

Student profile

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Bio data

MSc in Biotechnology and Crop Breeding

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January 2018- Date: **Msc Student** for Msc mobility program in the Department of Crop Production and Landscape management of Ebonyi State University (Nigeria)

January 2017- date: **Technician** in Laboratory of Genetics, Horticulture and Seed Sciences (GBioS).

Major publications: None

Crops of interest: Kersting's groundnut (*Macrotyloma geocarpum*)

Summary of proposal

Food security is one of FAO's greatest challenges to population growth under a changing climate and to a lesser extent land area for agriculture. Food organization emphasizes access to food and nutrition. There is a wide variety of foods produced around the world. Among these, some species that are not widely used by the scientific community, constituting a great source of diversity that can meet the world's food needs, may have interests in adapting to climate change.

Kersting's groundnut (*Macrotyloma geocarpum*) is an orphan grain legume widely consumed in West Africa (Assogba et al. 2016). As the third subterranean legume after groundnut and Bambara groundnut (Adu-Gyamfi, et al. 2012) it is an annual herbaceous crop belonging to the Fabaceae family and Phaseoleae tribe. The crop is indigenous to West Africa and a promising alternative source of quality protein for food and feed for the tropics (Bayorbor, et al. 2010). The crop is a useful source of incomes to producers as it has an increasing market value in many West African countries.

Despite its importance, the crop is cultivated on a small scale and identified as an under-utilized indigenous legume in Benin (Dansi, et al. 2012). It is also suffering from a lack of support from both decision makers and researchers (Ayenan and Ezin 2016). These are due to the low yield as for many other crops in sub-Saharan Africa and lack of improved varieties.

Kersting's groundnut has benefited from few studies on genetic diversity assessment. Assogba, et al. (2016) and Bayorbor, et al. (2010) collected and characterized respectively 12 and 32 Kersting's groundnut landraces in Ghana and in Benin, using agro-morphological traits and obtained three groups of accessions. (Pasquet et al. 2002) , using biochemical markers (allozyme) on 20 accessions from Togo, Burkina Faso and Cameroun, showed that there is a low diversity within and among domesticated accessions as well as within and between both wild accessions. This revealed a narrow genetic base in Kersting's groundnut. Therefore, measures should be taken up in order to broaden its genetic base through intensive crossing and mutation breeding.

Floral phenology is to study the relative role of inflorescence traits, flowering synchrony (temporal separation of female and male reproductive phases) and pollination context for infructescence and fruit initiation (Waser, 1983). Knowledge of the implications of floral biology on the system of reproduction is discussed from the plant breeding perspectives. Unfortunately, the floral phenology and reproductive system of *Macrotyloma geocarpum* are not well-known.

Kersting's groundnut is an active geocarpic species with subterranean fruiting from aboveground flowers (Barker 2005). Aboveground flowers are subsequently buried by the plant after the pollination. Chasmogamous flowers are often assumed to be out-cross-pollinated and typically appear when pollinators are present; they are also energetically costly (Schemske, et al. 1978). This study intends to prospect the self-pollinated or a cross pollinated nature of *Macrotyloma geocarpum* flowers in order to provide better insights into the reproductive system of the crop for more efficient breeding program.

This study intends to **understand the reproductive biology of *Macrotyloma geocarpum*** in order to bring out a strong breeding program for the species.

- ❖ Describe the floral phenology and floral biology in Kersting's groundnut
- ❖ Develop a protocol for successful hybridization in Kersting's groundnut
- ❖ Determine the fruit and seed set for different pollination systems in Kersting's groundnut

Materials and Methods

Plant Material

A total of five (5) landraces of kersting's groundnut collected by GBioS will be used in this study. Those landraces will be selected using seed coat color as major criterion

Sites and experimental design

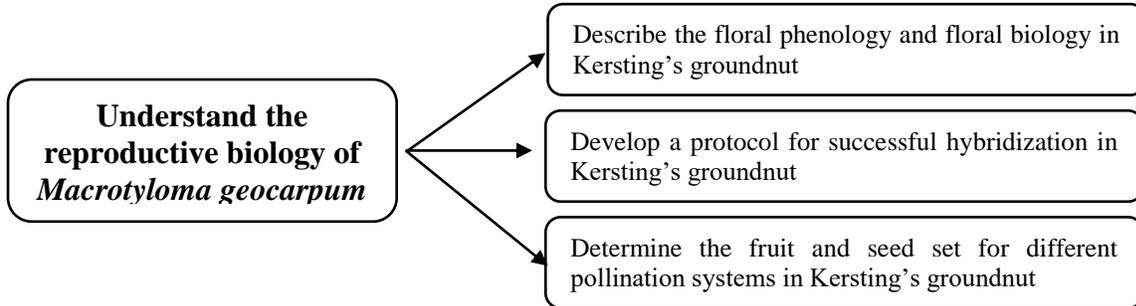
Seeds of each accession will be sown in bags arranged into a Randomized Complete Block Design with 3 replications. There will be two treatments: mode of pollination with three level such as selfed pollination (T1), Hand cross pollination (T2) and open pollination (T3) and accessions with five level. The experimental unit represents a set of 10 bags for each accession. The accessions will be arranged two by two to facilitate the crosses. The mating design that will be used will be a diallel design.

Data Collection

Period	Data	Code	Description
Vegetative	Canopy Area	CA	On five plants randomly selected, Once in a vegetative stage (at the flowering period)
	Plant height	PLH	
	Branches length	LPT	
	Number of Branches	NPT	
	Leaf Area	LA	
Reproductive	Date of 50% flowering	DFP	A total of 90 flowers will be crossed (T2), and we will determine for each of them those different data. Fruit set : percentage of flowers giving mature fruits permit to determine the number of abortion and the number of mature fruits
	Date of pollination of the flower;	DPF	
	Cross successful rate;	CSR	
	Fruit set;	FS	
	Number of seeds per crossing	NSC	
Harvest	Length of the pod;	LP	These data will be collected on seeds from each treatments.
	Diameter of the pod;	DP	
	Number of grains per pod;	NGP	

	Weight of 100grains	W100G
	Number of viable seeds/pods	NVS
	Seed color	SC

A graphic abstract of the research proposal



Useful pictures



Personal comment about the Mobreed opportunity

This scholarship is a great opportunity for all the beneficiaries. It allows us to fund our work while interacting with students from other countries in a climate conducive to research.

Progress report

Activities	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan
Proposal validation	x										
Field preparation		x									
1st Sowing			x								
Usual practices			x	x							

