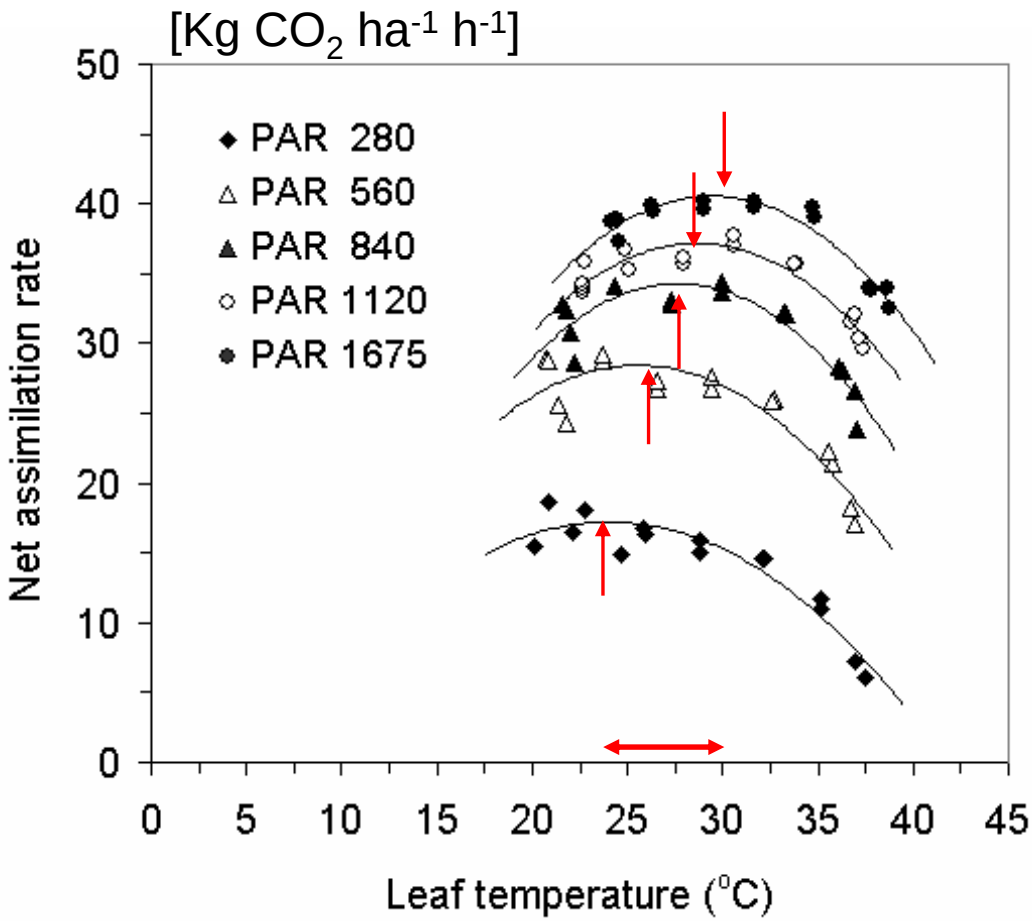
Everglades 41, August 11th 2004

Two types of interaction:

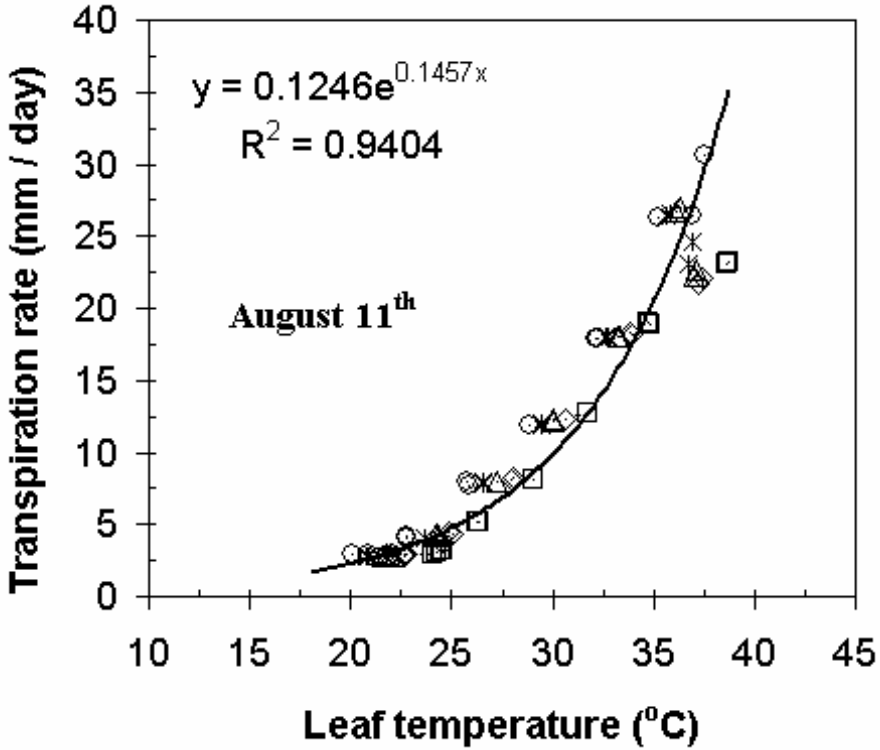
"To" for photosynthesis increases with the radiation level

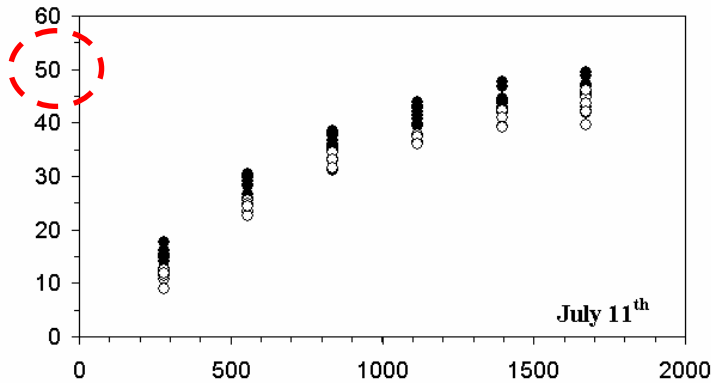
Beyond the "To" the temperature response is stronger at a higher radiation level than at a lower PAR level

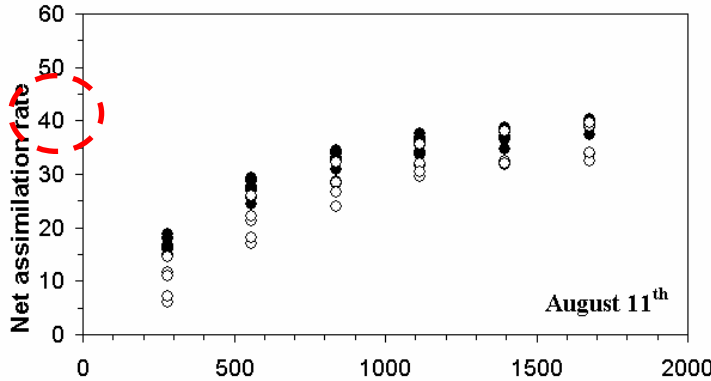
Ramachandrand & Rama (2000) found leaf "To" for kenaf 32 °C

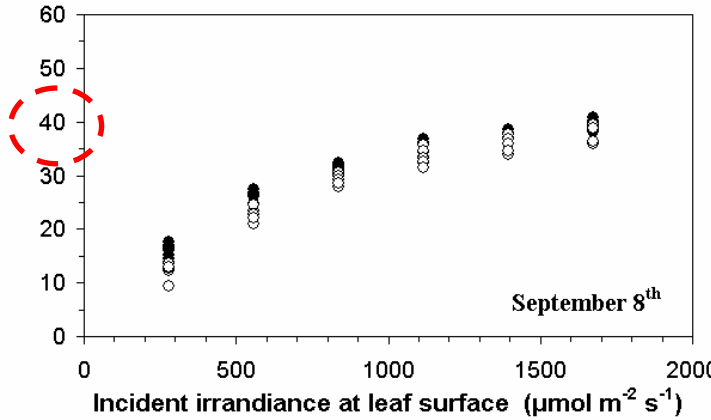


Light response curve / transpiration







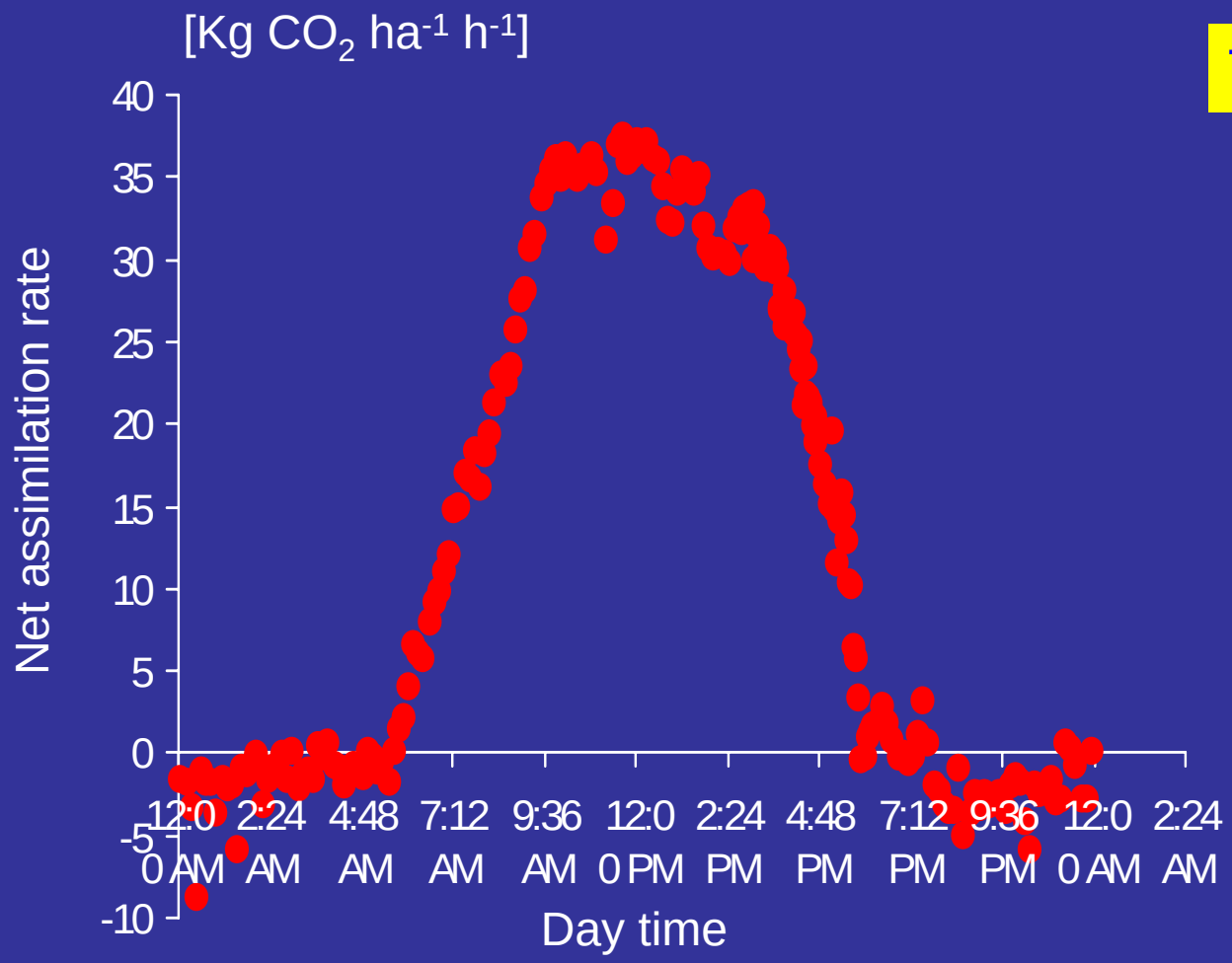


Photosynthesis 2005

Tainnung 2: 6/7, 22/7, 3/8, 9/8, 14/8, 15/8, 31/8

Everglades 41: 5/7, 21/7, 2/8, 8/8, 13/8, 16/8, 29/8

Net assimilation rate



Tainnung 2 (22/7/05)

C_{ref}: 344 - 643 ppm

AVRAD = 564 W m^{-2}

Av. T_{leaf} > 32°C →

High Respiration →

Low peak A_{net} value

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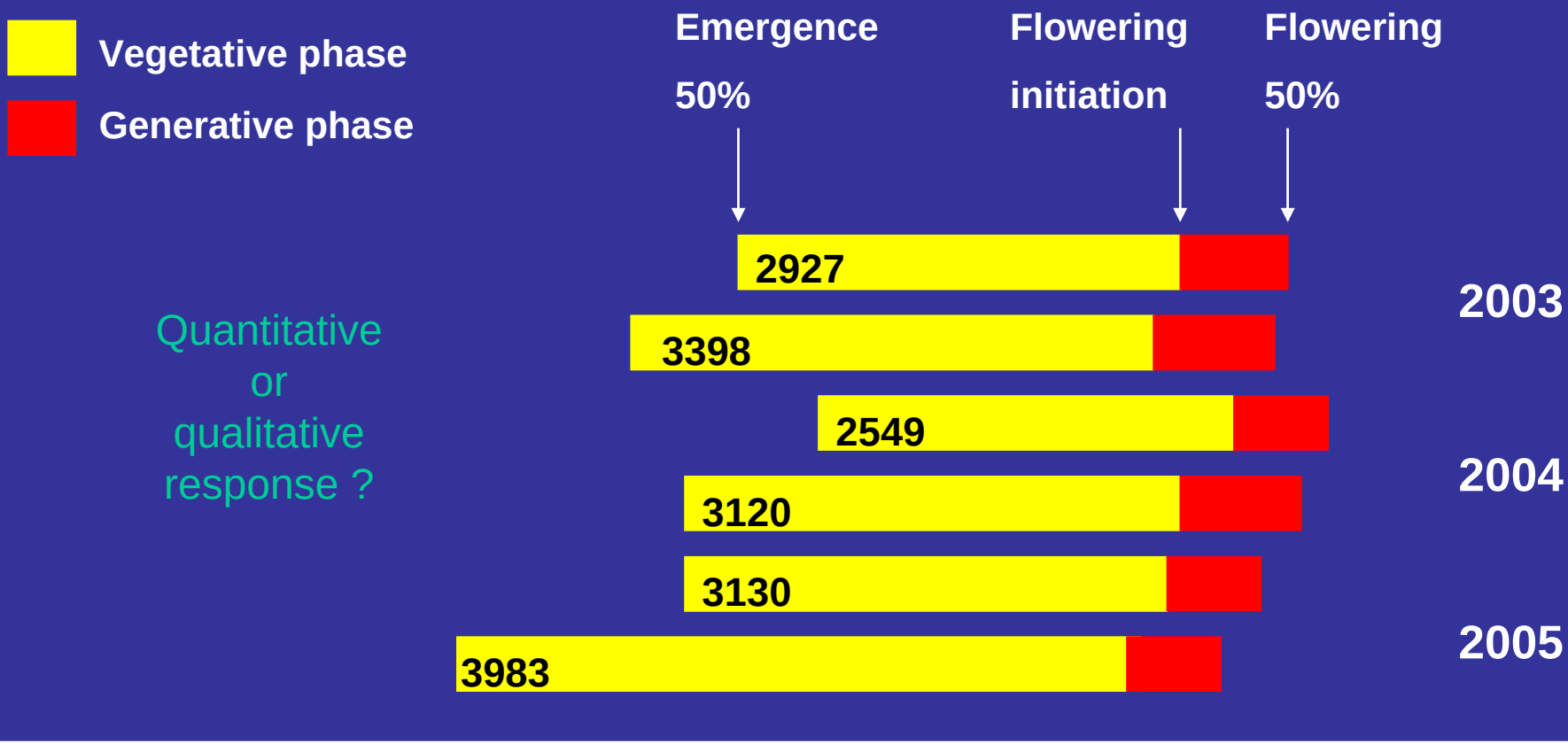
Kenaf Flowering



Kenaf flowering : function of temperature x radiation

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Main conclusions

- Under the prevailing climatic- and soil conditions, kenaf crop reaches potential productivity of about 21-22 t dm ha^{-1}
- Under 50% of irrigation (200-250 mm) 90-95% of potential biomass yield can be achieved in the study area
- The 90% of the final yield comprises the financial product (stem)
- Large amount of leaves incorporating into soil improving soil fertility
- Moderate to zero needs in N-fertilization in the sudy soil
- Kenaf is somewhat sensitive during the first month of establishment

Thank you for your attention !

Any questions ?




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