



DIVERSITY of SORGHUM

Dr. Magdalena Buschmann
KWS

SORGHUM ORIGIN

- Sorghum is from the family POACEAE
- Sorghum has its origin in Northeastern Africa as a wild plant
- Earliest known record of sorghum comes from Egyptian-Sudanese border and had been dated at 8.000 B.C.
- Sorghum belt is between 40 degrees North and 40 degrees South of the equator, in warm and hot countries characteristic for semi arid environment
- Sorghum is usually grown in areas that are too hot and dry for maize
- Over 50% of World sorghum varieties are hybrid, the lowest concentration of hybrid varieties is in Africa
- Hybrid production system is CMS



SORGHUM CLASSIFICATIONS

- Botanical classification
- Classification according usage

What do we see in the picture?



Source: KWS

SORGHUM TAXONOMY

Sorghum (*Sorghum bicolor* L. Moench)

- a tropical grass grown primarily in semiarid parts of the world, particularly in Africa, India and Asia, where it is an important staple food crop. It is a member of the family Poaceae and the tribe Andropogoneae, of which there are three main species:
 - ***S. bicolor*** - diploid ($2n=20$) all annual and domesticated types, including stabilized weedy derivatives such as Sudangrass. Widely distributed.
 - ***S. halepense*** - Johnsongrass. Tetraploid, native perennial of southern Eurasia, east to India.
 - ***S. propinquum*** - Diploid, native perennial of Sri Lanka and southern India.



Source: Cirad

BOTANICAL RACES OF CULTIVATED RACES OF S. BICOLOR SSP BICOLOR

I. Basic races:

- bicolor (B)
- guinea (G) - Sudanian area
- caudatum (C) – Eastern Africa
- kafir (K) – South Africa, mainly short plants
- durra (D) - East Africa, Middle East and India

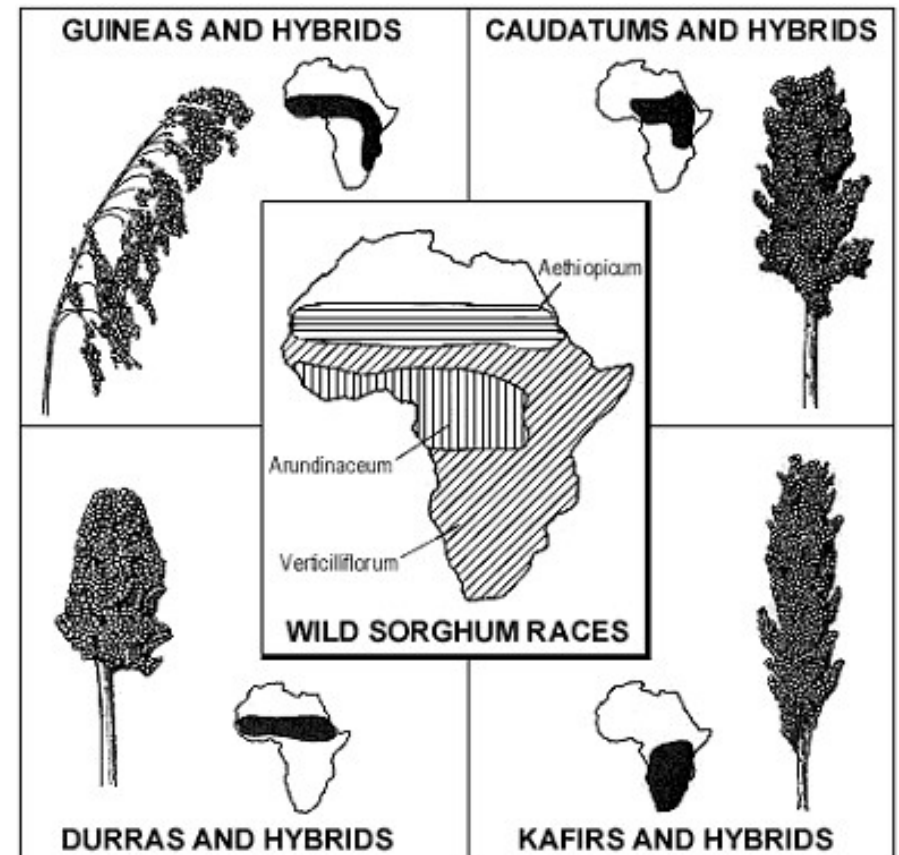
II. Intermediate races: (all combinations of basic races)

- guinea-bicolor (GB)
- caudatum-bicolor (CB)
- kafir-bicolor (KB)
- durra-bicolor (DB)
- guinea-caudatum (GC)
- guinea-kafir (GK)
- guinea-durra (GD)
- kafir-caudatum (KC)
- durra-caudatum (DC)
- kafir-durra (KD)

BOTANICAL RACES OF WILD SORGHUM (*SORGHUM BICOLOR* SSP *VERTICILLIFLORUM*)

III. Wild sorghum races: *S. bicolor* ssp *arundinaceum*.

- arundinaceum
- aethiopicum
- virgatum
- verticilliflorum



(courtesy of J Hancock: Plant Evolution and the Origin of Crop Species; art work by Marlene Cameron)

RACES OF SORGHUM BICOLOR - PANICLE TYPES



ssp. race **bicolor**



ssp. race **kafir**



ssp. race **durra**



ssp. race **caudatum**



ssp. race **guinea**



Ssp. race **Kafir-caudatum**



ssp. race **conspicuum**



ssp. race **Durra-caudatum**



Sb ssp. **drummondii**

Source: KWS

TAXONOMY OF SORGHUM TYPES USED IN AGRICULTURE

- ***Sorghum sudanense***
- ***Sorghum bicolor* x *Sorghum sudanense***
- ***Sorghum bicolor* x *Sorghum Bicolor***
slight tillering type
with diverse directions
of usage:
 - Sugar type
 - Forage type for silage
 - BMR
 - Grain type

S. bicolor x *S. sudanense*



S. bicolor ssp. *bicolor*



S. bicolor ssp. *bicolor*



Source: KWS

SORGHUM PANICLE TYPES - OPENESS



Source: KWS

Closed (compact) Panicle



Source: KWS

Semi Open Panicle



Source: Cirad

„Broom-Typ“ Open Panicle

MAIN TRAITS OF BICOLOR TYPE

- Almost no tillering
- Broad leaves
- Robust stem
- Lower sowing density

- Differences also according genetic origin or variety type
 - Closed panicles = Potentially of high sugar content
 - Broomcorn panicles = high yield potential and high lignin content
 - Kaoliang = good cold tolerance and earliness

Sorghum Bicolor x Sorghum Bicolor



Source: KWS

MAIN CHARACTER OF SUDANENSE TYPES

- Tillers – depending on type – sudanense pure has more tillers than crossing with Bicolor
- thin leaves
- thin stem
- Higher sowing density
- Weak to normal standability
- Weaker yield potential
- Earliness
- Good cold tolerance

Sorghum Bicolor x Sorghum Sudanense



Source: KWS

SEGMENTATION ACCORDING USAGE

BIOMASS SORGHUM



SWEET SORGHUM



FORAGE SORGHUM



GRAIN SORGHUM



MULTICUT SORGHUM



DUAL TYPES SORGHUM



UTILISATION OF SORGHUM NON GRAIN TYPES

- Biomass sorghum (including dual types)
 - Biogas plants → Energy
 - Combustion plants → Energy
 - Feed
- Broom sorghum
- Forage sorghum (including BMR types)
 - Feed as fresh forage
 - Feed as hay
- Multicut Sorghum
- PPS Sorghum
- Sweet sorghum
 - Feed
 - Bioethanol productions
 - Sweeteners (Syrup, molasse, sugar)



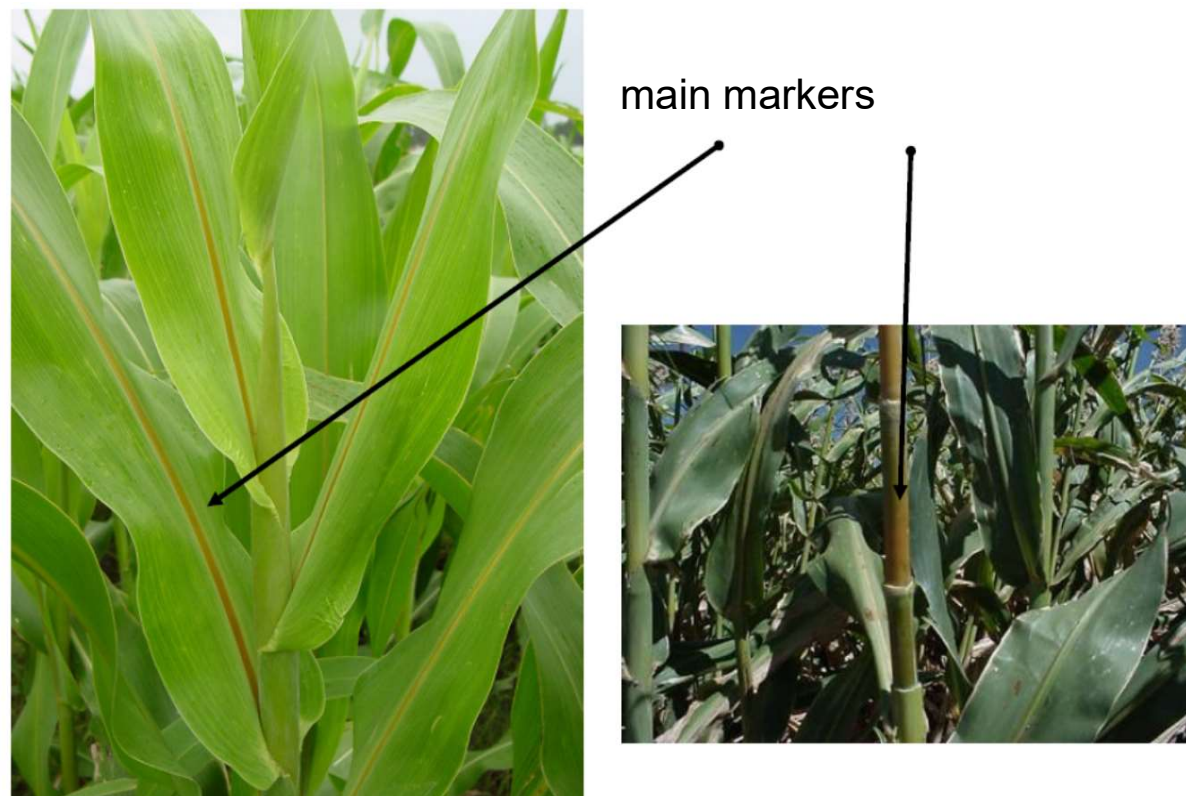
Source: <http://sirak.rs/hu/ciroksepru-forgalmazasa>



Source: Cirad

BMR TYPE OF SORGHUM

- High sugar content
- Lower Lignin content (about 40-60 % of normal biomass sorghum)
- Lower standability
- High digestibility
- High methane formation



Source: KWS

UTILISATION OF SORGHUM GRAIN TYPES



- Grain sorghum
 - Feed
 - Food
 - Tanin containing sorghum - alcohol production – e.g. Baijiu in China or beer
 - Tanin free sorghum - dry milling products and non gluten food products e.g. bread, flakes, pasta, puffs, crisps and chips
- Bioethanol production



Source: <https://nulifemarket.com>



**Thank you for your
attention!**