Properties of white food sorghums grown in different environments

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Abstract

Attributes of sorghums that produce light colored meals, flour and grits with bland flavors were evaluated under different environments in uniform yield trials with 40 entries. Red and white sorghum varieties grown at locations in Texas, Kansas and Nebraska from 1999-2001 were evaluated for hardness using a SKHT (single kernel hardness tester), decortication properties using TADD (tangential abrasive dehulling device), TKW (thousand kernel weight), color (L, a, b), test weight, density, proximate composition and relative mold damage. Environment and hybrids significantly affected composition, physical and processing properties. White tan sorghum (WT) hybrids were harder, more dense and lighter in color than white purple (WP) hybrids or red hybrids. WP hybrids were more adversely affected by weathering and molds than TW hybrids.

All of the ATx635 hybrids had significantly improved physical properties and higher milling yields than the other white hybrids. White sorghums had better milling performance than red hybrids. A significant correlation (r=0.69, n=105) was found between SKHT and TADD hardness values, suggesting SKHT could be used to predict decortication properties. Efforts by breeders, agronomists and food technologists have produced tan white food type sorghums with significantly improved food quality attributes.

Introduction

Fig. 1: White food sorghum in the field prior to harvest (left) and the harvested grain (right)

•Tan plant white (WT) sorghum hybrids (above) with improved milling properties (high grit yield and lighter color) over the traditional purple plant (WP) and red hybrids, are commercially produced.

•The WT sorghums also stain less during weathering.

•The WT sorghums have a potential to expand market opportunities in food and poultry industries.

• It is important to evaluate their performance relative to the traditional WP and red sorghum hybrids across different environments.

Fig. 2: Glumes affect white sorghum quality and desirability

Fig. 3: Red sorghum, used primarily for feed (left), and white sorghum

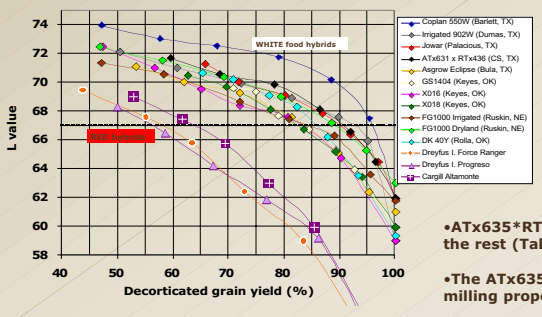
Materials & Methods

•Forty varieties of WT, WP, and red sorghums were grown in Texas, Kansas, and Nebraska in 1999-2001.

•Evaluated for hardness index (HI) using a Perten Single Kernel Hardness Tester (SKHT); decortication properties using Tangential Abrasive Dehulling Device (TADD); test weight, thousand kernel weight (TKW), density, color (L, a, b), and proximate composition.

Results and Discussion

Fig. 4: Relationship between L value and decorticated yields of food and non-food sorghums pearled for different times



•White hybrids had superior milling performance (higher grit yields at comparable L values) than the red varieties (Fig. 4 & 5). Pigments on red sorghums usually produce off-colors in grits.

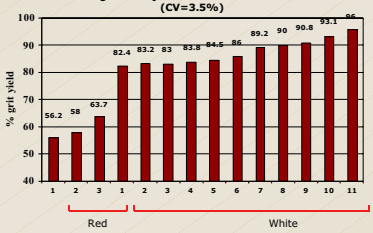
•Adjusting decortication yields to a constant L value(67) demonstrates the superior properties of white over red sorghums (Fig. 5).

•Yield and color of decorticated grits are important attributes of grain quality. Adjusting decortication yields to a constant color provides a good index of millability (Awika et al 2002).

•WT sorghums were harder and gave higher decorticated grit yield than the traditional WP or red hybrids (Table I).

•The WT sorghums also have bland flavor and are thus very suitable for different food applications.

Fig. 5: Decorticated Grain Yield of red and white sorghums adjusted to an L value of 67 (CV=3.5%)



•ATx635*RTx436 hybrid generally had better milling properties than the rest (Table I) across different environments.

•The ATx635 parent is known to consistently improve physical and milling properties of hybrids.

•Environment had significant effect on physical and processing properties, as well as proximate composition of the sorghums.

•A significant correlation (r = 0.69) was found between SKHT and TADD hardness values (Fig. 6).

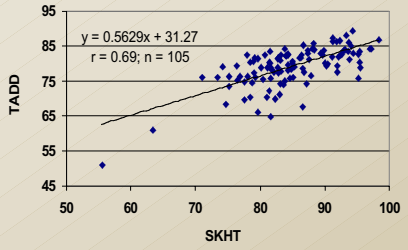
•SKHT is rapid and requires small amounts of sample, and may be useful in predicting decortication properties of sorghums.

Table I: Physical and composition attributes of selected sorghum hybrids grown in three years at four locations in Texas, Kansas and Nebraska.

Pedigree	Type	Hardness Index	Decort. Yield %	Grain L	Grit L	TKW (g)	Diameter (mm)	Density (g/cc)	Protein %	Fat %
ATx635*RTx436	WT	94.9 a	85.8 a	63.1 a	68.2 a	23.2	1.97	1.396 a	11.0	3.8
ATxArg-1*RTx436	WT	91.5 a	82.7 ab	62.6 ab	69.6 a	22.6	1.83	1.389 ab	10.8	3.6
888Y	WT	90.3 ab	86.4 a	59.5 c	67.8 ab	25.8	1.92	1.396 a	11.2	3.9
ATx378*RTx430	RP	83.4 bc	75.9 cd	47.7 d	65.3 b	30.0	2.22	1.376 cd	11.5	3.8
ATx623*RTx430	WP	83.0 c	74.9 cd	59.5 c	68.2 a	29.0	2.17	1.373 cd	10.0	3.5
ATx631*RTx436	WT	79.9 cd	79.1 bc	63.8 a	69.6 a	25.6	2.07	1.381 bc	11.1	3.9
ATx631*RTx2903	RT	74.1 de	72.3 d	46.8 d	69.9 a	24.3	2.03	1.369 d	12.5	4.0
AOK11*RTx2741	WP	70.6 e	70.7 d	60.4 bc	68.2 a	25.9	1.97	1.368 d	9.5	3.5
LSD (α=0.05)		7.2	5.9	2.3	2.4	4.0	0.22	0.011	1.3	0.3

Means with same letters not significantly different

Fig. 6: Correlation between SKHT hardness index and TADD hardness for white sorghums



Conclusion

•Tan white sorghum hybrids that perform consistently well across environments have been developed. These sorghums have superior milling and physical properties over the traditional WP and red sorghums.

•The white sorghums vary significantly in their decortication properties.

ATx635 improves physical and processing properties of the WT sorghums.

•SKHT may be useful to predict decortication performance of sorghums.

References

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http://sorghum.tamu.edu/

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