

# The relative role of soil, climate, and genotype in the variation of nutritional value of *Annona senegalensis* fruits and leaves

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## 1. Introduction

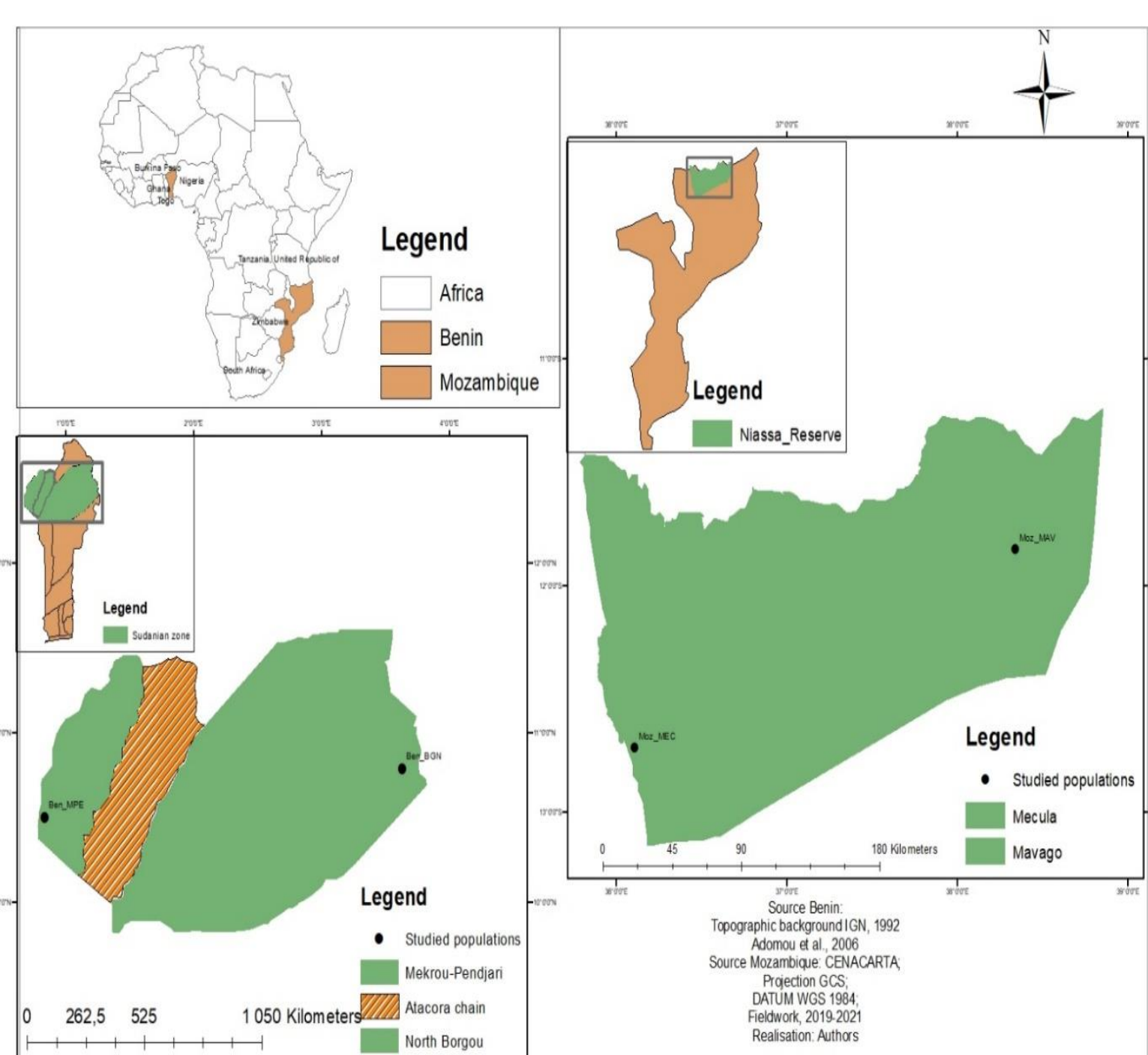
- *A. senegalensis* is a multipurpose shrub, 2 to 6 m tall that can reach 11 m height under favorable conditions.



Fig 1 : Seeds, flower, fruit and leaf (from left to right) of *A. senegalensis*

- In Africa, many authors have reported on the nutritional potential of the edible parts of the plant. The reported values vary greatly among studies.
- Such a variation could be linked to soil properties, climatic conditions, and genetic background.
- No previous research has attempted to explicitly investigate the real cause of this variation.
- Understanding this is however essential in designing sustainable management strategies and the improvement of nutrition of poor rural people who mostly depend on the species.
- The present study evaluated the variation of the proximate composition of fruits and leaves in populations from Benin and Mozambique. It further assessed the impact of soil, climate and genotype on the proximate composition.

## 2. Methodology:



Data were collected from four populations genetically different and analyzed using descriptive statistics, analysis of variance (ANOVA), principal component analysis, redundancy analysis (RDA), and variance partitioning.

Fig 1: Study area

## 3. Results

### Proximate composition of *A. senegalensis* fruits and leaves

- Results revealed significant variation in the proximate composition of fruits and leaves among the studied populations. Ashes and fibers in fruits, and lipids in leaves were 4.8-fold, 2.5-fold, and 1.25-fold higher respectively, in populations from Mozambique.
- Fruits moisture and lipids content were rather 1.4-fold and 1.10-fold higher in populations from Benin. Moisture and lipids were respectively 6-fold and 1.27-fold higher in fruits than in leaves, while ashes, fibers and proteins were approximately twice higher in the leaves than in the fruits.

### Relative importance of the influence of climate, genetic variation, and soil properties on the proximate composition of *A. senegalensis* fruits and leaves genetic variation.

- Genetic groups, climate and soils were found to influence this variation. All three factors explained 74.4% of the variation of nutritional value of fruits and leaves.
- 31.9% of which was exclusively due to genetic variation, 2.8% to the interaction of climate and soils, 24.1% to the interaction of soil and genetic variation, and 15.5% to the interaction of all three factors.

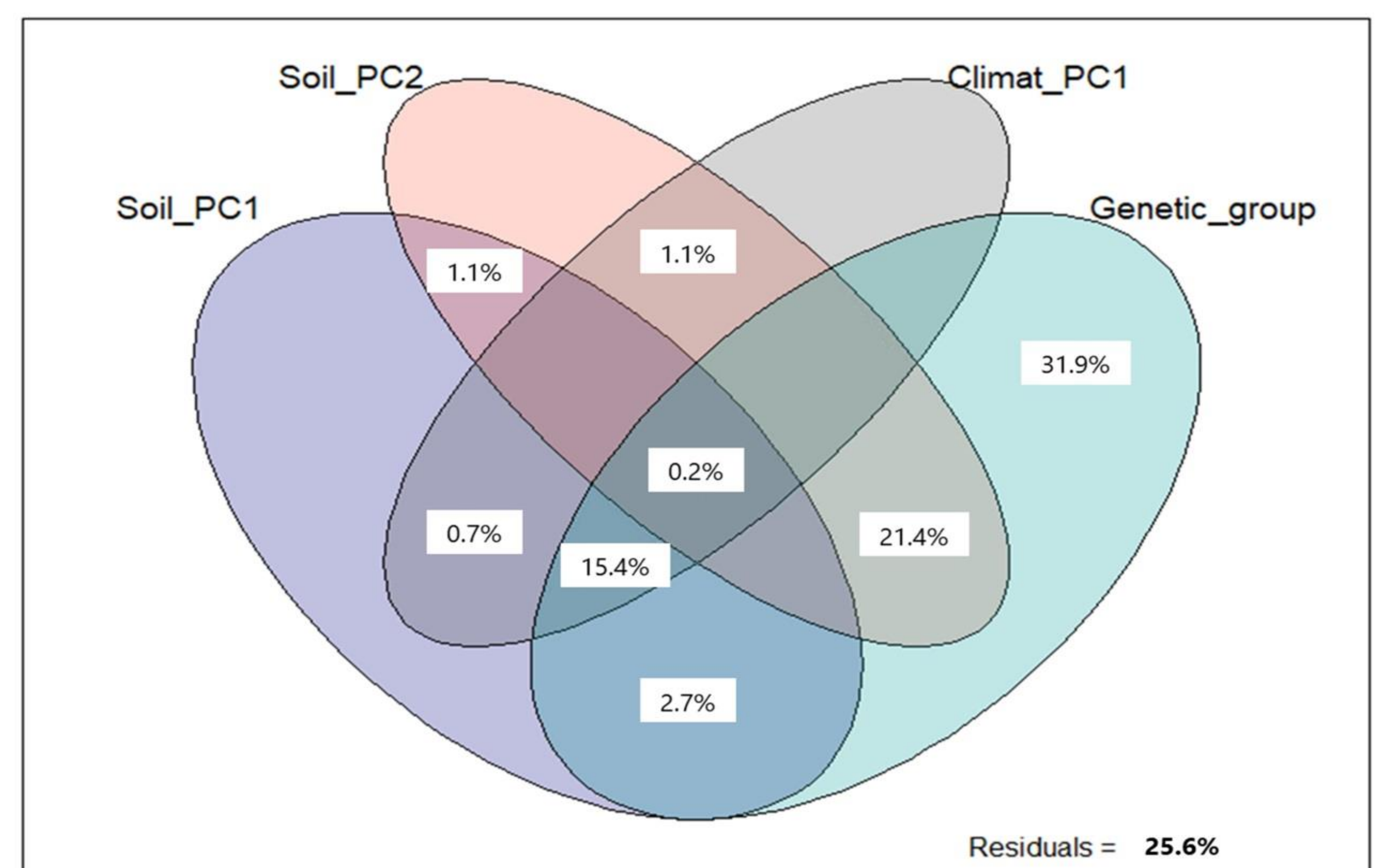


Fig 2 : Venn diagram illustrating the shared and unique variance explained in nutritional value by genetic group, soil, and climate variables.

## 4. Discussion:

- In this study, genetic variation, and soil better than climate stood out as the most influencing factors of the proximate composition of *A. senegalensis* fruits and leaves
- This indicate that an important part of the variation of the proximate composition in *A. senegalensis* fruits and leaves is exclusively due to allelic variation. However, gene expression seems to be dependent of specific climate and soil conditions.
- As such, a breeding program targeting a specific parameter of the proximate composition of *A. senegalensis* should consider genotype and soils.

## 4. Conclusions/Recommendations

- We reported a high variation of the proximate composition in fruits and leaves. Genotype, followed by soils contributed the most to the observed variation.
- However, some factors not considered here might also influence the nutritional composition observed and constitute limitations for the present study .

## 4. Acknowledgements

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