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Development of high yielding, early maturing *Grain Amaranth*

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Introduction

Leafy vegetables of Amaranthus are a significant dietary component in Sub-Saharan Africa, with black and pale-seeded varieties being the most popular. Globally, pale-seeded (grain) Amaranthus holds great potential due to its high protein content, making it suitable for confectioneries, biscuits and pastries. However, its production and utilization are limited, leaving it underutilized and lacking commercial recognition despite its immense nutritional and economic potential. This study seeks to enhance the production levels of Amaranthus for both leaf and seed to address these challenges.

Materials & Methods

Grain amaranth seeds were selected from advanced populations derived from breeding NHAMARI. The following procedures were employed:

1. DNA Extraction: SDS extraction protocol with modifications to improve DNA quality using the dried lead method.

2. Quality Analysis: DNA quality was assessed through agarose gel electrophoresis.

3. Sequencing: Amplified fragments were sequenced using an Applied Biosystems 3130xl Genetic Analyzer and the BigDye terminator v3.1 cycle sequencing kit.

4. Genetic Analysis: BioEdit software and MEGA X were used for nucleotide analysis and phylogenetic assessments.

Fig. 1: Cream Seed Amaranth

Fig. 2: Seed Amaranth

Results

Field Performance: The cream-seeded Amaranthus demonstrated excellent performance in farmers' fields, achieving an overall acceptability score of 88.5 out of 100.

Growth Characteristics: The first leaf harvest was achieved 10 days after transplanting.

Genetic Differentiation: Sequencing identified and separated NHAMARI from the cream-seeded Amaranthus, grouping them into two distinct phylogenetic clusters.

Yield: The new variety outperformed the previously released NHAMOLA5 (NHAMARI), yielding 2.8 t/ha compared to 2.5 t/ha for NHAMARI.

>NHAMARI

CTTAATSTAAGTGCCAAGATTAACAATAAGACTTATTATACTC
CTGATTATGAAACCCTARATACTGATATCTTGGCAGCATTCC
GAGTAAGTCCTCAACCTGGAGTTCCACCTGAAGAAGCGGG
GGCTGCAGTAGCTGCCGAATCTTCTACTGGTACATGGACAA
GTGTATGGACCGACGGACTTACCAATCTTGATCGTTACAAA
GGACGATGCTACAACATCGAGCCCGTTGCTGGAGAAGAAA
ATCAATATATTTGTTATGTAGCGTATCCTTTAGACCTTTTTGA
AGAAGGTTCTGTTACTAACATGTTTACTTCCATTGTGGGKAA
CGYATTTGGGTTCAAARCTTTGCGTGCTCTACMTTTGGAAG
ATTTGCGAATCCCTGTTGCTTATGTCAAAACTTTCCAAGGSC
CKCCTCWCGGWATCCAGGGTGAAAGARATAAATTGAACA
AGYACGGSCGTCCCCTATTGGGATGCACTATTAAACCASAAT
TGGGGGGATCCGCTAAAAACTAT

>AMARANTHUS CREDM SEED

AKYYYSSGTTKCWYMAGAYATRMSRMTAWGRCTKMKKAK
ACAYYYKRWKTWWSAAAACCCTAGATACTGATATCTTGGC
AGCATTCCGAGTAAGTCCTCAACCTGGAGTTCCACCTGAAG
AAGCGGGGGCTGCAGTAGCTGCCGAATCTTCTACTGGTACA
TGGACAAGTGTATGGACCGACGGACTTACCAATCTTGATCG
TTACAAAGGACGATGCTACAACATCGAGCCCGTTGCTGGA
GAAGAAAATCAATATATTTGTTATGTAGCGTATCCTTTAGACC
TTTTTGAAGAAGGTTCTGTTACTAACATGTTTACTTCCATTG
TGGGTAACGTATTTGGGTTCAAAGCTTTGCGTGCTCTACGT
TTGGAAGATTTGCGAATCCCTGTTGCTTATGTCAAAACTTTC
CAAGGCCCGCCTCACGGTATCCAGGTTGAAAGAGATAAATT
GAACAAGTACGGTCGTCCCCTATTGGGATGCACTATTAAAC
CAAAATTGGGGKTATCCGCTAAAAACTATGGTCGAGCATGT
TATGAATGTCTTCGCGGTGGACTTGATTTTACAAAM

>NHOKRA1

ATTMCGTCCCAAACAGAGACTAAAGYGCGGWGGACTTGA

Sample Codes	Identity
NHAMARI	Amaranthus hypochondriacus
AMARANTHUS CREDM SEED	Amaranthus retroflexus

Conclusion

The genetic improvement and field trials of cream-seeded Amaranthus have successfully produced a new high-yielding, early-maturing variety. Its enhanced yield, nutritional potential, and excellent acceptability make it a promising candidate for addressing the underutilization of grain Amaranthus and fostering its commercial recognition.