The participatory evaluation of Amaranth germplasm for leaf yield in South Africa.

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Introduction

Amaranth is a very popular leafy vegetable in South Africa and Africa. It is locally known as 'thepe' or 'imbuya'. Amaranth is very nutritious and 100 g cooked amaranth can contribute up to 70% of the daily beta-carotene and 30% of the daily iron needs of growing toddlers. Traditionally, amaranth is wild harvested but it can be cultivated with great success, however, no genetically improved material is available in South Africa. The Agricultural Research Council (ARC) in collaboration with the University of York (UoY), University of North West and the Department of Agriculture, Forestry and Fisheries (DAFF) has embarked on a project to evaluate amaranth germplasm.

Materials and Methods

Eleven promising amaranth lines (Table 1) were selected from the ARC germplasm collection. A formal yield trial were conducted at the ARC-Vegetable, Industrial and Medicinal Plants, Roodeplaat research farm, Gauteng. The yield trial were planted in a randomised complete block design with three replicates during 2018/19 and 2019/20 cropping seasons. The young growth shoots and leaves were harvested three times and the fresh and dry weight of the three harvests were determined. In addition, participatory demonstration trials were planted during 2019/20 cropping season and with two farmers in Gauteng, one farmer in Mpumalanga and a farmers group in KwaZulu Natal (Figure 1). Seedlings were supplied to the farmers and then the farmers were visited during the growing season. Focus group discussions were held with each visit.

Table 1: The amaranth germplasm included in the project

Accession Number	Name	Specie	Attributes
ARC-IV-83	Life-power Amar	*cruentus*	Tall plant and high yield, high overall
ARC-IV-117	ACAT Seedfair	*cruentus*	South african, quite good overall, not tall
ARC-IV-539	A550	*sp*	Indigenous, high yield, quite tall
ARC-IV-367	Den Do (TOT4151)	*hypochondriacus*	Long time to flowering, Vietnamese, red colour
ARC-IV-120	Appelschbos Imbuya	*graezicans*	High Zn, good branching,
ARC-IV-107	Anna 2000	*cruentus*	High Zn, Fe,
ARC-IV-36	Ames 2241	*cruentus*	High leaf size and high Zn, high overall
ARC-IV-78	Local 33	*sp*	High leaf number, Indigenous
ARC-IV-87	050613 49	*caudatus*	High leaf number, good leaf area
ARC-IV-116	Green stem imbuya	*cruentus*	Good for plant height and leaf number
ARC-IV-32	Arusha	*cruentus*	High iron

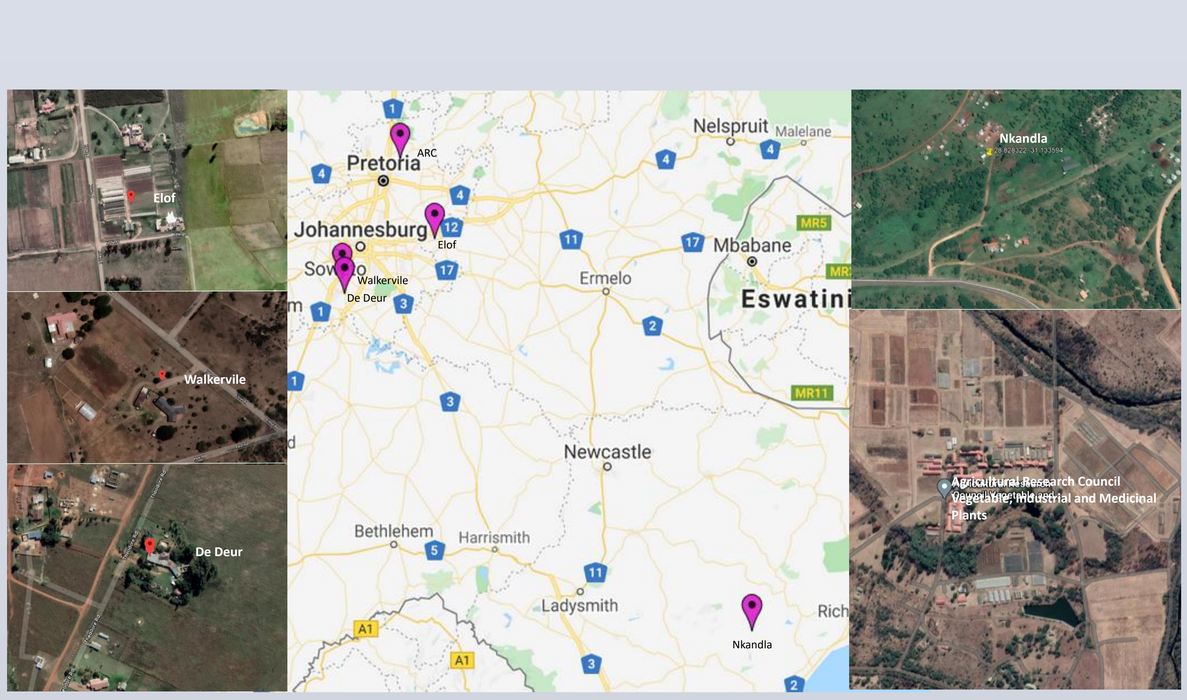

Figure 1: The location of the different trial sites in South Africa with aerial views of each site

Materials and Methods

The project was based at five sites, namely, ARC VOP (Roodeplaat), Walkerville and De Deur in Gauteng, Elof in Mpumalanga and Nkandla in KwaZulu Natal

The feedback from the farmers on the different lines were as follows:

Elof: The buyers prefer the small leaved lines like Local 33 because it is what they used to. However, Local 33 has a low yield.

De Deur: Prefer the large leaved varieties because it is easier to harvest.

Walkerville: The buyers prefer green leaved lines. They said that the large leaved green varieties, like Anna and Arusha, taste the same as the small leaved lines. They do not like the Den Do (TOT4151), with red leaves, because the taste is too bitter. They also like ACAT seed fair despite the reddish tint of the leaves.

Nkandla: The cooperative members and their buyers prefer Anna, Arusha and ACAT seed fair, because they like the taste and the big leaves is easier to harvest. The also feel that the red leaved Den Do is too bitter, however, they give it to the children that have stomach ailments.

Yield trial

The average yield vary from 31.46g (A550) to 92.19g (accession Amar) figure 2). Accession A550 has the lowest yield compared to the test accessions because it is an *Amaranthus tricolor* line. Those are generally small plants with large leaves that mature very early. In production, they will be suitable for gardens where single leaves are harvested and the crop is replaced at shorter intervals (6 to 8 weeks). The projected yield per hectare, with a spacing of 30 cm within row and 50 cm between rows (66 666plnts/ha) vary from 2.1t (accession A550) to 6.15t (accession Amar).

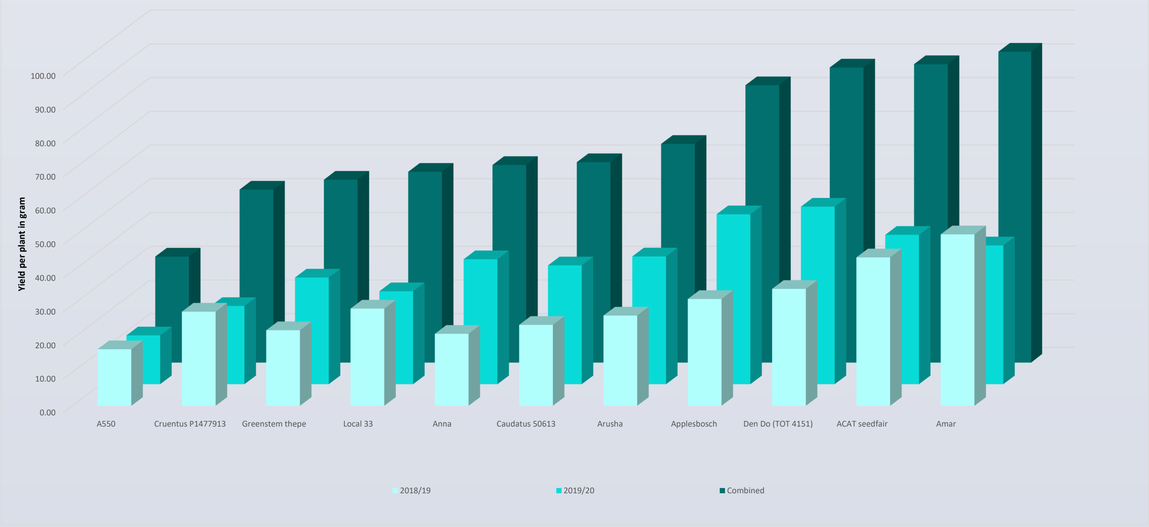

Figure 2: The fresh yield per plant of the amaranth lines included in the trial

Conclusion

In general, accessions Anna, ACAT seed fair and Arusha are the most popular among the farmers and their buyers. Den Do is perceived as too bitter by some or is used as a medicine. However, other red leaved varieties tested since were well received. In other areas (not part of the this study) Den Do was preferred to Anna and Arusha. This support the notion that the background of the person do have an influence on their preference.

Based on the farmers preference and yield, four lines (accessions Anna, Den Do (TOT4151), Arusha and ACAT seed fair) can be earmarked for registration and commercialization. Den DO is specifically included for its red leaves. Seed of these lines will be multiplied and bulked for distribution to farmers for production.

Acknowledgements

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