Institute of Horticultural Poduction Systems
Vegetables Systems Modelling
Leibniz Universität Hannover

Quantifying Architectural Traits of Amaranths (*Amaranthus* spp) by 3-Dimensional Digitisation

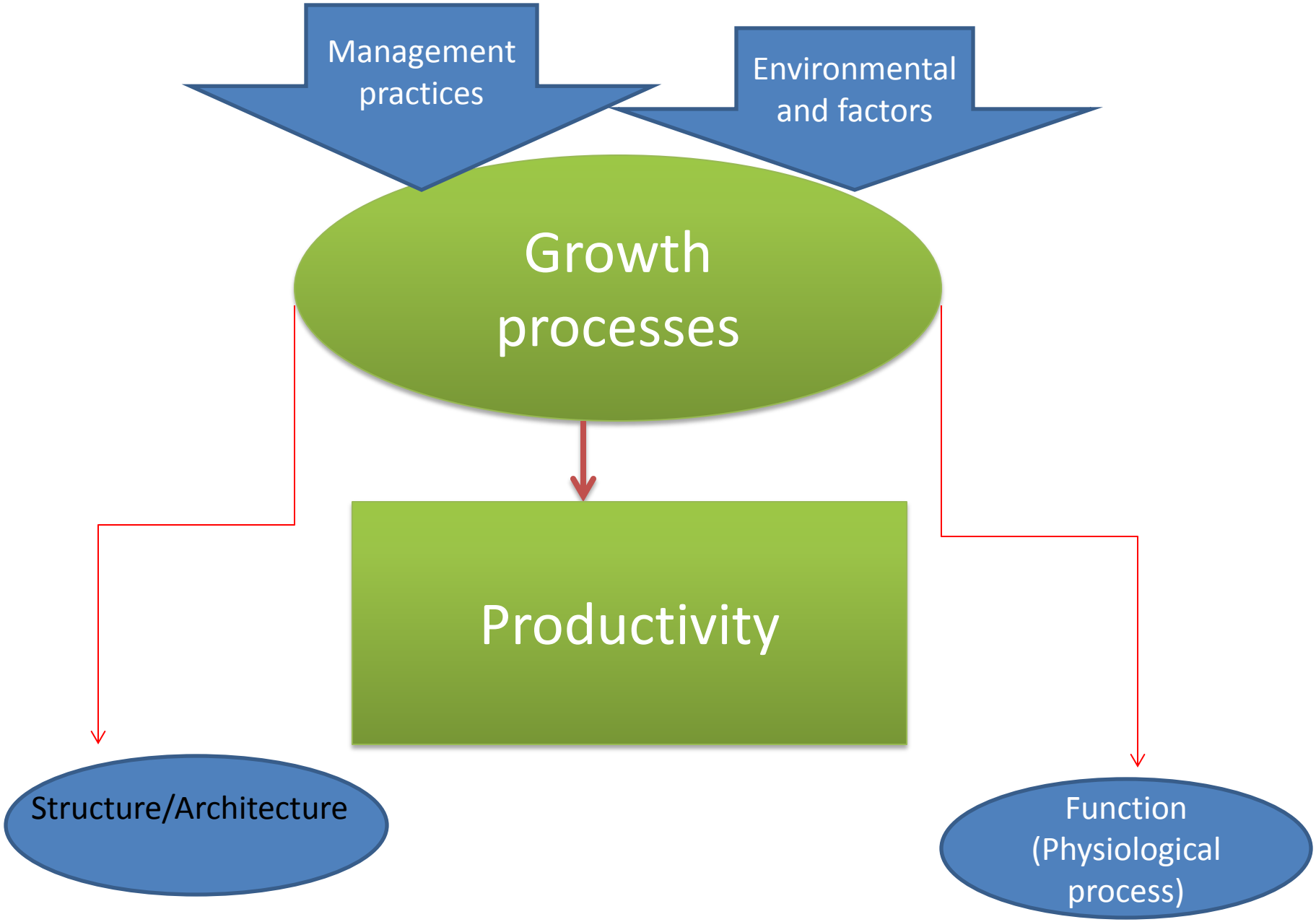
M.Osei-Kwarteng, I. Napp, D. P. Moualeu & H. Stutzel

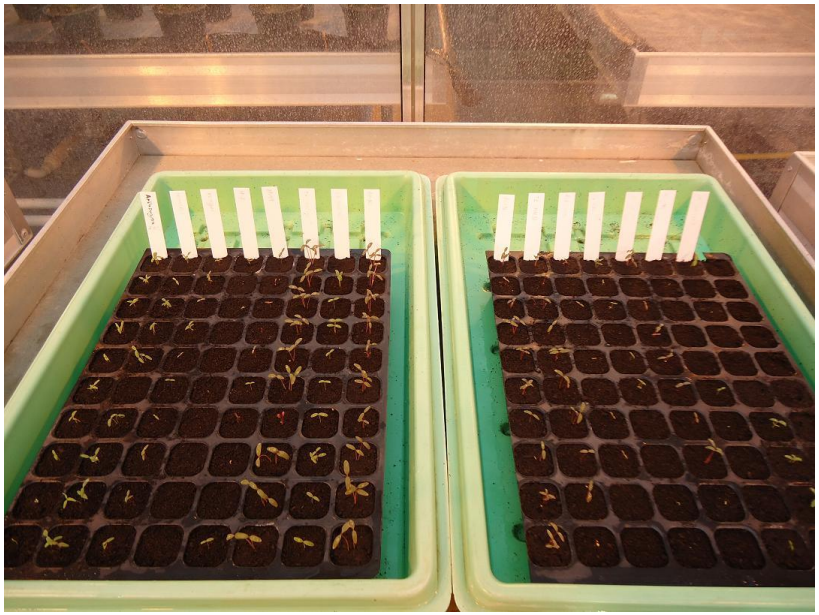
A.cruentus : Ex Zim – Vegetable

A.hypochondriacus : TSM -102 (Grain)

A.tricolor: Arkasuguna (Vegetable –Asian)

A. dubius (Mombo 2)


Management practices
Environmental and factors
Growth processes
Productivity
Structure/Architecture
Function (Physiological process)



A.cruentus

A.dubius

A.hypochondriacus

A.tricolor

Objective:

Quantify architectural traits in four *Amaranthus* spp and relate them to their dry matter yield

Architectural traits : leaf size (length and width) , leaf shape, leaf orientation angles (inclination and azimuth) and internode length.

Materials and Methods

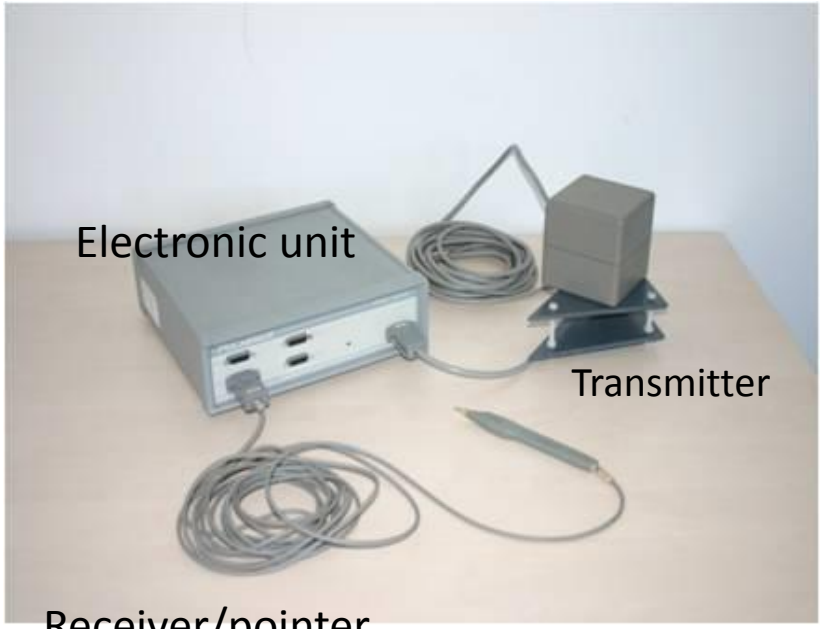
•Grown under non limiting nutrient and water conditions
•Spacing: 30 cm x 30 cm isometric
•Duration: May-June 2015 on the field
•Location: Institute of Horticultural Production Systems, Hannover (52°2’ N) Germany
• Experimental design: Randomized complete block (RCBD)
•Statistical analysis: Analysis of variance procedure (SAS,2003)

Materials and Methods

Digitising:

Plants were digitised acropetally in a standardized sequence

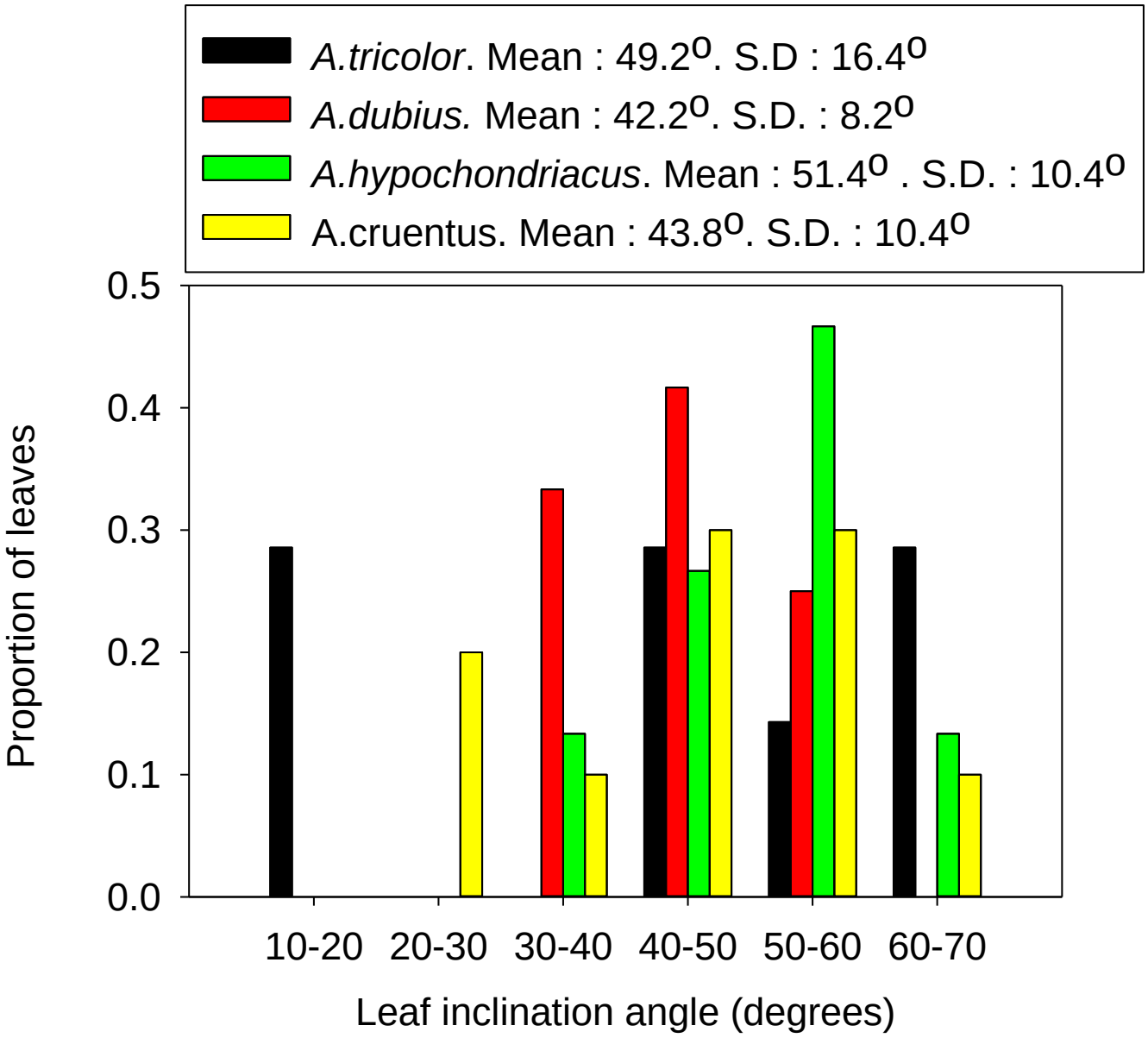
- Leaves were digitised with 9 points
- A node was the point of attachment of a leaf petiole on the stem
- Internode was the interval between two nodes
- Four plants were digitised per genotype



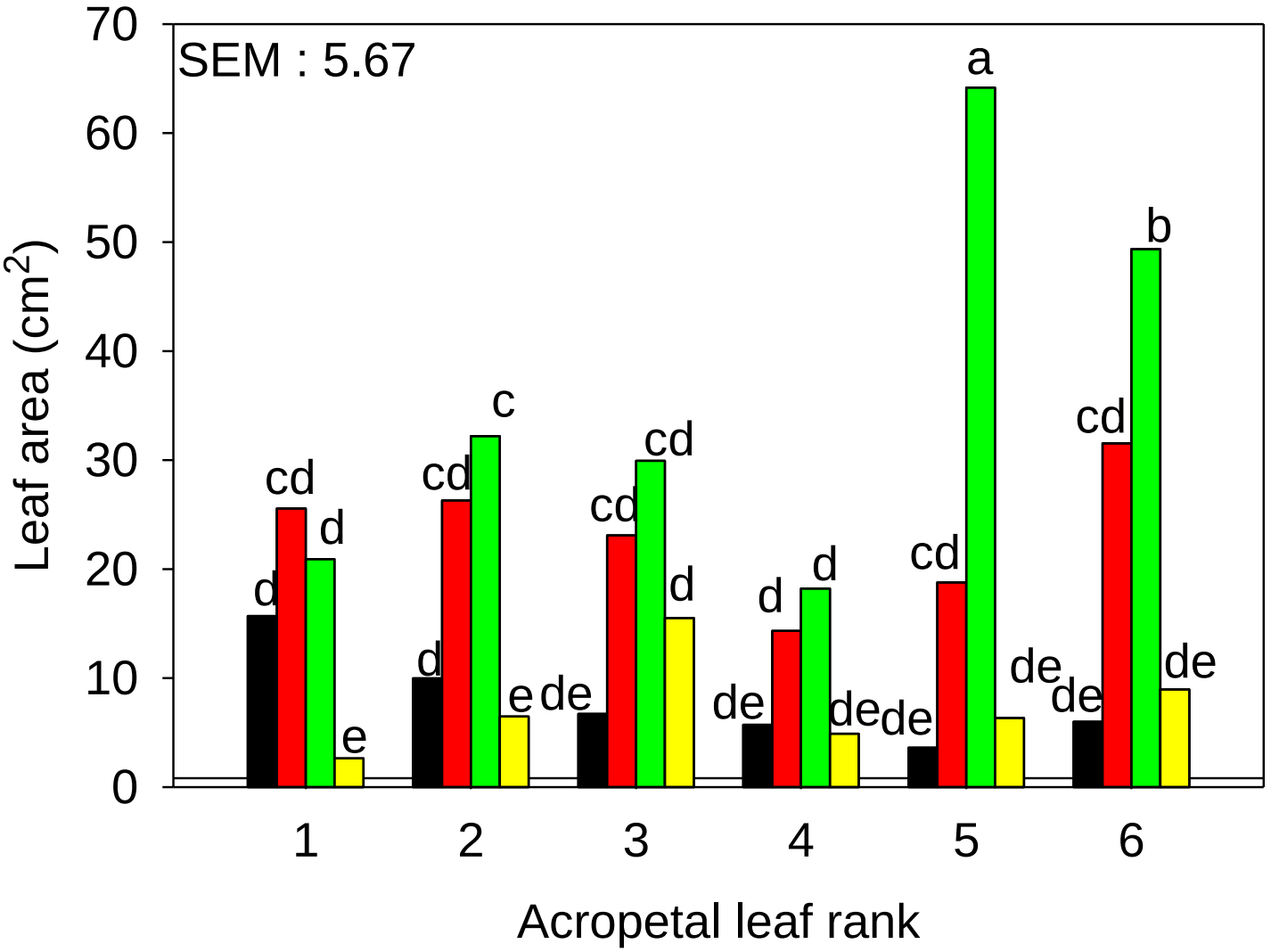
3-D Fastrak magnetic digitiser

Digitising plants

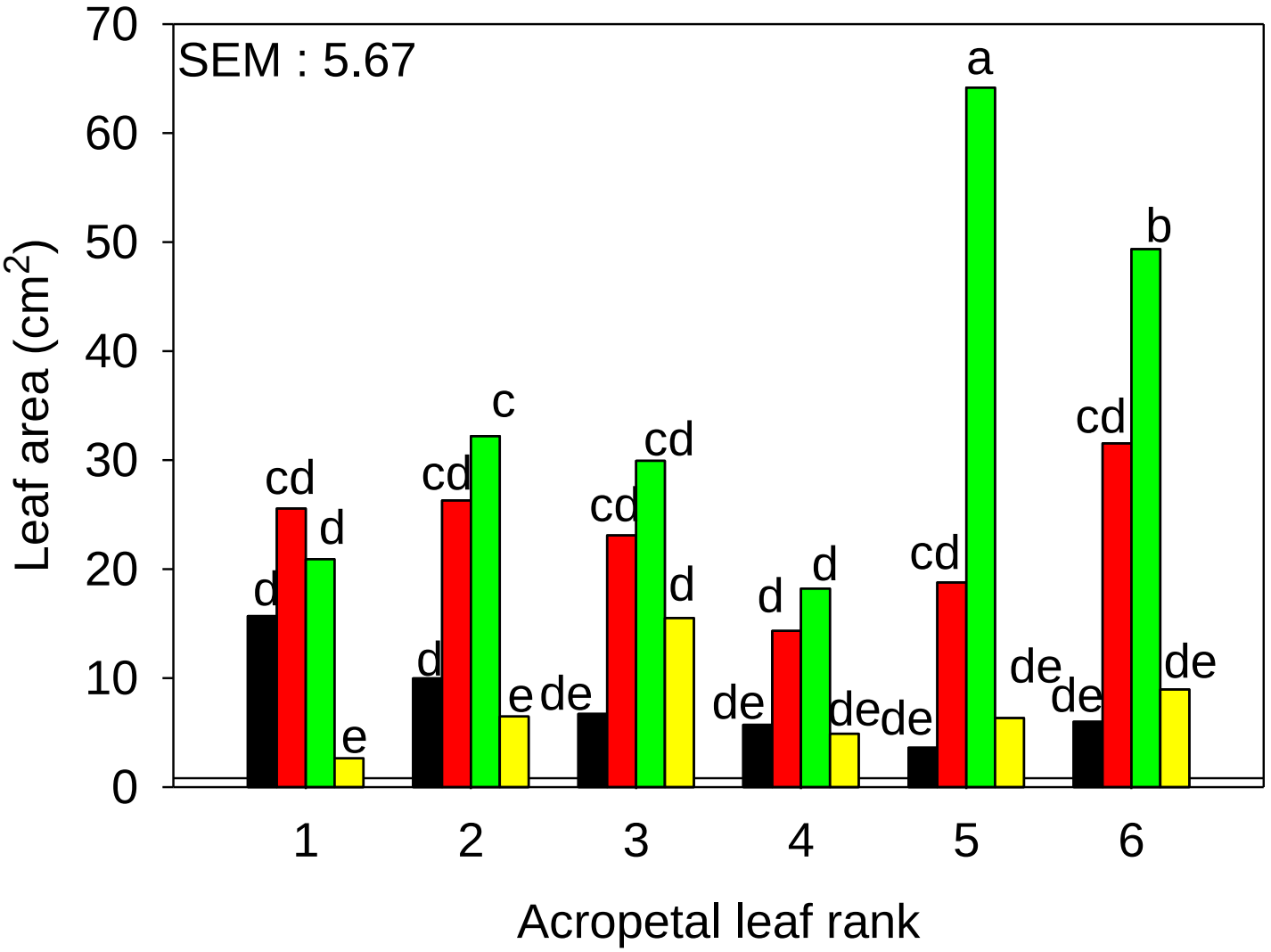
Preliminary results

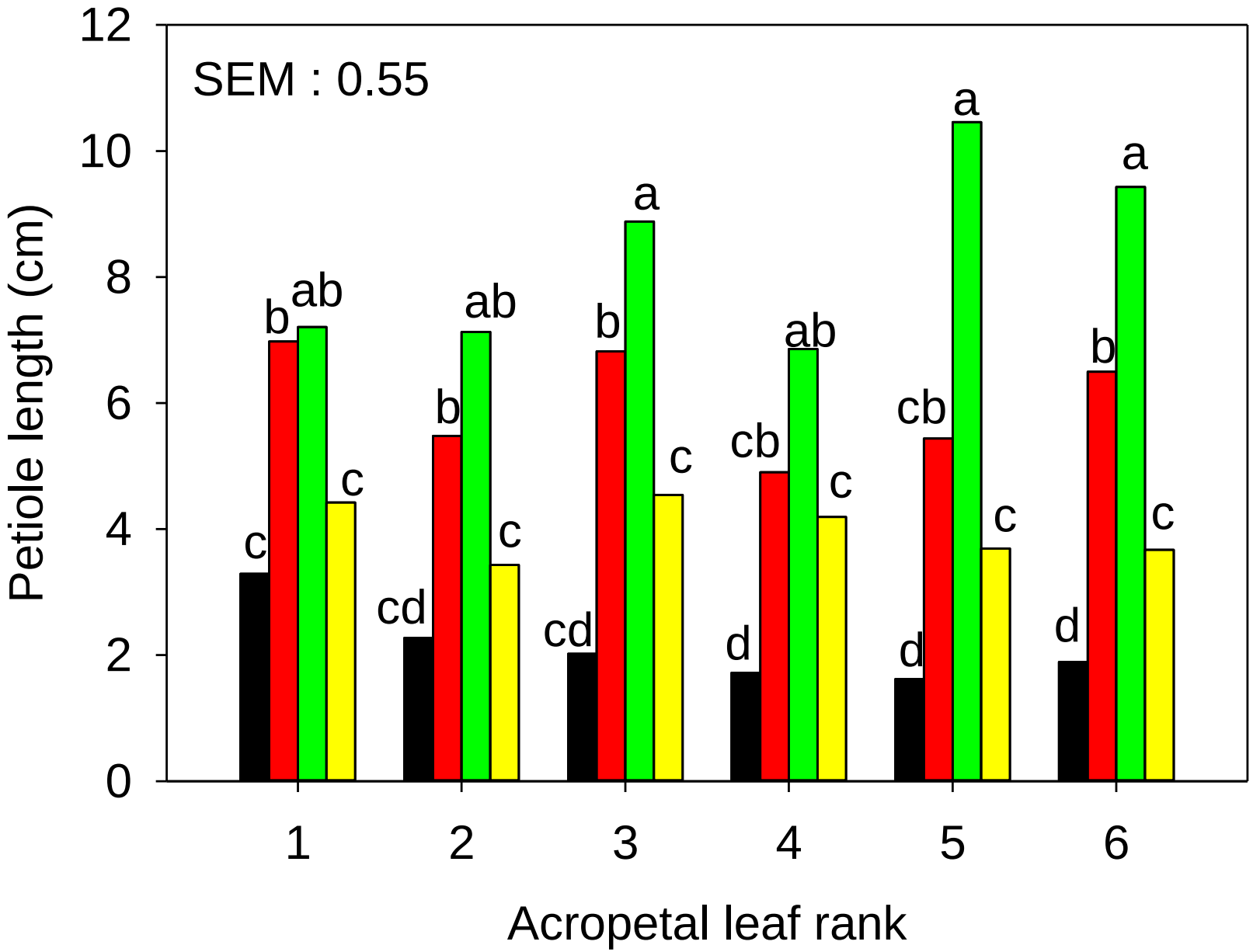


Preliminary results



Preliminary results




SEM : 0.55
Petiole length (cm)
Acropetal leaf rank
0
2
4
6
8
10
12
1
2
3
4
5
6
c
b
ab
c
cd
b
ab
c
cd
b
a
c
d
cb
ab
c
d
cb
a
c
d
b
a
c

Conclusion

- Young plants of *A. tricolor* have leaves equally distributed from being fairly horizontal to vertical in orientation.
- Young plants *of A tricolor* and *A cruentus* exhibit low leaf areas across existing leaf positions with *A. tricolor* displaying low petiole length.
- The fifth acropetal leaves of *A. hypochondriacus* have large leaf area and longer petioles than the other genotypes
- Significant interaction effects exist between leaf position and some leaf dimensions

Outlook

- Analyse other architectural traits and construct a 3D static model plant from digitised data
- Relate the angular distribution and projected leaf area of genotypes to light interception
- Relate differences in architectural traits to dry matter yield

Thank You For Your Attention !!!!