Will Allanblackia trees fruit on-farm? Developing tools for testing

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Introduction

- *Allanblackia* seed is the subject of increased interest for edible oil production. A domestication programme has begun, based on the vegetative propagation of selected types.
- One area where information on the biology of *Allanblackia* is needed is in the level of pollen flow from male to female trees.
- If pollen flow occurs over long distances (scenario A), a higher ratio of female: male trees can be planted in the agricultural landscape than if pollen flow is limited (scenario B).
- Here, we develop a molecular tool to analyse pollen flow, known as simple sequence repeat (or SSR) marker analysis.

A male flower of *Allanblackia*

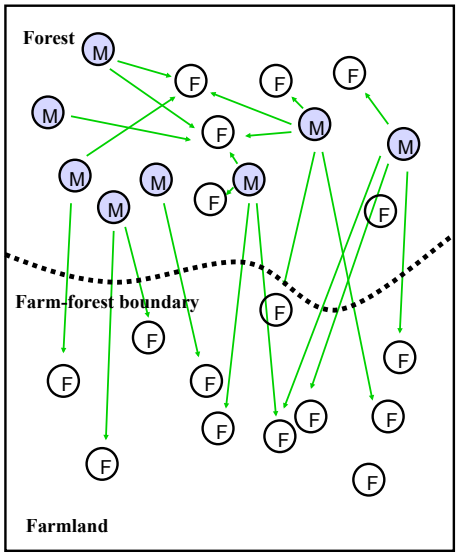
Method

- DNA was sampled from five species and 11 populations of *Allanblackia* (Table 1).
- Markers were developed by sequencing DNA from one individual taken from an *A. stuhlmannii* population in Tanzania.
- Markers that worked well were used to genotype 101 individuals from all 11 populations.

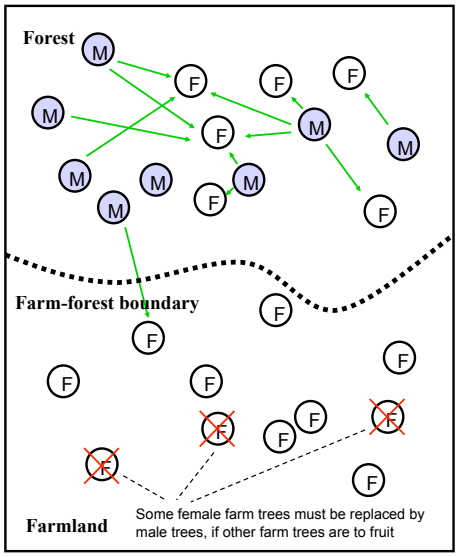
Table 1. *Allanblackia* sampled from three countries in Africa. *N* is the number of individuals scored for four SSR loci, *A* the number of alleles revealed and A_5 the number of alleles corrected to account for varying stand sizes. NA = not available, excluded from analysis because of limited data

Tested material	Species	*N*	*A*	A_5
By site				
Tanzania				
Amani	*A. stuhlmannii*	12.50	10	9.82
Manyangu	*A. stuhlmannii*	9.00	12	10.56
Mazumbai	*A. stuhlmannii*	13.50	10	8.51
Mufindi	*A. stuhlmannii*	10.25	13	11.12
Uluguru	*A. stuhlmannii*	8.75	11	9.49
Ghana				
Composite*	*A. parviflora*	18.25	6	4.58
Cameroon				
Bangangte	*A. gabonensis*	1.75	7	NA
Sangmelima	*A. gabonensis*	-	-	-
Sangmelima	*A. floribunda*	6.75	10	9.05
Yalpenda	*A. floribunda*	11.75	11	8.27
Yalpenda	*A. stanerana*	8.25	9	7.98
Totals		100.75	25	8.82†
By country				
Tanzania	*A. stuhlmannii*	54.00	19	9.90†
Ghana	*A. parviflora*	18.25	6	4.58†
Cameroon	*A. gabonensis*, *A. floribunda*, *A. stanerana*	28.50	16	8.43†
By species				
Tanzania	*A. stuhlmannii*	54.00	19	9.90†
Ghana	*A. parviflora*	18.25	6	4.58†
Cameroon	*A. gabonensis*	1.75	7	NA
Cameroon	*A. floribunda*	18.50	14	8.66†
Cameroon	*A. stanerana*	8.25	9	7.98†

* Collected across an area of ~ 150 km (N/S) by 75 km (E/W) in southwestern Ghana.
† The arithmetic mean of individual stands.



Scenario A. Pollen flow from male (M) to female (F) trees is possible over long distances. Male forest trees can fertilise female farm trees. A higher female: male planting ratio in farmland is possible.



Scenario B. Pollen flow from male (M) to female (F) trees is limited to short distances. Male forest trees can not generally fertilise female farm trees. More male trees need to be planted in farmland.

Results

- Nine SSR markers worked well for *A. stuhlmannii*, but only four across all five species.
- The four primers pairs tested across all individuals revealed between two and 12 alleles at a locus, with a total of 25 alleles observed.
- On average, Tanzanian stands showed most allelic diversity, followed by Cameroonian stands and then Ghanian material.

Discussion

- SSR markers revealed sufficient variation to make them appropriate for assessing pollen flow in *A. stuhlmannii*.
- Cross-species application of markers appears limited and each species may require its own set of SSRs.

Future work

- SSR markers developed for *A. stuhlmannii* will be used to test scenarios A and B for forest and remnant farm stands in Tanzania.
- The material needed for testing (parents and progeny) is currently being collected.

Acknowledgements
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Further reading
Russell JR, Kadu CAC, Jamnadass R, Booth A, Cordeiro NJ, Woodhead M, Dawson IK (2008) Genetic diversity in the African fruit tree *Allanblackia*: implications for conservation and use of a genus newly subject to domestication. *Conservation Genetics* (under review).