Effect of phenological variation on photoperiodic sorghums production in the Sahel

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1. Introduction

In West Africa and particularly Mali, the sorghum and the millet are the two more important cultures. they contribute to more than 80% of the food needs for the population.

In 2008 the sorghum was cultivated in Mali on a surface of 990 995 ha with a production of 1 027 202 tons and yield average is 1036 kg/ha (http://faostat.fao.org/site/567/DesktopDefault.aspx?PageID=567).

The production of the sorghum proceeds under very variable constraining climatic conditions from one year to another.

Soils are very low in Nitrogen and phosphorus

Problems: dryness ,inundation and diseases rainfall variation

OBJECTIVE

To study and measure the phenologic variability of the sorghums in Mali and to show how this variability contributes to the reduction in the climatic risks..

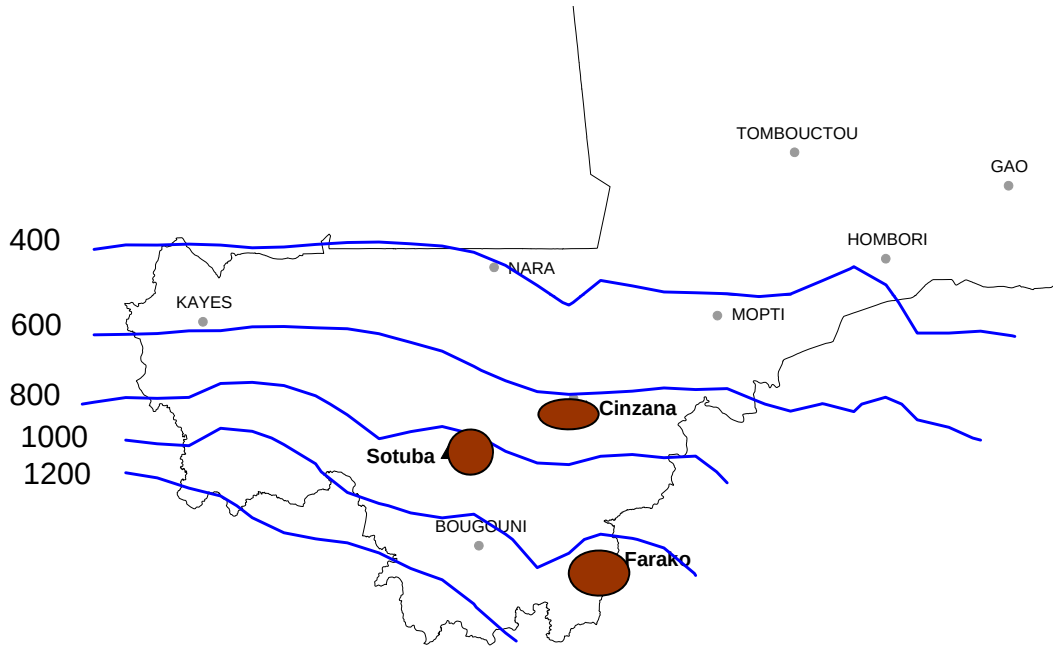
Hypothesis

The biodiversity of sorghum is a tool for reduction of the impact of the climate change

Question of research

How the variation of the date of sowing affect the production of the sorghum in the Sahel ?

Sites



The site were
- the Station of Agronomic research of **Cinzana** (600 mm 13° 15 N, 5° 58 W,)
- The agronomic research station of **Sotuba** (900 mm 12° 39 N, 7° 56 W)
- The agronomic research station of **Farako** (1000 mm, 11°21 N, 5°46 W)

Soils experiments:
Cinzana: ***silty clay soil***
Sotuba: ***loamy sand soil***
Farako***: sandy loam soil***

Materials and methods

Genetics materials

	Noms	Sources	Types		Noms	Sources	Types
V1	*CSM 63E*	IER Breeder	*Guinea*	*V6*	*976BF5D5-150*	IER Breeder	*Guinea*
V2	*Wassa*	IER Breeder	*Guinea*	*V7*	*Grinkan*	IER Breeder	*Caudatum*
V3	*CSM 388*	IER Breeder	*Guinea*	*V8*	*Lakahieri*	Diakaguedou village	*Durra*
V4	*Dancouma*	Farako Village	*Guinea*	*V9*	*Boiguele*	Diakaguedou village	*Durra*
V5	*IRAT 204*	CIRAD	*Caudatum*	*V10*	*Lata-3*	ICRISAT-Mali	*Guinea*

Materials and methods

Genetics materials




Racial diversity

Rain fall by Site

		Janv	Fév	Mars	Avril	Mai	Juin	Juil	Août	Sept	Oct	Nov	Déc	Total
Cinzana	Moy.	1.2	0.2	2.5	14.2	39.0	92.7	187.3	200.3	116.8	30.8	1.3	0	686
	An 2010	0	0	0	46.7	12.8	102.0	157.9	246.4	202.0	76.7	0	0	845
Sotuba	Moy.	1.7	0.7	1.5	17.5	51.6	116.8	208.8	282.5	156.0	52.3	1.2	0	891
	An 2010	0	9.5	0.0	32.6	114.7	161.4	213.3	324.3	219.9	110.0	0	0	1186
Farako	Moy.	1.2	3.8	12.6	43.2	105.5	147.3	211.5	281.9	176.8	68.1	6.8	0.8	1059
	An 2010	0	56.9	0	49.7	114.8	131.7	182.9	121.2	288.2	128.8	0	0	1074

Environmental conditions and experimental design

A split plot arrangement (with planting date as main plot factor and varieties as subplot factor) within a randomized complete block design was used.
Sub-plot size was 9 m X 4 m. Sowing was done on ridges with the spacing of 75 cm X 25 cm.
The number of rows by plot was 12 and the number of hills per row was 16.
The distance between plots within a sowing date was 0.75 m and the distance between the plots of any two sowing dates within a replication was 2.0 m.
The distance between replications was 3 m. The same experimental design was used in the three Sites

Fertilizer Application:
A basic fertilizer of 200 kg ha-1 of “15-15-15 was applied 2 weeks after seedling emergence. This was followed by an application of 50kg of urea per ha 4 weeks after seedling emergence, and finally another 50kg of urea (46-0-0) per ha 6 weeks after seedling emergence.

Data weather

For each sites we have the data day of :
the ***rain***, of the ***temperature min and max***, the ***relative humidity of the air***, ***solar radiation the duration of the day and the speed of the wind***..

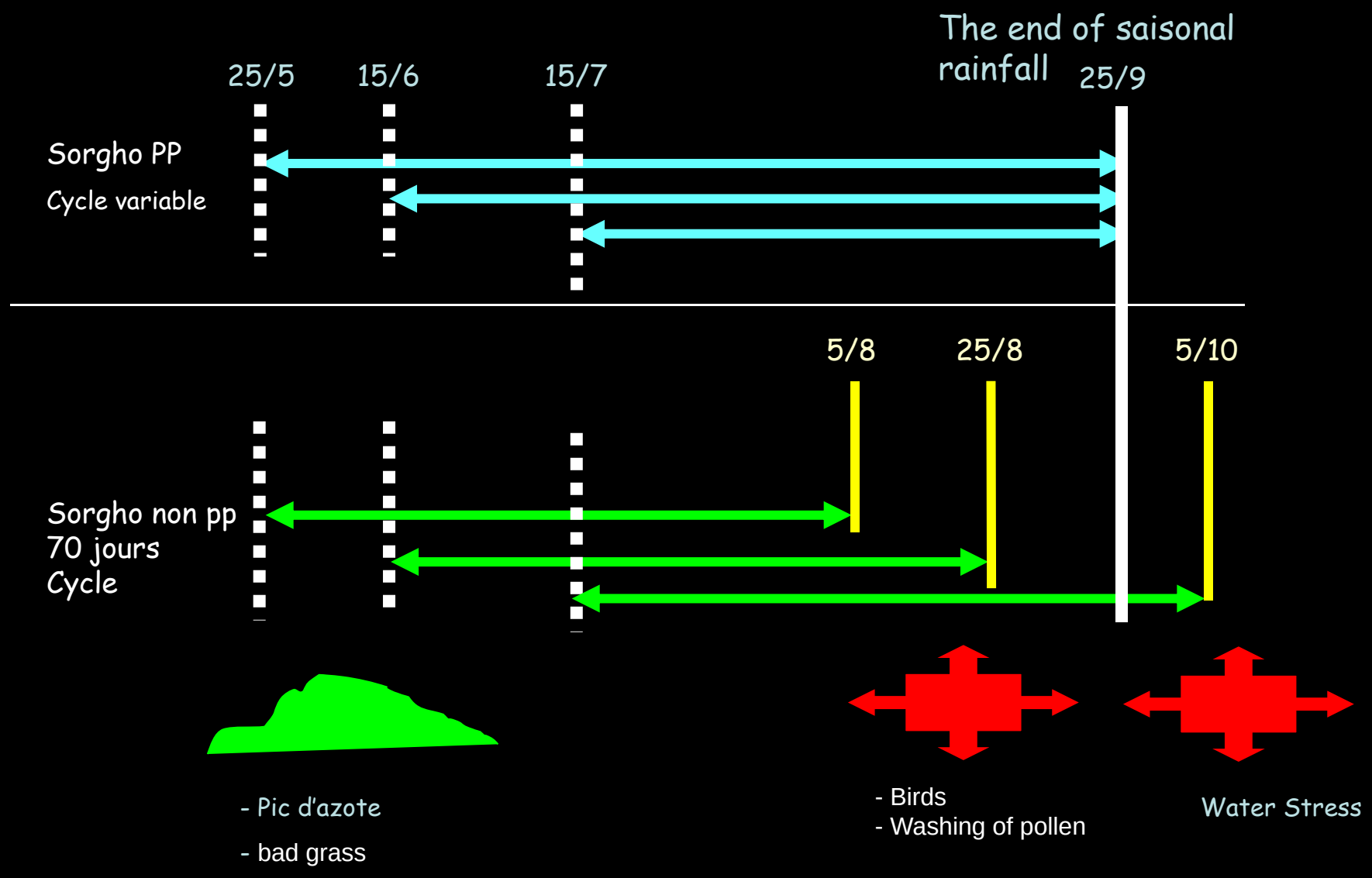
observation and measurement

Phases of development

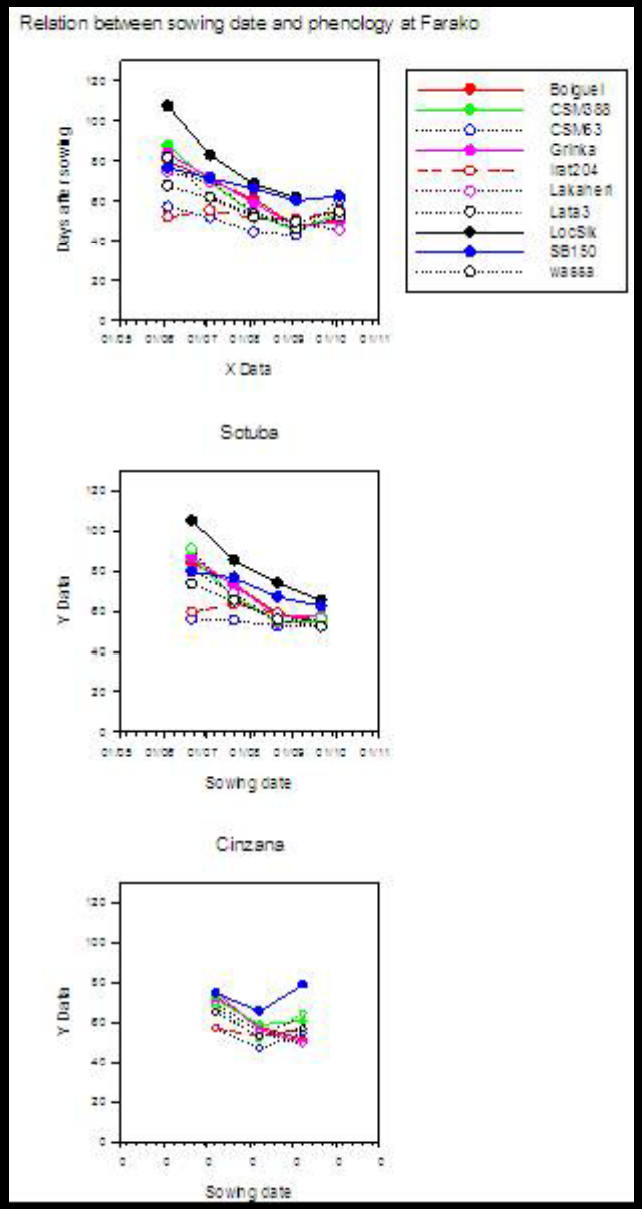


Organs measurements and physiology in field


How is photoperiodism at the African sorghums



4. Results effet of sowing date on phenology by Site

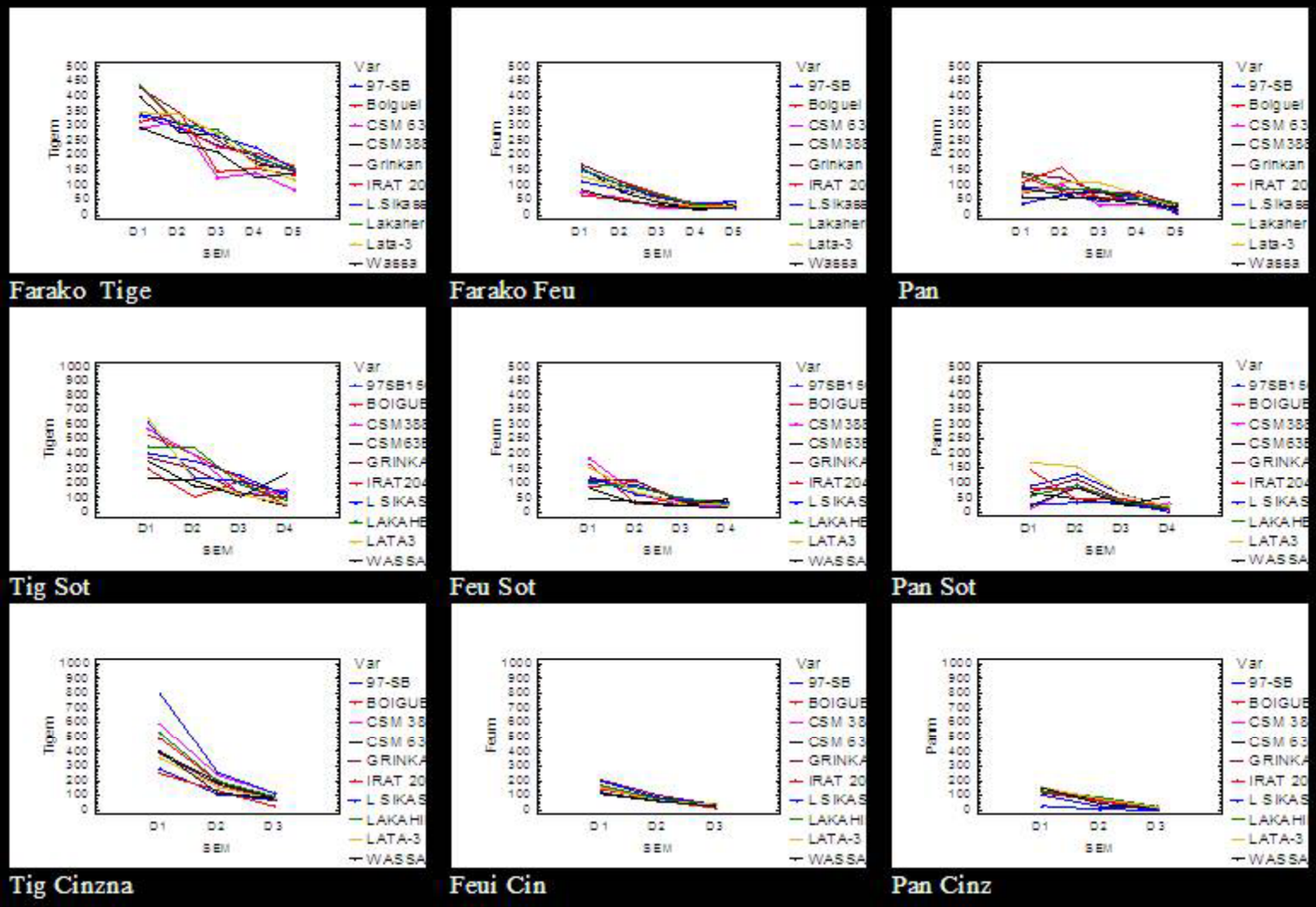


In all site durations SFL (time for flag leaf) decrease with the delay of sowing (110 to 45 days). 8 genotypes are very photoperiodics

But IRAT204 and CSM63 are few PP

Their cycle is not affect by the sowing date variation.

Effet of sowing date on the biomass (stem, leaves,panicles) by variety



south gradients (13°N to 11°N). This is a consequence of varieties sensitivity to day length (photoperiod). Total biomass was reduced (50 to 800g m-²) with vegetative phases shortening.

Conclusion

There exists great variability among varieties within and between sites on total biomass produced.

This variability is due to threshold differences in varieties sensitivity to photoperiod.

These results justify well the early sowing practices of Sahelian farmers which support reasonable use of their biodiversity in order to better exploit early rain falls. These practices are to mitigate climate change effects


THANK YOU FOR
YOUR ATTENTION