

Agro-morphological Characterization of *Amaranthus* spp.

*Presentation by
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Slide 1

MSOffice1 Please include Institution of affiliation: In this case include the co-author thus
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Introduction

- A wide range of indigenous vegetables are consumed in Malawi MSC
- Valued in rural areas, but people in the cities increasingly turning to these crops (Schippers, 2000)
- Rural families traditionally have made conscious efforts to preserve these plants (Kwapata, *et al.* 1992).

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Introduction Cont...

Amaranthus (Amaranthaceae)

- *Amaranthus* is one of the vegetables considered indigenous in Africa
- Extremely variable, erect to spreading herb (Rensburg *et al.* 2007)
- High amts of vit C, iron, β carotene, calcium, folic acid and protein. (O'Brien and Price, 2008; Kwapata *et al.*, 1992).

Introduction...

Importance of IVs



- **Employment: peri-urban masses**
- **Vitamins and micro-elements (O'Brien & Price, 2008; Kwapata *et al.* 1992).**
- **Livestock feed (O'Brien and Price, 2008)**

Problem Statement & Justification

- Availability of IVs has declined
- Some *Amaranthus* spp consciously preserved evolved locally but have not been characterized
- Need to properly characterize and select, using morphological traits, preferred spp

Problem Statement & Justification...

- **Promotion of the best cultivars of *Amaranthus* spp never considered in Mw. attention given to exotic vegetables.**
- **Need for some further studies on different *Amaranthus* spp currently under cultivation in Mw**

Research Goal

- Document the diversity of *Amaranthus* genotypes under cultivation in the study areas
- Evaluate growth performance of those different genotypes.
- Select and recommend to farmers spp that are better performing & demonstrate favourable traits

Objectives

● Overall:

- To characterize morphological diversity, and to assess the cultivation of *Amaranthus* spp in Central Malawi

● Specific:

- To characterize diversity of *Amaranthus* spp using morphological traits
- To evaluate the growth performance of *Amaranthus* spp that are being cultivated

Materials & Methods

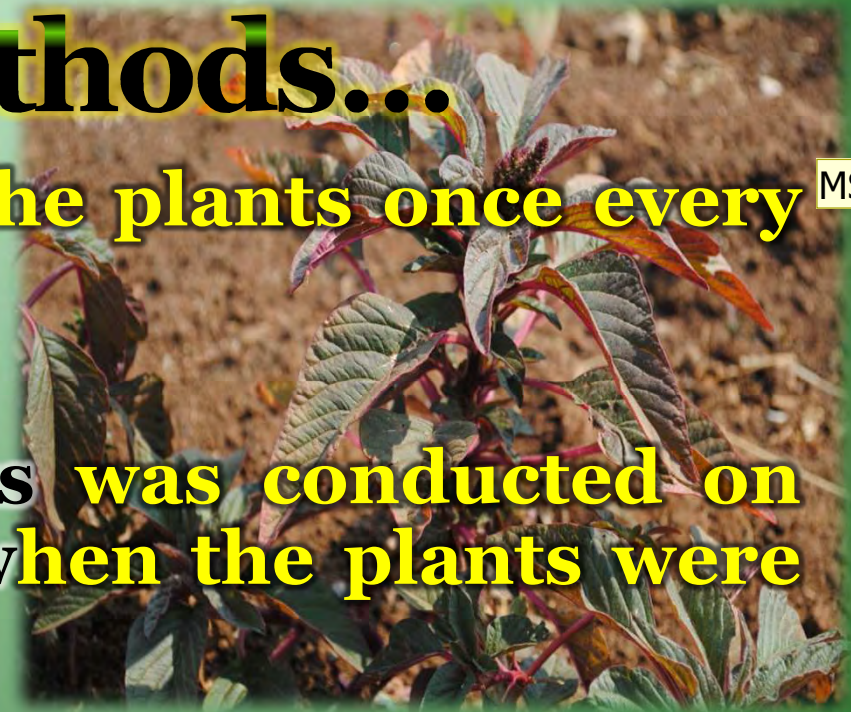
- 8 accessions established & maintained at the horticulture farm
- 3 of these accessions were from the area around Bunda - *A. cruentus* (LL-BF-02), *A. hybridus* (LL-BF-05), *A. lividus* (LL-BF-01) and Green giant (LL-BF-04)
- 2 from Dedza *A. cruentus* (DZ-BF-01) & *A. hybridus* (DZ-BF-02)
- 1 *A. hybridus* (KU-BF-01); 1 *A. cruentus* (ZW-BF-01), and 1 *A. hypochondriacus* (BV-BF-01) each from Kasungu, Zalewa and Bvumbwe research station respectively.

Materials & Methods...

- 1st established by direct planting on 29th Aug 2011 on 10 x 1m sunken beds 0.6m apart.
- Planted in 3 rows at 0.45m between rows and 0.2m within rows
- Successful establishment on the 10th of October, 2011 on ridges. Each accession planted on 2 ridges.
- Weeding in the first 3 weeks done manually and done using a hoe after thinning

Materials & Methods...

- Pesticides applied to **the plants once every** week. MSC
- Thinning of the plants **was conducted on 31st of October, 2011 when the plants were 14 – 23 cm in height.**
- **23-21:0+4s** was applied a week after emergence and every 2 weeks thereafter.
- Other 19 were characterized *in situ* bringing the total of studied accessions to 27.



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Materials & Methods...

Sampling Techniques



- Accessions planted at the farm allocated to ridges at random
- 5 plants randomly selected for characterization both *in situ* & *ex situ* except in spots with few plants *in situ*
- 5 samples/accession taken for LL, LW, BbL, TbL, ISL, ILL, AIL, leaf & seed yield

Materials & Methods...

Data Collection

- Collected based on IPGRI Amaranthus descriptors

- Qualitative traits: *GH, PP, BI, LP, RT, SP, LS, IS, SPg, IA, AI, ID, IC & LPg*

- Quantitative traits: *PH, LL, LW, BbL, LN, ISL, TbL, PL, ILL, AIL, LY & SY*



Materials & Methods...

Data Collection...

- Leaf yield data was collected for 3 times (in 2 week intervals)
- Seed yield data collected after maturity from field plants only



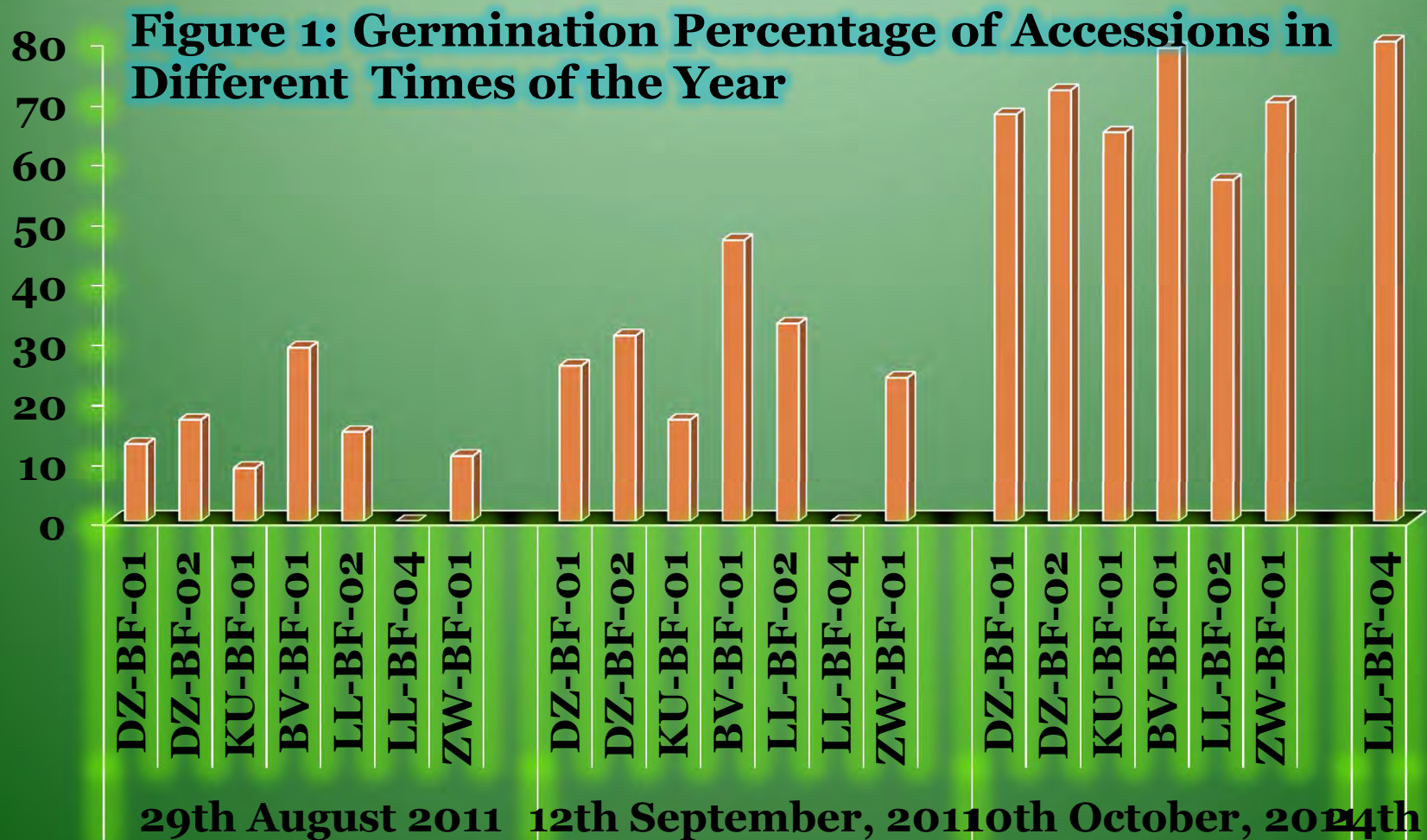
Data Analysis

- Data on qualitative traits SPSS analyzed
- Data on quantitative traits analyzed using GenStat to generate ANOVA tables.
- MINITAB generated cluster dendrogram. Characters score as per IPGRI descriptors
- Mean data was subjected to statistical analysis to calculate range, std dev and CV
- Means were compared using Tukey's Test in GenStat.

Results & Discussion...

Establishment

MSO



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Results & Discussion contd

Table 1: Qualitative traits of Amaranth spp

PARAMETERS	DESCRIPTION	
GH	20 Erect	7 Prostrate
BI	1 Few all base , 2 Many all base, 22 branches all along, & 1 AAT	
SP	1 Present	26 Absent
SPg	14 Green with 4 Dark Green, 11 Red & 2 Green with Red Stripes	
AI	16 Absent (28.6% Prstr & 71.4% Erect)	11 Present (70% Pst & 30% Erect)
IC	16 Green, 6 Red/Purple, 5 Rusty (Mixture of Red & Green Parts)	
SLA	6 Spines	21 No spines
LP	Absent in all	

Results & Discussion contd...

Table 2: Quantitative traits of Amaranth spp

Trait	Minimum	Maximum	Grand Mean	CV %	SE
PH	38.30	361.00	154.80	49.40	76.49
BbL	12.40	291.00	92.83	22.80	21.16
TbL	2.00	116.70	31.96	19.50	6.01
AIL	0.20	12.80	3.08	27.60	0.38
LL	1.9	29	15.86	7.70	1.22
LW	1.2	16.5	8.73	4.70	0.41
PL	1.3	18.5	8.88	5.30	0.47
LN	316	7319	2182.00	42.50	927.50
ISL	4.9	69	24.16	30.70	7.43
ILL	2.1	18.1	7.29	5.70	0.41

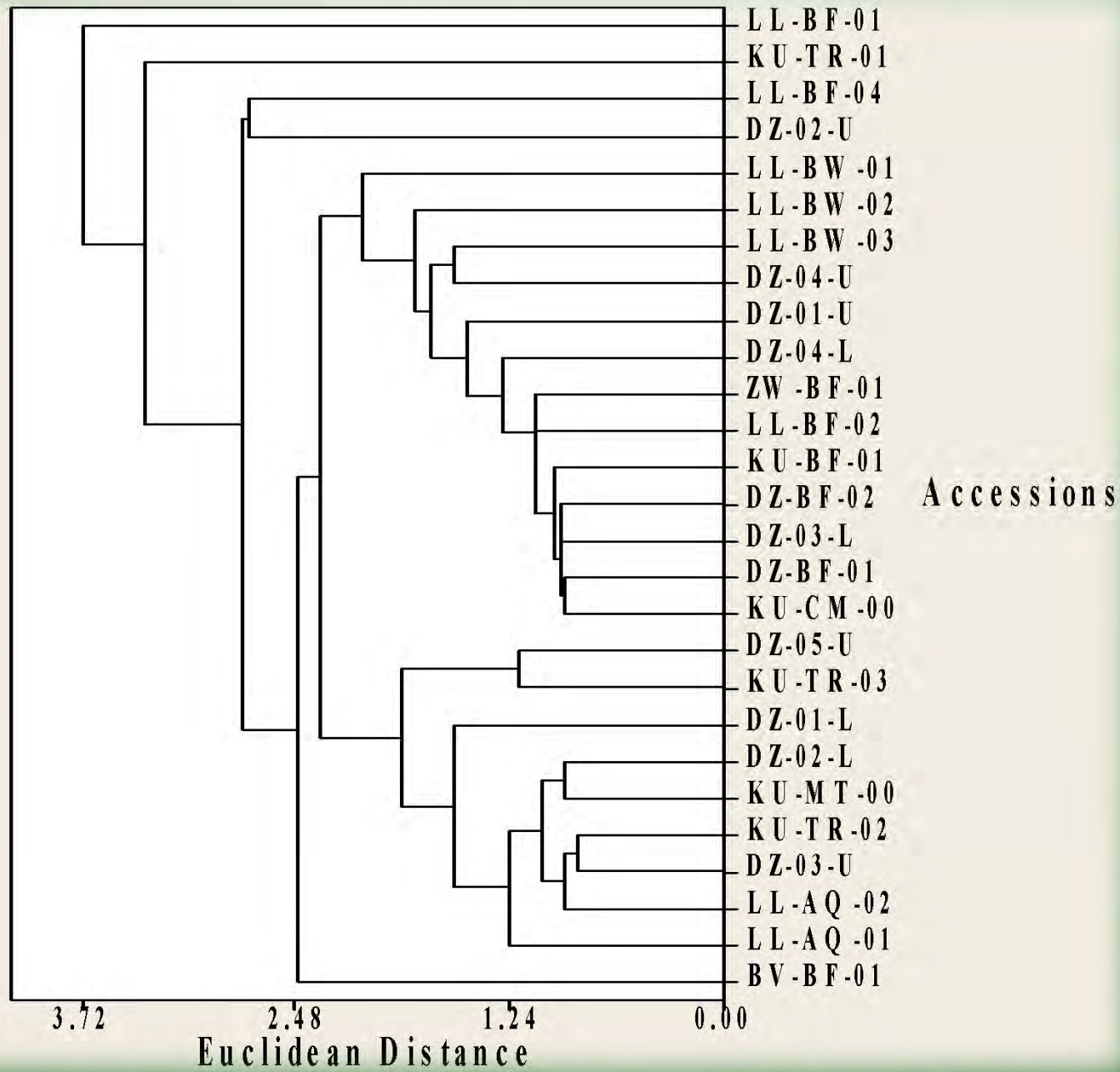


Figure 2: Dendrogram separating the accessions

Results & Discussion...

Table 3: Yield parameters of the Accessions

Accession	Leaf Yield (g)				Seed Yield (g)
	Week 2	Week 4	Week 6	Total	
1) LL-BF-02	450	710	3500	4660 c	267.65 c
2) LL-BF-04	480	5100	13000	18580 a**	178.85 f
3) ZW-BF-01	390	630	2500	3520 f	277.08 b
4) DZ-BF-02	510	740	3600	4850 b	77.78 g*
5) DZ-BF-01	430	690	3300	4420 d	250.14 d
6) KU-BF-01	430	700	3200	4330 e	244.91 e
7) BV-BF-01	270	310	550	1130 g*	685.43 a**
Mean	422.86	1268.57	4235.71	5927.14	283.12

** Maximum

* Minimum

Data on each Accession was collected from 5 plants

Challenges

- **It was difficult to identify accessions in spots**
- **Preferred by livestock, nibbled**
- **Poor road conditions to site**
- **Establishment affected by irrigation**

Conclusion

- **There were clear differences among the different accessions**
- **Plant height, growth habit, leaf number, seed yield, spines were most important in separating accessions**
- **BV-BF-01 – High seed yield, LL-BF-01 – Dwarf with all parts smaller than other accessions and LL-BF-04 – Huge crown**
- **Agromorphological characterisation important step in attaining Conservation of biodiversity, promotion of production of NUS for nutrition**

Recommendations

- It would help if similar studies were conducted in all regions including use of molecular markers
- Conservation of the studied species and others that are endangered has to be considered in the National Gene Banks
- Owing to the different growth habits of Amaranthus species, there is need of more agronomical research

Acknowledgements

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Thank



You...