Responses of olive (cv. *Chemlali)* and pistachio *(cv. Mateur)* after five years of experiment to potassium mineral nutrition under rainfed condition

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Introduction

Olive tree is widely cultivated in Tunisia (1.6 million hectares) with more than 95% of the orchards growing under rainfed conditions.

Depending on the water availability, the density vary from very low (17 trees/ ha in the centre and south of the country) to super high density with more than 1600 T/ha.

Pistachio tree area is more than 40000 hectares with almost 98% of it under rainfed conditions in arid and semi arid zones.

Introduction

Optimal potassium nutrition is essential to maximize yield and quality

Soil moisture is a factor affecting the potassium release or fixation.

Since the majority of Tunisian olive and pistachio trees are in arid or semi-arid regions ➔ water stress.

Foliar application could be helpful to satisfy plant requirement especially in arid zones where a lack of water under low rainfall conditions in summer drastically depresses absorption of soil nutrients.

➔ a trial was established on K mineral nutrition given as foliar spray or soil spreading on tree K status, yield and quality for olive and pistachio tree

IPI Regional Workshop on Potassium and Fertigation Development in West Asia and North Africa. Rabat, Morocco. 24-28 November, 2004

Foliar potassium application on pistachio tree.

M. Ben Mimoun, O. Loumi, M. Ghrab*, K Latiri** et R. Hellali

- First year of the experiments
  - Foliar K fertilization improved the nut quality (fruit weight and percentage of split nuts).
  - Mineral deficiencies were observed for N, P and K.
  - Potassium fertilization increased leaf concentration with no effect observed on N, P and Mg leaf contents.

- Experiments to be continued.

Foliar potassium application on olive tree.

M. Ben Mimoun, O. Loumi, M. Ghrab*, K Latiri** et R. Hellali

- During this first year of the experiments:
  - The potassium fertilization enhanced the fruit weight and the flesh to pit ratio but showed no effect on yield
  - No significant effect was observed on vegetative growth, fat content and acidic composition of the extra virgin oil obtained.
  - A potassium leaf deficiency for the control.

- Those experiments should be continued.

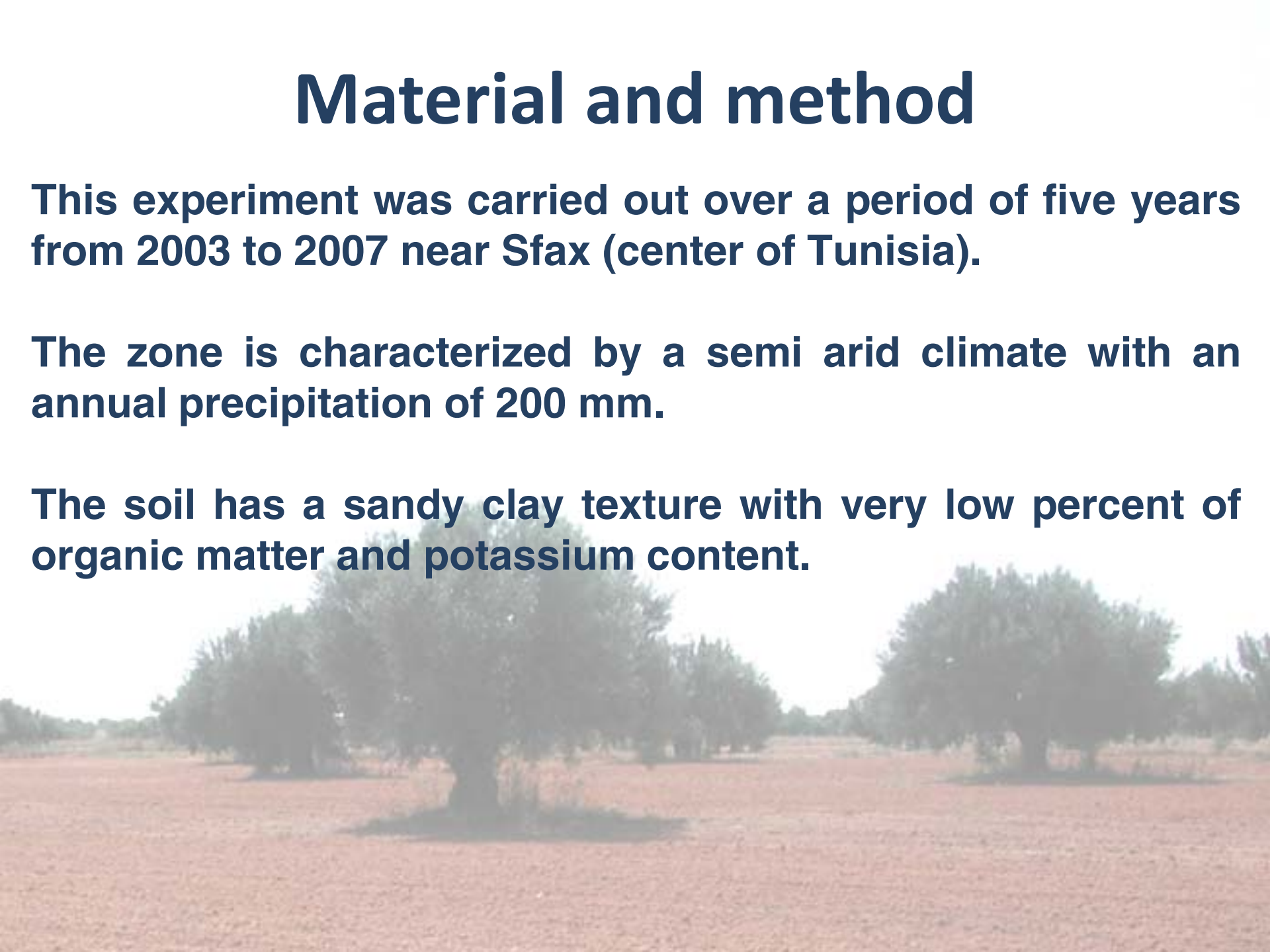
➔ a long term trial was established on K mineral nutrition given as foliar spray or soil spreading on tree K status, yield and quality for olive and pistachio tree

Material and method

This experiment was carried out over a period of five years from 2003 to 2007 near Sfax (center of Tunisia).

The zone is characterized by a semi arid climate with an annual precipitation of 200 mm.

The soil has a sandy clay texture with very low percent of organic matter and potassium content.



Material and method

Material and method

Soil spreading, one application during the flowering period.

Foliar fertilization were applied using a sprayer :

- **20% at the end of fruit set**
- **40% during the second fruit development stage (shell lignifications)**
- **40% during the third fruit development stage (kernel growth).**

Material and method

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Soil spreading treatment, total quantity incorporated in one application during the flower bud swell.

The foliar fertilization treatments were applied using a sprayer:

- **30% of K during the flower bud swelling**
- **40% of K during the second fruit development stage**
- **30% of K just at the beginning of the fruit color change.**

Results

Pistachio tree

Results

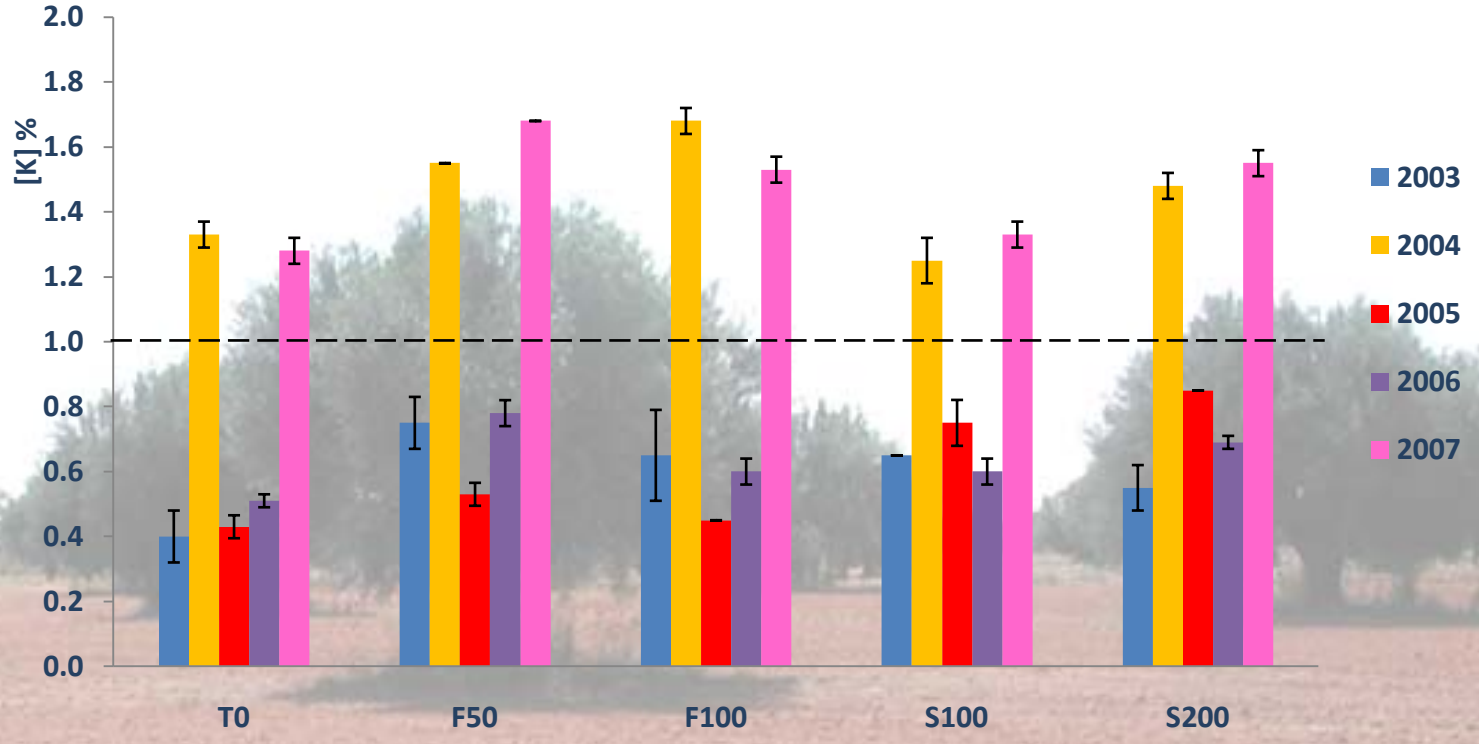
Average and cumulated yield in kg/tree during the period between 2003 and 2007.

	Average yield (Kg/tree)					
	2003	**2004**	**2005**	**2006**	**2007**	**Cummulated yield**
control	10.64	2.04	10.20	9.64	0.00	32.52 a
F50	12.76	0.92	11.44	10.80	0.00	35.80 a
F100	11.36	0.96	11.32	8.84	0.00	32.60 a
S1OO	9.36	5.68	11.20	11.12	0.00	37.36 a
S200	11.48	4.12	9.20	10.64	0.00	35.44 a

After five years of experiments, potassium applied either as foliar or in soil has no effect on yields.

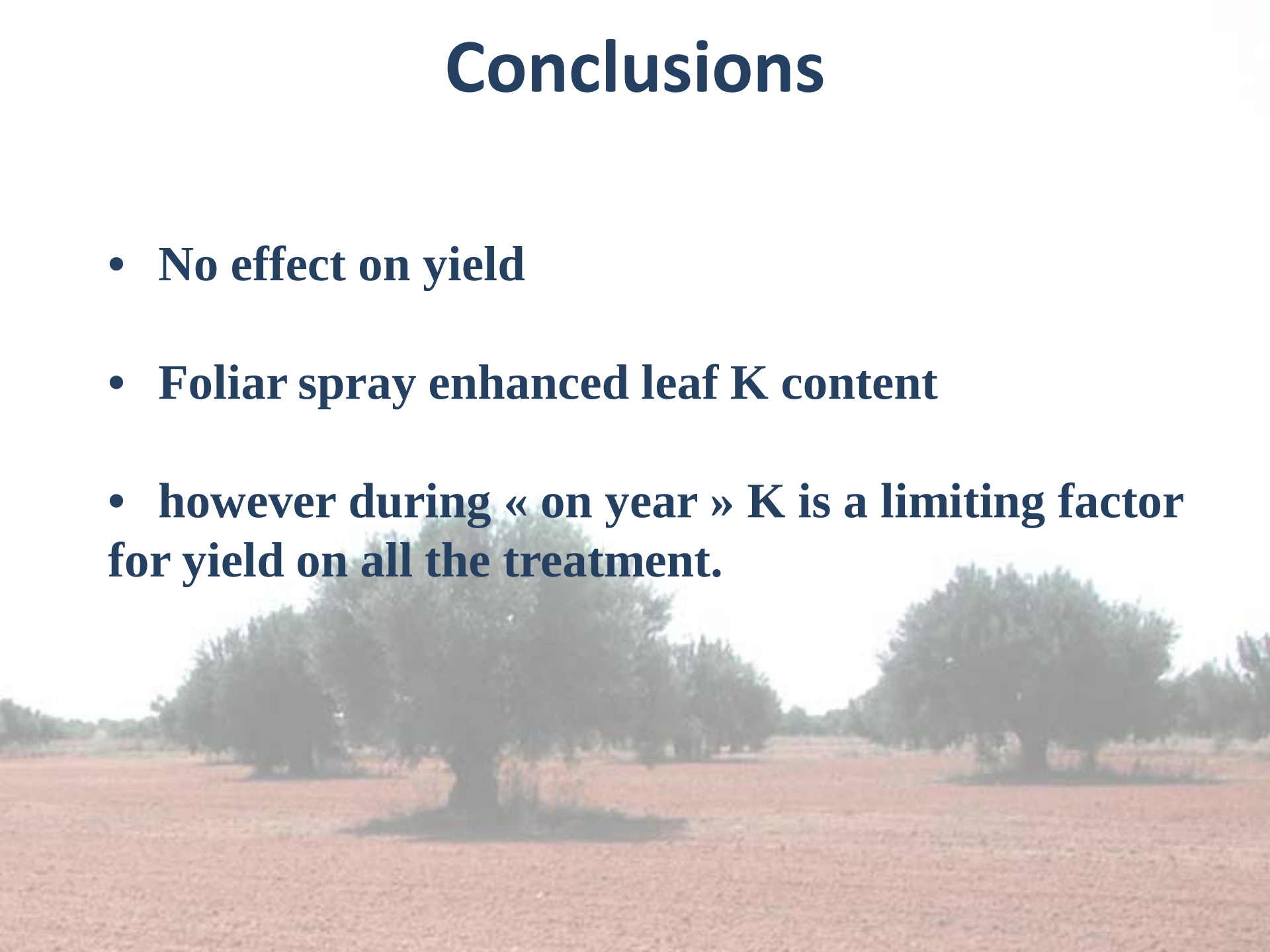
Results

The effect of fertilization treatments on K leaf concentration of Mateur pistachio cultivar for the years 2003, 2004, 2005, 2006 and 2007.



Conclusions

- **No effect on yield**
- **Foliar spray enhanced leaf K content**
- **however during « on year » K is a limiting factor for yield on all the treatment.**



Olive tree

Results

Average and cumulated yield in kg/tree during the period between 2003 and 2007.

	Average yield					Cumulated yield**
Treatments	2003	2004	2005	2006	2007	
Control	143.75a	0.00	34.25 a	56.25 a	84.75 a	319.00 a
F50	161.25 a	0.00	47.50 a	48.75 a	200.50 ab	458.00 ab
F100	183.25 a	0.00	71.25 b	36.25a	237.00 b	527.75 b
S100	145.25 a	0.00	45.00 a	38.75 a	112.00 ab	341.00 a
S200	156.25 a	0.00	71.25 b	42.50 a	109.00 ab	379.00 ab

A significant difference in the cumulated yield was observed between foliar spray at 100% (F100) and the control.

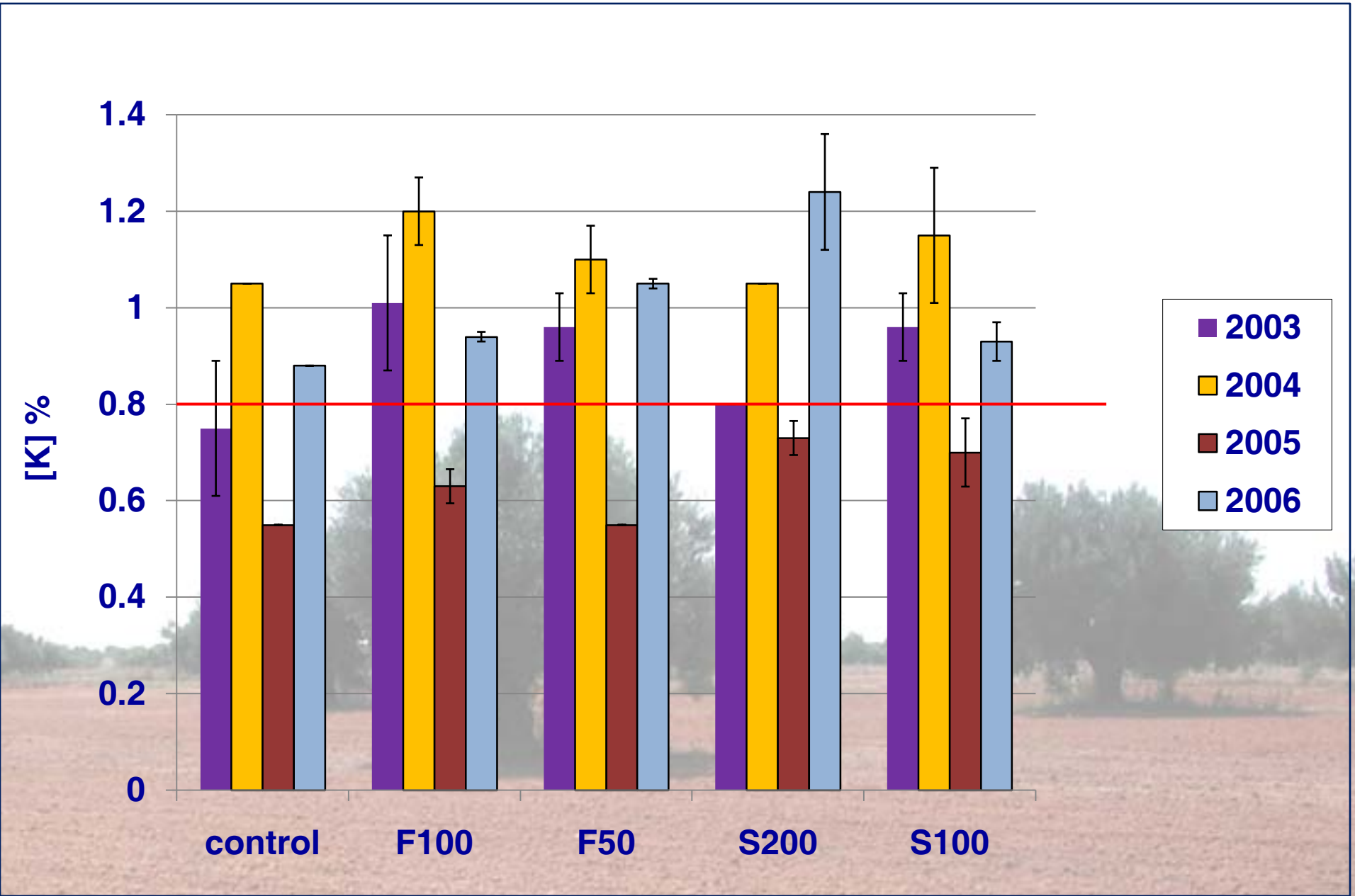
Yield and fruit pomological characteristics under potassium treatments.

	Year	Treatments				
		T0	F50	F100	S100	S200
Fresh weight (g)	2003	0.61 a	0.66 b	0.81 d	0.70 c	0.69 bc
	2005	0.50 a	0.48 a	0.64 b	0.50 a	0.55 a
	2006	1.39 a	1.48 ab	1.62 b	1.34 a	1.43 a
	2007	1.38 ab	1.21 a	1.35 ab	1.31 a	1.42 b
Flesh to Pit ratio	2003	2.94 a	3.19 b	3.65 c	3.25 bc	3.10 b
	2005	1.64 a	1.59 a	2.28 b	1.77 a	1.83 a
	2006	3.78 a	4.00 a	4.87 b	4.24 a	4.00 a
	2007	4.52 ab	4.08 ab	4.00 ab	4.68 b	3.96 a

Olive oil characteristics

Treatment	Chlorophyll content (ppm)	Acidity (%)	Polyphenols content(ppm)
Control	2.67 a	0.28 a	29.59 a
F50	1.63 a	0.35 a	37.55 a
F100	2.48 a	0.30 a	34.86 a
S100	2.46 a	0.35 a	31.70 a
S200	2.59 a	0.29 a	36.46 a

The effect of fertilization treatments on K leaf concentration of Chemlali olive cultivar for the years 2003, 2004, 2005 and 2006.



Conclusions

- Significant higher yield observed with K foliar spray at 100% of tree requirement
- better fruit weight and flesh to pit ratio
- No effect observed on olive oil characteristics
- Higher K leaf content with K foliar spray.

Conclusions

This study shows the importance of potassium nutrition in increasing the yield of rainfed olive.

The effect of foliar application of potassium was superior to soil application.

the need for a long term approach in such conditions, as both the fruit type (olive and pistachio) and the climatic conditions represent a challenge in the analysis of data from field experiments.


Thank You