UNIVERSITY OF BOLOGNA

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BIOKENAF Project

Contract No: QLK5-CT2002-01729

VI Technical Meeting

Volos – November 22 - 23, 2005

Third Year Results until October 2005

(WP2 - Task 2.2 _ 2.3)

Technical staff:
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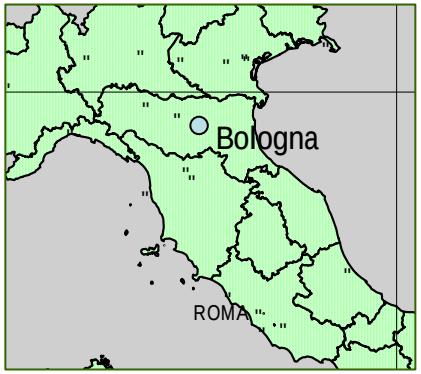
TESTED TREATMENTS AND EXPERIMENTAL LAYOUT OF Task 2.2 and Task 2.3

Experimental Farm of Bologna University

Cadriano (Northern Italy)



44° 33' N, 11° 21' E

altitude: 32 m a.s.l.
soil slope: 0%
organic matter = 1.9%
pH = 7.14

farm soil typology:
Udic Ustochreps fine silty, mixed mesic

sand = 19%
silt = 53%
clay = 28%

Experimental layout

Complete randomized block design for all tested factors

TASK 2.3

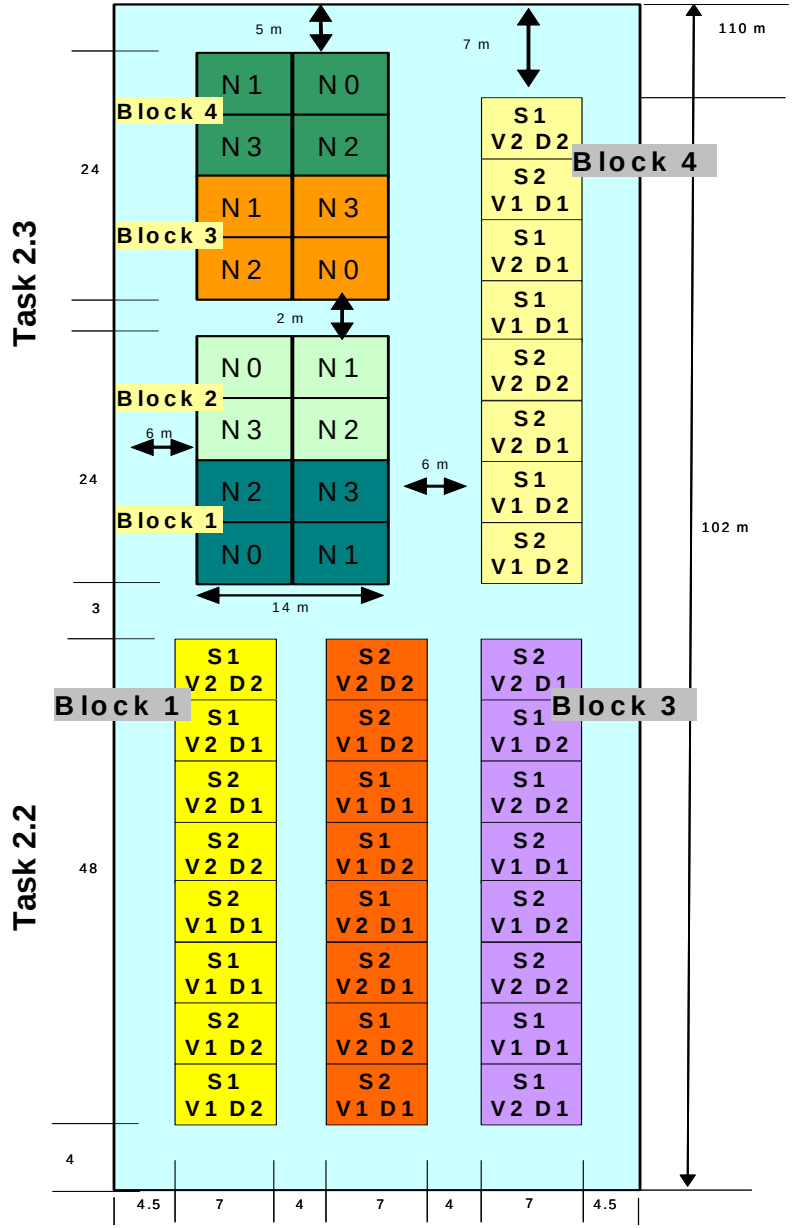
N0: 0 Kg N / ha
N1: 50 Kg N / ha
N2: 100 Kg N / ha
N3: 150 Kg N / ha

TASK 2.2

S1: *First sowing time*
S2: *Second sowing time*

V1: *Tainung2*
V2: *Everglades41*

D1: *20 p m^{-2}*
D2: *40 p m^{-2}*



FIELD TRIALS PREPARATION and EMERGENCE

- **Sowing Bed preparation**
- **Mechanical sowing**
- **Woven non woven tissue**
- **Irrigation after sowing to help emergence**

10 days to reach complete emergence for S1 in 2005

	2003		2004		2005	
	sowing date	days of emergence	sowing date	days of emergence	sowing date	days of emergence
Task 22_S1	19/5	5	7/5	5	28/4	10
Task 2.3	26/5	4	21/5	5	10/5	5
Task 2.2_S2	19/6	8	9/6	6	30/5	5

Temperatures during S1 sowing of 3 years field trials.

	T MAX		T MIN		T MEAN	
sowing	5 days before	10 days after	5 days before	10 days after	5 days before	10 days after
19/05/03	23,26	26,23	9,46	12,54	16,36	19,39
07/05/04	19,13	20,32	11,28	8,84	15,21	14,58
28/04/05	20,40	25,10	8,50	10,40	14,45	17,75

…few pictures from 2005 field trials

…few pictures from 2005 field trials

24/10/2005

DATA COLLECTING

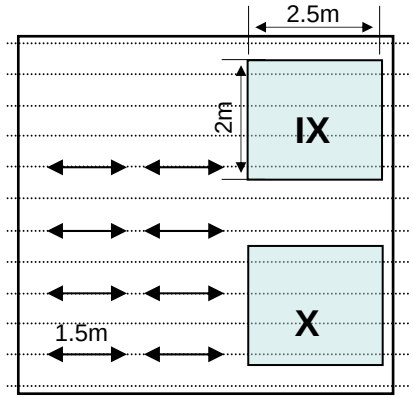
Meteorological data like …

- Daily maximum/minimum air temperature (°C)
- Precipitation (mm)
- Air humidity (%)
- Evaporation (glass A panel)
- Sunshine hours
- Water table

Repeated harvests during crop cycle

(rows of 1,5 m)

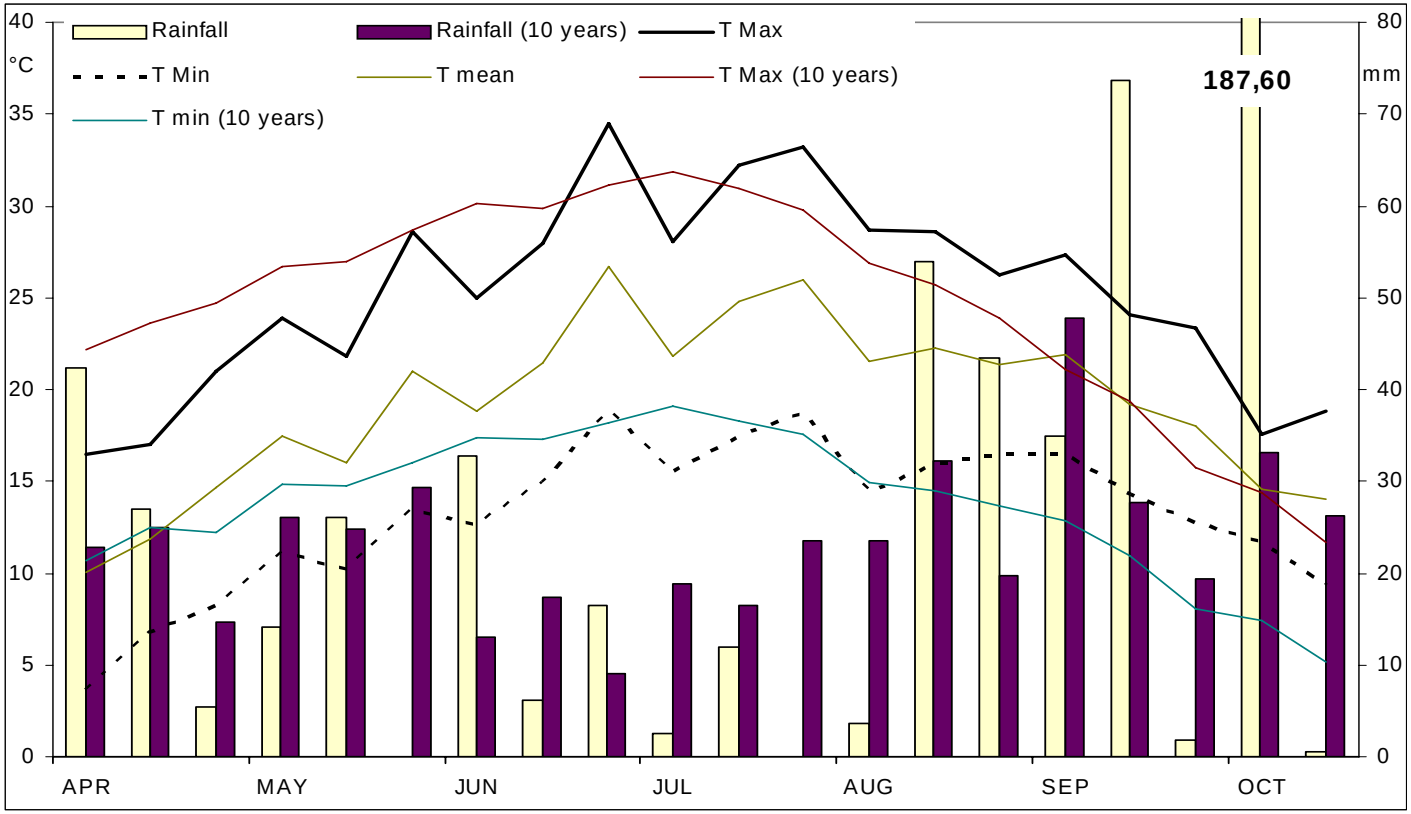
- Fresh / dry weight of harvested row
- Number of plants
- Height (cm) and Base Stem Diameter (mm)
- Fresh / dry weight of stems, leaves and petioles
- Leaf area (cm^2)



Timetable of repeated harvests.

	Harvest n°	I	II	III	IV	V	VI	VII	VIII	IX	X
TASK 2.2	date	20/6	27/6	12/7	26/7	9/8	30/8	14/9	-	END OF NOVEMBER	DECEMBER / JANUARY
	DOY	171	178	193	207	221	242	257	-		
	S1 DAE	43	50	65	79	93	114	129	-		
	S1 GDD	314	413	580	763	930	1130	1276	-		
	S2 DAE	16	23	38	52	66	87	102	-		
	S2 GDD	139	239	405	588	754	955	1101	-		
TASK 2.3	DAE	36	43	58	72	86	107	122	-		
	GDD	291	391	557	740	907	1107	1253	-		

Rainfall, Min and Max temperature during the experimental period until October.

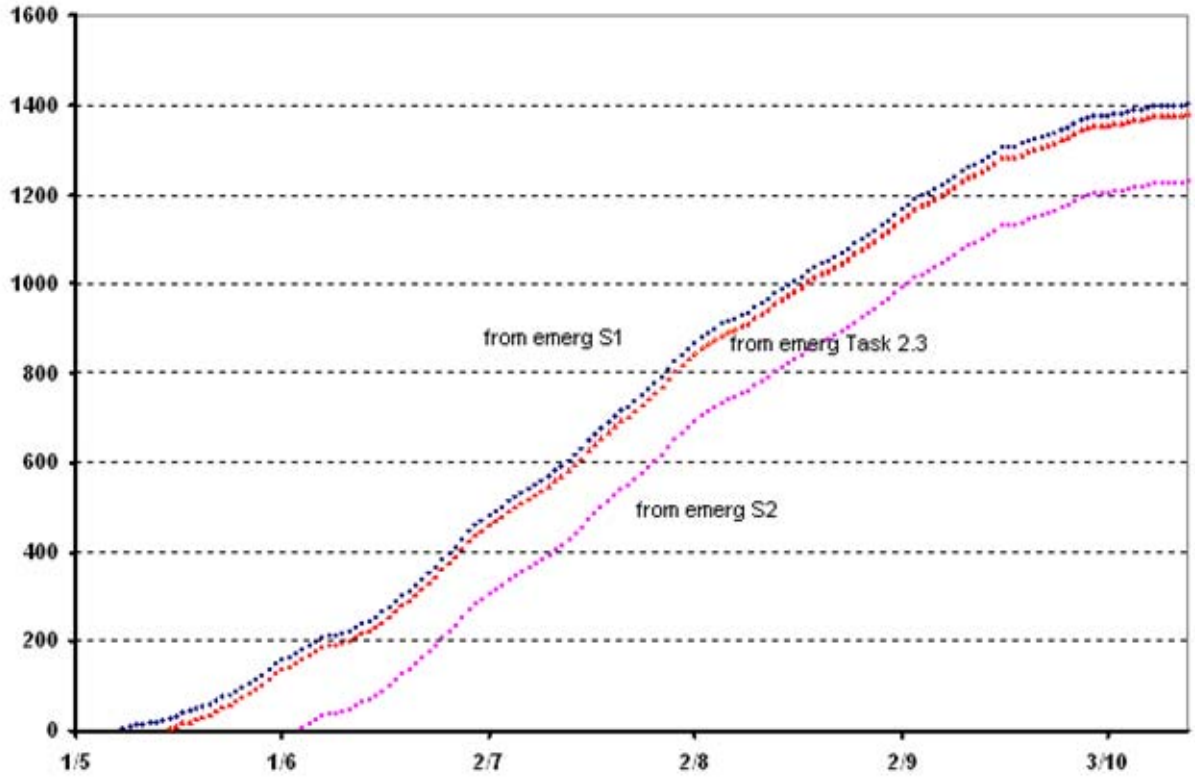


Air Temperatures resulted lower respect to the 10 year trend until July

Precipitation was absent only on first 10 days of June and August

From 15th of April to 15th of October accumulation of rainfall was 509 mm in 2005 (270 mm in 2004)

Accumulation of Growing Degree Day from emergence during the experimental period until October.



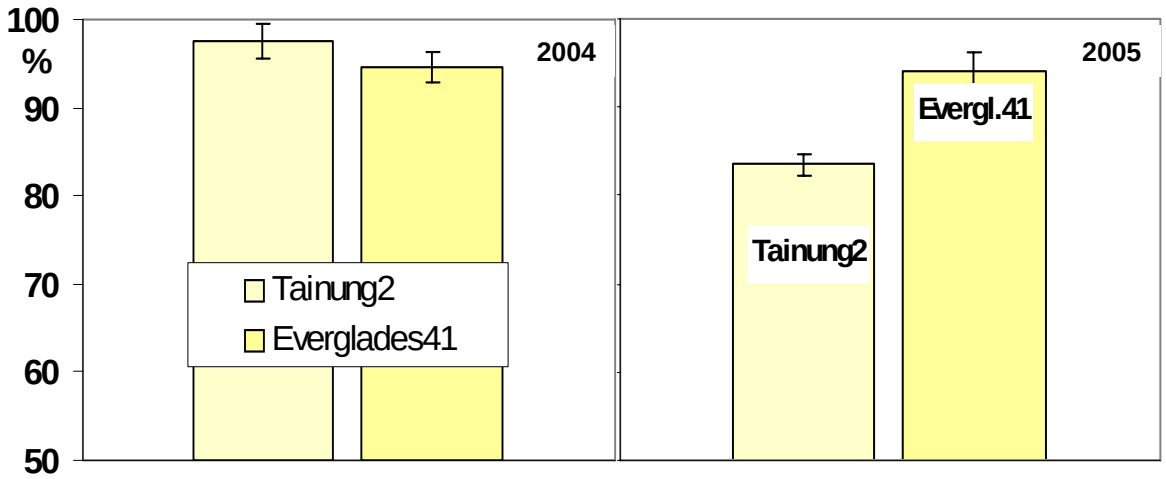
Low difference between first sowing time of Task 2.2 and Task 2.3

Values similar to 2004

50 seeds per 4 replications. Incubation room at 20-30 °C with light.

Sowed on 21/04/2005. First germination survey on 26/04/2005. Second germination survey on 29/4/2005.

% of germinated plants after 10 days of incubation in 2004 and 2005.



Plant population on field during harvests

2005

D1: 25.81 ± 2.59 plants m^{-2}

D2: 45.99 ± 3.57 plants m^{-2}

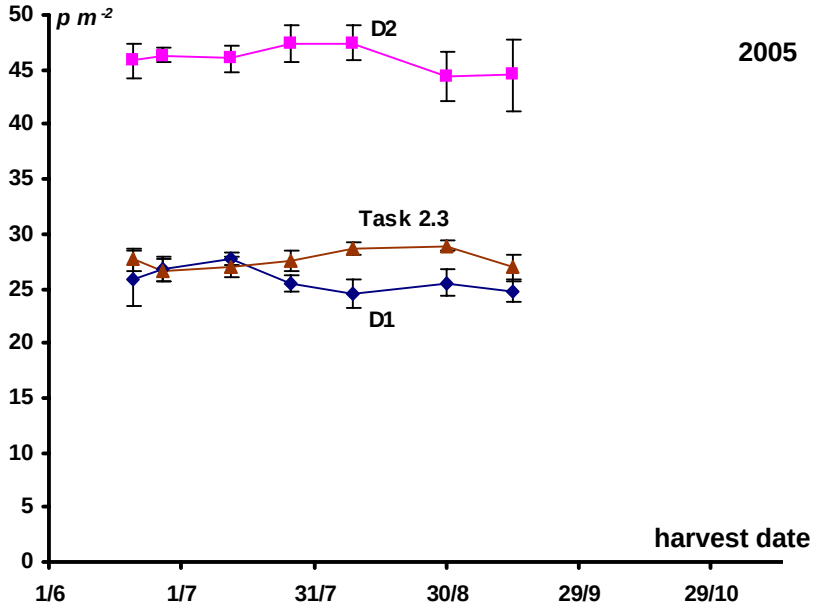
Task 2.3: 27.62 ± 1.79 plants m^{-2}

2004

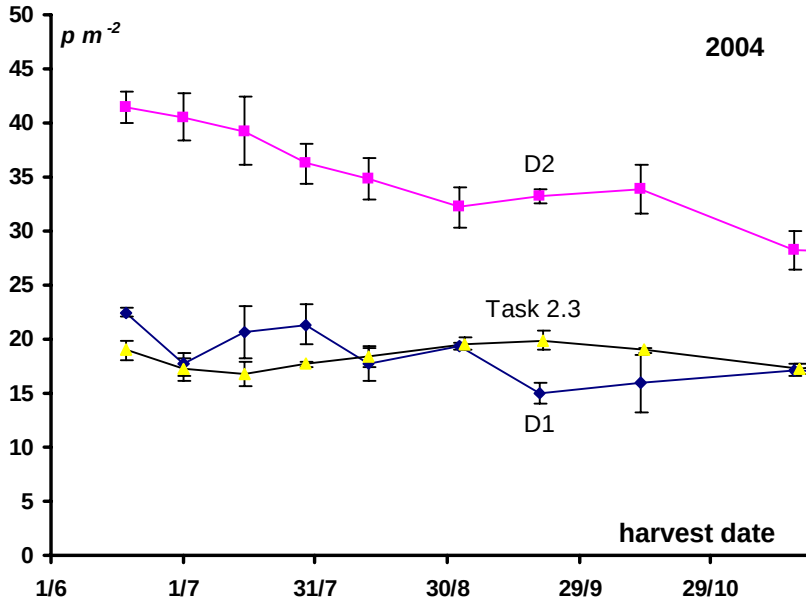
D1: 18.4 ± 3.5 plants m^{-2}

D2: 35 ± 5.7 plants m^{-2}

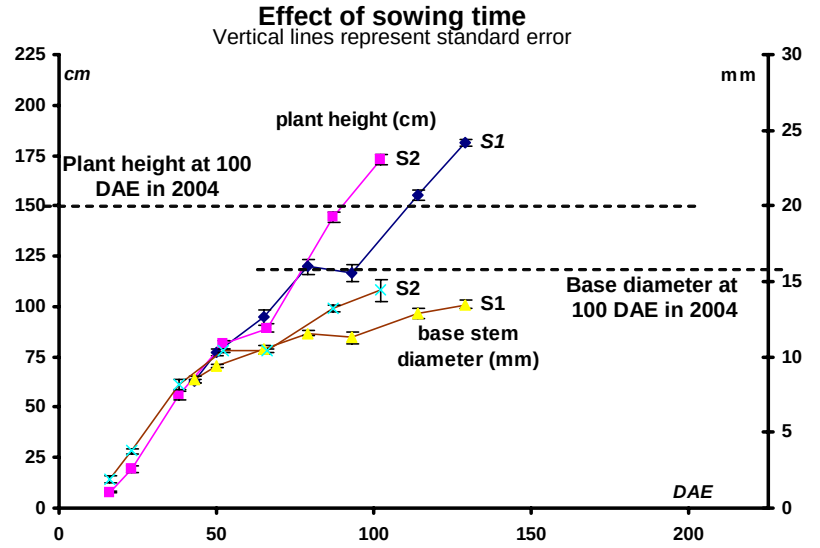
Plant population on field during time in 2005.

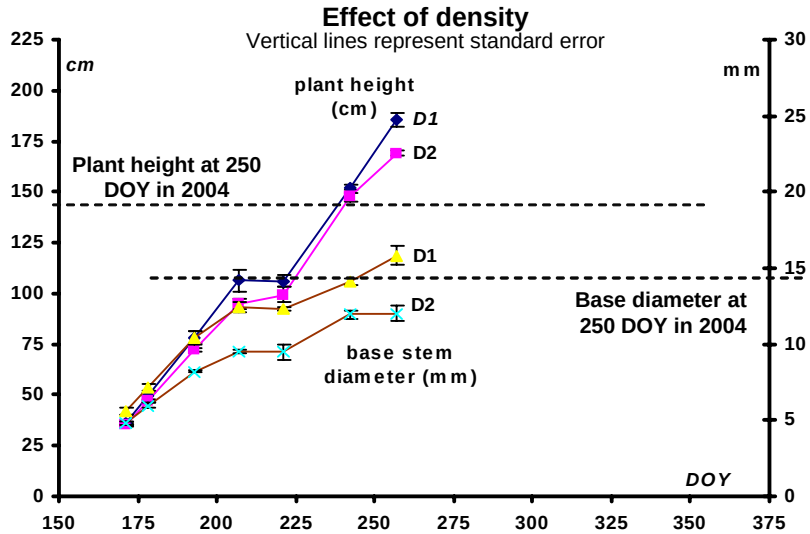


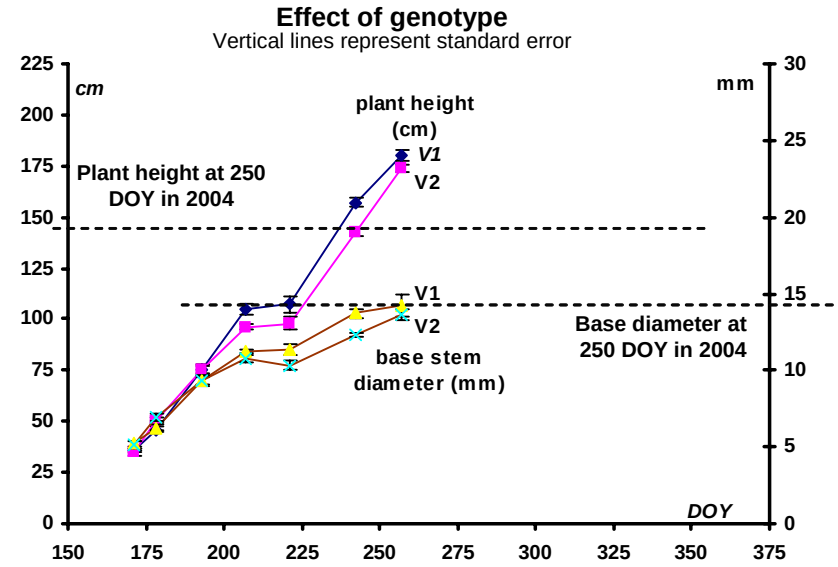
Plant population on field during time in 2004.

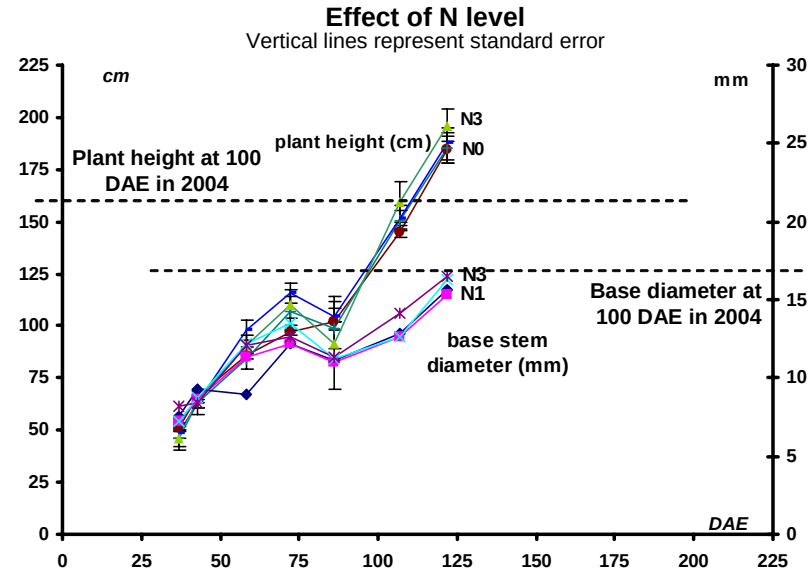


Height (cm) and Base stem diameter (mm) during time

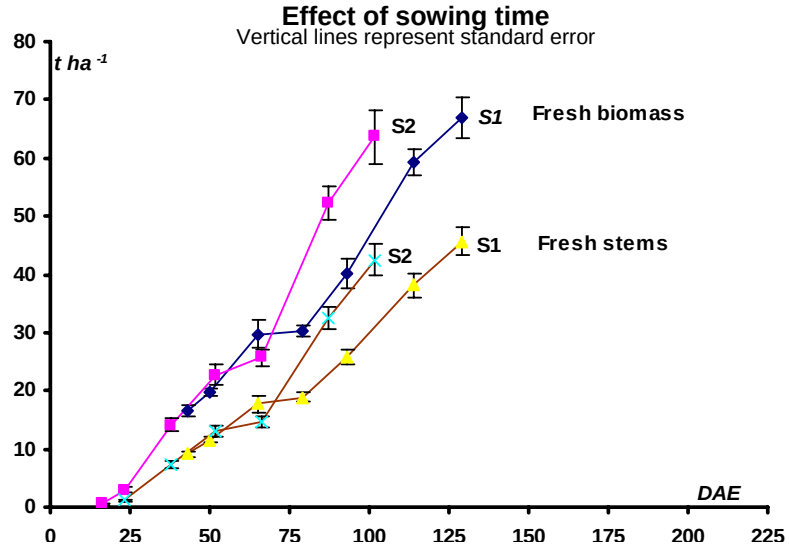


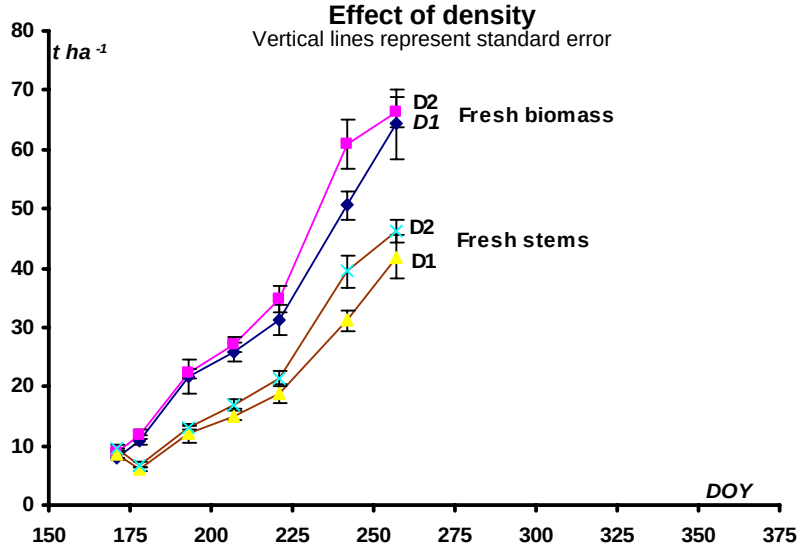


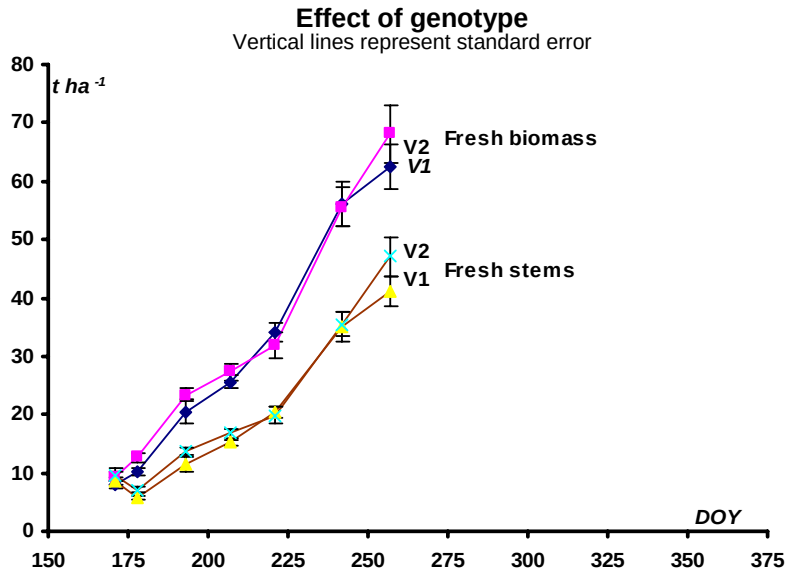


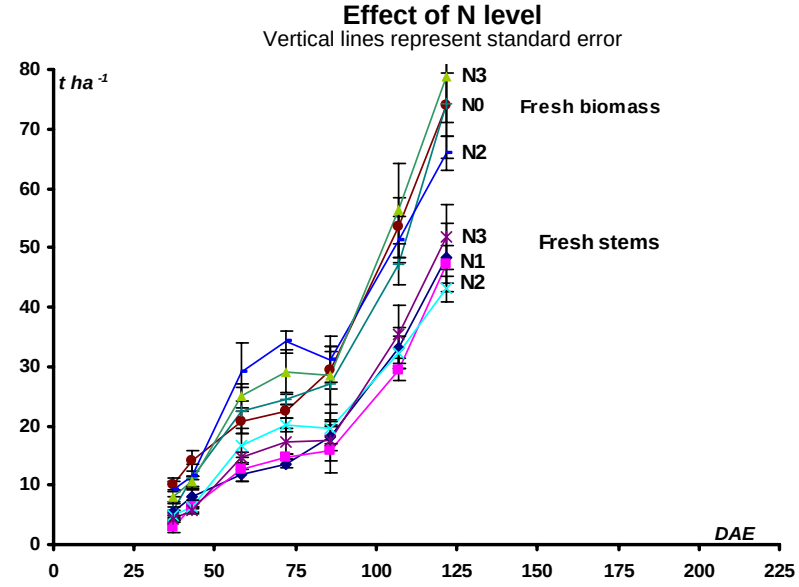


Fresh yields (t ha^{-1}) of total biomass and stems during time



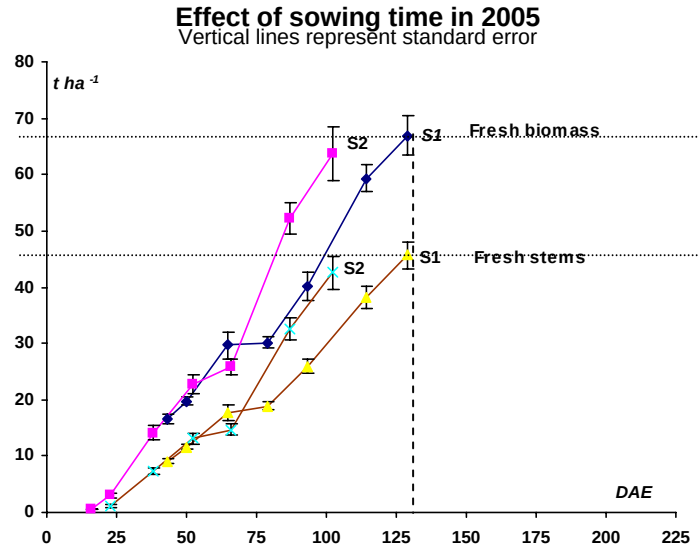


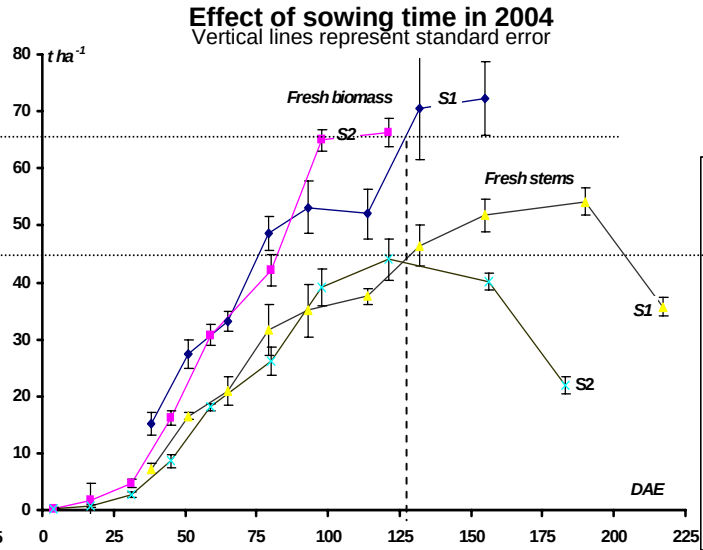


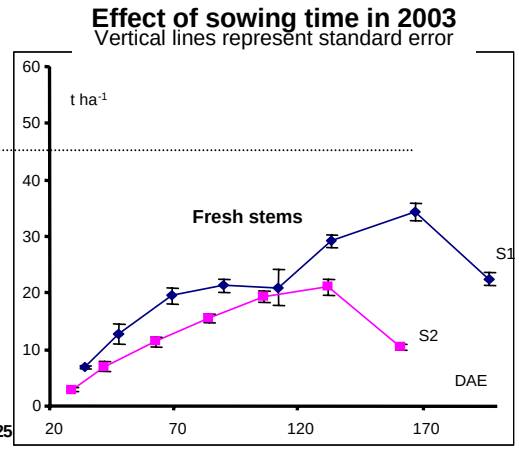


Fresh yields (t ha^{-1}) of total biomass and stems

Comparison among the 3 years





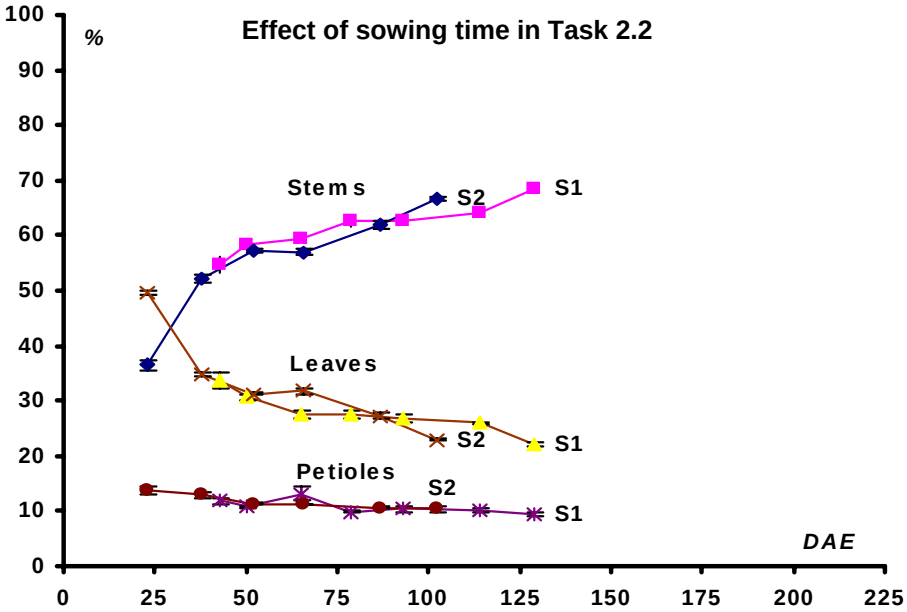


Similar levels of fresh yield in 2005 and 2004.

Low fresh yield in 2003.

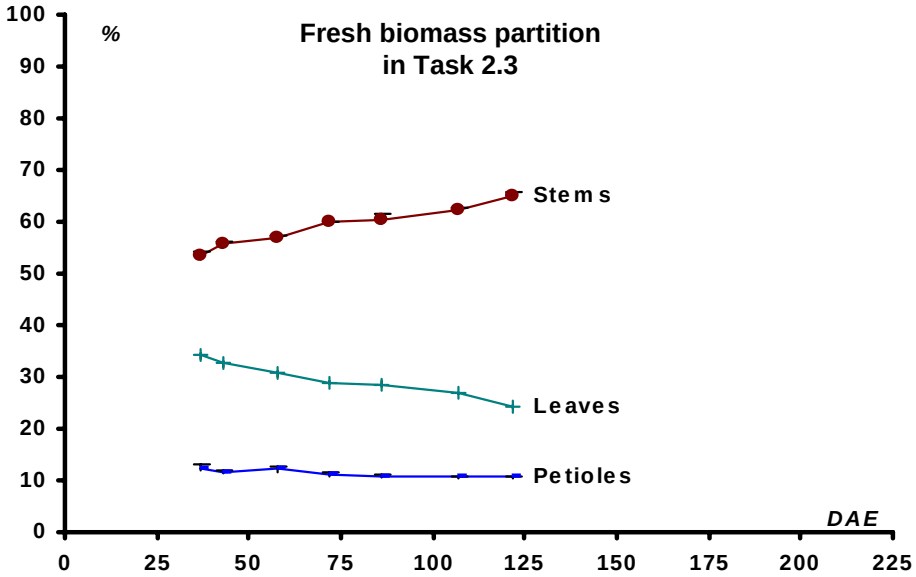
In general, the effect of factors are less evident in 2005

Partition of FB on plant organs during time



Stem % increased during time.
Leaves decreased until to reach almost 20% at 125 DAE (14/9/2205). Petiole % was around 10 %.

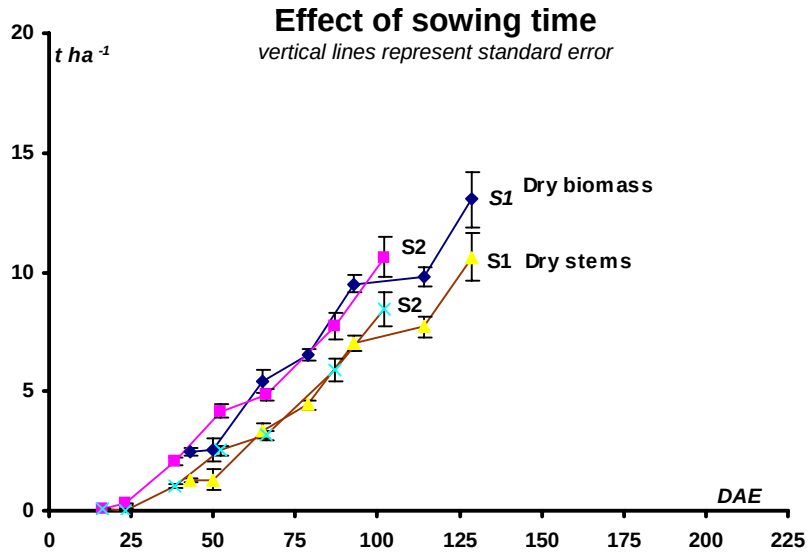
Sowing did not show effect on partition of biomass in plant organs. A little effect was observed in 2004: S2 showed higher values of leaves % during time until November.

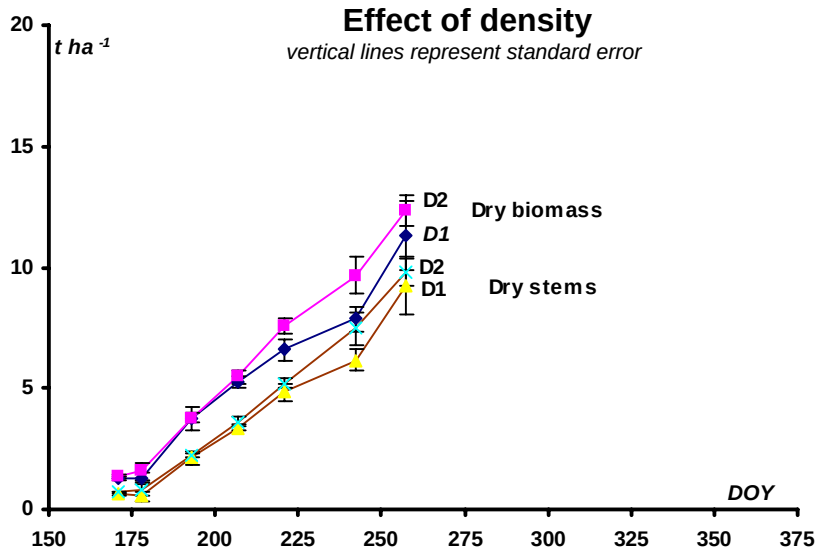


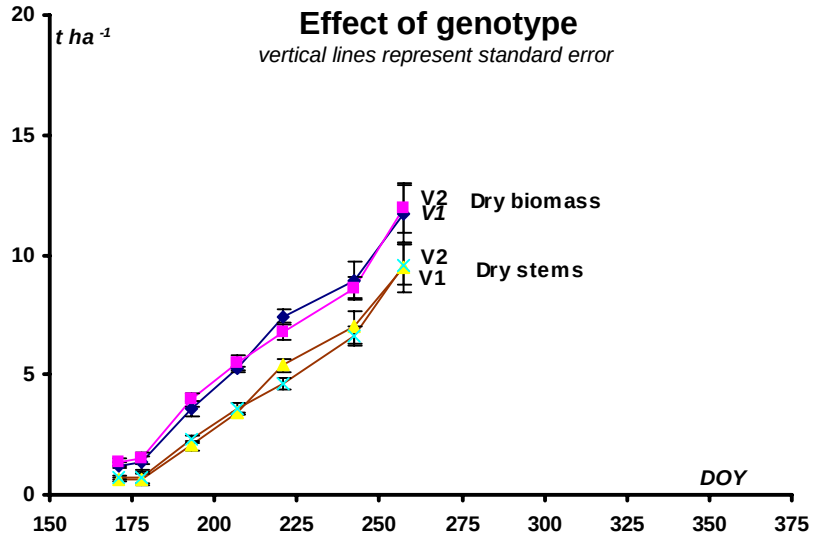
Density and genotype did not affected the partition of biomass on plant organs.

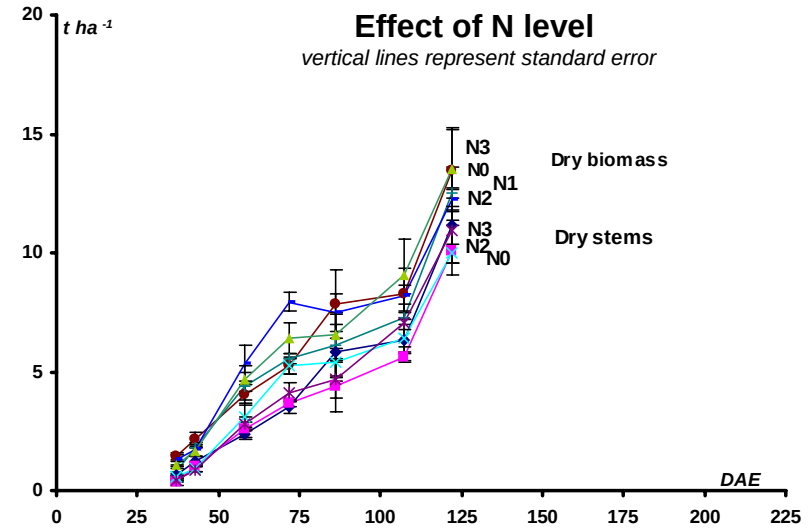
The same consideration can be done for N level

Dry Biomass yields (t ha^{-1})



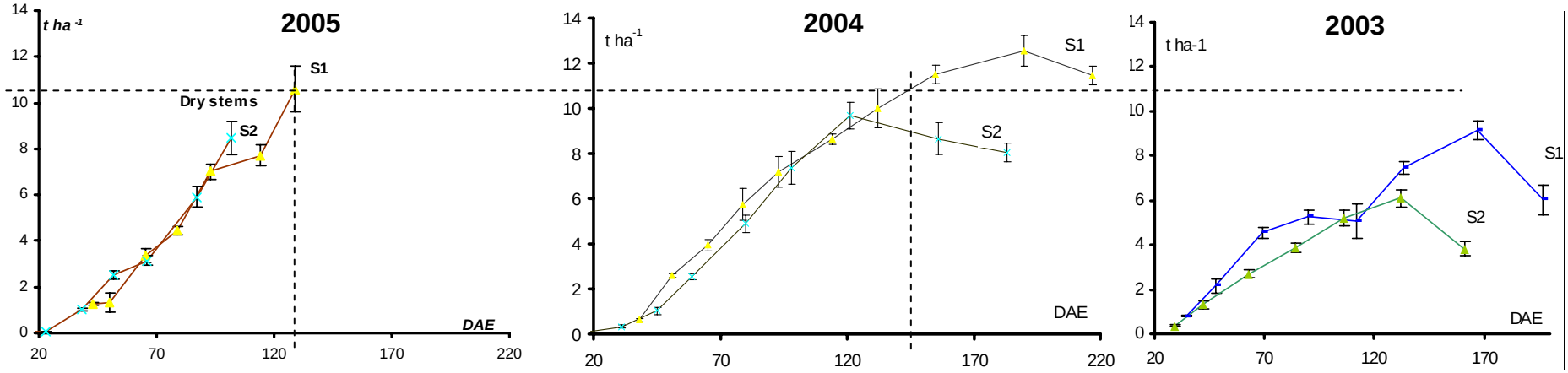




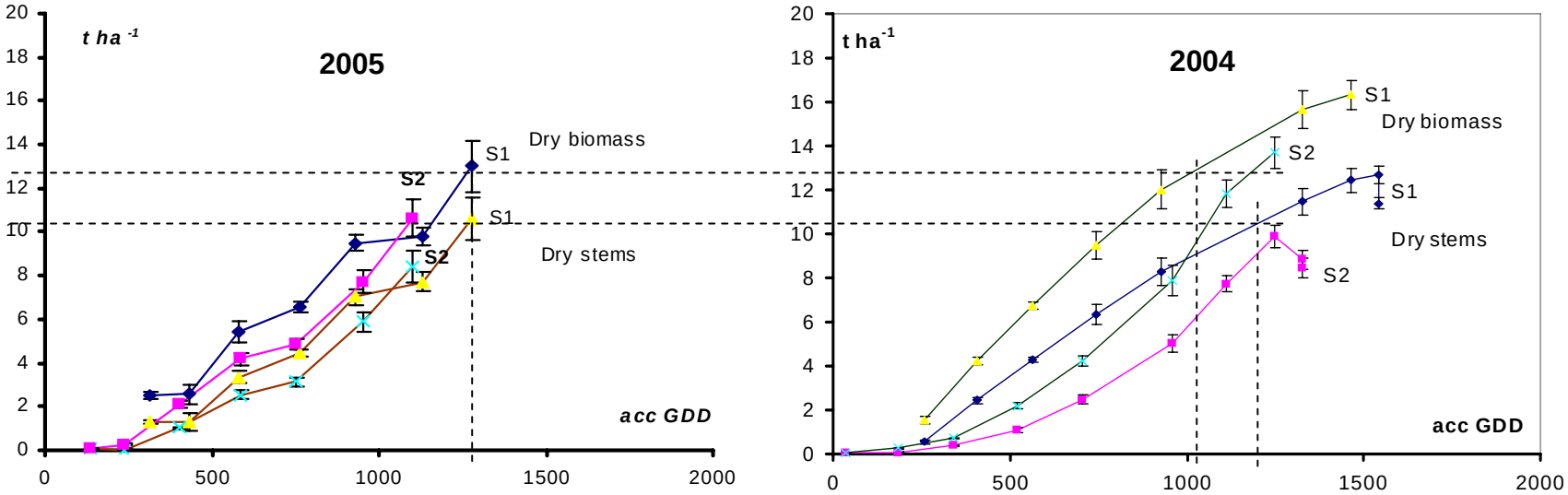


Dry stem yields (t ha^{-1})

Dry stem yield: comparison among the 3 years



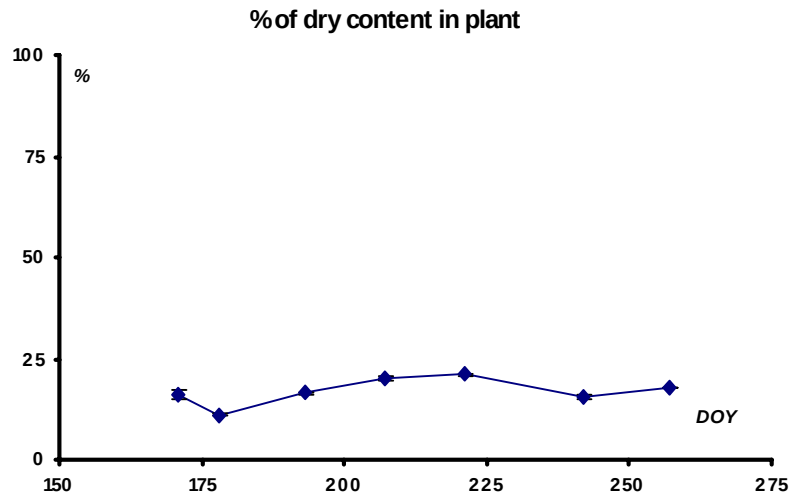
Effect of sowing time on dry biomass yield and stems respect to he accumulation of the GDD (°C)



Dry biomass content (%) during time

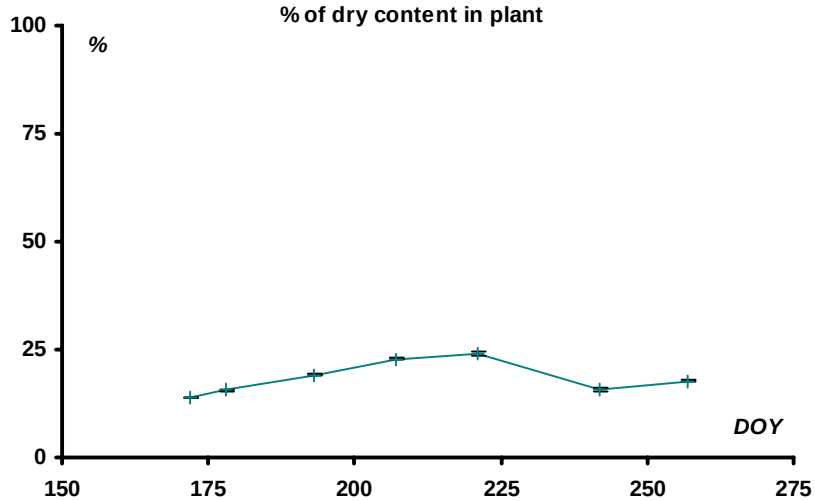
Dry biomass content (%) in plant during time in Task 2.2

vertical lines represent standard error



Dry biomass content (%) in plant during time in Task 2.3

vertical lines represent standard error



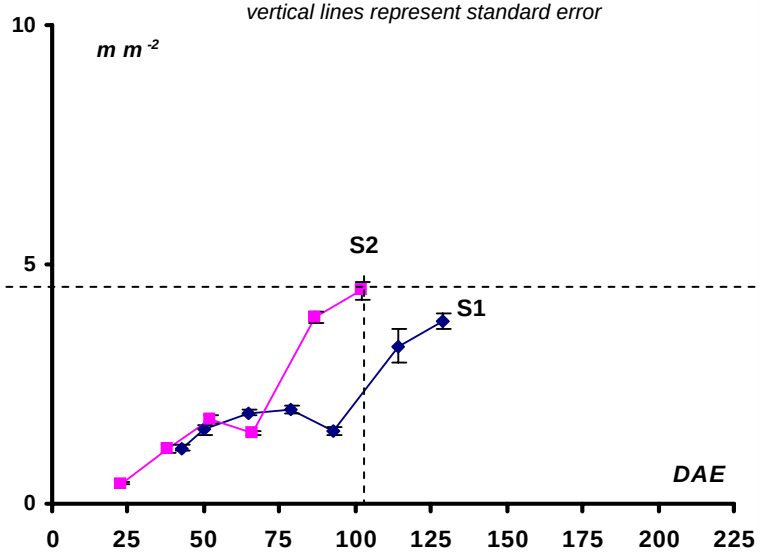
Dry matter content ranged from around 10 to 20 % (like in 2004 in the same period).
Increasing till around 40 % is expected for the last harvests.

For all treatments trends were very similar

Leaf Area Index (m^2 m^{-2})

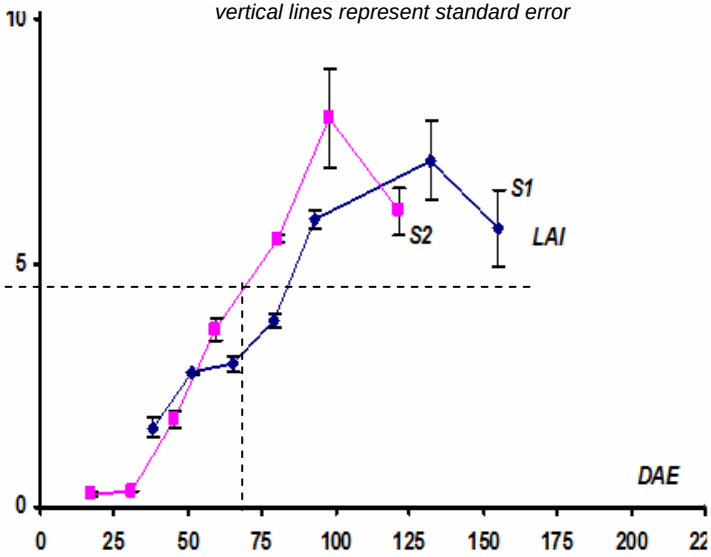
Effect of sowing time in 2005

vertical lines represent standard error



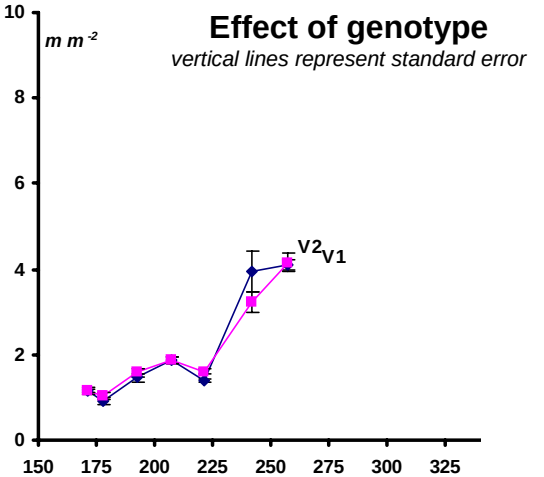
Effect of sowing time in 2004

vertical lines represent standard error



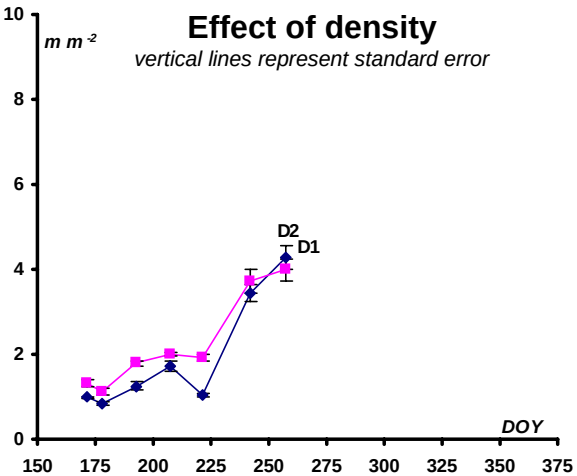
Effect of genotype

vertical lines represent standard error



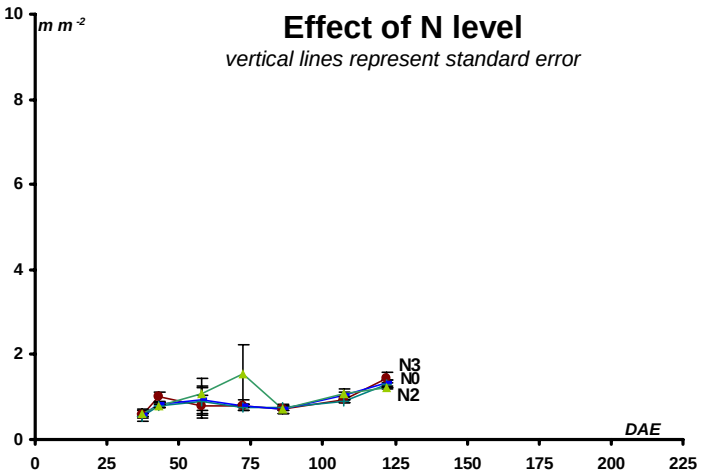
Effect of density

vertical lines represent standard error



Effect of N level

vertical lines represent standard error



FUTURE WORK

- **Data of Harvest VIII has to be considered**

- **Two final harvests (5 m^2):**

HARVEST A: 29th of November

HARVEST B: middle of December or January ?

Biometric parameters

- **Number of branches**
- **Number of nodes**
- **Decortication (fresh / dry weight of bark and core)**
- **C and N% in leaves, stems and soil (Harvest A)**
- **Hash content in core**

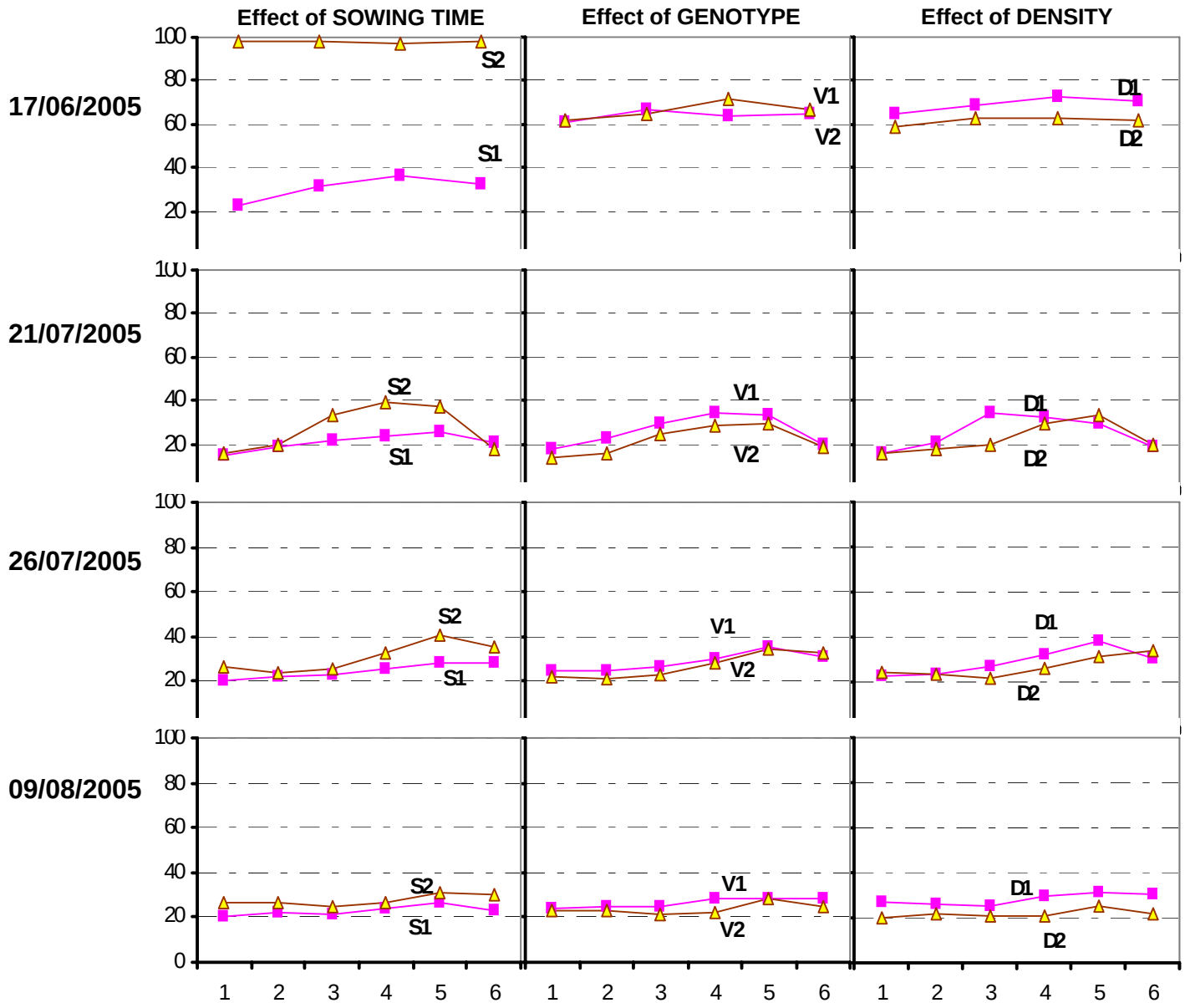
Trasmittance % (fraction of incident light at soil)

Block 2

8 plots

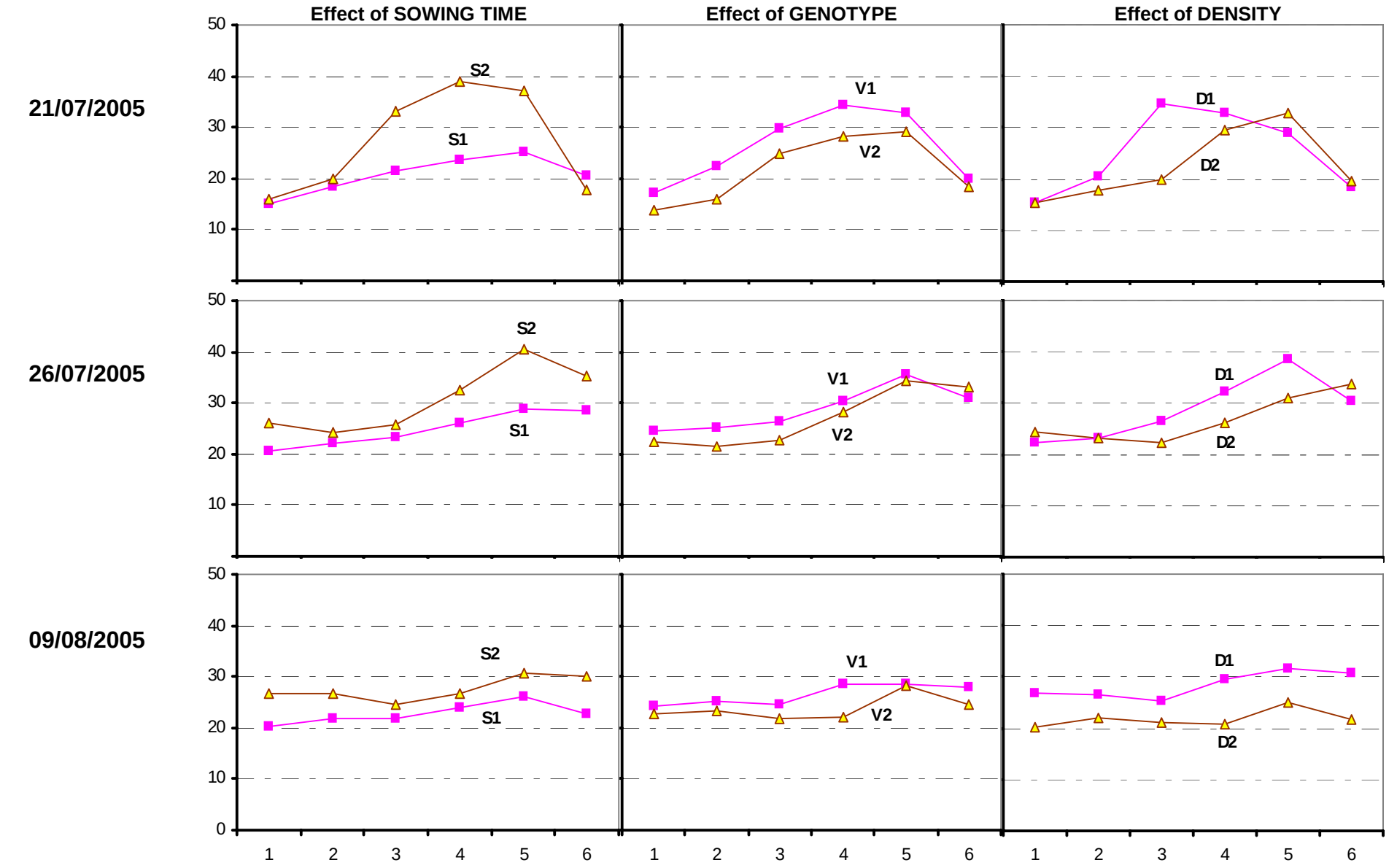
4 rows each plot

80 cm average radiation (μmol m^{-2} $s^{-1)}$ at soil each 10 cm within the row



LIGHT EXTINTION

Trasmittance % (fraction of incident light at soil)



D1 vs D2 (Tainung2, First sowing time)

3 portions per plant at 25, 50 and 75% of stem height

5 plants each density

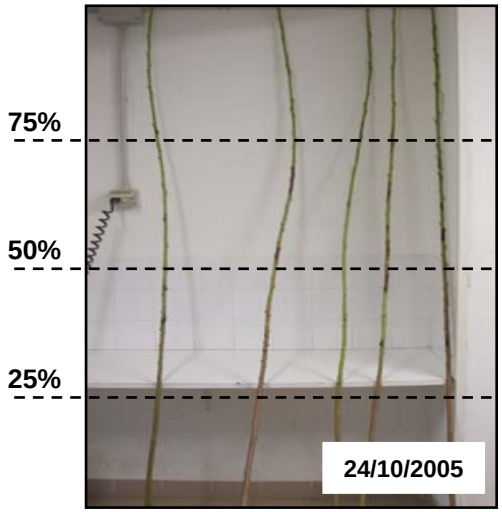
Fresh and dry weight of plants

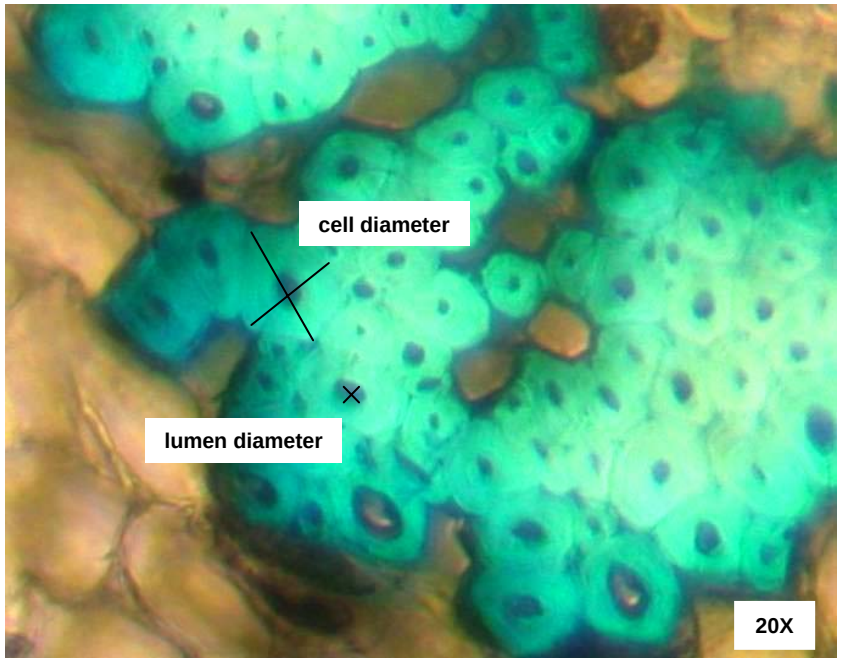
Base stem diameter (mm)

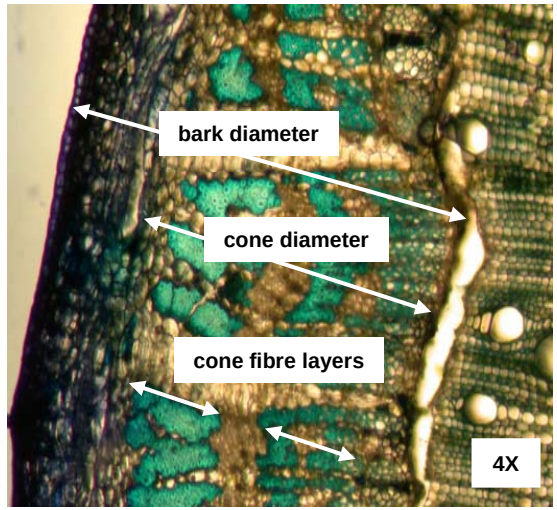
Stem diameter at 25, 50 and 75% of stem height (mm)

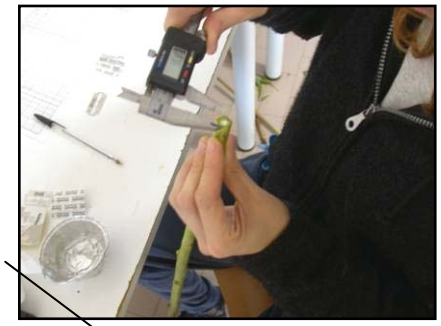
Bark and fibre cells cone diameter (μm)

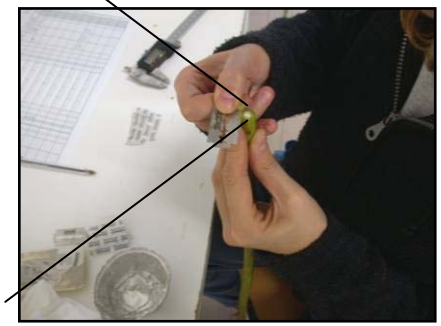
Cell diameter and lumen diameter (μm) of 10 cells (the oldest cells), cell wall diameter as difference









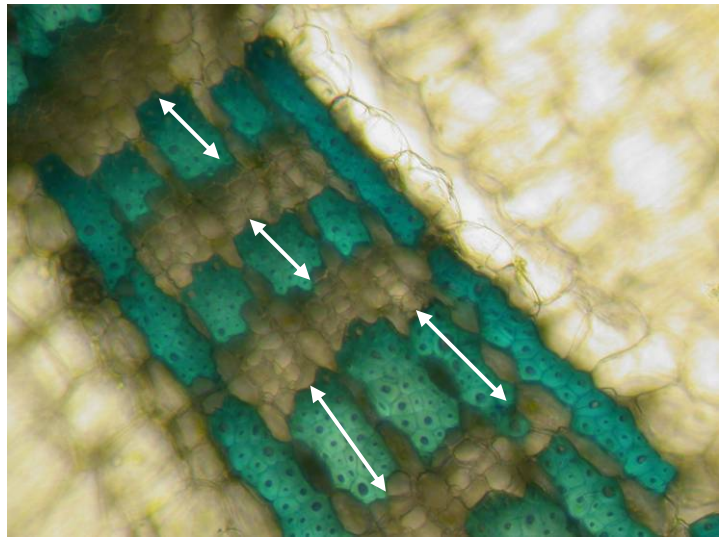


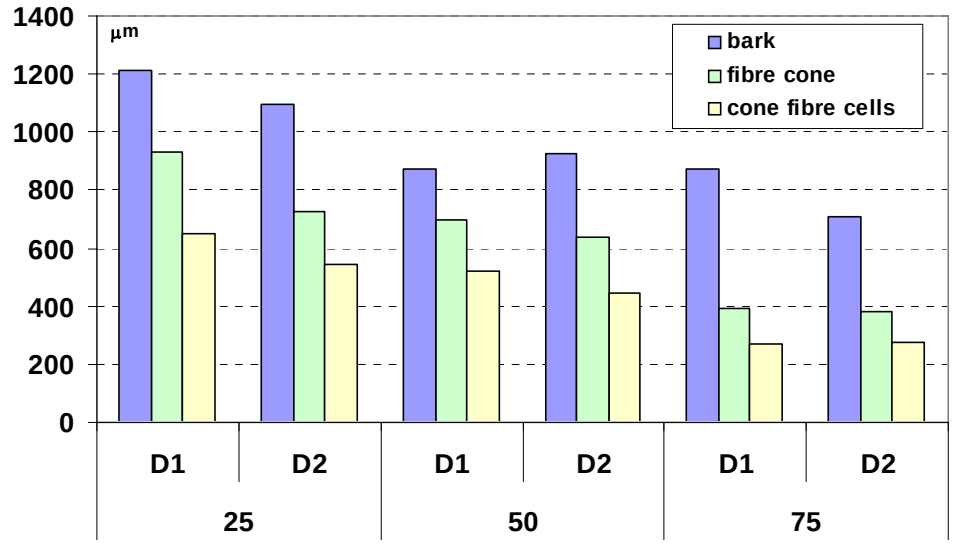
Height and base stem diameter

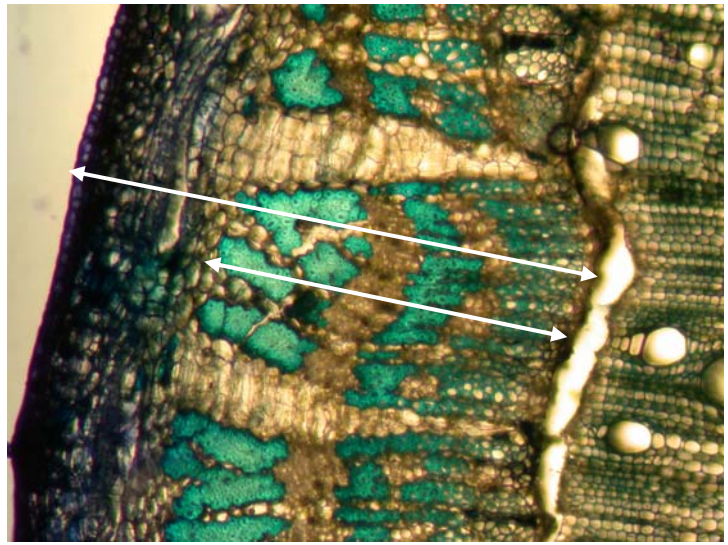
	D1	D2
Stem H (cm)	290,6	277,6
Base Stem D (mm)	21,98	17,00

N° of fibre cell layers

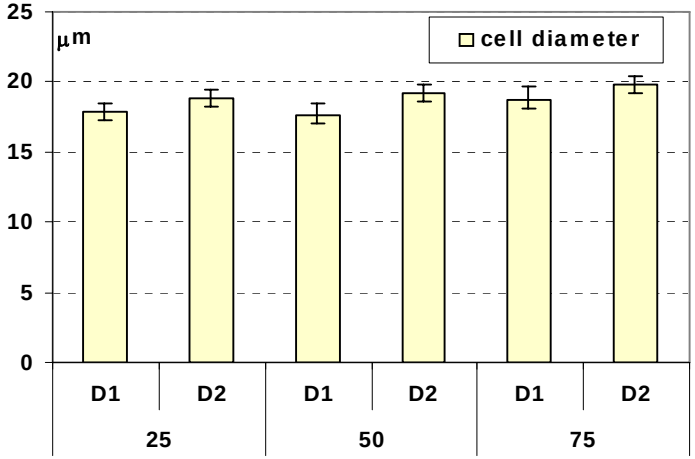
stem portion	density	n ° of fbre layers
25	D1	6,20
	D2	5,80
50	D1	4,00
	D2	3,20
75	D1	2,00
	D2	2,00

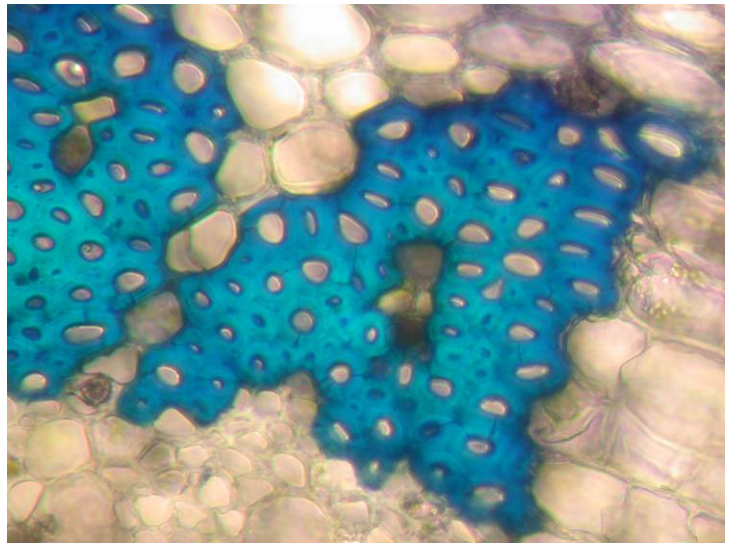


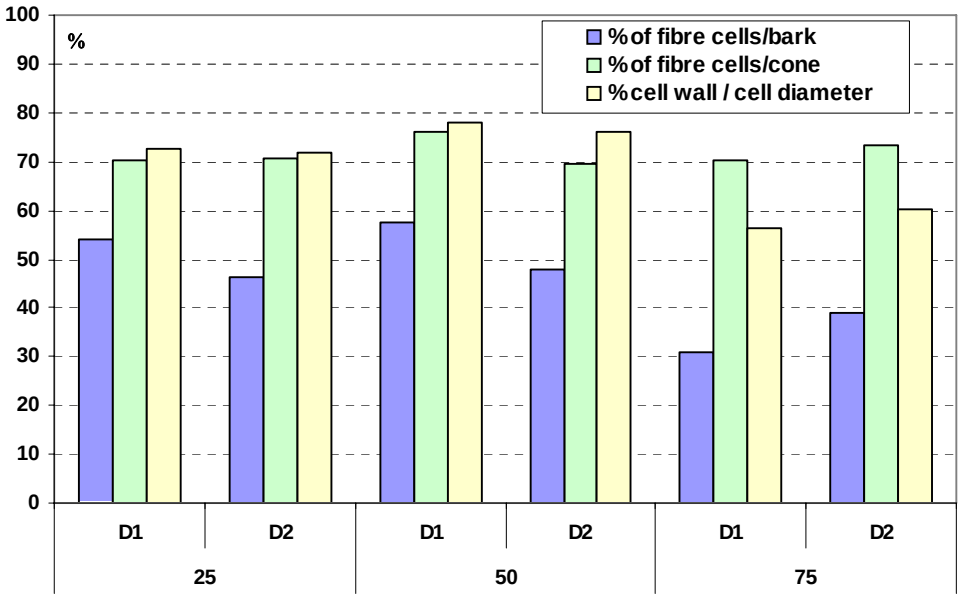


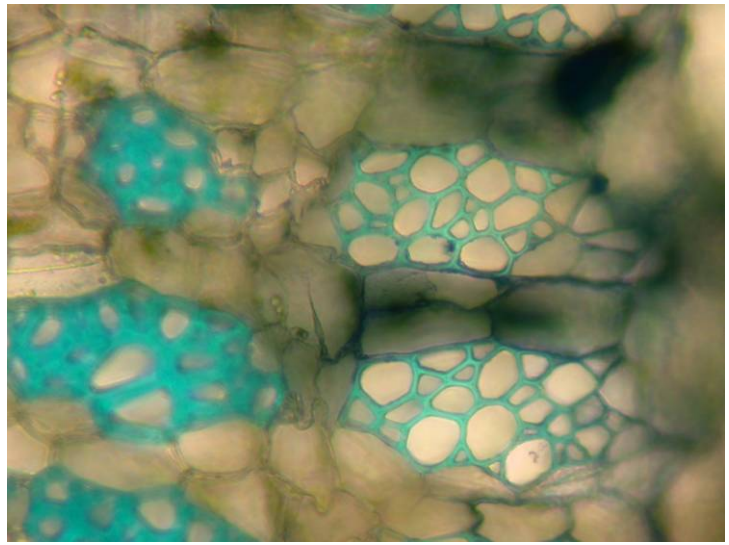


External layer fibre cell diameter (μm)

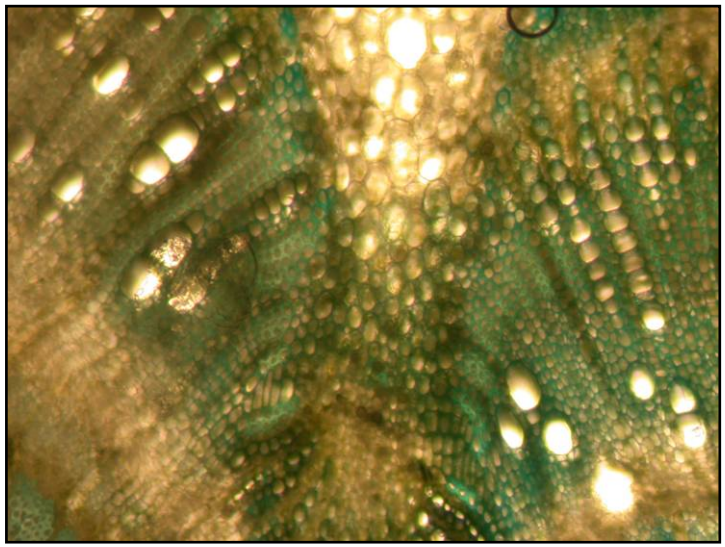


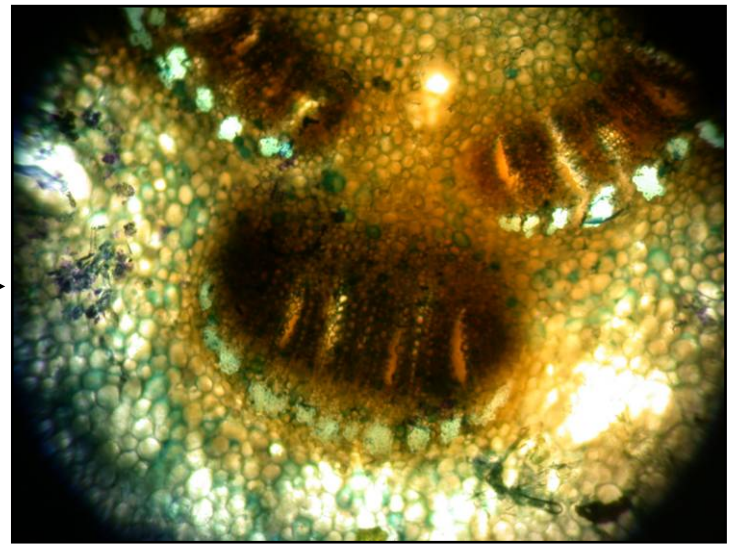


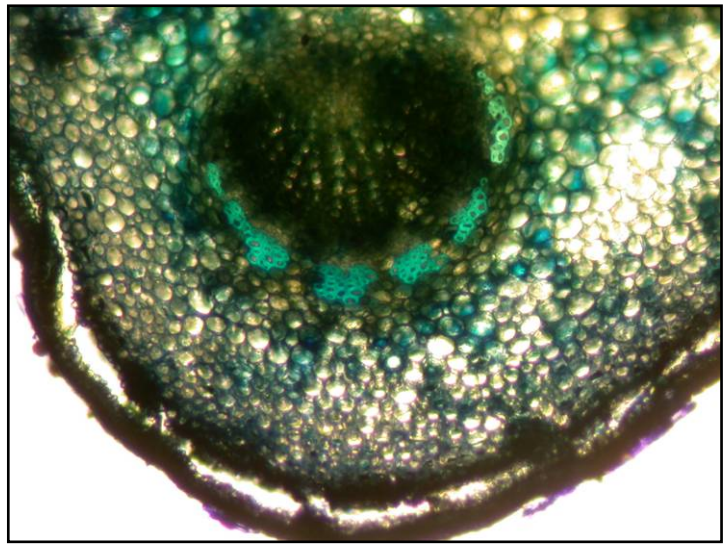


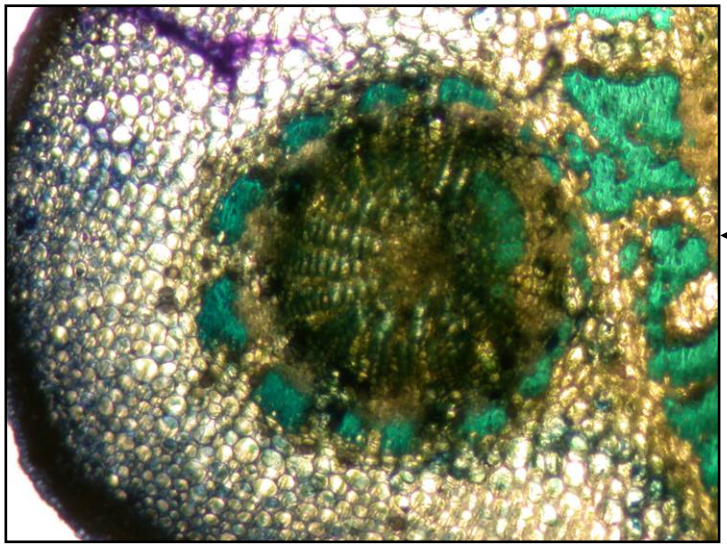


KENAF FIBRE









FIRST CONCLUSIONS

More rainfall than 2004

Fresh biomass and fresh stem similar values in 2005 and 2004, both significantly higher than 2003

Flowers seem to be more present on field respect to 2004 and 2003 (...not yet evaluated).

Stem ramifications or branches are almost absent this year (…not yet evaluated).

Sowing time affected most of investigated parameters, but the difference was lower respect what observed during the last year.

Two tested varieties did not showed important differences as well as nitrogen levels seem do not influence yields.

The effects of density were low for the yield parameter, influencing mainly stem diameter and plant height

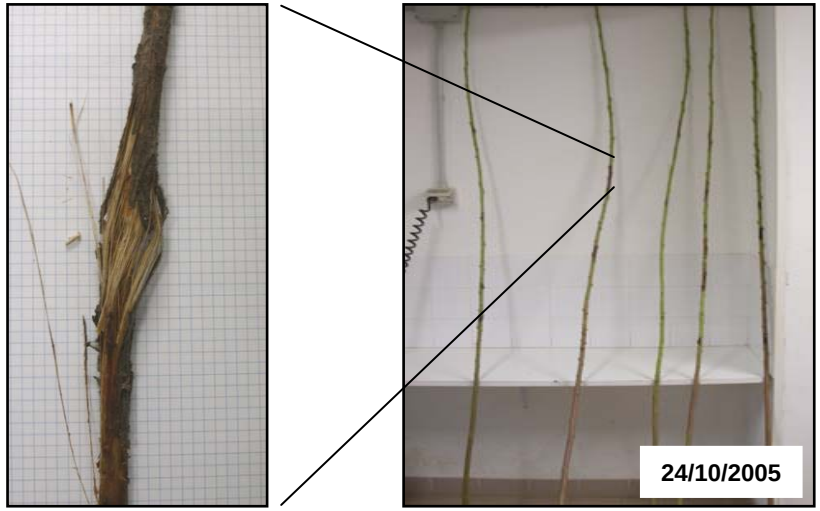
In general factor effects seem s to be less evident in 2005 respect to 2004 and 2003.

… conclusion of yield comparison after the last harvests.

…questions

(?) Field retting of fibres

- **is it needed**
- **effect on fibre quality**
- **utilization**
- **harvest time**



(?) How density and stem portion can affect fibre cells, considering the possibility of the utilization of different stem portions for different purposes.