

## Preliminary Evaluation of Some Qualitative Traits of Sugarcane Germplasm of North-Western Nigeria

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**ABSTRACT:** Thirty five local sugarcane (*Saccharum spp.*) accessions were collected in an expedition in North-Western Nigeria, covering Sokoto, Kebbi, Zamfara, Katsina, Kaduna, Kano and Jigawa States in September 2011. The germplasm accessions were maintained at Usmanu Danfodiyo University Sokoto. Data on leaf colour, leaf sheath colour, thrashability, ligular process, spines (pubescence), stem colour and bud groove were collected. The study indicate that shape of the accessions could be used either directly or indirectly as a selection tool for pest resistance and mechanical cultivation in sugarcane. Leaf sheath colour and number of green leaves per plant could form additional selection tools for high photosynthesis efficiency to the already existing ones.

**Key words:** Evaluation, Sugarcane, Germplasm, Characters, Accessions

### INTRODUCTION

Sugarcane is currently grown in over 110 countries in the world (FAOSTAT, 2009). An estimated 989,466,957 tonnes were produced worldwide, harvested from 8,748,983 hectares in 2009, with an average of 893,671kg/ha. The African total production for the year 2009 was 9,984,154,405 tonnes harvested from 367,488 hectares at a yield per hectare of 59,853kg (FAOSTAT, 2009). In Nigeria the total production was 24,661 tonnes, harvested from 35,324 hectares at an average yield of 90,405 kg/ha (FAOSTAT, 2009).

Sugarcane (*Saccharum officinarum* L.) is an important industrial cash crop in Nigeria (Olaoye, 2006). Besides sugar production, sugarcane produces numerous valuable byproducts like ethanol used by pharmaceutical industry and used as fuel (Zafar *et al.*, 2009). Also, Noosheen and Ashraf (2001), reported that characters most influenced by environment are quantitative characters such as size and colour e.t.c. Those quantitative characters have less value in cane yield identification than the stable characters (qualitative characters) such as shape of vegetative organs (bud groove, spines, ligules, node-shape and thrashability).

Producing sugarcane seedlings from genetically-diverse parents or breeding clones is essential for developing high yielding, disease and insect resistant sugarcane cultivars for commercial planting by the

sugar industry or by local cane chewing farmers (Olaoye, 2005). Land races of cultivated crops are believed to be useful donors of favourable alleles for adaptation (Olaoye, 2006). Also, wild progenitors of sugarcane have been reported to act as donors of variable agronomic characters and thus play crucial role in the development of modern commercial varieties (Dunckelman and Breaux, 1969). Higher cane yield is the function of higher genetic potential of a variety (Maqbool *et al.*, 2001). Thus, efforts are made to increase cane production by introducing high yielding varieties and adoption of improved crop production techniques (Farooq, 1989). Traits such as biomass and sugar yield are met by different progeny testing stages before the choice of the best progeny clones is suggested for preliminary or advanced yield trials (Gill, 1999). Among environmental factors that have impact on sugarcane breeding are temperature (Bull and Glasziou, 1963), rainfall distribution (Olaoye, 2006), photoperiod, rising atmospheric concentrations of CO<sub>2</sub> (Ehara and Takamura, 1994) and pollution levels. For example, intermittent occurrences of night temperature below 18°C, during the period of floral induction reduce flowering intensity and/or delay seedling emergence (Dunckelman and Breaux, 1969). While frequent occurrences of day- time temperatures exceeding 31°C acting singly or in combination with moisture stress, have also been implicated in similar reduction in flowering intensity or delayed emergence (Olaoye, 2006). Harsh weather conditions also result in pollen

abortion or permanent pollen shed, which limit cross manipulation by breeders during the crossing period. Furthermore, amount and distribution of rainfall during flowering do affect pollen viability and seed set in sugarcane (Olaoye, 2006).

The objective of the study was to evaluate some qualitative characters that are related to yield and quality of sugarcane germplasm of North-western Nigeria.

### **MATERIALS AND METHODS**

Thirty five local sugarcane accessions were collected in an expedition in North-western Nigeria, covering Sokoto, Kebbi, Zamfara, Katsina, Kaduna, Kano and Jigawa States in September 2011 (Table 1). They were planted at Usmanu Danfodiyo University, sokoto immediately. Sokoto is located in the Sudan Savanna agro-ecological zone of Nigeria on latitude 13° 01'N; longitude 5° 15'E altitude of about 350m above sea level (ASL). Mean annual rainfall is about 752 mm, the minimum and maximum temperatures are 26° and 35°, respectively, and relative humidity of 23-41%. The area is characterized by long dry season with cool air during Hamattan (November – February), dry air during hot season from March – May followed by a short rainy season (Bello, 2006).

Data on stalk and leaf quality characters were observed and recorded from the accessions. These included joint/node-shape, ligular process, stem colour, bud groove, leaf sheath colour, leaf colour, presence or absence of spines and thrashability based on morphological description of Artschwager (1948) and Van Diller wijin (1952).

### **RESULTS**

Results obtained indicate that more than half of the accessions had stem and leaf sheath with green/purple colour. Those with straight node were more than those with staggered nodes (ZM/11/01, ZM/11/03, SOK/11/04, KT/11/01, KN/11/04) (Table 2). Those with bud groove were few (KN/11/03, ZM/11/01, ZM/11/02, KN/11/04) and all of the accessions had loose thrashability except three (JG/11/01, ZM/11/07, KB/11/03) that have tight thrashability. While those with green leaves were also greater in number (30 accessions) than those with yellow/green (KT/11/03, KD/11/01, KB/11/06, KN/11/01, KN/11/04), and those with spines on their leaves were more numerous than

those that had no spines (KD/11/03, KD/11/02, KB/11/04, KN/11/04).

### **DISCUSSION**

Observations on the accessions indicate that the quantum of variability in the accessions with respect to stalk shape showed that only very few accessions had staggered nodes (five accessions), while most of them had straight nodes, which is a very important character for mechanized farming in sugarcane (Farooq 1989). Straight cane stalk, and small blade joint are the quality characters that make sugarcane varieties the most suitable for mechanical cultivation and post harvest handling (Farooq 1989). It was also reported by Piscitelli (1994), that the most important exomorphological characters of sugarcane variety were the shape of the aerial organs, because it is a qualitative character that is not influenced by environmental factors thus; can be used as a selection tool in any breeding programme. Most of the accessions had green leaves which are very important trait that play vital role in photosynthesis. However, Olaoye (2005) reported that leaf colour had a negative association with stalk length. Most of the accessions also had spines on their leaves. Leaf spines is among different control measures used by host plant resistance (HPR), which is of paramount importance as the approach does not poss any adverse effect on non-target organisms (Dhaliwal and Arora 2004). The accessions also had high thrashability that plays a vital role in storage of sucrose for long time after senescence period in sugarcane (Dariew and Kultiasova, 1981).

### **CONCLUSION**

The preliminary evaluation of sugarcane germplasm collected indicate that diversity exist among the accessions under study with respect to potentiality for mechanical cultivation and source of genes for resistance to pests.

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**Table1:** Thirty five accessions collected in expedition from North-Western Nigeria.

S/N	Accessions	Descriptions
<b>Sokoto State</b>		
1	Sok/11/01	Cultivated under irrigation less than one year under rain fed
2	Sok/11/02	White in colour, fast growth and disease resistance
3	Sok/11/03	White, disease resistance under high moisture condition and six months with irrigation
<b>Kebbi State</b>		
4	Kb/11/01	White disease resistance and six months under good management
5	Kb/11/02	Less popular but sweeter than kebbi five
6	Kb/11/03	- - - -
7	Kb/11/04	Yar Bacita, White and susceptible to stem borer
8	Kb/11/05	White, and susceptible to many pest.
9	Kb/11/06	White, five months under good management, less tillers
10	Kb/11/07	White, Yar tsauri, can be grown any where and sweeter than kebbi 6.
<b>Zamfara State</b>		
11	Zm/11/01	White, high tillers, grow better at fadama area.
	Zm/11/02	White, most popular, third indigenous in the area.
12	Zm/11/03	White, called kantoma, second indigenous.
13	Zm/11/04	White, called bahausa less popular but use medicinally for eye treatment.
14	Zm/11/05	White, called Yar kodus, cultivated over 40 years in the area.
15	Zm/11/06	White, called bahausa high response to fertilizer, need no irrigation when established
16	Zm/11/07	White, called kwandaji, has high tillering ability 50-100 tillers/stool
17	Zm/11/08	White, called kwandaji, its planting time is NOV-DEC. response very well to fertilizer.
<b>Katsina State</b>		
19	KT/11/01	White, called kwandaji, use medicinally for liver disease treatment
20	KT/11/02	White, early maturity but difficult to chew during dry season.
21	KT/11/03	White.
22	KT/11/04	White, called kyalla sweeter than any variety sarrobund, 10mths. susceptible to disease and pest
23	KT/11/05	White, response to fertilizer application
<b>Kaduna State</b>		
24	KD/11/01	White, less popular.
25	KD/11/02	White, sweet, soft, and less marketable.
26	KD/11/03	White called kwandaji difficult to chew but drought tolerant
27	KD/11/04	White, called kwandaji, shorter and resistance to water logging
<b>Kano State</b>		
28	KN/11/01	White, called kantoma, 10months duration, and resistance to disease.
29	KN/11/02	White, called bakarkwandaga and not withstand drought.
30	KN/11/03	White, susceptible to pest and disease.
31	KN/11/04	White, easy to chew.
<b>Jigawa State</b>		
32	JG/11/01	White, called savannah, 4months duration.
33	JG/11/02	White, called gwado-gwado, resistance to disease.
34	JG/11/03	White, called gwado-gwado, resistance to disease
35	JG/11/04	White, called savannah, 4months duration, soft but less sweeter.

**Table 2:** Quality Traits of Sugarcane Accessions from North-Western Nigeria

ACCESSIONS	CHARACTERS							
	Leave colour	Leave Sheath colour	Thrash ability	Spines(pubescence)	Ligular process	Stem colour	Joint(nod e-shape)	Bud Groove
<b>Sokoto State</b>								
Sok/11/01	Green	Green with purple tinge	Loose	Present	Present	Green with purple tinge	Straight	Absent
Sok/11/02	Green	Green with purple tinge	Loose	Present	Absent	Yellow with purple tinge	Straight	Present
Sok/11/03	Green	Green with purple tinge	Loose	Present	Absent	Yellow with Green tinge	Straight	Absent
Sok/11/04	Green	Green with purple tinge	Loose	Present	Present	Yellow with Green tinge	Straight	Absent
<b>Kebbi State</b>								
Kb/11/01	Green	Green with purple tinge	Loose	Present	Present	Green with purple tinge	Straight	Absent
Kb/11/02	Green	Green with purple tinge	Loose	Present	Absent	Yellow with purple tinge	Straight	Present
Kb/11/03	Yellow/Green	Green with purple tinge	Tight	Present	Absent	Yellow with Green tinge	Straight	Absent
Kb/11/04	Green	Green with purple tinge	Loose	Absent	Present	Yellow with Green tinge	Straight	Absent
Kb/11/05	Green	Green with purple tinge	Loose	Present	Present	Green with purple tinge	Straight	Absent
Kb/11/06	Yellow/Green	Green with purple tinge	Loose	Present	Absent	Yellow with purple tinge	Straight	Present
Kb/11/07	Green	Green with purple tinge	Loose	Present	Absent	Yellow with Green tinge	Straight	Absent
<b>Zamfara State</b>								
ZM/11/01	Green	Green with purple tinge	Loose	Present	Present	Green with purple tinge	Staggered	Present
ZM/11/02	Green	Green with purple tinge	Loose	Present	Absent	Yellow with purple tinge	Straight	Present
ZM/11/03	Green	Green with purple tinge	Loose	Present	Absent	Yellow with Green tinge	Staggered	Absent
ZM/11/04	Green	Green with purple tinge	Loose	Present	Present	Yellow with Green tinge	Straight	Absent
ZM/11/05	Green	Green with purple tinge	Loose	Present	Present	Green with purple tinge	Straight	Absent
ZM/11/06	Green	Green with purple tinge	Loose	Present	Absent	Yellow with purple tinge	Straight	Absent
ZM/11/07	Green	Green with purple tinge	Tight	Present	Absent	Yellow with purple tinge	Straight	Absent
ZM/11/08	Green	Green with purple tinge	Loose	Present	Present	Yellow with purple tinge	Straight	Absent

Table 2 Continued

ACCESSIONS	CHARACTERS							
	Leave colour	Leave Sheath colour	Thrash ability	Spines(pubescent)	Ligular process	Stem colour	Joint(node -shape)	Bud Groove
<b>Katsina State</b>								
KT/11/01	Green	Green with purple tinge	Loose	Present	Present	Green with purple tinge	Staggered	Absent
KT/11/02	Green	Green with purple tinge	Loose	Present	Absent	Yellow with purple tinge	Straight	Absent
KT/11/03	Yellow/Green	Green with purple tinge	Loose	Present	Absent	Yellow with Green tinge	Straight	Absent
KT/11/04	Green	Green with purple tinge	Loose	Present	Present	Yellow with Green tinge	Straight	Absent
<b>Kaduna State</b>								
KD/11/01	Yellow/Green	Green with purple tinge	Loose	Present	Present	Green with purple tinge	Staggered	Absent
KD/11/02	Green	Green with purple tinge	Loose	Absent	Absent	Yellow with purple tinge	Straight	Absent
KD/11/03	Green	Green with purple tinge	Loose	Present	Present	Yellow with Green tinge	Staggered	Absent
KD/11/04	Green	Green with purple tinge	Loose	Absent	Absent	Yellow with Green tinge	Straight	Present
<b>Kano State</b>								
KN/11/01	Yellow/Green	Green with purple tinge	Loose	Present	Present	Green with purple tinge	Straight	Absent
KN/11/02	Green	Green with purple tinge	Loose	Present	Absent	Yellow with purple tinge	Straight	Absent
KN/11/03	Green	Green with purple tinge	Loose	Present	Absent	Yellow with Green tinge	Straight	Present
KN/11/04	Yellow/Green	Green with purple tinge	Loose	Absent	Present	Yellow with Green tinge	Staggered	Present
<b>Jigawa State</b>								
JG/11/01	Green	Green with purple tinge	Tight	Present	Present	Green with purple tinge	Staggered	Absent
JG/11/02	Green	Green with purple tinge	Loose	Present	Absent	Yellow with purple tinge	Straight	Absent
JG/11/03	Green	Green with purple tinge	Loose	Present	Absent	Yellow with Green tinge	Staggered	Absent
JG/11/04	Green	Green with purple tinge	Loose	Present	Present	Yellow with Green tinge	Straight	Absent

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