

JatroMed EU Project: Current status and results concerning Jatropha growth and adaptation in North African Countries



Jatropha curcas L. (physic nut, γιατρόφα)

Family: Euphorbiaceae

Perennial shrub or small tree (3-5 m in height)

Life-span more than 50 years

Semi-evergreen monoecious plant

Fruits bearing 3 black seeds

Non food crop – toxic to humans and animals

Survive in a wide range of pedo-climatic conditions:

Grow in marginal and degraded lands

pH: 6.0 and 8.0

Mean annual temperatures: 18-28° C,

Mean maximum temperatures: 35-45° C

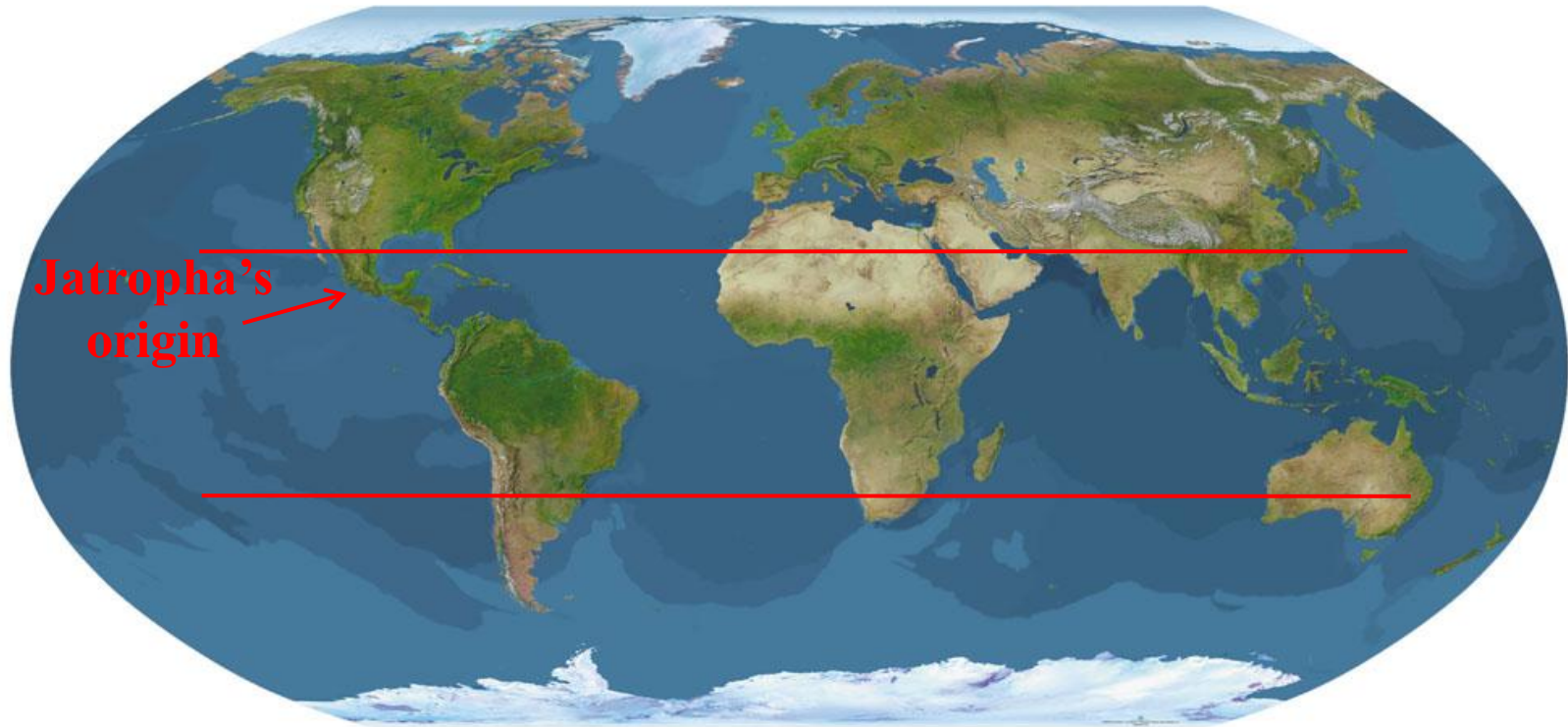
Sensitive to frost

Wide range of rainfall regimes from 250 to over 1500 mm per year



Female Male





Favorable attributes & considerable potentials

- ✓ hardiness
- ✓ drought resistance
- ✓ rapid growth
- ✓ easy propagation
- ✓ high oil content in seeds
- ✓ low input requirements
- ✓ multiple uses



Phytoremediation



Other benefits:

- Medical uses
- Soap making
- Erosion control
- Bio fence
- Soil amendments



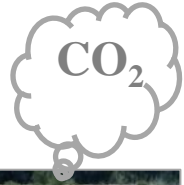
Land restoration

Biodiesel-Crude oil



Seedcake:

Fertilizer, solid biomass, feed, biogas



Soil carbon sequestration



Rural income-employment generation

*Evaluation of the energy crop *Jatropha curcas* as a mean to promote renewable and sustainable energy for the Mediterranean region (JatroMed)*
(www.jatromed.aua.gr)

JatroMed is co-financed by the European Union

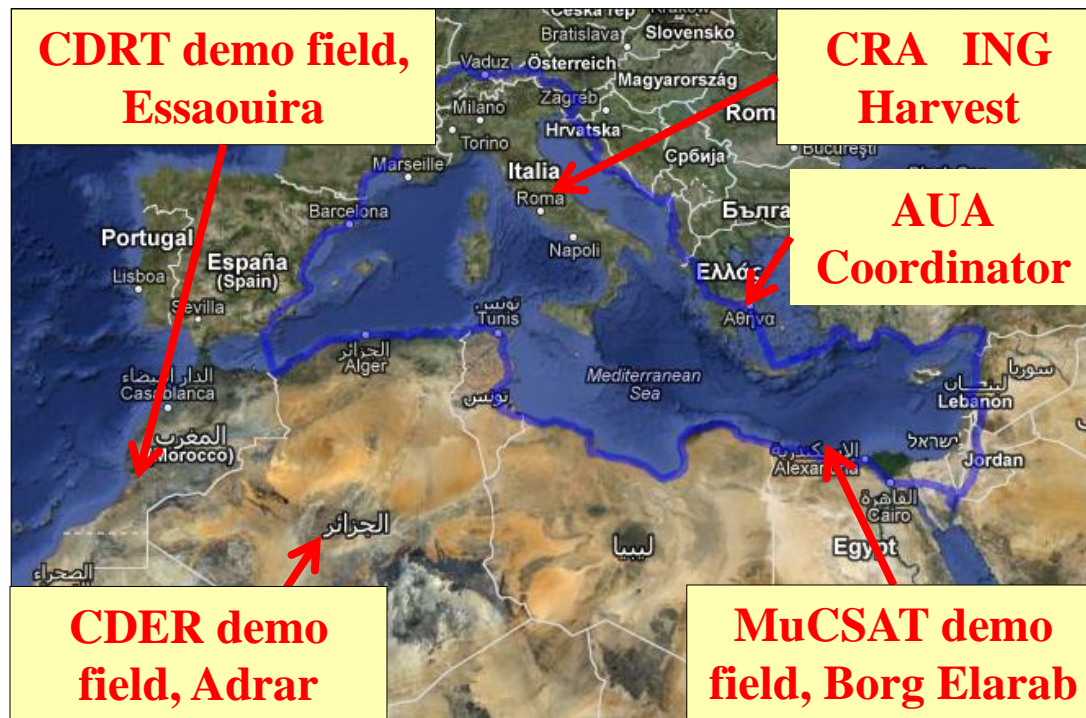
Reference Call for Proposals : EuropeAid/128320/C/ACT/Multi)

Title of the Call for Proposals: Thematic Programme for Environment and sustainable management of natural resources, including energy

Contract Number: 2011 / 221-037

Duration: 4years (Start Date: 28 June 2011)

Budget: 1.817.496 Euro



AUA: Agricultural University of Athens-Research Committee, GREECE

CRA ING: Agricultural Research Council, ITALY

MuCSAT: City for Scientific Research and Technology Applications, EGYPT

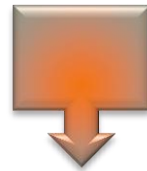
CDRT: Centre de Développement de la Région de Tensift, MOROCCO

CDER: Centre de Développement des Energies Renouvelables, ALGERIA



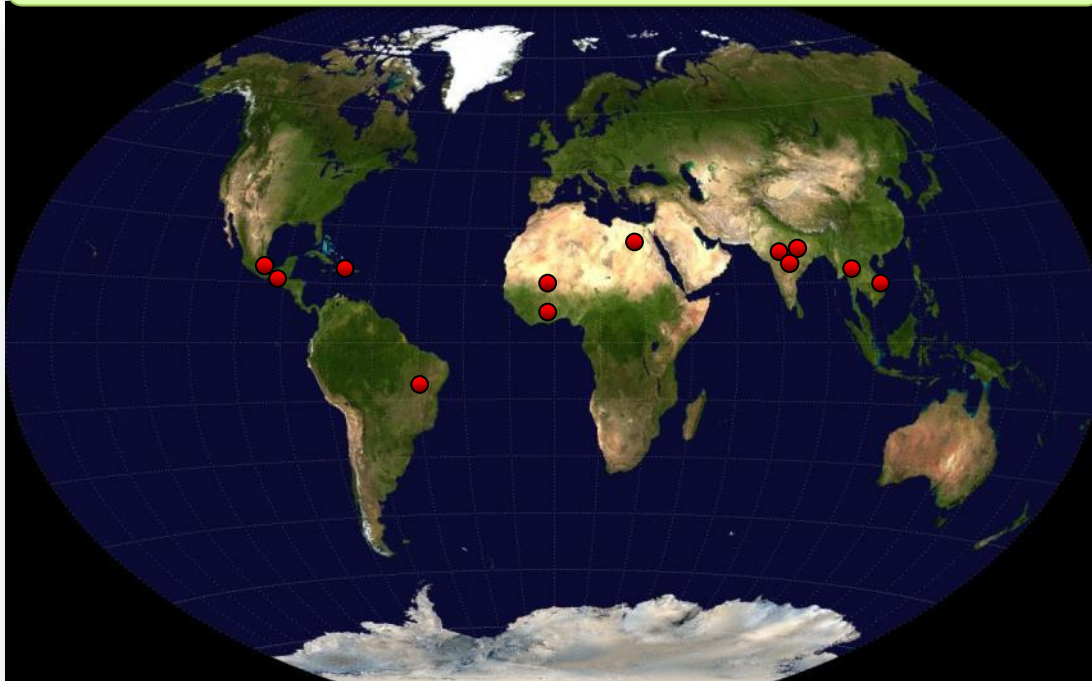
The JatroMed project aims to:

- ✓ reinforce and upgrade the natural and socioeconomic conditions of poor rural areas
- ✓ to give local populations the opportunity to produce sustainable energy to cover their own needs



- ✓ assess the adaptability of genotypes collected worldwide under the pedo-climatic conditions of the target countries
- ✓ evaluate the plant productivity under different fertilization, irrigation and pruning treatments

Geographical distribution of genotypes

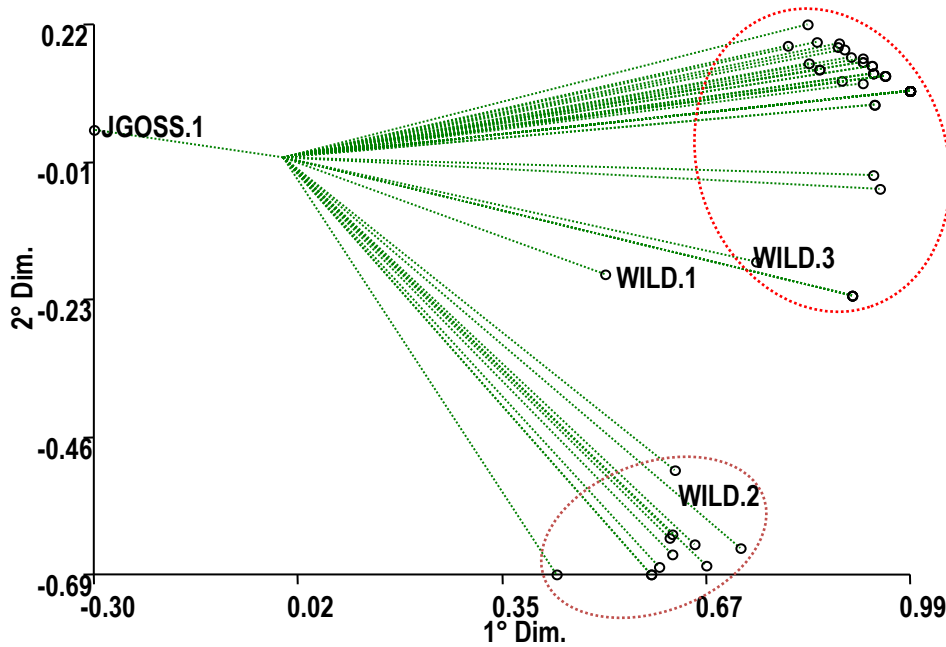


Allocation of genotypes to target countries

EGYPT	MOROCCO	ALGERIA
Michoacán (Mexico)	Michoacán (Mexico)	Michoacán (Mexico)
JCLMax 3.0 (India)	JCLMax 3.0 (India)	JCLMax 3.0 (India)
GHS-B (Brazil)	Mali (Mali)	Veracruz (Mexico)
JAT106 (India)	QVP 3014 (India)	GHN-D (Dominican Republic)

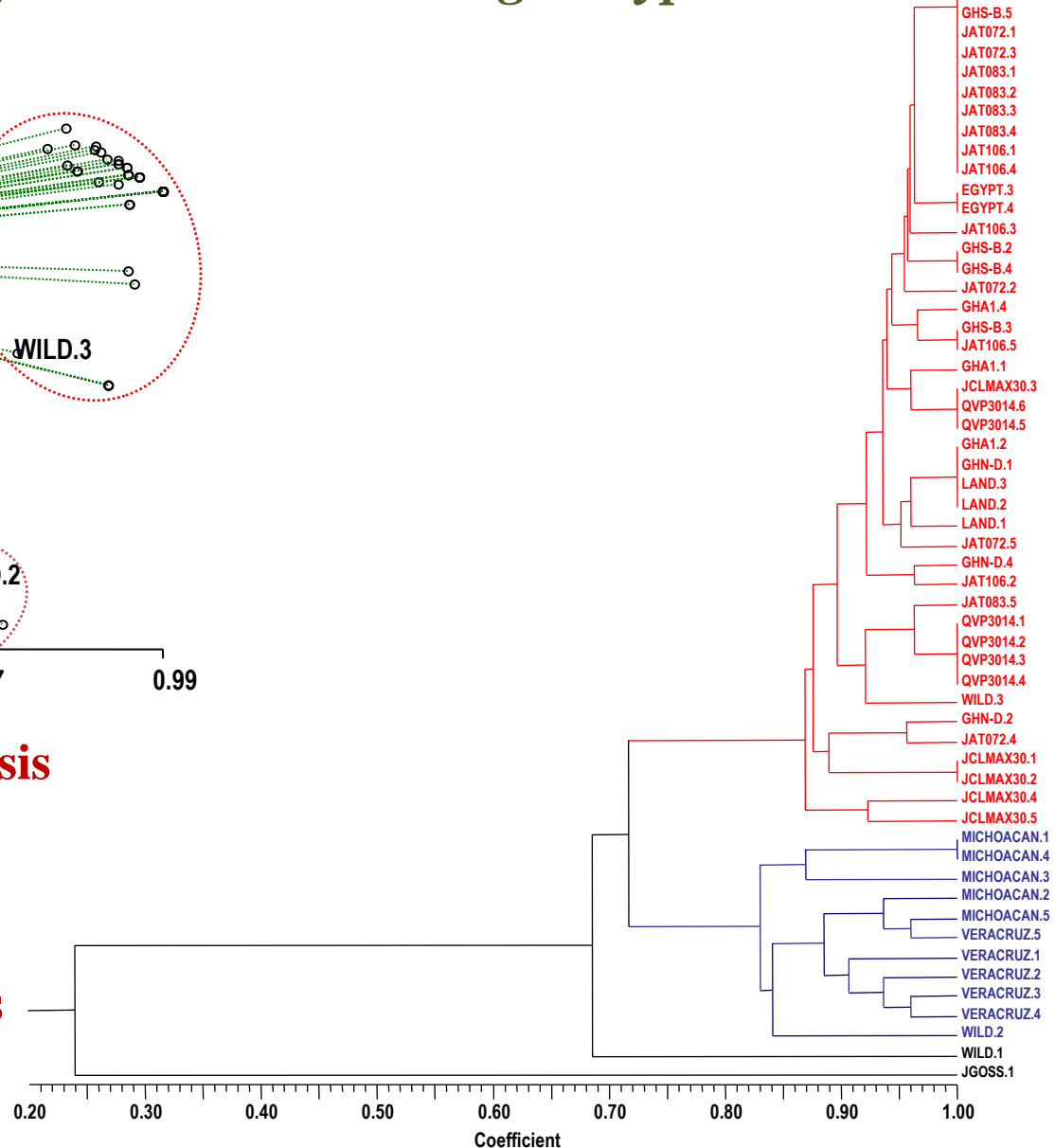
SELECTION OF *J. curcas* GENOTYPES

Genetic diversity between *J. curcas* genotypes



Principal Component Analysis

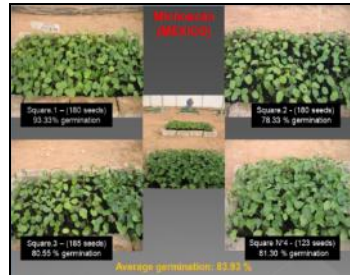
Cluster Analysis



CDRT demo field in Essaouira

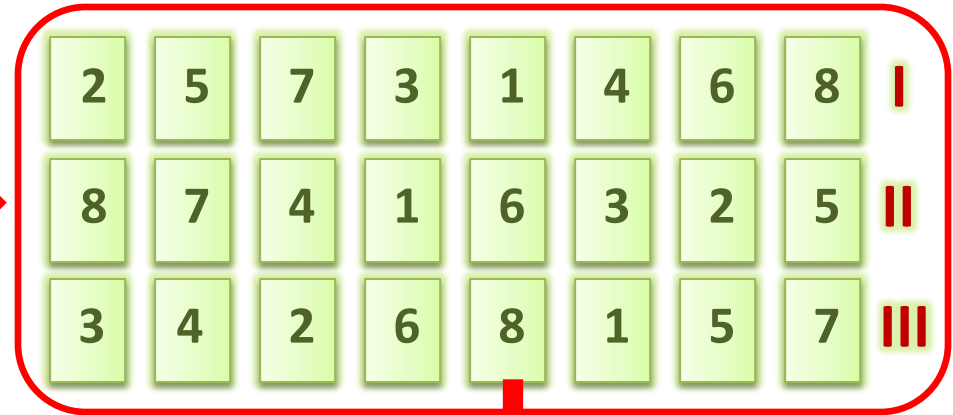
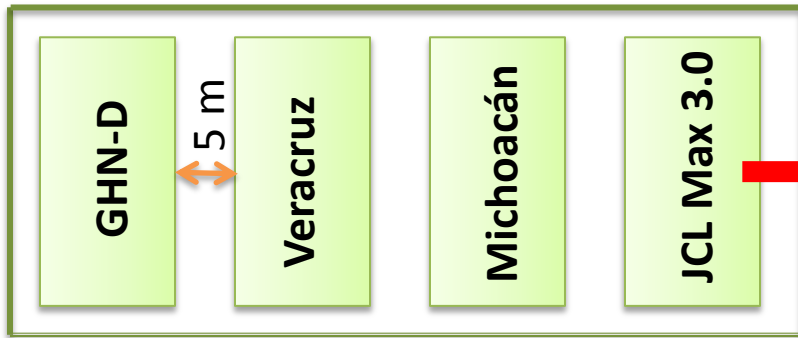


CDER demo field in Adrar

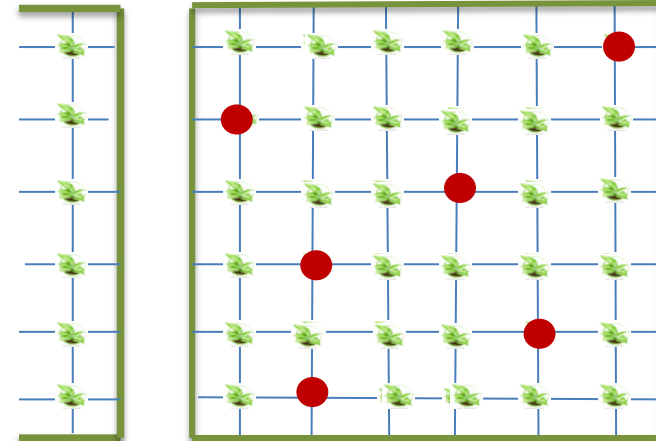


MuCSAT demo field in Borg El Arab





Area per country (ha):	4
Area per genotype (ha):	1
Number of plots per genotype:	24
Total number of plots per country:	96
Surface of each plot (m ²):	279
Number of plants per plot:	36
Number of plants per genotype:	864
Number of plants per country:	3456



Measured parameters in the field: 18
Measured parameters in laboratory: 11

TREATMENT A: Fertilization

Treatment A1: 10 g of urea per plant

Treatment A2: 10 g of 20 N-20 P-20 K per plant

Every month both doses will be increased by 5 g

TREATMENT B: Irrigation

Treatment B1: 4L/hour every 7 days

Treatment B2: 8L/hour every 7 days

TREATMENT C: Pruning

Treatment C1: Cup-shaped plants

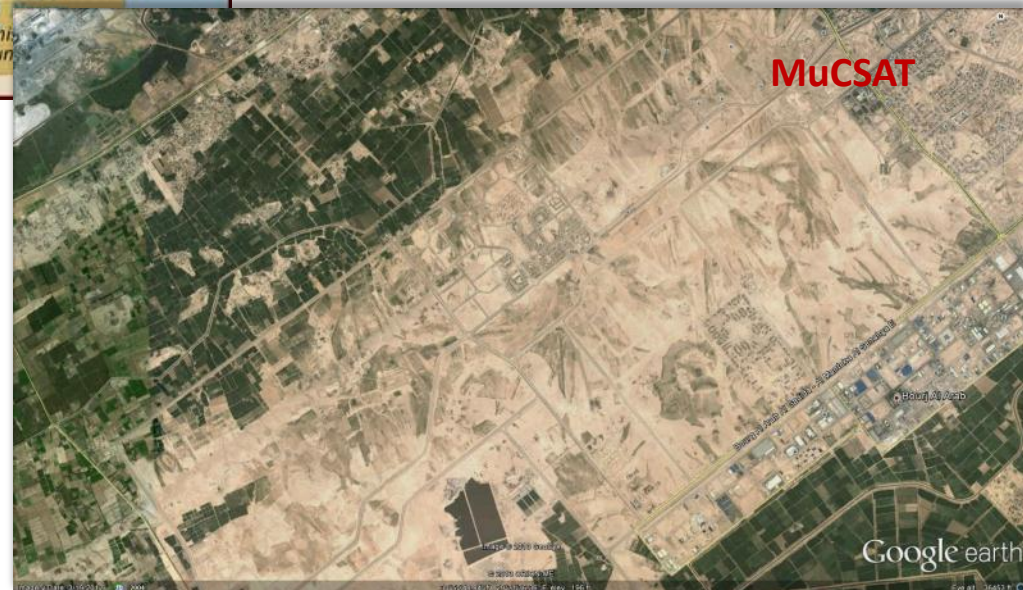
Treatment C2: Tree-shaped plants



<u>Plots</u>	<u>Treatments</u>
1	→ A1-B1-C1
2	→ A2-B1-C1
3	→ A1-B2-C1
4	→ A2-B2-C1
5	→ A1-B1-C2
6	→ A2-B1-C2
7	→ A1-B2-C2
8	→ A2-B2-C2

Egypt

Borg El Arab Region - $30^{\circ} 53' 32.13''$ N, $29^{\circ} 32' 54.98''$ E



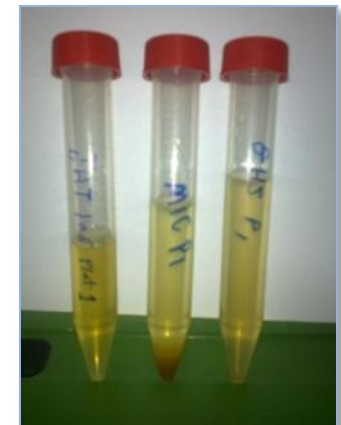


Nursery



Field preparation - Transplantation





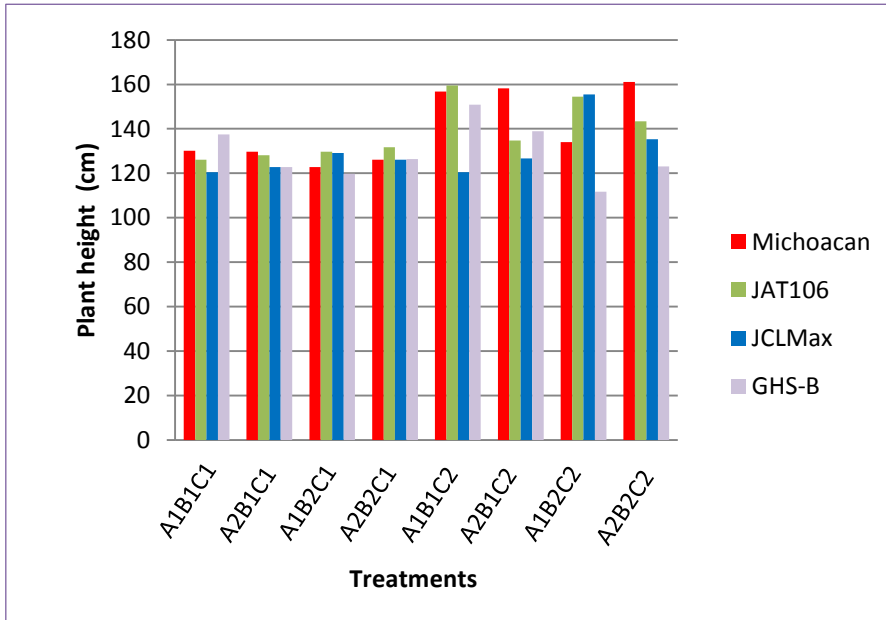


Oil content in seeds

	JCL Max 3.0 (%)	Michoacán (%)	GHS-B (%)	JAT-106 (%)
A1B1C1	31.78	40.11	38.37	37.58
A2B1C1	31.40	34.42	27.50	36.85
A1B2C1	37.11	37.93	36.76	32.13
A2B2C1	33.96	35.14	36.44	33.75



Data



TREATMENT A: Fertilization

Treatment A1: 10 g of urea per plant

Treatment A2: 10 g of 20 N-20 P-20 K per plant

TREATMENT B: Irrigation

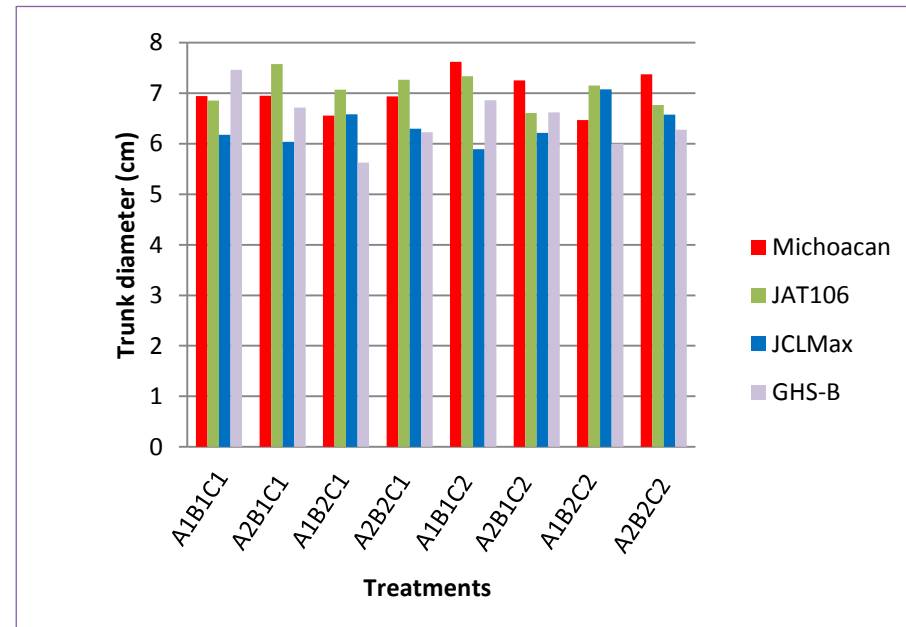
Treatment B1: 4L/hour every 7 days

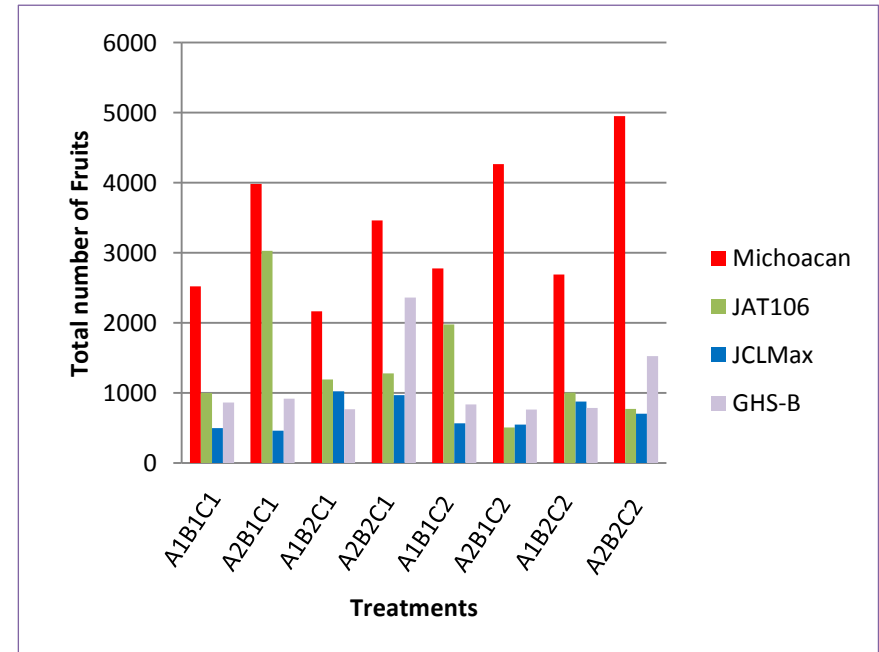
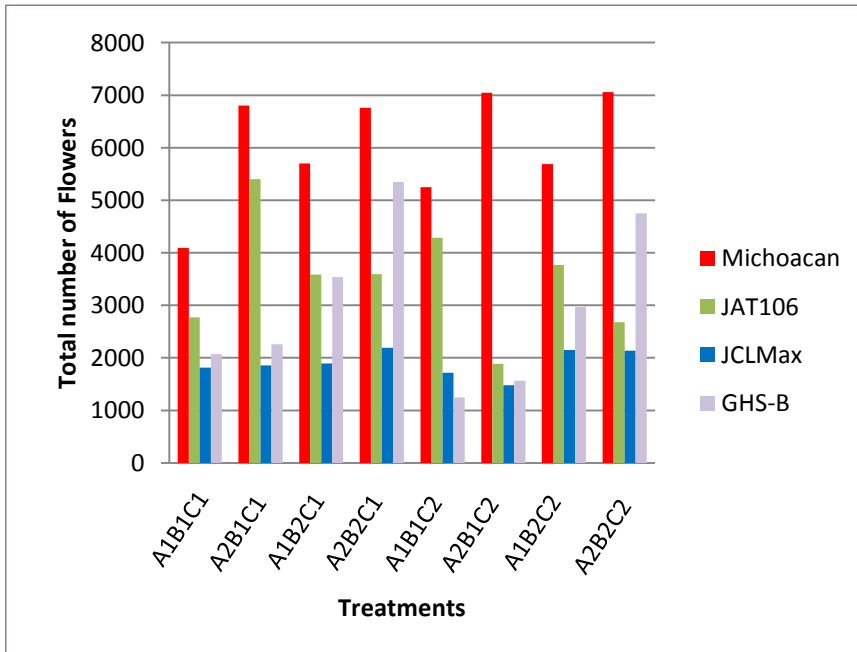
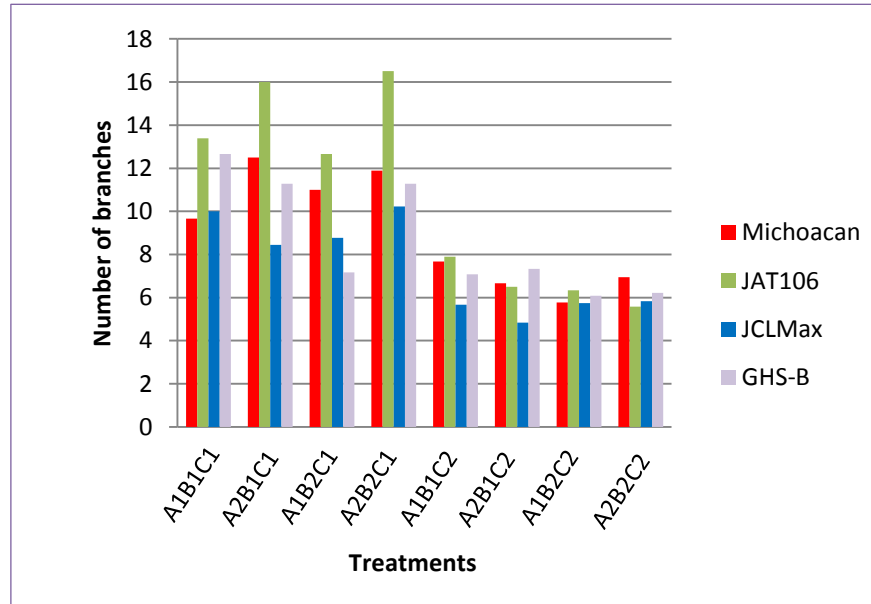
Treatment B2: 8L/hour every 7 days

TREATMENT C: Pruning

Treatment C1: Cup-shaped plants

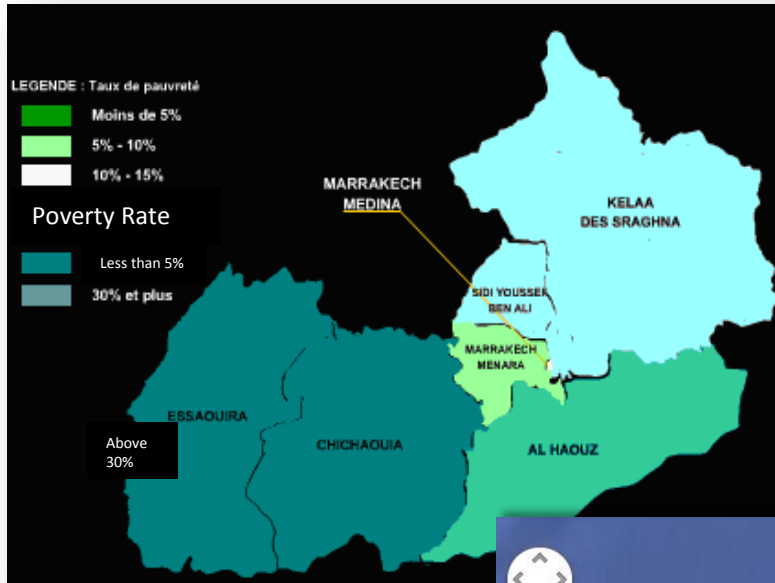
Treatment C2: Tree-shaped plants





Morocco

Essaouira Region: commune Hadd Dra - 31 ° 34' 39.56''N, 09 ° 32' 19.45'' W



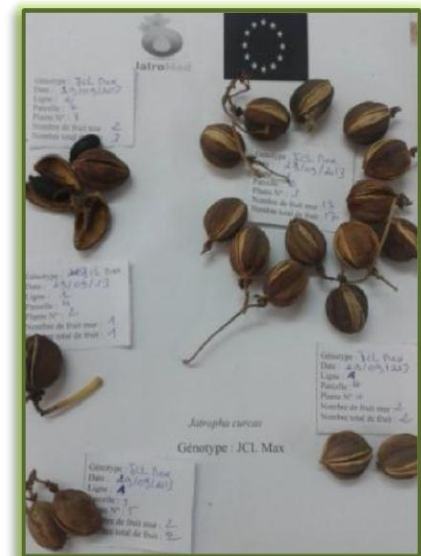
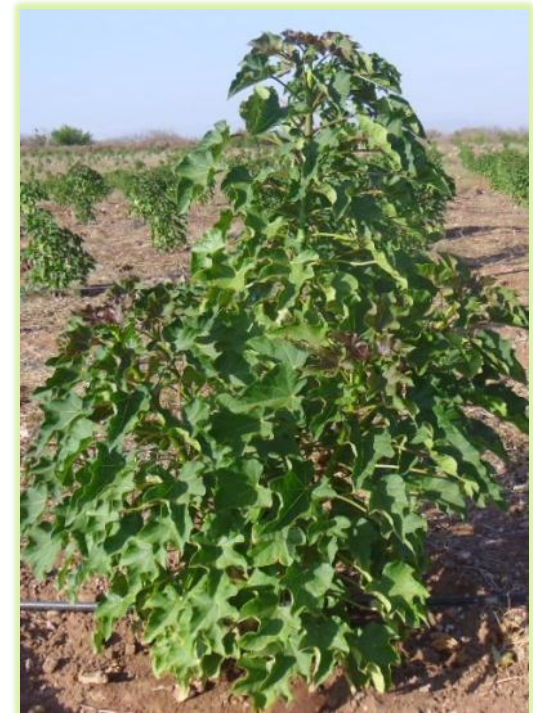
Nursery



Field preparation - Transplantation



**Transplantation
success: 99%**







JCLMAX 3.0



Mali



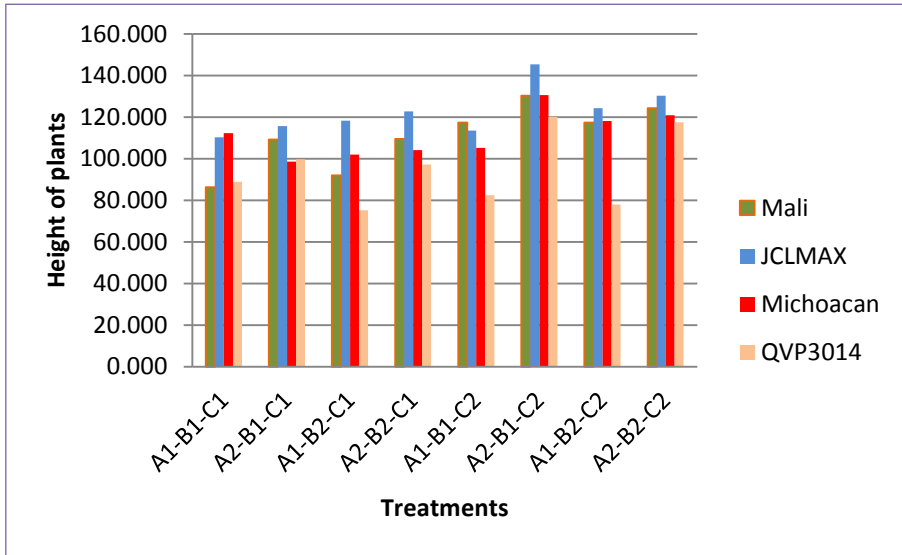
Michoacán



QVP3014



Data



TREATMENT A: Fertilization

Treatment A1: 10 g of urea per plant

Treatment A2: 10 g of 20 N-20 P-20 K per plant

TREATMENT B: Irrigation

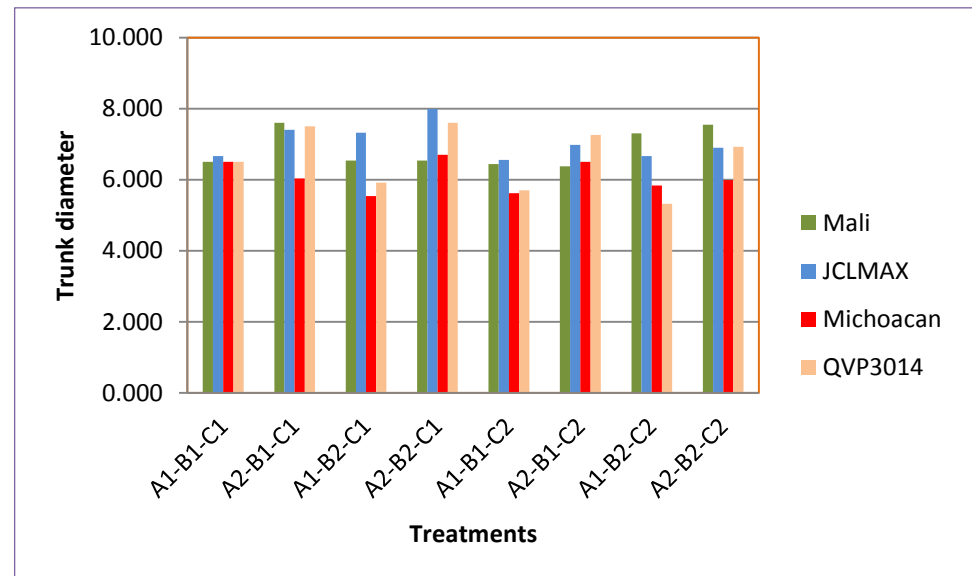
Treatment B1: 4L/hour every 7 days

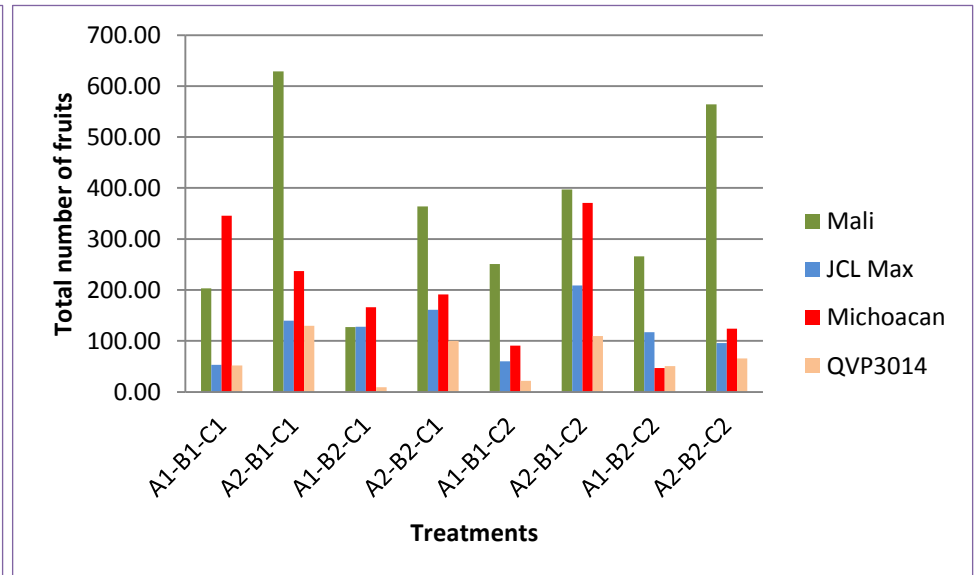
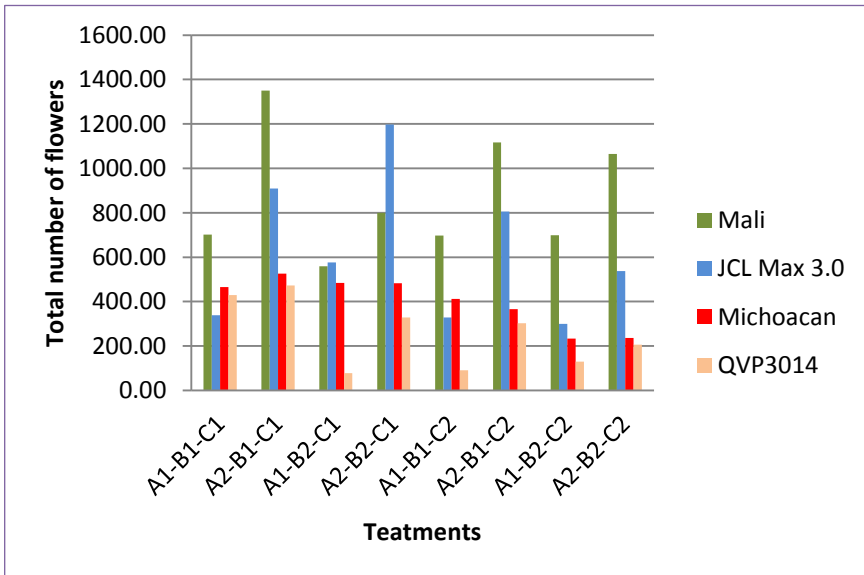
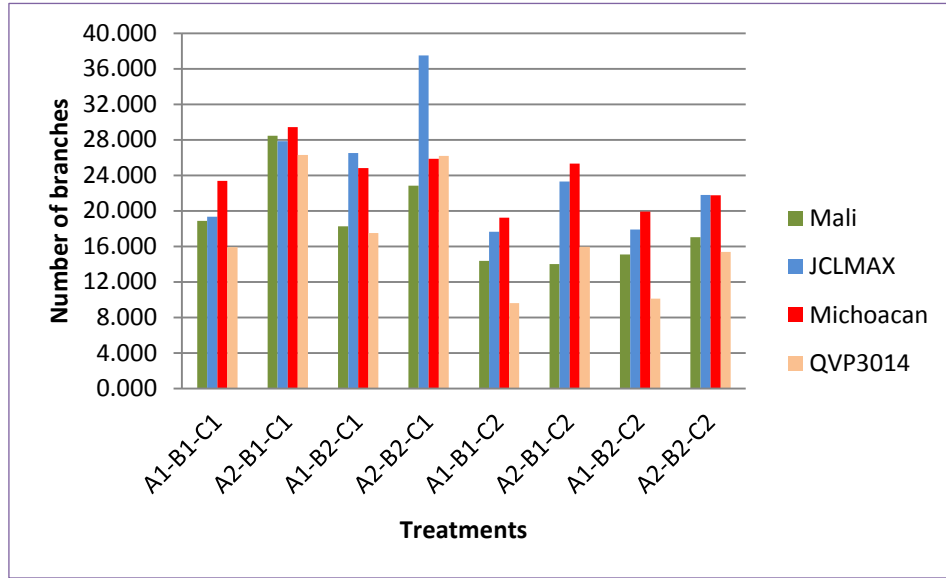
Treatment B2: 8L/hour every 7 days

TREATMENT C: Pruning

Treatment C1: Cup-shaped plants

Treatment C2: Tree-shaped plants



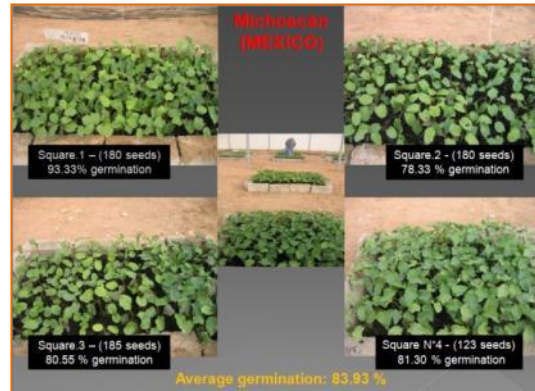


Algeria

Adrar Region - 27° 54' N, 00° 11' W



Nursery



Field preparation - Transplantation



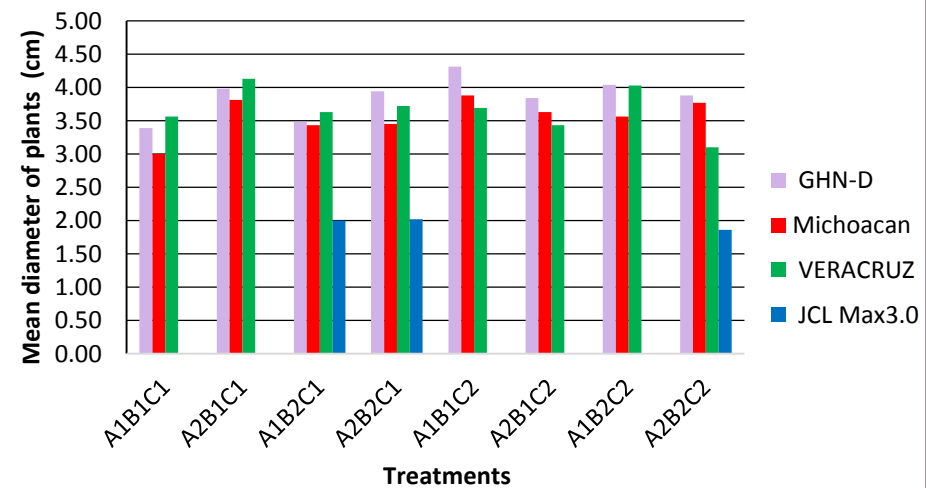
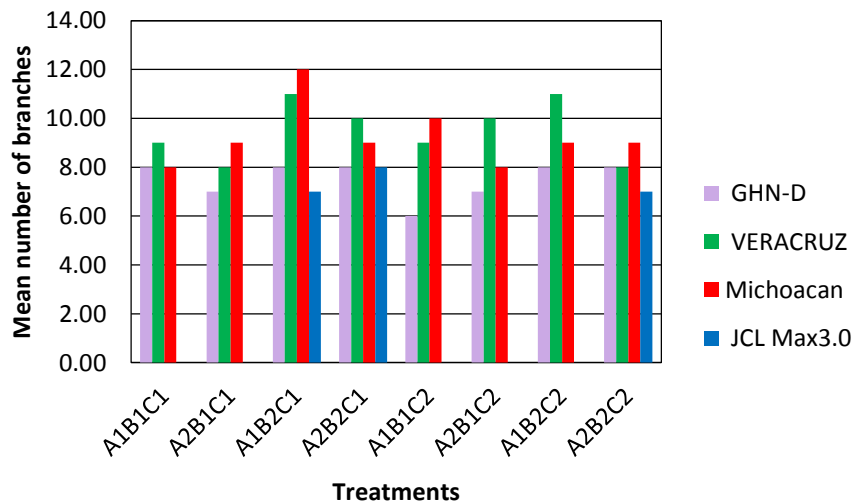
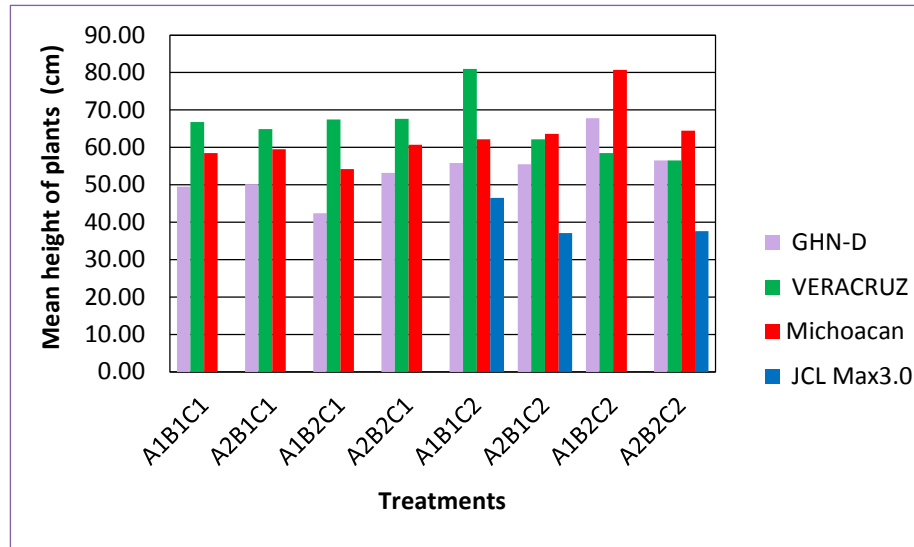
Some of the problems...

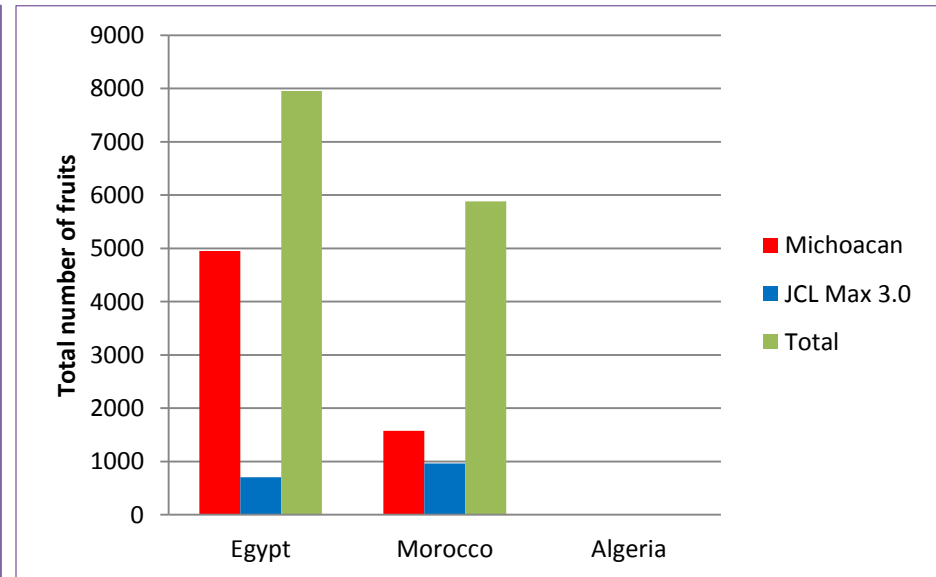
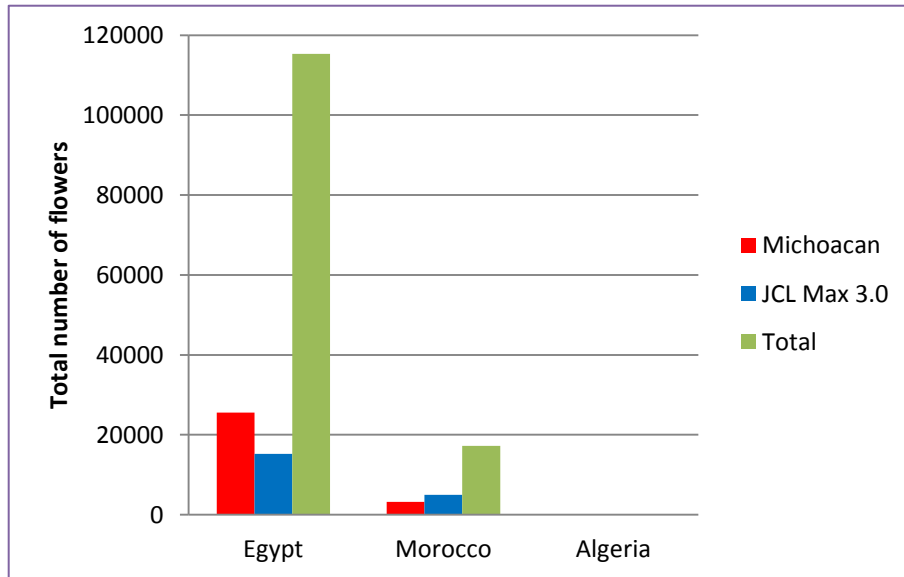
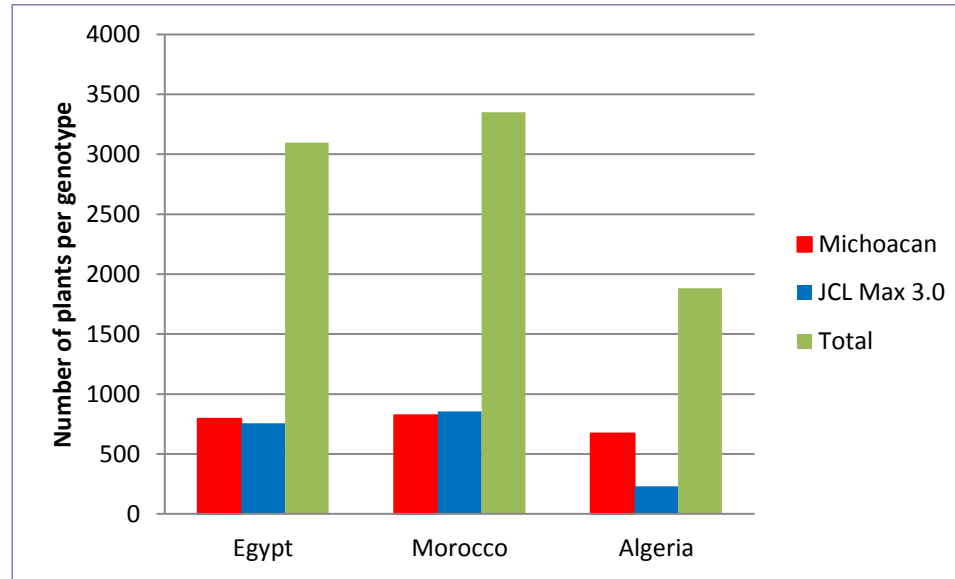






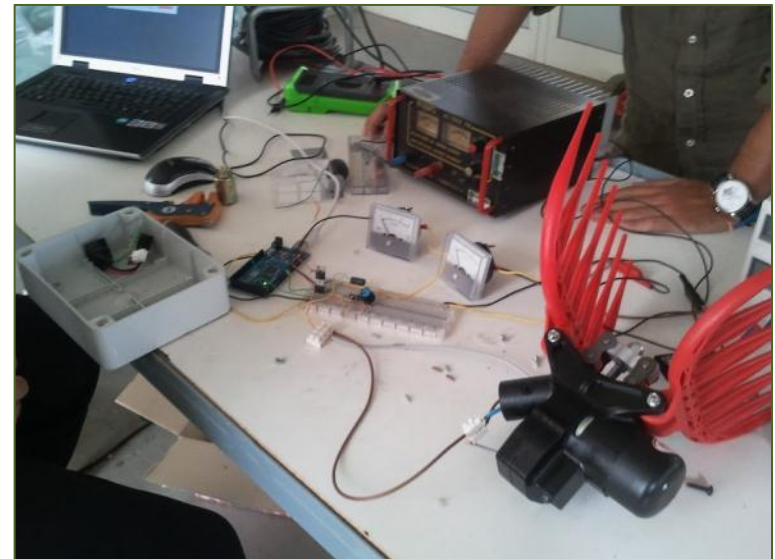
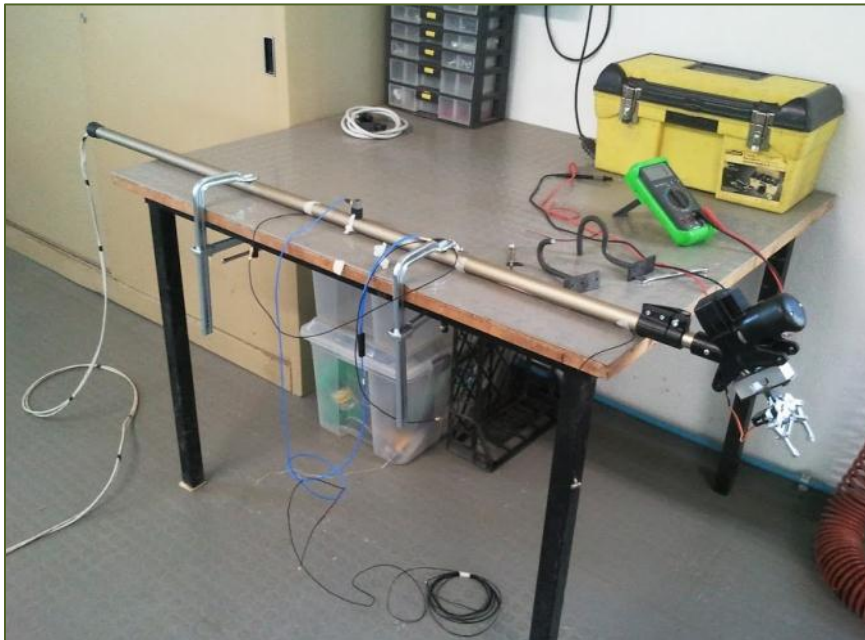
Data







Laboratory tests



Field tests in Agadir, Morocco (22-26 October, 2012)



Modifying a commercial machine with beating harvesting system



Beating system that will be adapted or modified to different needs or applications. The device is compound of an air compressor with the capacity to supply two pickers (rakes) and two pneumatic scissors at the same time.



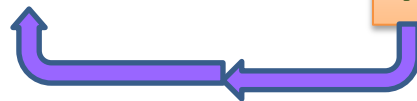
Main goals:

- ✓ Analyze the costs of jatropha cultivation
- ✓ Compare the costs of jatropha in the three demo fields (Egypt, Morocco, Algeria)
- ✓ Implement an environmental-energy analysis of the jatropha production process



Software package for the analysis of costs of investment projects in agriculture
(<http://www.abc.aua.gr/>)

Laboratory of Agribusiness Management
Agricultural University of Athens



A/A	Country	Genotypes	Treatments	A/A	Country	Genotypes	Treatments	A/A	Country	Genotypes	Treatments
1	Egypt	Michoacan	A1B1	17	Morocco	Michoacan	A1B1	33	Algeria	Michoacan	A1B1
2			A2B1	18			A2B1	34			A2B1
3			A1B2	19			A1B2	35			A1B2
4			A2B2	20			A2B2	36			A2B2
5		JCLMax 3.0	A1B1	21		JCLMax 3.0	A1B1	37		JCLMax 3.0	A1B1
6			A2B1	22			A2B1	38			A2B1
7			A1B2	23			A1B2	39			A1B2
8			A2B2	24			A2B2	40			A2B2
9		GHS-B	A1B1	25		QVP 3014	A1B1	41		Veracruz	A1B1
10			A2B1	26			A2B1	42			A2B1
11			A1B2	27			A1B2	43			A1B2
12			A2B2	28			A2B2	44			A2B2
13		JAT106	A1B1	29		Mali	A1B1	45		GHN-D	A1B1
14			A2B1	30			A2B1	46			A2B1
15			A1B2	31			A1B2	47			A1B2
16			A2B2	32			A2B2	48			A2B2

ABC simulation platform. Cost analysis scenarios per country - all genotypes and treatments considered (48 scenarios)

The activities considered for the economic analysis are:

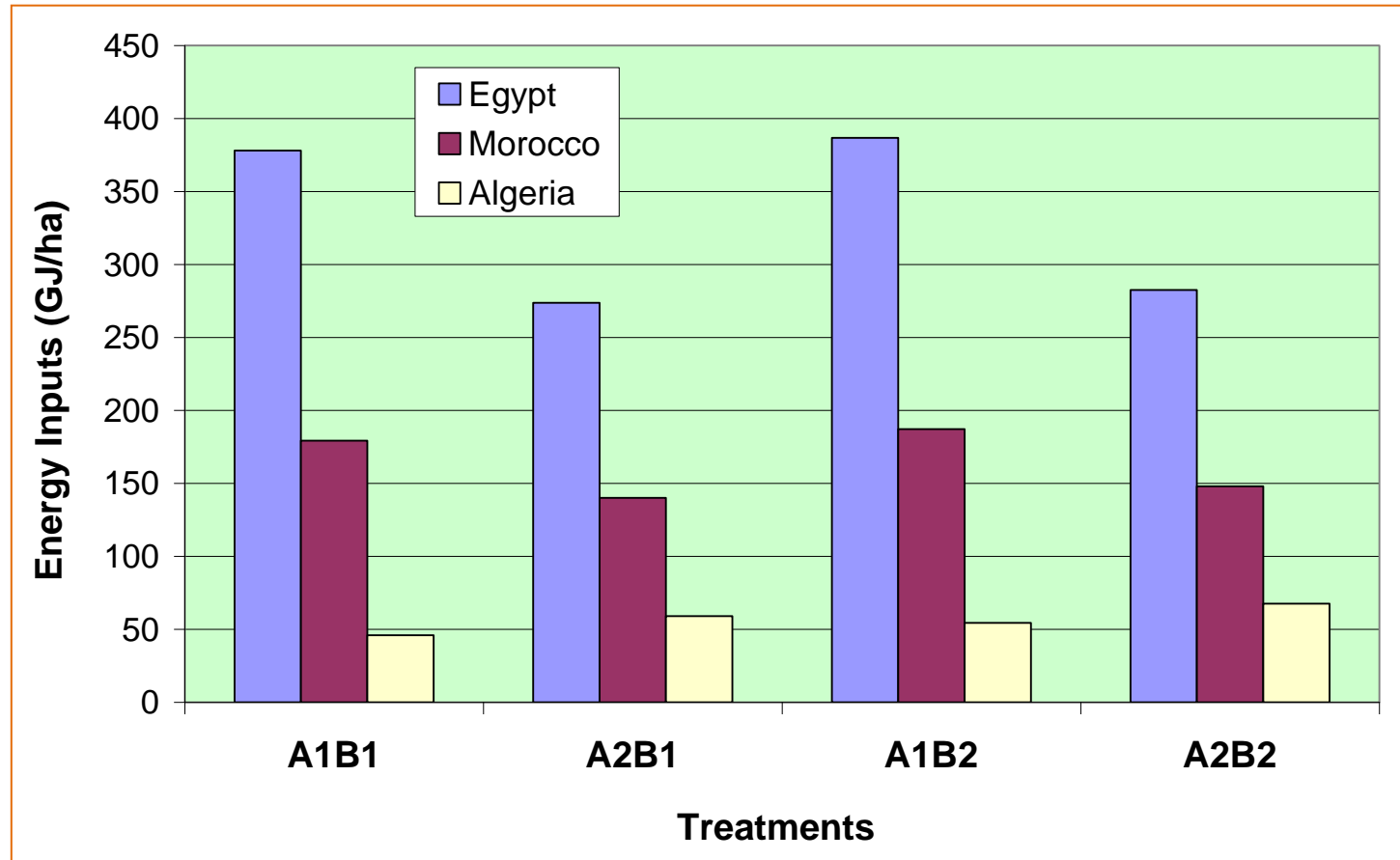
1. Sowing seeds in nurseries
2. Field preparation
3. Transplantation
4. Fertilization
5. Irrigation
6. Pest control
7. Weeding
8. Pruning
9. Harvesting
10. Preparation of harvested fruits and possible storage
11. Transportation of seeds to oil extraction
12. Oil extraction

Activity needs:

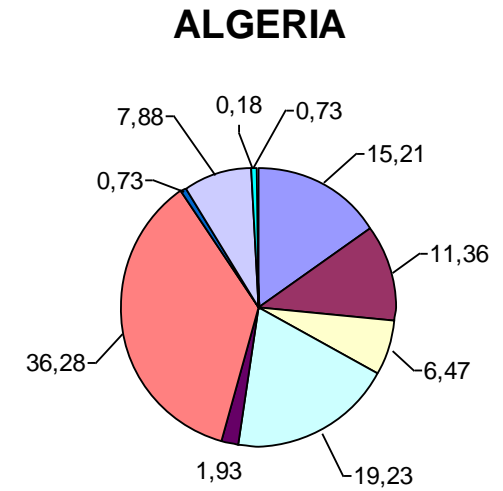
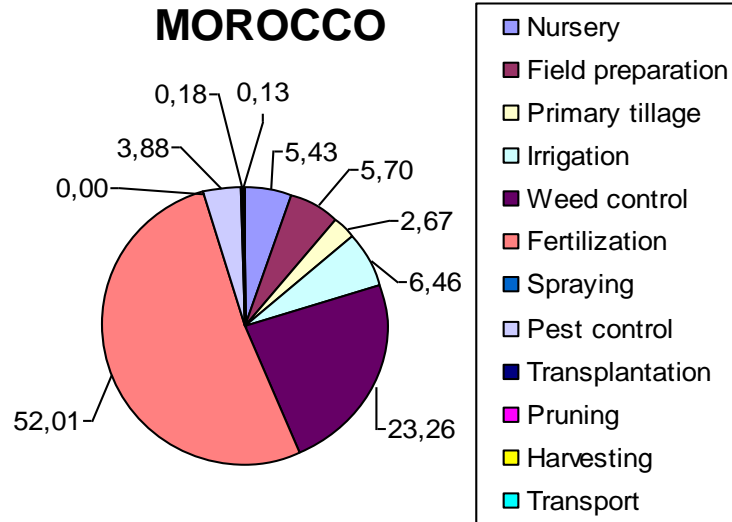
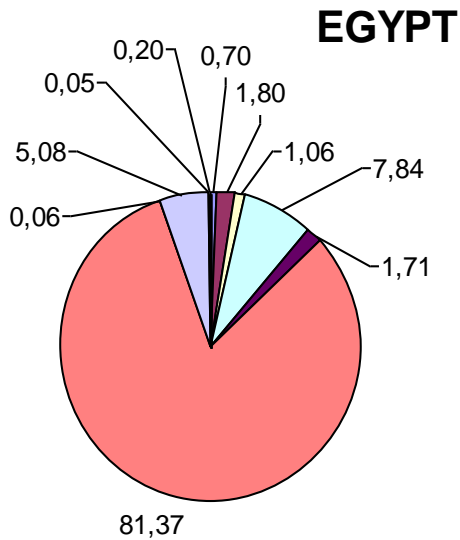
- ✓ Labour
- ✓ Machinery (tractors, pumps, etc.)
- ✓ Energy (fuel, electricity, etc.)
- ✓ Raw material (seeds, fertilizer, etc.)



Energy Analysis for Jatropha demo fields



Comparison of energy inputs for the three fields and for combinations of treatments of irrigation and fertilization



Distribution of Energy Inputs in all Operations for the three regions – Case of Highest Inputs

- ✓ Website (www.jatromed.aua.gr)
- ✓ Social media (<https://www.facebook.com/Jatromed?ref=hl>)
- ✓ Three newsletters released
- ✓ 22 publications in International Conferences
- ✓ Three publication in scientific journal
- ✓ Meetings with farmers, local population, politicians, stakeholders
- ✓ Field visits by farmers and stakeholders
- ✓ Knowledge transfer events



Knowledge transfer events

EGYPT



MOROCCO



ALGERIA



THANK YOU FOR YOUR ATTENTION
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Acknowledgement



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