WP2. Adaptability and Productivity Field Trials

Results from the fourth growing period and comparison of the results recorded from the years 2003, 2004 and 2005

> E. Alexopoulou CRES Biomass Department





* The six tested varieties were:

Everglades 41

late variety that produce reasonable fiber production and a cotton-like leaf shape

Tainung 2

late variety, with superior raw fiber production and palmate leaf shape

Ġregg

is a new variety with slightly longer growing period that may contributes to greater fiber production and palmate leaf shape

Dowling

new variety, that may prove to be a very high fiber producer with non-palmate leaf shape

SF 459

new variety that is favored for soils with nematode problem and palmate leaf shape

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it is considered as a photoperiod-insensitive variety that combines a short maturity cycle (100-130 days between emergence and flowering) and high productivity when grown in the Mediterranean region)





Plant Height (cm)



Plant height (cm)

- In the middle of September 2006 the plant height by ascending order was 199 cm for Dowling, 212 cm for G4, 213 cm for Tainung 2, 221 cm for Gregg, 223 cm for Everglades 41 and 265 cm for SF 459.
- It was found that the highest plants, averaged overall varieties were developed in 2003 with a height of 370 cm, followed by the ones in 2004 (334 cm) and 2005 (325 cm).



Basal stem diameter (mm)

- In the middle of September 2006 the stem diameter by descending order was 20.8 mm for Gregg, 20.2 mm for Everglades 41, 19.2 mm for SF 459, 19.1 mm for SF 459, 19.1 mm for G4, 19.0 mm for Dowling and 17.9 mm for Tainung 2.
- Averaged overall varieties, the larger stems were developed in 2004 with a mean stem diameter of 21.1 mm, while in 2005 was 20.9 and in 2003 was 20.1



Accumulation of dry matter yields (t/ha) till September 2006

In the middle of
September 2006 the fresh
biomass yields by
descending order was 74.2
t/ha for SF 459, 66 t/ha for
Dowling, 61.9 t/ha for
Gregg, 60.2 t/ha for
Everglades 41, 55.8 t/ha for
Tainung 2 and 55.4 t/ha for
G4.

 At the same time the dry matter yields were 17.2 t/ha for SF 459, 14.6 t/ha for Dowling, 12.6 t/ha for Gregg, 12.53 t/ha for Everglades 41, 11.9 t/ha for Tainung 2 and 11.7 t/ha for Gregg.

Comparison among the six varieties in terms of the peak dry yields

Peak dry matter yields (t/ha) 30 25 20 15 10 5 0 G4 Tainung 2 Everglades Gregg Dowling SF 459 Mean 41

The maximum dry matter yields (t/ha) were recorded each year at the end of October (50-100% of the flowering). Only the early variety G4 reached the peak yields earlier at the end of September.

The mean maximum yields ranged from 14.4 t/ha (G4) to 23.2 t/ha (SF 459).

Comparison of dry matter yields in December (2003, 2004, 2005)



Final dry matter yields (t/ha)



The highest mean dry stem yields were recorded in 2003 (16 t/ha), followed by the mean yields of 2004 (14.4 t/ha) and of 2005 (12.2 t/ha).

⇒Each year the peak dry stem yields were recorded by a late maturity variety that was Tainung 2 in 2003 (19.3 t/ha), Everglades 41 in 2004 (18.8 t/ha) and SF 459 in 2005 (15.1 t/ha). The lowest dry stem yields were recorded in each yaer by the variety G4 (9.7 in 2003, 12.3 in 2004 and 9.1 t/ha in 2005) that was the only early variety of the six tested varieties.

Experimental layout of Task 2.2 Sowing times and plant populations



Treatments:

Early sowing, Late sowing

V1: Tainung 2, V2: Everglades 41

D1: 200,000 pl/ha, D2: 400,000 pl/ha





Experimental plot of Task 2.2

The plant height was measured on five marked plant per plot every two weeks, while on the same plants the basal stem diameter was measured every four weeks.

Harvest dates: 15/7/06 7/8/06 28/8/06 13/9/06



- The size of each plot will be 6×8m (48m²)
- The distance between the rows will be 50 cm and within the rows 5 cm for the density of 400,000 plants/ha and 10 cm for the density of 200,000 plants/ha.
- A total number of 16 rows will be sown in each plot.



Final plant height (cm)

- Among the three years the highest plants were developed in 2003 (296 cm) and the lowest ones in 2005 (226 cm).
- Averaged the years, the early sowing gave higher plants compared to the late one (264 and 234 cm, respectively).
- The two plant populations did not effect the plant height and so the mean height was 252 cm in the plots of 200,000 plants/ha and 251 cm in the plots of 400,000 plants/ha.
- A slight superiority of Tainung 2 over Everglades 41 was recorded averaged overall years (257 and 247 cm, respectively).

Effect of sowing dates, plant density and variety on stem diameter



In the middle of September 2006 the sowing date effect statistical significant the stem diameter with the early sowing to have a mean stem diameter of 18.8 mm and the late sowing had a mean stem diameter of 16.5 mm.

The two plant densities and the two varieties gave almost the same values for the stem diameter.

Comparison of basal stem diameter (mm) (2003, 2004, 2005)



- Averaged overall years, it was found that the largest stem were developed in 2003 (19.1 mm) and the smallest ones in 2005 (17.2 mm).
- Averaged the years, the early sowing resulted in stems with smaller diameter compared to the ones from the late sowing (17.8 versus 18.6 mm).
- It was found that the low density resulted in stems with larger diameter compared to high density (19 versus 17.5, mean values)
- For the two varieties (Tainung 2 and Everglades 41) almost the same men density was recorded (18.1 versus 18.3 mm).



Effect of sowing time on fresh and dry matter yields (t/ha)

- Statistical significant differences were recorded between the two sowing dates until the middle of September 2006.
 In the middle of September 2006
 - the early sowing gave 10.8 t/ha dry matter yields, while the late sowing gave 9.63 t/ha.



Effect of plant density and variety on dry matter yields (t/ha)

The achieved dry matter yields were almost the same in the fourth growing period with a slight superiority of the high density over the low one (no statistical significant differences).

A comparison between the two late varieties (Tainung 2 and Everglades 41) showed a superiority of Tainung 2 over the Everglades 41 (no statistical differences).

Effect of sowing dates on dry matter yields



In all sites the early sowing resulted in significant higher dry matter yields. The peak dry matter yields (end of October - early November) varied from 12.9 t/ha (Lisbon) to 20.4 (Palamas), while for the late sowing varied from 10.8 t/ha (Bologna) to 15.4 t/ha (Catania).

At the final harvest of the crop (both yields and moisture reduced) the yields from early sowing varied from 9 t/ha (Bologna) to 17.3 t/ha (Palamas, Catania) and for the late sowing ranged from 6 (Bologna) to 14.3 t/ha (Catania).



Effect of plant density on dry stem yields

There is no clear picture regarding the effect of plant population on yields. In cases like Aliartos, Catania and Madrid a clear superiority of the low density (200,000 plants/ha) over the high one (400,000 plants/ha) was recorded, while in Bologna and Lisbon the opposite was happened. In Palamas and Paris both densities gave almost the same yields. The mean yields of low density, averaged overall sites, was 12.5 t/ha, while for the high density was 12.2 t/ha.

28 26 24 22 ⁻inal dry stem yields (t/ha) 20 18 16 14 12 10 8 6 4 2 Palamas (GR) -V1 alamas (GR) -V2 5 ologna (IT) -V2 ⋝ Catania (IT)-V1 Catania (IT)-V2 30 3 3 3 3 3 3 3 3 3 3 3 3 4 1 3 4 1 3 4 1 3 4 1 3 3 4 1 3 1 Aadrid (ES) -V1 Aadrid (ES) -V2 .isbon (PT) -V1 isbon (PT) -V2 Paris (FR) -V1 Paris (FR) -V1 Tainung Aliartos (GR) -Everglades liartos (GR) -

Effect of variety on dry stem yields

In three sites (Aliartos, Catania and Madrid) Tainung 2 was more productive compared to Everglades 41. The opposite findings were recorded in the cases of Bologna and Lisbon. In the case of Paris almost the same productivity was recorded for both varieties. Averaged overall trials, Tainung 2 gave 12.5 t/ha, while Everglades 41 gave 12.2 t/ha.

Experimental layout of Task 2.3 Irrigation and nitrogen fertilization rates





Experimental plot of Task 2.3 Irrigation and nitrogen fertilization rates



The plant height was measured on five marked plant per plot every two weeks, while on the same plants the basal stem diameter was measured every four weeks.

> Harvest dates: 15/7/06 7/8/06 28/8/06 13/9/06



- The size of each plot will be 6×8m (48m²)
- The distance between the rows will be 50 cm and within the rows 10 cm (200,000 plants/ha).
- One variety will be sown (Tainung 2 or Everglades 41).
- A total number of 16 rows will be sown in each plot.





Plant height and stem diameter as recorded in September 2006 (11/9)

In the middle of September 2006 (11/9) the plant height varied from 128.3 mm (no irrigation) to 193 cm (100% of PET). At the same time the plant height among the nitrogen rates varied from 168 cm (no nitrogen) to 177 cm (150 kg N/ha).

Correspondingly, the stem diameter for the irrigation rates ranged from 13.1 mm (no irrigation) to 18.2 mm (100 % of PET), while for the nitrogen rates varied from 15.7 mm (no nitrogen) to 16.9 mm (150 kg N/ha).





Plant height (cm)

- The plant height found to be significant affected by the irrigation. It should be noted that the highest plants grew up in 2003. Averaged overall years, the plant height was 224 cm (no water), 268 cm (25%), 280 cm (50%) and 289 (100% of PET).
- On the contrary no effects of nitrogen rates were recorded on plant height. Averaged overall years, the mean plant height was 258 cm (no nitrogen), 263 cm (75 kg N/ha) and 275 cm (150 kg N/ha).

Effect of irrigation and nitrogen rates on basal stem diameter (2003, 2004, 2005)



⇒The basal stem diameter averaged all years for the irrigation rates was 16.7 mm (no irrigation), 18.6 mm (25%), 19.6 mm(50%) and 20.6 mm (100% of PET).

⇒ At the same time the mean stem diameter for the nitrogen rates was 18.5 mm (no fertilization), 18.8 mm (75 kg N/ha) and 19.4 mm (150 kg N/ha)



Accumulation of dry matter yields (t/ha) in 2006

- In September 2006 the achieved dry yields were 6.3 t/ha (no irrigation), 10.1 t/ha (low irrigation), 10.6 t/ha (medium irrigation) and 12.1 t/ha (high irrigation).
- In September 2006 the dry yields were 9.3 t/ha (no fertilization), 9.9 t/ha (75 kg N/ha) and 9.9 t/ha (150 kg N/ha).
- Statistical significant differences were recorded only among the irrigation rates.

Effect of irrigation on kenaf dry yields



- The mean peak yields were 5.7 t/ha (no irrigation), 11 t/ha (25% of PET), 12.8 (50% of PET) and 18 t/ha (100% of PET). The corresponding values for the final dry yields were 4.7, 9, 11 and 13.
- The achieved dry yields (peak and final) were increasing when the applied irrigation rate was increasing.
- It should be pointed out that the most clear effect of irrigation on yields was recorded in the case of Madrid.





Effect of nitrogen on kenaf yields

- In most sites it was found that when the nitrogen application was increasing the dry yields were also slightly increased.
- It should be pointed out that only in very few cases the differences among the nitrogen rates were differ statistically significant.
- Averaged all trials, it was found that the peak dry yields were 10.2 t/ha (0 kg N/ha), 10.6 t/ha (75 kg N/ha) and 11.2 t/ha (150 kg N/ha). The corresponding values for the final dry yields were 7.6, 8.1 and 8.8 t/ha.

Effect of nitrogen on kenaf final dry yields



The increasing of the applied nitrogen fertilization (from 0-150 kg N/ha) did not result in increasing of dry yields in the cases of Palamas and Bologna. The mean dry yields were 13.6 t/ha (0 kg N/ha), 15.5 t/ha (50 kg N/ha), 13.6 t/ha (100 kg N/ha) and 15 t/ha (150 kg N/ha).

Conclusions

- The late maturity varieties more productive compared to the early.
- The new variety SF 459 is very productive with yields higher than the yields of the two traditional varieties Tainung 2 and Everglades 41.
- The yields were increased when the sowing time was between the early to the middle of May. When the sowing time was delayed until the middle of the end of June a serious decline of the yields were recorded.
- A mixture picture was recorded regarding the effect of plant density on the yields. Both densities (200,000 and 400,000 pl/ha), averaged overall trials, gave almost the same mean yields.
- Similar findings with plant densities were also recorded for the two varieties. It was found that their yielding capacity was almost the same with a slight superiority of Tainung 2 over Everglades 41, when grown in South Europe.



Conclusions

- It was found that by increasing the applied water in the kenaf fields their productivity was increased and in most cases the yields that were recorded for the applied irrigation rates were differ statistically (P<0.05). This trend was quite strong and clear in all years in the case of Madrid
- On the contrary the dry yields did not or slight increased by the increase of the applied nitrogen.

