Genetic diversity of cassava (*Manihot esculenta* Crantz) introduced in the oceanic islands of Vanuatu, Melanesia, South Pacific

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VANUATU :

- 83 islands
- Population : 200, 000
- 3 Official Languages : English, French, Bislama
- -+ 100 local languages
- Diet based on root crops (traditionally yam and taro)

CASSAVA IN VANUATU

- Introduced in the 1850s (« sweet » cultivars only)
- Quickly fully adopted by population
- Now cultivated from north to south
- Eaten boiled, roasted or made into *laplap* (traditional pudding)
- Leaves are not consumated
- Vegetatively propagated (stem cuttings)
- Polymorphic
- Its diversity has never been studied in Vanuatu

THE AIM OF THIS STUDY:

- Conduct a survey of the different named varieties and have an estimation of cassava's diversity
- Compare phenotypic and genetic diversity
- Determine the implication of sexual events in generation of the observed variability

Materials and Methods

- **A survey in 10 villages located on a different island : collection of cultivated varieties**

=> A large panel of ecological and cultural situations

Materials and Method

- **Description of cultivars by farmers**
- **DNA extraction from dried leaves**
- **Neutral and co-dominant markers : 12 Single Sequence Repeat (SSR)**
- **Analysis: population description: Hexp, Hobs, Wright's fixation index (Fis values) and construction of a neighbour-joining tree based on the dissimiliraty matrix (genetic groups determination)**

RESULTS

A global collection of 109 different varieties

- max. / village: 21

- min. / village: 5

+ 8 plants issued from seeds

RESULTS

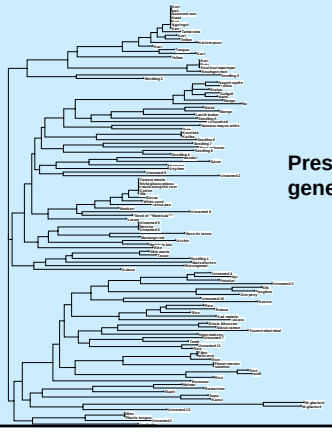
- **Molecular data: 3 to 8 alleles / locus with an average of 5.92 alleles / locus**
- **H_{exp} = 0.6632 and H_{obs} = 0.7162**

	Fis		Fis
Locus 1	-0.087	Locus 7	-0.169
Locus 2	0.093	Locus 8	-0.048
Locus 3	-0.197	Locus 9	0.029
Locus 4	-0.203	Locus 10	-0.097
Locus 5	-0.066	Locus 11	-0.018
Locus 6	0.036	Locus 12	-0.188

For 9 of the 12 loci, Fis values are negative

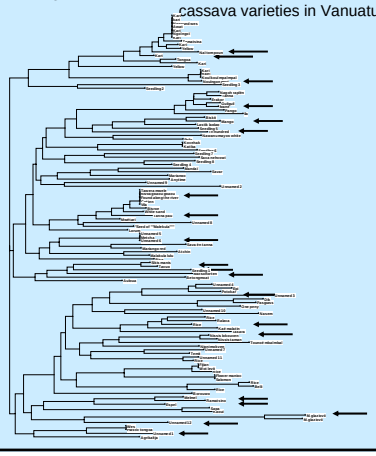
=> The population presents an excess of heterozygotes

Dendrogram based on dissimilarities calculated from the SSR data set on named cassava varieties in Vanuatu.



Presence of genetic groups

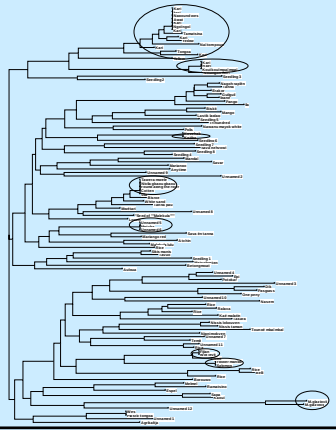
Dendrogram based on dissimilarities calculated from the SSR data set on named cassava varieties in Vanuatu.



Varieties collected in Santo :

No geographical structure of genetic diversity

Dendrogram based on dissimilarities calculated from the SSR data set on named cassava varieties in Vanuatu.



Group A

Group B

« Wild »

Finally: 91 different genotypes in this population

Discussion

- **Loci which are polymorphic and presence of genetic groups:**

  => several different genotypes introduced

- **No geographical organization of genetic diversity:**

  => circulation of cultivars throughout the country

- **A large number of different genotypes:**

  => somatic mutation on SSR loci

  => participation of sexual events in generation of diversity

Discussion

- Excess of heterozygotes in the population:

=> selection of heterozygotes issued from seeds by farmers

Heterozygosity confers advantage to seedlings which favour their retention, multiplication and adoption as new clones

Inadvertent or deliberate selection ?

Discussion

Presence of genetic clones collected in different islands:

=> particular clones appreciated by farmers are clonally propagated and well conserved

Low rate of clonemates (rakes) on the dendrogram:

=> common varieties which are clonally propagated might be melted with incorporated plants issued from seeds

CONCLUSION

- Since their introduction, cassava's clones have circulated widely throughout the country
- Despite vegetative propagation by farmers, it appears that incorporation of volunteer plants occurs commonly enough to have affected genotypic diversity

CONCLUSION

- Human selection, perhaps bolstered by natural selection, has favoured heterozygous genotypes
- Study of genetic diversity within named varieties and study of variation among villages on a single island would give more insights into the structure and dynamics of the diversity of cassava in Vanuatu

Thank you

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