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BUILDING CAPACITIES
FOR A SUSTAINABLE
AFRICAN CASHEW INDUSTRY

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Effects of different soil substrates on germination emergence and growth of cashew varieties (Anacardium occidentale L.) at the ISRA station in Sangalkam/Senegal.

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18 September 2024

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INTRODUCTION

The cashew tree (*Anacardium occidentale* L) is native to north-east Brazil in the Ceara region (Boris, 1949).

Portuguese navigators introduced it to their West African colonies in the 15th century.

Africa 58.4% of world production (FAOSTAT, 2020)

Cashew cultivation has become a lever for socio-economic development in Africa (Diop, 2020)

Orchard yields (250 to 400 kg/ha) are still low (Charahabil et *al*., 2017).

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India, Brazil and Vietnam: Yields of around 1.5 to 2 tonnes/hectare (DJAHA et al., 2019)

INTRODUCTION

Low yield

- Lack of use of selected and improved varieties
- Ageing of plantations
- Use of low-yielding varieties and unknown origins (Sarr, 2002; Ndiaye et *al.*, 2017)
- Phytosanitary constraints (Viana et *al.*, 2007)

It was against this backdrop that Shelter For Life's LIFFT-Cashew Project, in collaboration with ISRA, imported cashew seeds from Vietnam to improve quality and productivity in the SéGaBi region.

INTRODUCTION

GO

Contribute to improving cashew tree productivity in Senegal.

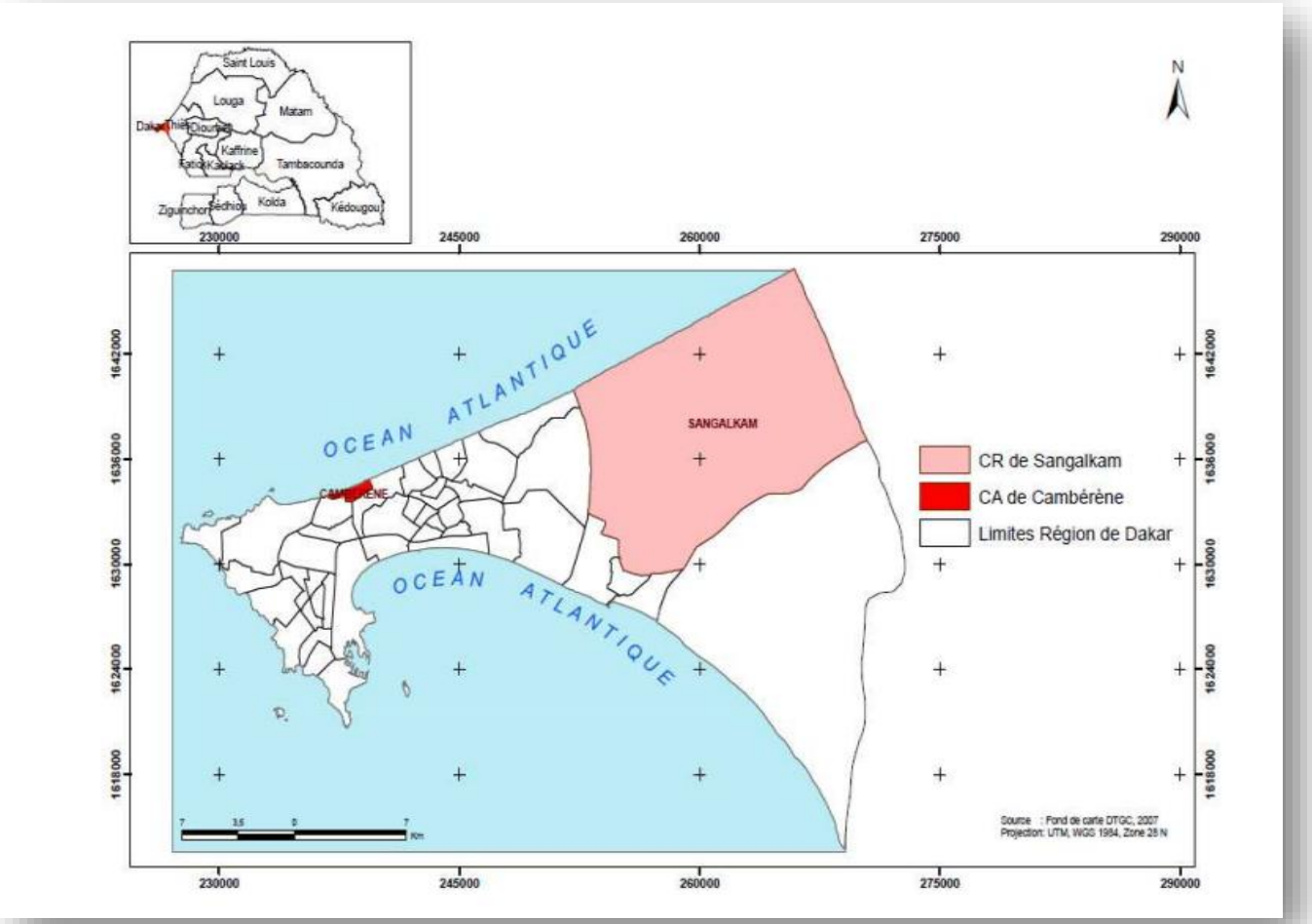
- **SO1** Assess the behaviour of a variety from Vietnam in a controlled environment
- **SO2** Identify the type of soil best suited to this origin
- **SO3** Offer growers the best soil/plant combination for growing this variety.

The hypotheses underlying our study are as follows:

- **H1** The cashew of Vietnamese origin has a higher germination rate than the one of local origin
- **H2** The cashew of Vietnamese origin is better adapted to sandy-clay texture
- **H3** The growth and development of the seedlings are better in the cashew of Vietnamese origin

MATERIALS AND METHODS

Site presentation



- Sangalkam (Latitude 14° 46' 44.30'' N, Longitude 17° 13' 33.65'' W, Altitude 19 m)
- The climate is sub-Canary type and the soils are clay, sand, sandy clay and sandy clay, rich in organic matter.
- Average temperatures range from 25 to 30°C
- Average annual rainfall is around 400 mm (Camara et *al.*, 2017).

MATERIALS AND METHODS

Plant material

V1

- Local variety
- Harvested: March 2023 at Keur Martin in the Fatick region
- Provided by ISRA
- 250 kg/ha to 400 kg/ha (Ndiaye et *al.*, 2017)

V2

- Vietnamese variety
- Imported in February 2023
- Characteristics : 10 to 15 fruits per bunch ;
- Number of nuts per kg: 140-160 kernels/kg:
- Potential yield: 2,500-3,000 kg/ha (Le Quy Kha-FR, 2017)

Plant material

MATERIALS AND METHODS

Types of substrate

- T_0 = dune sand
- T_1 = sandy
- T_2 = clay
- T_3 = sandy clay
- T_4 = clay sandy

T_3 2/3 sand and 1/3 clay

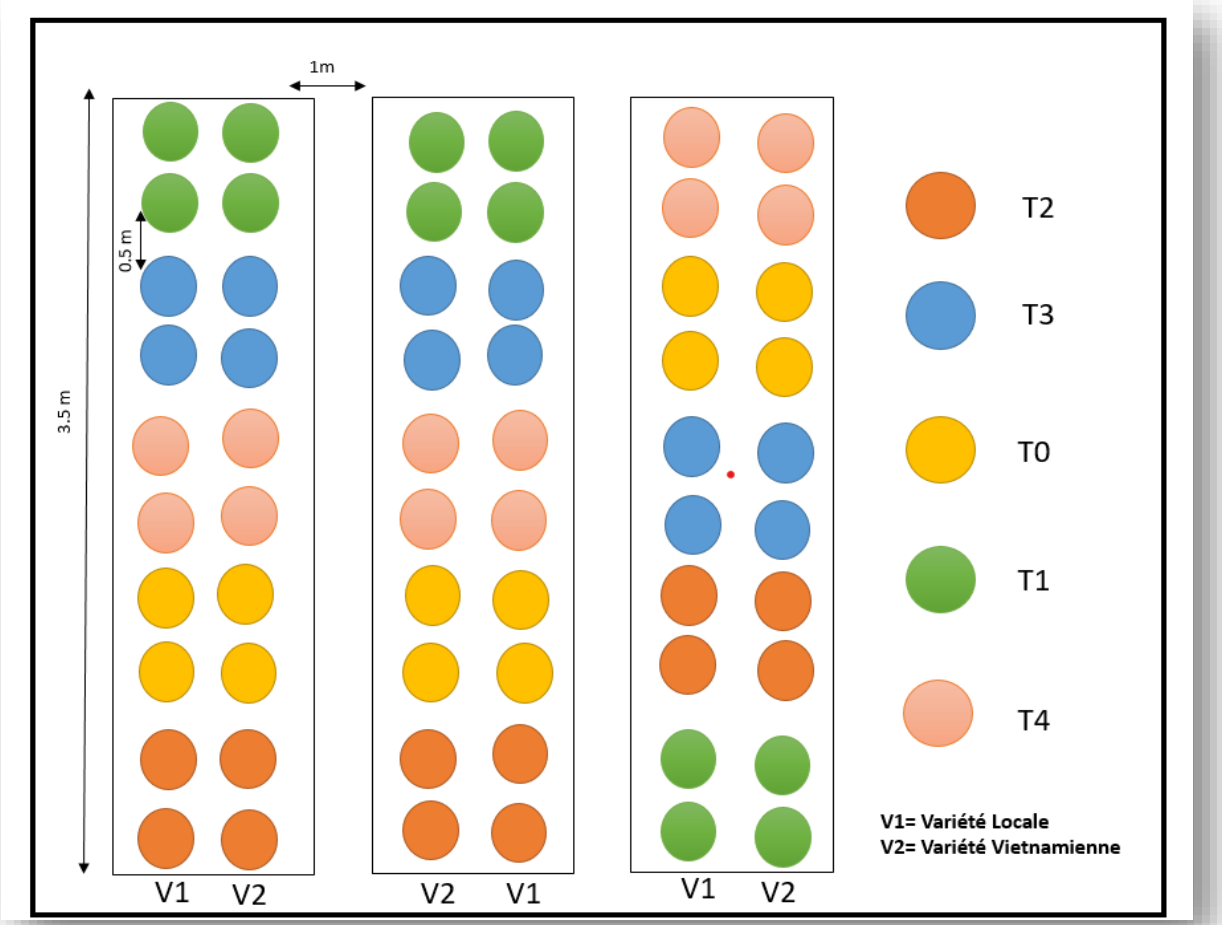
T_4 2/3 clay and 1/3 sand

Types of substrate

2/3 texture for 1/3 well-decomposed manure

MATERIALS AND METHODS

Experimental set-up



Split plot mechanism

MATERIALS AND METHODS

Data collected

- Final germination rate:

- Germination rate (GR) = time by which 50% of seeds have germinated (Come, 1970; Scott et *al.*, 1984).
- Germination delay (GD): is the time interval between sowing and the first germinated seeds (Bayarassou, 2011; Samb, 2015).
- 30,60,90DAS growth parameters were collected: Height, Diameter, Number of Leaves
- Vigour was calculated using the formula of Alexandre (1977): Height/Diameter

MATERIALS AND METHODS

Data processing and analysis

Excel 2016 spreadsheet

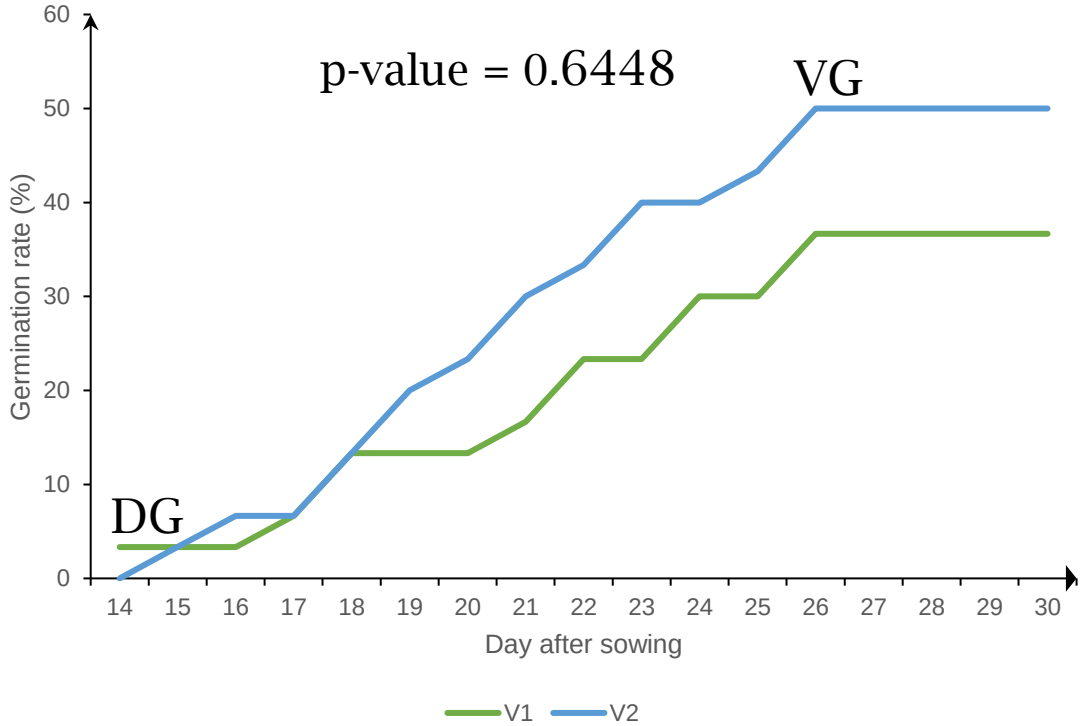
- Data entry
- Graphs

R studio version 4.2.1

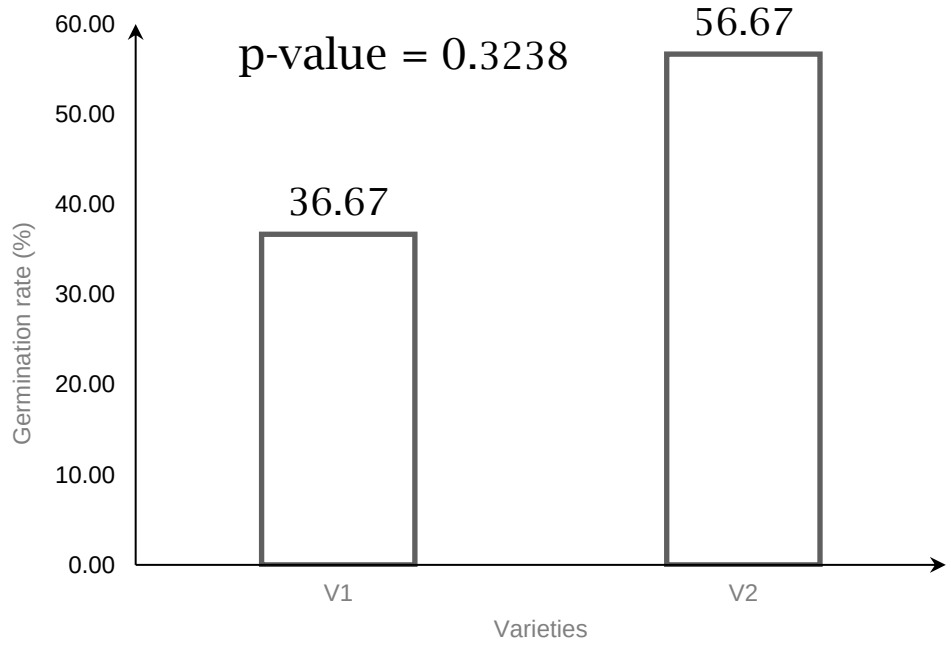
- Normality test
- Wilcoxon test
- Kruskall-wallis test
- Two-factor anova
- Tuckey test
- Bar chart
- Boxplot

RESULTS AND DISCUSSION

Germination depending on the variety



Germination emergence rate over time as a function of variety



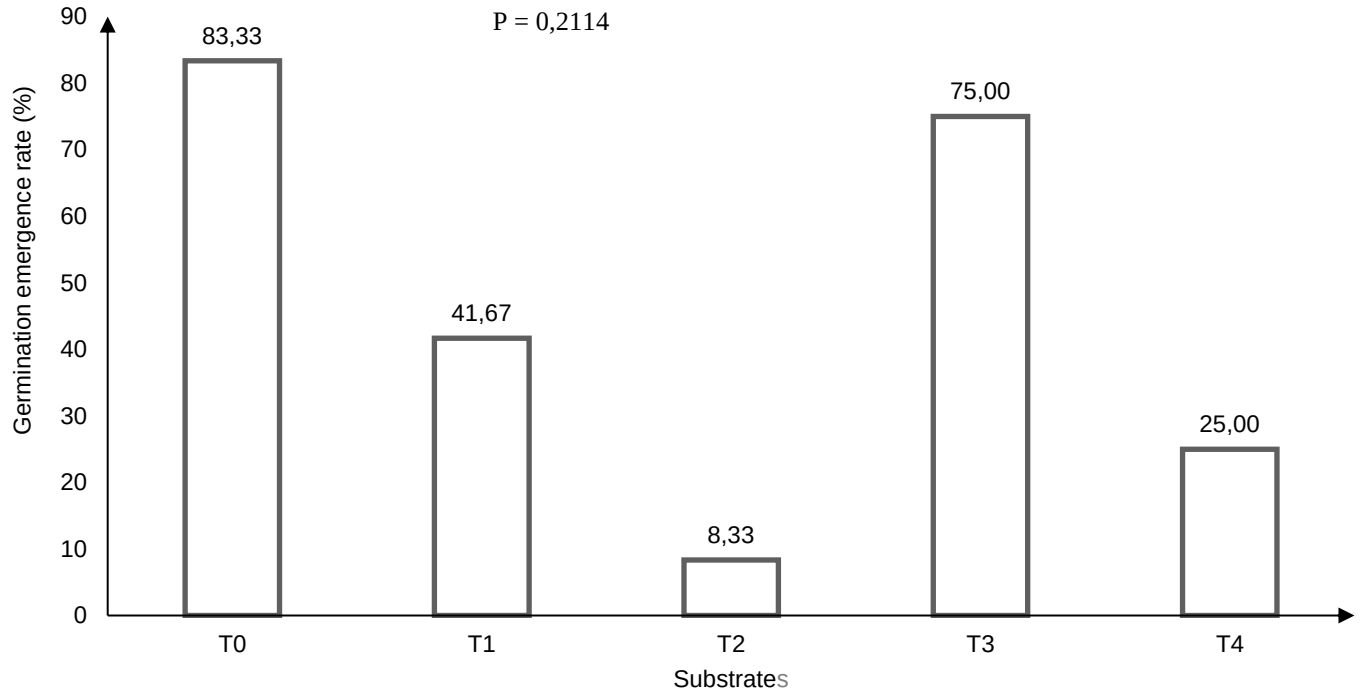
Germination emergence rate as a function of variety

The Wilcoxon test did not reveal any significant difference in sprout emergence between varieties (p-value = 0.6448).

The Wilcoxon test showed no significant difference in the number of emergences between varieties: p-value = 0.3238.

RESULTS AND DISCUSSION

Germination according to substrate type



Germination emergence rate as a function of substrate type at 30DAS

The emergence rate varied significantly according to substrate (P=0.2114). The highest emergence rate was obtained with T0 (83.33%) and T3 (75%). T2 gave the lowest germination emergence rate (8.33%).

RESULTS AND DISCUSSION

Growth parameters according to variety

		60DAS	75DAS	90DAS	P-value
Height	V1	27±7,74	27,78±7,74	28,92±7,74	NS
	V2	26,86±7,74	29,14±7,74	29,88±7,74	
Diameter	V1	0,50±0,12	0,52±0,12	0,58±0,12	0,00413
	V2	0,54±0,12	0,62±0,12	0,69±0,12	
Height/Diameter	V1	54,61	53,42	52,63±16.89	0,0425
	V2	51,41	48,18	44,35±16.89	
Number of Leaves	V1	8±2	8±2	9±2	0,00137
	V2	11±2	12±2	12±2	

These results show that there is no significant difference in height between varieties. Diameter and number of leaves vary significantly according to variety. In fact, V2 had the best averages at 75 and 90 DAS. The H/D ratio of V1 is higher than that of V2, which means that V2 has better vigour than V1 at 90DAS. However, plants from both varieties have good vigour (H/D less than 80).

RESULTS AND DISCUSSION

Growth parameter as a function of texture

		60DAS	75DAS	90DAS	P-value
Height	T0	30,9±7,74	32,10±7,74	31,70±7,74	0,000728
	T1	27,6±7,74	29,30±7,74	30,57±7,74	
	T3	23,17±7,74	24,75±7,74	26,20±7,74	
	T4	26,50±7,74	29,75±7,74	30,25±7,74	
Diameter	T0	0,46±0,12	0,51±0,12	0,51±0,12	0,00111
	T1	0,61±0,12	0,65±0,12	0,77±0,12	
	T3	0,525±0,12	0,55±0,12	0,67±0,12	
	T4	0,470±0,12	0,64±0,12	0,69±0,12	
Height/Diameter	T0	67,49±16,89	63,26±16,89	63,36±16,89	1,63e-08
	T1	45,40±16,89	44,84±16,89	39,97±16,89	
	T3	44,74±16,89	44,40±16,89	38,95±16,89	
	T4	57,43±16,89	48,46±16,89	43,93±16,89	

These results show that the seedlings obtained the best vigour on the T3 and T1 substrates. Seedlings on substrate T0 showed the lowest vigour.

CONCLUSION AND OUTLOOK

- The results show that the origin of the seed has an influence on the germination and growth of cashew seedlings. The Vietnamese variety obtained the highest germination rate.

- The highest germination rate was obtained on the T0 and T3 substrates.

- T2 has the lowest germination rate

- Seedlings on T1 and T3 substrates have the largest diameter.
- The highest average height was obtained for plants in the T0 substrate.
- Seedlings of the V2 variety had the highest number of leaves.

- In terms of vigour, seedlings of the V2 variety had the best results.

We can say that the V2 variety adapts better to the T3 and T1 substrates.

CONCLUSION AND OUTLOOK

However, further studies will have to be carried out on the effects of :

- irrigation on the germination and growth of cashew varieties;
- temperature on the growth of cashew seedlings in the nursery ;
- grafting of local and Vietnamese varieties on seedling growth and development;
- the dose of clay on germination and growth of cashew varieties in Senegal

- monitoring plantations and pathogen attacks on the Vietnamese cashew variety in Senegal

- Study on the productivity of the Vietnamese variety in Senegal

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THANK YOU FOR YOUR ATTENTION