

STUDY OF AGRONOMIC CONSTRAINTS TO THE DISSEMINATION OF THE CULTIVATION OF *JATROPHA CURCAS* L. IN SENEGAL

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INTRODUCTION

Alternatives to fossil fuels are needed to satisfy the world demand for energy. Unlike other agrofuel crops *Jatropha curcas* L. (JCL) is a non-edible plant with multiple uses (soil fertilization, wasteland reclamation, plot delimitation) and is rather drought resistant. Its seeds contain high quantities of oil that is traditionally used to produce soap, but only marginally for energy production. The oil of JCL can be used in simple engines, in adapted stoves and as bio pesticide. Growing JCL could thus provide employment, alleviate rural poverty, enhance the quality of rural life and improve the environment in developing countries. Despite the efforts recently made to domesticate it, JCL can still be considered as a wild species.

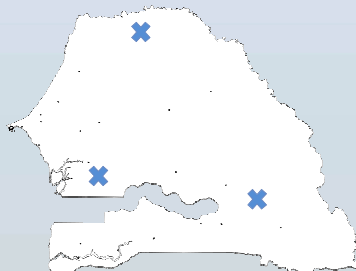
Selection works carried out in field trials installed in Northern Senegal permitted to identify superior JCL clones. Furthermore, several pests and diseases have been identified in different regions in Senegal, where JCL is cultivated. The preliminary results of these trials are presented and discussed here.

MATERIAL AND METHOD

Selection and multiplication of high yielding clones adapted to the local growing conditions

Superior clones were selected in Northern Senegal in a field build up from JCL ecotypes originating from Africa, Southern America and Asia. A first selection was carried out in 2009 in a population of 5000 plants, where 100 superior clones were chosen. A second selection was done in 2010 in a population of 3500 plants, where 30 superior clones were chosen. These clones were installed in three different agro-ecological environments in order to assess the actual yield potential of the crop and the importance of the main agronomic constraints (pests and diseases, water stress, soil types) that affect its profitability.

- Bokhol (Northern Senegal) :
 - near the Senegal River
 - six hectares planted in 2007
 - drip irrigation system
 - annual rainfall is only 200 mm
- Bambougar (Central-Western Senegal) :
 - four hectares installed in 2009
 - under rainfed conditions
 - annual rainfall is 700 mm
- Dialakoto (Eastern Senegal) :
 - four hectares installed in 2009
 - under rainfed conditions
 - annual rainfall is 1000 mm



Actual yield potential of the crop

Preliminary results of the actual yield production after two years shows that the expected yields in the three different sites are not achieved (table 1). Significant differences can be seen between the different clones within one site and within the different sites under rainfed condition (Bambougar and Dialakoto) and under irrigation (Bokhol). The average seed yield ranges from 0 to 250 gr of dry seed per plant (i.e from 0 to 625 kg ha⁻¹ with a plant population of 2.500 plants ha⁻¹).

Clone #	BAMBOUGAR				DIALAKOTO				BOKHOL			
	AVG.	SD	MIN	MAX	AVG.	SD	MIN	MAX	AVG.	SD	MIN	MAX
23	2,50	1,73	0,00	4,00	55,30	72,10	0,00	160,00	120,00	25,80	78,00	144,00
53	0,75	0,96	0,00	2,00	21,40	15,61	0,00	36,00	184,90	80,60	60,00	266,30
62	3,33	7,69	0,00	19,0	117,20	113,80	24,00	244,00	227,30	117,30	84,00	438,00
68	3,75	2,87	2,00	8,00	139,30	117,60	0,00	286,00	219,20	111,80	107,00	394,00
70	6,25	7,14	0,00	16,0	74,00	67,80	18,00	176,00	223,80	51,90	185,00	300,00
80	2,50	2,38	0,00	5,00	62,00	50,60	4,00	149,00	39,30	49,90	0,00	105,00

Table 1: Yields of seed in g per plant obtained during the rainy season 2010 for seven clones installed in three different agro-ecological environments, two years after plantation.

CONCLUSIONS

The available planting materials of JCL do not thrive on marginal land. They can survive on it but only poor yields can be obtained in this situation.

Despite its toxicity, JCL is not pest resistant. It is sensitive to fungal wilt whose attacks seem to be favoured in irrigated growing conditions.

JCL cultivation does not guarantee high return. This is mainly because of their poor average yield and of the high yield variability existing between plants. JCL production could be economically, environmentally and socially sustainable if it is cultivated in intercropping systems. Furthermore, improved planting material must be made available and adequate integrated pest management strategies must be developed.

These conditions must be met to permit the development of sustainable JCL production and transformation chains.



RESULTS

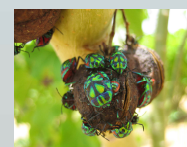
Senegal river area, Sahelian climate with irrigation

- Fast initial growth of JCL
- Favourable growing conditions from mid-June to mid-November
- Unfavourable growing conditions from mid-December to mid-June
 - December to March : low night temperature
 - Plants shed their leaves
 - April to mid-June : very hot and dry wind
 - flower desiccation and boll abortions
- Yield inferior to 500 Kg ha⁻¹

Southern parts of Senegal, under rainfed conditions

- Very variable growth
 - Soil characteristics
 - JCL does not grow well in heavy soils
 - Rainfall level
 - Tending practices
 - JCL is very susceptible to weed competition
- Good results with direct sowing
- Good results with intercropping
- Low impact of pests and diseases
- Yield inferior to 1000 Kg ha⁻¹

Pests and diseases



Calidea panaethiopica
(Heteroptera, Scutelleridae)



Stomphastis thraustica
(Lepidoptera, Gracillariidae)



Pempelia morosalis
(Lepidoptera, Pyralidae)



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The JCL plantation of Bokhol suffered severe attacks of a fungus that killed about 65 % of the plants in three years. According to the preliminary results we obtained so far, it could belong to a new species of *Fusarium* close to *F. equiseti* and *F. acuminatum* (gibbosum section).

