Developing a Mini Core Collection of Sorghum for Diversified Utilization of Germplasm

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ABSTRACT

The sorghum [Sorghum bicolor (L.) Moench] germplasm collection at the ICRISAT gene bank exceeds 37,000 accessions. A core collection of 2247 accessions was developed in 2001 to enable researchers to have access to a smaller set of germplasm. However, this core collection was found to be too large. To overcome this, a sorghum mini core (10% accessions of the core or 1% of the entire collection) was developed from the existing core collection. The core collection was evaluated for 11 qualitative and 10 quantitative traits in an augmented design using three control cultivars in the 2004-2005 postrainy season. The hierarchical cluster analysis of data using phenotypic distances resulted in 21 clusters. From each cluster, about 10% or a minimum of one accession was selected to form a mini core that comprised 242 accessions. The data in the mini core and core collections were compared using statistical parameters such as homogeneity of distribution for geographical origin, biological races, qualitative traits, means, variances, phenotypic diversity indices, and phenotypic correlations. These tests revealed that the mini core collection represented the core collection, which can be evaluated extensively for agronomic traits including resistance to biotic and abiotic stresses to identify accessions with desirable characteristics for use in crop improvement research and genomic studies.

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Abbreviations: CR%, coincidence rate; H`, diversity index; REML, residual maximum likelihood; VR%, variable rate.

Сованим [Sorghum bicolor (L.) Moench] is the world's fourth most Jimportant cereal crop after wheat (Triticum spp.), rice (Oryza sativa L.), and maize (Zea mays L.) and is grown throughout the arid and semiarid tropics (Smith and Frederiksen, 2000). For example, in 2007 sorghum was grown worldwide on 43.8 million ha in 104 countries, with a total production of 64.6 million Mg and productivity of 1.47 Mg ha⁻¹ (http://faostat.fao.org/ verified 8 July 2009). About 80% of sorghum production comes from developing countries. Sorghum is indigenous to Africa, where it is grown in the semiarid zone, spread over a large belt from Senegal to Ethiopia, bordering the Sahara desert in the north, the equatorial forest in the south, and extending southwards through the drier parts of eastern and southern Africa. The major sorghum growing countries include Burkina Faso, Cameroon, Chad, Egypt, Ethiopia, Mali, Mozambique, Niger, Nigeria, Sudan, Tanzania, and Uganda in Africa; India, China, and Yemen in Asia; the U.S. and Mexico in North and Central America; Argentina, Brazil, and Venezuela in South America; and Australia in Oceania (http://faostat.fao.org/). Sorghum is a major staple food and fodder crop in tropical and semi-tropical Africa and Asia (Doggett, 1988). Sorghum grains in many parts of the world are also used for animal (swine, poultry, and cattle) feed (Bramel-Cox et al., 1995). More recently, sweet sorghum has emerged as a 'smart' crop for production of ethanol (biofuel) in Brazil and India, which is becoming popular in many Asian countries (Doggett, 1988; Rao et al., 2004).

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The genus Sorghum has five subgenus or sections: Eu-Sorghum, Chaetosorghum, Heterosorghum, Para-Sorghum, and Stiposorghum (Garber, 1950), of which, Eu-Sorghum contains all sorghum races and varieties as S. bicolor subsp. bicolor (2n = 2x = 20 chromosomes) and wild and weedy relatives (Harlan and de Wet, 1971; Doggett, 1988). Further, Harlan and de Wet (1972) recognized five basic races (bicolor, guinea, caudatum, kafir, and durra) and ten intermediate races (guineabicolor, guinea-caudatum, guinea-kafir, guinea-durra, caudatumbicolor, kafir-bicolor, durra-bicolor, kafir-caudatum, kafir-durra, and durra-caudatum) that originated as a result of natural intercrossing among basic races, all recognizable on the basis of spikelet/panicle morphology alone, which can be linked back to their specific environments and the nomadic peoples that first cultivated them (Smith and Frederiksen, 2000). Race bicolor is widely distributed in Africa and Asia; guinea, predominant in West Africa; caudatum, throughout Central Africa; kafir, south of the equator in Africa; durra, in Ethiopia and India (Harlan and de Wet, 1972).

Vast collections of germplasm are locked in national and international genebanks. For example, CGIAR (Consultative Group on International Agricultural Research) institutions alone hold ~600,000 germplasm accessions of its mandate crops. Low use of germplasm in crop improvement programs has resulted in a narrow genetic base in many crops (Dalrymple, 1986; Vellve, 1992; Dowswell et al., 1996; Upadhyaya et al., 2003; Kumar et al., 2004; Bhattacharjee et al., 2007). Large holdings in genebanks and the non-availability of data on traits of economic importance restricted breeders and caused them to repeatedly use their own working collections in crop breeding. Moreover, many of the agronomic and seed quality traits show considerable genotype \times environment interaction. Multi-location evaluation of such a large collection is resources consuming, it is also a constraint to obtain reliable phenotypic data from such evaluations to identify useful parents by the breeders. Core collection (~10% of entire collection), representing over 70% of the genetic variation present in the entire collection with 95% certainty (Brown, 1989), has been suggested as a gateway to enhanced utilization of diverse germplasm in crop breeding programs. Core collections, based on phenotypic characterization data, have been reported (see Upadhyaya, 2004) for crops such as pearl millet [Pennisetum glaucum (L.) R. Br.] (Bhattacharjee et al., 2007), sorghum (Rao and Rao, 1995; Grenier et al., 2001a,b), quinoa (Chenopodium quinoa Willd.) (Ortiz et al., 1998), finger millet (Eleusine coracana (L.) (Upadhyaya et al., 2006), foxtail millet [Setaria italica (L.) P. Beauv.] (Upadhyaya et al., 2008), Caribbean maize (Taba et al., 1998), and USDA rice (Yan et al., 2007). In sorghum, Rao and Rao (1995) were the first to develop core collection of 3475 accessions. Subsequently, Grenier et al. (2001b) used three sampling procedures-constant, logarithmic, and proportional-to establish three subsets of the core collection, each possessing 2247 accessions. The

logarithmic subset showed differences for response to the photoperiod that was considered in the stratification of the collection. A core of this size is still large for multi-location evaluation of morphological diversity. The size of the core makes it difficult to identify accessions that are genetically diverse and that also possess beneficial traits for use in crop breeding. To overcome this, Upadhyaya and Ortiz (2001) suggested the mini core collection approach, which is a core of a core (10% of core or 1% of the entire collection) representing the species diversity. A mini core is established after evaluating the core subset for various morphological, agronomic, and seed quality traits, and selecting about 10% of the accessions from the core subset. This study reports the development of a mini core subset in sorghum using the Grenier et al. (2001b) core that was developed using logarithmic sampling, for enhanced utilization of genetically diverse germplasm in sorghum improvement.

MATERIALS AND METHODS

A sorghum core collection consisting of 2247 landrace accessions from 58 countries (Grenier et al., 2001b), was the base material to constitute a sorghum mini core collection. One accession (IS 3422) was excluded from the evaluation as it was de-notified from the in-trust collection. The core collection represented all basic [bicolor (6.6%), guinea (11.6%), caudatum (17.6%), kafir (9.9%), and durra (10.9%)] and intermediate races [guinea-bicolor (1.0%), guinea-caudatum (12.6%), guinea-kafir (0.6%), guinea-durra (0.4%), caudatum-bicolor (10.5%), kafir-bicolor (0.9%), durra-bicolor (4.4%), kafir-caudatum (3.4%), kafir-durra (1.2%), and durra-caudatum (8.5%)]. The entire core collection of 2246 accessions and three controls, IS 9830 (caudatum; a striga resistant accession), IS 33844 (durra; Parbhani Moti-a released cultivar, India), and IS 2205 (durra-bicolor, a shoot-fly- and stem-borer-resistant accession) were evaluated in a Vertisol field in the 2004-2005 postrainy season (October-April) at the ICRISAT research farm, Patancheru, 18° N lat; 78° E long, at an altitude of 545 masl (meters above sea level). The experiment was sown in an augmented design with one of the three control cultivars repeated after every nine test entries. Each plot was single-row, 9 m long, with a row-to-row spacing of 75 cm, and plant-to-plant spacing within a row of 10 cm. Ammonium phosphate was applied at the rate of 150 kg ha⁻¹ as a basal dose, and 100 kg ha⁻¹ of urea was applied as top dressing after 3 wk of planting. As the experiment was conducted during the post-rainy season, five irrigations (each with 7 cm water) were provided at equal intervals until grain maturity. All core accessions germinated well and produced panicles. Data on 11 qualitative traits (plant pigmentation, nodal tillers, midrib color, panicle compactness and shape, glume color and covering, threshability, grain color, grain luster, grain subcoat, and endosperm texture), and 10 quantitative traits [days to 50% anthesis, basal tillers, plant height, panicle exsertion, panicle length and width, yield plant⁻¹ (g), yield plot⁻¹ (kg), grain size (mm), and grain weight (g)] were recorded following sorghum descriptors (IBPGR and ICRISAT, 1993). Midrib color was recorded after 50% anthesis. Grain traits were recorded at post-harvest stage in the laboratory. The number of days to anthesis was recorded as the number of days from the

50% seedling emergence to the date when 50% plants had started anthesis. Data on plant height (cm), tiller number, panicle exsertion, and panicle length and width were recorded on five randomly selected plants. All other observations were recorded on plot basis. Panicle exsertion is measured as the length of exposed peduncle from the flag leaf to the base of the panicle. Panicle length and width were measured at maturity as the maximum length from the base to the tip of the panicle, and maximum width in natural position. Grain covering indicates the amount of grain covered by glumes at maturity and is an important trait in the racial classification of cultivated sorghum. Threshability was recorded as difficult to thresh, partly threshable, and freely threshable. Grain weight is the weight in grams of 100 sound, matured healthy grains at about 120 g kg⁻¹ H₂O on wet basis. For quantitative traits data, averages of five plants plot⁻¹ values were computed that were used for statistical analyses.

The residual maximum likelihood (REML; Patterson and Thompson, 1971) in GenStat 10 (http://www.vsni.co.uk; verified 9 July 2009) was used to analyze data of 10 quantitative traits, considering genotypes as random and races as fixed. Variance components due to genotype ($\sigma^2 g$) and its standard errors (SE) were estimated (Table 1). Significance of differences among races was tested using Wald (1943) statistics. Best linear unbiased predictors (BLUPs) (Schönfeld and Werner, 1986) were worked out for all quantitative traits. A phenotypic distance matrix was created for 2246 accessions by calculating differences between each pair of accessions for the 21 (11 qualitative and 10 quantitative) traits. Data on qualitative traits was transformed to numerical scale (IBPGR and ICRISAT, 1993) to calculate phenotypic distance matrix. The diversity index was calculated by averaging all the differences in the phenotypic values for each trait divided by the respective range (Johns et al., 1997). This distance matrix was subjected to hierarchical cluster algorithm (Ward, 1963) at an R^2 (squared multiple correlation value) of 0.75. This method optimizes an objective function because it minimizes the sum of squares between groups. A proportional sampling strategy of selecting the accessions was used, and 10% of the accessions or a minimum of one accession from each cluster was randomly selected to form a mini core collection. Thus, a mini core collection consisting of 242 accessions (10.8% of the core collection and 1.1% of the entire collection) was constituted.

The 58 countries of origin (Table 2) were grouped into 10 regions: Central Africa, Eastern Africa, Southern Africa, Western Africa, Americas, East Asia, South and Southeast Asia, West Asia, Mediterranean, and Oceania. Frequencies of geographic regions, countries within regions, races/intermediate races, and all the qualitative traits in the core and mini core collections were tested by χ^2 . Yates (1934) correction was applied if the number of accessions in the core collection was less than five. Means for the core and mini core collections were compared by the Newman-Keuls procedure (Newman, 1939; Keuls, 1952). Homogeneity of variances was tested by Levene's test (Levene, 1960). The variance difference (VD%), mean difference (MD%), coincidence rate (CR%), and variable rate (VR%) were calculated to compare the core and mini core collections (Hu et. al., 2000). Shannon and Weaver (1949) diversity index (H') was used to measure and compare the phenotypic diversity for each trait in core and mini core collections. Phenotypic correlations among 10 quantitative traits in the core and mini core collections were estimated separately to determine whether associations, which may be under the same genetic control, were conserved in the mini core collection.

RESULTS AND DISCUSSION Residual Maximum Likelihood (REML) Analysis

Genotypic variance was significant for all the traits indicating the presence of adequate diversity in the core collection (Table 1). The Wald (1943) statistics showed that the five races and 10 intermediate races differed significantly for all the traits.

Clustering

A phenotypic distance matrix created on 21 traits was subjected to hierarchical cluster analysis (Ward, 1963) that resulted in classifying the 2246 accessions of the core collection into 21 clusters. Number of accessions in individual clusters ranged from 27 to 279. A mini core collection of 242 accessions (10.8% of the core collection) was formed using the sampling strategy of 10% or a minimum of one accession from each cluster. This mini core collection captured six shoot-fly-resistant accessions (IS 4360, IS 4515, IS 4581, IS 4631, IS 5094, and IS 8774), two accessions each resistant to anthracnose (IS 4092 and IS 7957) and leaf blight (IS 4951 and IS 7250), and four accessions each resistant to rust (IS 473, IS 7250, IS 7957, and IS 31446) and grain mold (IS 602, IS 603, IS 20727, and IS 20740).

Geographic Origin

 χ^2 probabilities for geographic origin of accessions in core and mini core collections were not significant for any of the 58 countries (p = 0.159 to 0.978). Heterogeneity (p = 0.692 to 0.988) and χ^2 probabilities (p = 0.120to 0.902) for all the 10 geographic regions were nonsignificant. The χ^2 values for accessions according to

Table 1. Variance components due to genotype (σ^2 g) and Wald's statistics of different races and intermediate races in sorghum core collection evaluated during the 2004–2005 post-rainy season, Patancheru, India.

Character	$\sigma^2 g$	Wald's statistic (Races/intermediate races)	df	Р
Days to 50% anthesis	218.37***	302.92	14	<0.001
Plant height (cm)	2786.70***	395.77	14	< 0.001
Panicle exsertion (cm)	39.95***	117.01	14	< 0.001
Panicle length (cm)	25.24***	1293.34	14	< 0.001
Panicle width (cm)	15.46***	522.09	14	< 0.001
Yield per plant (g)	18.46***	372.17	14	< 0.001
Plot yield (Kg ha-1)	101793***	322.23	14	< 0.001
100-seed weight (g)	0.36***	472.49	14	<0.001
Seed Size (mm)	0.05***	234.06	14	< 0.001
Basal tillers (number)	0.45***	143.69	14	<0.001
***Significant at $P = 0.001$				

Region Country within region	Accessions in core	Accessions in mini core	df	χ^2	Р	Country Region within region	Accessions in core	Accessions in mini core	df	χ^2	Р
Central Africa	164	17	1	0.025	0.873	Honduras	1	1	1	0.977	0.323
Burundi	5	1	1	0.448	0.503	Mexico	4	1	1	0.003	0.953
Cameroon	145	13	1	0.274	0.601	Nicaragua	1	1	1	0.977	0.323
Chad	11	2	1	0.648	0.421	USA	148	16	1	0.836	0.361
Zaire	3	1	1	0.115	0.735	Venezuela	1	1	1	0.977	0.323
Heterogeneity			3	1.460	0.692	Heterogeneity			6	3.685	0.719
Eastern Africa	402	38	1	0.652	0.419	East Asia	172	18	1	0.015	0.902
Ethiopia	116	12	1	0.098	0.755	China	126	12	1	0.107	0.744
Kenya	50	6	1	0.343	0.558	Japan	5	1	1	0.434	0.510
Rwanda	8	1	1	0.079	0.779	Republic of	40	5	1	0 159	0 601
Somalia	20	3	1	0.651	0.420	Korea	40	5	I	0.150	0.091
Sudan	112	6	1	1.987	0.159	USSR	1	0	1	0.105	0.746
Tanzania	37	4	1	0.072	0.788	Heterogeneity			3	0.789	0.852
Uganda	59	6	1	0.032	0.858	South & SE Asia	297	36	1	0.500	0.480
Heterogeneity			6	2.610	0.856	Bangladesh	3	1	1	0.051	0.821
Southern Africa	663	65	1	0.580	0.446	India	284	30	1	0.569	0.451
Botswana	58	5	1	0.083	0.774	Indonesia	3	1	1	0.051	0.821
Lesotho	91	8	1	0.095	0.758	Myanmar	3	1	1	0.051	0.821
Madagascar	3	1	1	0.144	0.704	Pakistan	2	1	1	0.274	0.601
Malawi	20	2	1	0.001	0.978	Sri Lanka	1	1	1	1.184	0.277
Mozambique	5	1	1	0.530	0.467	Thailand	1	1	1	1.184	0.277
South Africa	240	25	1	0.092	0.762	Heterogeneity			7	2.863	0.897
Swaziland	76	9	1	0.322	0.570	West Asia	116	18	1	2.421	0.120
Zambia	23	3	1	0.246	0.620	Afghanistan	2	1	1	0.116	0.734
Zimbabwe	147	11	1	0.808	0.369	Iran	1	1	1	0.766	0.381
Heterogeneity			8	1.741	0.988	Saudi Arabia	1	1	1	0.766	0.381
Western Africa	232	22	1	0.359	0.549	Republic of	112	15	1	0.326	0.568
Benin	9	1	1	0.025	0.874	Yemen			•	0 4 4 7	0 000
Burkina Faso	36	1	1	1.707	0.191	Heterogeneity	05	<i>_</i>	ა კ	1.075	0.930
Gambia	3	1	1	0.163	0.686	Mediterranean	25	5	-	1.975	0.160
Ghana	11	1	1	0.002	0.966	Algeria	3	1	-	0.017	0.897
Mali	39	6	1	1.433	0.231	Egypt	3	1	-	0.017	0.897
Niger	20	2	1	0.006	0.940	IVIOFOCCO	I	I	I	0.450	0.502
Nigeria	80	7	1	0.045	0.832	Synan Arab Republic	1	1	1	0.450	0.502
Senegal	15	1	1	0.125	0.723	Turkev	17	1	1	1.694	0.193
Sierra Leone	2	1	1	0.508	0.476	Heterogeneity			4	0.653	0.957
Togo	17	1	1	0.232	0.630	Oceania Australia	13	1	1	0.210	0.647
Heterogeneity			9	3.887	0.919	Heterogeneity	10		9	7.711	0.564
Americas	162	22	1	1.183	0.277	Over all	2246	242	57	25.082	0.999
Argentina	6	1	1	0.122	0.838		2210		0.	201002	51000
Cuba	1	1	1	0.977	0.323						

Table 2. χ^2 test the frequency distribution of core and mini core collection accessions in different regions and countries within region.

geographical regions and also across the countries within regions were nonsignificant. This indicated that the accessions for countries/regions in the mini core collection are representative of the core collection.

χ^2 Test for Races and Intermediate Races

Distribution of accessions in core and mini core collections for different races and intermediate races were nonsignificant (p = 0.166 to 0.937) for all the races and intermediate races individually. Of the 1272 accessions of five basic races (*bicolor, caudatum, durra, guinea,* and *kafir*) in

the core collection, 139 accessions were captured in the mini core collection (χ^2 0.028 and p = 0.868). Similarly, of the 974 accessions of the 10 intermediate races in the core collection, 103 were captured in the mini core collection (χ^2 0.036 and p = 0.849). Heterogeneity for races (χ^2 2.058 and p = 0.725) and intermediate races (χ^2 5.996 and p = 0.740; Table 3) were nonsignificant, indicating that the constitution of the mini core collection was appropriate. *Caudatum, durra,* and *guinea* among races and *caudatum-bicolor* and *guinea-caudatum* among intermediate races were dominant in both the core and mini core collections.

χ^{2} Test for Frequency Distribution of Classes in Qualitative Traits

 χ^2 probabilities for distribution of classes in all the 11 qualitative traits were nonsignificant (0.164 to 0.955; Table 4). Uniform distribution of classes in the core and mini core collections indicated that the sampling technique to constitute the mini core was appropriate.

Means and Variances

Differences between the means of core and mini core collections were compared using Newman-Keuls procedure (Newman, 1939; Keuls, 1952) and were found nonsignificant for all the traits, resulting in 0% mean difference percentage (Table 5). The homogeneity of variances of all the 10 quantitative traits in the core and mini core collections were tested by Levene's test (Levene, 1960) and were homogeneous (p = 0.067 to 0.796) for all the traits, resulting in 0% VD (Table 5).

Shannon-Weaver Diversity Index (H`)

This index is used to measure allelic richness and evenness in the population. A low H` indicates an extremely unbalanced frequency classes for an individual trait and a lack of genetic diversity. The average H` index for the mini core collection (0.460 ± 0.085 for qualitative and 0.587 ± 0.018 for quantitative traits) was comparable to the core collection (0.453 ± 0.085 for qualitative and 0.596 ± 0.016 for quantitative traits). Seed color had the highest value in both the core (0.917) and mini core (0.919) collections (Table 6). These estimates further suggest that the mini core collection has captured adequate diversity from the core collection.

Coincidence Rate (CR%) and Variable Rate (VR%)

The coefficients of variations or variable rate for most of the traits were higher in the mini core collection than in the core collection, resulting in 104.4% VR for quantitative traits

Table 3. Frequency distribution of accessions in different races and intermediate races with χ^2 and probability in sorghum core and mini core collections.

Race/intermediate races	Accessions in core	Accessions in mini core	df	χ^2	Ρ
Races	1272	139	1	0.028	0.868
Bicolor	149	20	1	0.849	0.357
Caudatum	395	39	1	0.402	0.526
Durra	245	30	1	0.389	0.533
Guinea	261	29	1	0.008	0.929
Kafir	222	21	1	0.438	0.508
Heterogeneity			4	2.058	0.725
Intermediate races	974	103	1	0.036	0.849
Caudatum-bicolor	235	30	1	1.067	0.302
Durra-bicolor	98	7	1	1.092	0.296
Durra-caudatum	191	19	1	0.071	0.790
Guinea-bicolor	22	2	1	0.046	0.831
Guinea-caudatum	283	27	1	0.286	0.593
Guinea-durra	10	2	1	0.840	0.359
Guinea-kafir	13	3	1	1.921	0.166
Kafir-bicolor	20	2	1	0.006	0.937
Kafir-caudatum	76	7	1	0.134	0.715
Kafir-durra	26	4	1	0.569	0.451
Heterogeneity			9	5.996	0.740
Over all	2246	242	14	14.587	0.407

Table 4. χ^2 value and probability for frequency distribution of classes in ten qualitative traits in sorghum core and mini core collections.

Traits	df	χ^2	Р
Plant pigmentation	1	1.941	0.164
Nodal tillers	1	0.115	0.735
Midrib color	3	2.537	0.469
Panicle compactness and shape	12	8.737	0.725
Glume color	11	4.445	0.955
Glume covering	8	11.003	0.202
Seed color	10	4.248	0.936
Seed luster	1	0.743	0.389
Seed subcoat	1	0.503	0.478
Endosperm texture	6	7.406	0.285
Threshibility	2	2.104	0.349

Table 5. Descriptive statistics fo	r comparison of ten	quantitative traits in core and	d mini core collection of sorghum.
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Character	Ra	Range				Variance [‡]			
	Core	Mini core	Core	Mini core	Core	Mini core	F value	Р	
Days to 50% anthesis	47.79–117.62	50.36-117.36	82.2a	82.6a	212.93	204.97	0.29	0.592	
Plant height (cm)	84.32-393.29	118.28–393.29	228.5a	234.7a	2556.58	2230.57	2.04	0.153	
Panicle exsertion (cm)	3.27-40.15	3.27-40.15	18.3a	18.8a	32.77	35.34	0.60	0.400	
Panicle length (cm)	8.98–39.01	9.72-37.51	21.1a	21.5a	19.12	23.21	3.36	0.067	
Panicle width (cm)	1.71-42.35	2.66-40.59	7.5a	7.7a	14.60	18.65	0.72	0.397	
Yield per plant (g)	15.26–29.48	16.94–29.48	21.3a	21.4a	4.45	4.35	0.07	0.796	
Plot yield (Kg ha ⁻¹)	751.24–2172.82	853.95–2172.82	1206.4a	1221.5a	27646.4	31016.30	0.83	0.364	
100-seed weight (g)	1.72-5.71	1.75-5.71	2.9a	2.9a	0.20	0.26	3.20	0.074	
Seed Size (mm)	2.12-3.96	2.15-3.89	3.0a	3.0a	0.04	0.05	3.27	0.071	
Basal tillers (number)	1–10	1–8	2.1a	2.2a	0.72	0.92	2.20	0.138	

[†]Means were tested by Newman-Keul test and were nonsignificant for all traits at P = 0.05. [‡]Variances were tested by Levene test and were nonsignificant for all traits at P = 0.05.

Table 6. Coincidence rate (CR%), variable rate (VR%), and Shannon-Weaver diversity index in sorghum core and mini core collections.

Character			H`-index			
Character	CR%	VH%	Core	Mini core		
Quantitative traits						
Days to 50% anthesis	95.9	97.6	0.607	0.609		
Plant height (cm)	89.0	90.9	0.625	0.633		
Panicle exsertion (cm)	100.0	101.1	0.630	0.636		
Panicle length (cm)	92.5	108.0	0.625	0.607		
Panicle width (cm)	93.3	110.3	0.494	0.443		
Yield per plant (g)	88.2	98.6	0.631	0.624		
Plot yield (Kg ha ⁻¹)	92.8	104.6	0.623	0.586		
100-seed weight (g)	99.2	113.4	0.612	0.576		
Seed Size (mm)	94.6	112.7	0.601	0.617		
Basal tillers (number)	77.8	107.0	0.511	0.545		
Mean	92.3	104.4	0.596	0.587		
SE(±)	2.02	2.30	0.016	0.018		
Qualitative traits						
Plant pigmentation	_†	-	0.049	0.069		
Nodal tillers	-	-	0.174	0.180		
Midrib color	-	-	0.254	0.253		
Panicle compactness and shape	-	-	0.715	0.725		
Glume color	-	-	0.820	0.835		
Glume covering	-	-	0.548	0.554		
Seed color	_	-	0.917	0.919		
Seed luster	-	-	0.294	0.288		
Seed subcoat	-	-	0.286	0.280		
Endosperm texture	_	-	0.601	0.602		
Threshibility	-	-	0.331	0.353		
Mean			0.453	0.460		
SE(±)			0.085	0.085		
Mean-all			0.521	0.521		
SE(±)			0.047	0.047		
t not estimated						

[†] = not estimated.

(Table 6). The variances and coefficients of variation in the selected collection should be higher than in the entire collection (Hu et al., 2000). High range (80–100) variation or CR% was captured in 9 out of 10 quantitative traits in the mini core collection. The high CR% captured for quantitative traits (92.3%) (Table 6) in the mini core collection confirmed that the mini core was representative of the core collection.

Correlation Coefficients

Phenotypic correlations were performed for all quantitative traits in the core and mini core collections separately and the pattern was found to be similar, demonstrating that associations observed in the core collection were well preserved in the mini core collection. Further, the proportion of variance in one trait that can be attributed to its linear relationship with a second trait is indicated by the square of correlation coefficient (Snedecor and Cochran, 1980). Estimates of this value greater than 0.71 or lower than -0.71 have been suggested as meaningful correlations (Skinner et al., 1999). In our study we found such high correlation coefficients in both the core (r = 0.712) and mini core (r = 0.702) collections between plot yield and yield per plant (Table 7).

There is a need to enhance the use of basic germplasm in sorghum breeding for widening the genetic base of the newly bred cultivars. Precise evaluation of the present core collection of sorghum (2246 accessions) using replications and multi-locations would be costly because of limited resources. This mini core collection has been developed using data of one environment and consists of 242 accessions, representing nearly the full diversity of the core collection and would provide an opportunity for precise evaluation and identification of valuable parental lines. The mini core collections in chickpea (*Cicer arietinum* L.), groundnut (*Arachis hypogaea* L., and pigeon pea (*Cajanus cajan* (L.) Millsp.) have already proved to be very useful in identifying agronomically valuable traits. Evaluation of 211 chickpea mini core accessions (Upadhyaya and Ortiz,

Character	Days to 50% anthesis	Plant height	Panicle exsertion	Panicle length	Panicle width	Yield per plant	Plot yield	100-seed weight	Seed size	Basal tillers
	d			cm ———		g	kg ha-1	g	mm	no.
Days to 50% anthesis	1	0.653	-0.265	0.210	-0.009	-0.093	-0.247	-0.047	-0.146	0.006
Plant height (cm)	0.645	1	0.038	0.408	0.292	-0.056	-0.160	0.068	-0.028	0.015
Panicle exsertion (cm)	-0.202	0.088	1	0.088	-0.044	-0.193	-0.061	0.115	0.108	0.081
Panicle length (cm)	0.258	0.391	0.100	1	0.582	-0.107	-0.081	-0.126	-0.073	0.087
Panicle width (cm)	0.146	0.337	-0.073	0.507	1	0.042	0.034	-0.162	-0.046	0.057
Yield per plant (g)	-0.057	-0.048	-0.084	-0.032	0.070	1	0.702	0.312	0.327	-0.208
Plot yield (Kg ha ⁻¹)	-0.156	-0.142	-0.029	-0.040	0.058	0.712	1	0.118	0.159	-0.014
100-seed weight (g)	-0.064	0.076	0.097	-0.028	-0.125	0.182	0.064	1	0.618	-0.217
Seed Size (mm)	-0.078	0.006	0.054	-0.034	-0.108	0.150	0.104	0.565	1	-0.242
Basal tillers (no.)	-0.098	-0.038	0.035	0.044	0.041	-0.139	-0.063	-0.158	-0.164	1

Table 7. Correlation coefficient between ten quantitative traits in sorghum core and mini core collections[†]. Above diagonal = mini core collection correlations; below diagonal = core collection correlations.

⁺r ≥ 0.150 significant at 1% p for mini core collection (DF 240); r ≥ 0.049 significant at 1% p for core collection (DF 2244).

2001), resulted in identifying lines with deep root systems that avoid drought (Krishnamurthy et al., 2003; Kashiwagi et al., 2005), genotypes with high salinity tolerance (Serraj et al., 2004; Vadez et al., 2007), genotypes resistant/tolerant to wilt, ascochyta blight, botrytis gray mold, and dry root rot (Pande et al., 2006). Similarly, the groundnut mini core collection was the source of 18 genotypes that have drought tolerance (Upadhyaya, 2005). Likewise, the sorghum mini core collection with a reduced number of accessions (242) could be evaluated more extensively for traits of economic importance and therefore used in crop improvement research.

The identity of accessions of the sorghum mini core collection, country of origin, race, and data on plant height, days to 50% anthesis, and 100-seed weight is given in Appendix 1 and also on the website http://www.icrisat.org.

Appendix Table 1. Identity, country of origin, race, and data on days to 50% anthesis, plant height (cm), and 100-seed weight (g) of sorghum mini core accessions at ICRISAT Patancheru, 2004–2005.

Sl. no. Identity		Country of origin	Race	Days to 50% anthesis	Plant height	100-seed weight	
				d	cm	g	
1	IS 2426	Afghanistan	Caudatum-bicolor	78.63	230.20	2.86	
2	IS 31681	Algeria	Bicolor	69.46	191.81	2.77	
3	IS 14090	Argentina	Caudatum	75.47	142.11	3.23	
4	IS 12697	Australia	Bicolor	88.14	289.67	2.39	
5	IS 19389	Bangladesh	Caudatum	83.14	230.22	2.61	
6	IS 26484	Benin	Guinea	89.21	283.98	3.97	
7	IS 14290	Botswana	Kafir-durra	74.38	221.24	2.91	
8	IS 19445	Botswana	Kafir	79.86	188.99	3.46	
9	IS 19450	Botswana	Guinea-kafir	75.07	202.14	3.64	
10	IS 22239	Botswana	Kafir	83.70	201.04	3.01	
11	IS 22294	Botswana	Kafir	89.59	240.75	3.15	
12	IS 27557	BurkinaFaso	Guinea	100.08	287.42	2.85	
13	IS 31557	Burundi	Caudatum	96.00	279.08	2.31	
14	IS 14779	Cameroon	Caudatum	78.37	247.35	2.85	
15	IS 14861	Cameroon	Caudatum	103.9	319.38	3.95	
16	IS 15170	Cameroon	Caudatum	79.35	228.88	3.23	
17	IS 15466	Cameroon	Caudatum	88.19	213.19	3.17	
18	IS 15478	Cameroon	Guinea-caudatum	81.93	277.15	3.20	
19	IS 15744	Cameroon	Durra-caudatum	76.08	210.35	3.63	
20	IS 15931	Cameroon	Guinea	84.48	213.39	3.58	
21	IS 15945	Cameroon	Guinea-caudatum	86.84	277.15	3.00	
22	IS 16151	Cameroon	Caudatum-bicolor	76.13	222.74	2.80	
23	IS 16382	Cameroon	Guinea	56.01	190.31	3.34	
24	IS 16528	Cameroon	Guinea	115.90	312.20	3.46	
25	IS 30572	Cameroon	Guinea-caudatum	61.00	190.22	3.13	
26	IS 30838	Cameroon	Guinea	79.47	247.72	4 09	
27	IS 10757	Chad	Caudatum	102.95	358 19	3.46	
28	IS 10867	Chad	Guinea-caudatum	101.49	287 53	3 79	
29	IS 1212	China	Kafir-hicolor	61.30	229.79	2 57	
30	IS 1212	China	Guinea-bicolor	64.89	237.59	2.07	
31	IS 1233	China	Bicolor	59.00	204.35	2.00	
32	IS 29654	China	Kafir-bicolor	78 58	253.87	3.04	
33	15 30383	China	Caudatum-bicolor	67.79	254 74	2 59	
34	IS 30400	China	Caudatum-bicolor	70.03	262.67	2.80	
35	IS 30417	China	Caudatum-bicolor	60.92	260.28	2.01	
36	IS 30443	China	Caudatum-bicolor	78.86	258.05	2.77	
37	IS 30450	China	Caudatum-bicolor	69.75	208.57	2.61	
38	IS 30451	China	Caudatum-bicolor	66 10	246.05	2.88	
39	IS 30460	China	Caudatum	64 14	205.42	3 19	
40	IS 30466	China	Caudatum-bicolor	64.33	244 42	2 72	
41	IS 12965	Cuba	Caudatum	66.63	135.65	2.72	
42	IS 2872	Equat	Caudatum-bicolor	68.63	158.47	3.67	
43	IS 11026	Ethiopia	Durra	90.41	302.34	4 24	
40	IS 11/73	Ethiopia	Caudatum	68 59	21/ 1/	3.82	
15	IS 11610	Ethiopia	Durra-bicolor	95.80	315.00	2.62	
46	IS 11010	Ethiopia	Durra-bicolor	88.93	188 58	2.52	
47	IS 12027	Ethiopia	Kafir	78.96	252.45	2.00	
48	IS 2351/	Ethiopia	Caudatum	74 / 18	181 28	2.01	
-0 /0	10 20014	Ethiopia	Guinea-coudatum	81 20	156 72	2.00	
	10 2002 1	Ethiopia	Guinea-caudatum	70 50	201 07	2.10	
51	10 2001 8	Ethiopia	Guinea-caudatum	81 20	201.97	2.09	
01	10 20000	сипоріа	Guinea-CaudaluIII	01.00	202.09	0.20	

Appendix Table 1. Continued.

SI. no.	Identity Country of origin Race Da		Days to 50% anthesis	Plant height	100-seed weight	
		, ,		d	cm	g
52	IS 23590	Ethiopia	Guinea-caudatum	86.21	229.67	2.85
53	IS 25249	Ethiopia	Durra-bicolor	97.23	360.05	2.01
54	IS 25301	Ethiopia	Durra-bicolor	104.10	393.29	2.28
55	IS 23644	Gambia	Guinea	100.83	264.76	2.55
56	IS 25089	Ghana	Guinea	101.93	243.18	3.08
57	IS 33090	Honduras	Durra	108.21	207.65	2.56
58	IS 1004	India	Durra	94.77	298.90	3.68
59	IS 1041	India	Durra	68.26	219.49	3.37
60	IS 3971	India	Durra	74.41	185.63	2.20
61	IS 4060	India	Durra-bicolor	64.10	199.68	2.66
62	IS 4092	India	Caudatum	75.50	232.34	2.89
63	IS 4360	India	Durra	83.24	255.81	3 17
64	IS 4372	India	Guinea-durra	72 04	225.66	3.92
65	IS 4515	India	Durra	78.33	235.49	3.32
66	IS 4581	India	Durra	76.37	205.40	3.10
67	10 4001	India	Durra	84.22	205.54	2.00
69	10 4010	India	Durro	79.20	240.07	2.30
60	10 4001	India	Durra	70.29	224.92	3.27
70	15 4090	India	Durra	07.05	220.30	3.09
70	15 4951	India	Guinea	97.95	264.82	2.49
/ 1	IS 5094	india	Durra	79.27	230.46	2.88
72	IS 5295	India	Guinea	100.89	225.11	2.26
73	IS 5301	India	Guinea-caudatum	91.08	203.88	2.44
/4	IS 5386	India	Durra	78.08	260.77	2.73
75	IS 5667	India	Durra	87.90	255.23	2.36
76	IS 5919	India	Durra	79.06	247.84	3.04
77	IS 6351	India	Durra	86.48	243.24	2.84
78	IS 6354	India	Durra	86.48	249.70	2.92
79	IS 6421	India	Durra	86.48	247.86	3.13
80	IS 12883	India	Durra	72.20	188.20	2.38
81	IS 17941	India	Caudatum	60.82	147.28	2.41
82	IS 17980	India	Durra	65.33	224.21	2.17
83	IS 18039	India	Durra-bicolor	69.29	217.21	3.41
84	IS 19859	India	Durra	66.30	189.01	3.45
85	IS 24348	India	Caudatum	60.73	155.43	2.68
86	IS 32349	India	Guinea	106.96	267.11	2.63
87	IS 32439	India	Guinea	100.08	254.18	3.31
88	IS 20956	Indonesia	Durra-caudatum	79.86	222.23	2.93
89	IS 2413	Iran	Bicolor	74.37	274.91	2.34
90	IS 8012	Japan	Bicolor	81.27	215.80	2.68
91	IS 9108	Kenya	Caudatum	80.01	240.68	2.21
92	IS 9113	Kenya	Caudatum	82.96	232.37	2.66
93	IS 9177	Kenya	Caudatum	92.78	236.98	2.67
94	IS 21083	Kenya	Caudatum	87.07	285.63	3.11
95	IS 33353	Kenya	Caudatum	83.72	202.35	2.32
96	IS 30507	Republic of Korea	Caudatum-bicolor	70.03	229.42	2.60
97	IS 30508	Republic of Korea	Caudatum-bicolor	66.45	194.06	2.72
98	IS 30533	Republic of Korea	Caudatum-bicolor	83.23	249.53	2.62
99	IS 30536	Republic of Korea	Caudatum-bicolor	68.26	246.27	2.68
100	IS 30562	Republic of Korea	Bicolor	79.28	189.04	3.03
101	IS 29358	Lesotho	Kafir	72.81	194.46	2.79
102	IS 29392	Lesotho	Kafir	67.90	187.99	3.01
103	IS 29441	Lesotho	Kafir-caudatum	60.43	189.72	2 79
104	IS 29468	Lesotho	Guinea-caudatum	74 64	209.56	2.99
105	IS 29519	Lesotho	Kafir-caudatum	68.29	198.95	2.00
106	IS 29565	Lesotho	Guinea-caudatum	81 52	223.41	3.18
107	IS 29568	Lesotho	Kafir-caudatum	71 23	234 04	2.85
108	10 20000	Losotha	Kofir	74.65	160 61	2.00 0.01
100	10 29002 19 06617	Medagaaaar	Nallí Caudatum biaslar	14.00 02 01	100.01	2.01
110	10 20011	Malauri		30.04 71.07	243.80 175 10	2.42
110	1021012	Malawi	Guinea	(1.3)	1/0.19	2.30
110	15 21645	Malawi	Guinea	80.21	184.42	2.49
112	15 25/32	Mali	Durra	/5.81	234.43	2.86
113	15 25836	Maii	Durra	/3.85	198.42	2.47
114	15 25910	Mali	Guinea	84.26	240.41	2.09
115	IS 25989	Mali	Guinea	82.21	277.51	1.95

Appendix Table 1. Continued.

SI. no.	Identity	Country of origin Race		Days to 50% anthesis	Plant height	100-seed weight	
				d	cm	g	
116	IS 26025	Mali	Guinea	100.99	278.43	2.83	
117	IS 26046	Mali	Guinea	100.99	299.67	2.70	
118	IS 13549	Mexico	Caudatum-bicolor	103.62	320.62	2.35	
119	IS 27786	Morocco	Durra-bicolor	65.81	162.44	3.20	
120	IS 23684	Mozambique	Guinea	114.57	292.46	2.39	
121	IS 22616	Myanmar	Bicolor	96.39	269.50	2.46	
122	IS 12945	Nicaragua	Kafir	95.64	285.70	2.81	
123	IS 20195	Niger	Bicolor	81.31	230.77	3.73	
124	IS 20298	Niger	Caudatum-bicolor	57.47	175.64	3.16	
125	IS 2902	Nigeria	Caudatum-bicolor	77.47	232.34	3.42	
126	IS 7250	Nigeria	Guinea	113.78	355.22	2.93	
127	IS 7305	Nigeria	Caudatum	93.77	268.00	3.25	
128	IS 7310	Nigeria	Guinea	79.42	275.80	2.97	
129	IS 7679	Nigeria	Guinea	101.12	333.59	2.80	
130	IS 7957	Nigeria	Guinea-bicolor	98.64	317.63	3.58	
131	IS 7987	Nigeria	Guinea	94.25	292.96	3.29	
132	IS 8348	Pakistan	Durra	72.73	214.61	2.56	
133	IS 25548	Rwanda	Caudatum	93.08	274.16	2.74	
134	IS 12735	Saudi Arabia	Caudatum-bicolor	67.29	220.89	3.01	
135	IS 19975	Senegal	Guinea	110.99	345.44	2.95	
136	IS 27697	SierraLeone	Guinea	98.12	208.93	2.07	
137	IS 22720	Somalia	Durra	73.59	213.12	2.99	
138	IS 22799	Somalia	Durra	73.59	210.35	3.37	
139	IS 32787	Somalia	Durra	65.01	212.27	2.72	
140	IS 2379	South Africa	Caudatum	65.53	195.50	2.85	
141	IS 2382	South Africa	Caudatum	88.11	254.60	2.69	
142	IS 2389	South Africa	Kafir	78.99	214.14	2.91	
143	IS 2397	South Africa	Kafir	73.1	176.28	2.97	
144	IS 2864	South Africa	Caudatum	63.57	139.17	2.70	
145	IS 3158	South Africa	Kafir	73.06	128.72	3.34	
146	IS 8774	South Africa	Kafir-durra	76.35	196.30	2.87	
147	IS 13782	South Africa	Kafir-durra	78.31	179.68	2.69	
148	IS 13893	South Africa	Kafir-caudatum	106.46	230.72	2.83	
149	IS 13919	South Africa	Kafir-caudatum	94.68	229.79	3.04	
150	IS 13971	South Africa	Caudatum	102.95	271.39	2.62	
151	IS 14010	South Africa	Caudatum-bicolor	67.01	196.42	3.44	
152	IS 24453	South Africa	Caudatum-bicolor	98.75	216.16	2.44	
153	IS 24462	South Africa	Caudatum-bicolor	63.4	118.28	3.01	
154	IS 24463	South Africa	Kafir	78.16	247.72	3.04	
155	IS 24492	South Africa	Kafir	87.97	238.48	2.99	
156	IS 24503	South Africa	Bicolor	108.17	262.11	1.75	
157	IS 26694	South Africa	Caudatum	97.99	267.69	2.68	
158	IS 26701	South Africa	Caudatum-bicolor	105.62	247.56	2.35	
159	IS 26737	South Africa	Kafir	96.81	231.10	2.77	
160	IS 26749	South Africa	Kafir	81.10	148.91	2.73	
161	IS 27887	South Africa	Caudatum-bicolor	96.78	287.26	2.88	
162	IS 27912	South Africa	Kafir-caudatum	84.98	215.57	2.85	
163	IS 29606	South Africa	Kafir	88.40	230.79	3.48	
164	IS 29627	South Africa	Durra-caudatum	83.50	235.35	2.90	
165	IS 22609	Sri Lanka	Caudatum	104.66	226.81	1.80	
166	IS 9745	Sudan	Caudatum	68.23	205.59	3.85	
167	IS 12447	Sudan	Durra-caudatum	69.21	137.40	3.32	
168	IS 19153	Sudan	Guinea-caudatum	73.17	152.07	2.68	
169	IS 19262	Sudan	Guinea-caudatum	61.31	119.25	2.48	
170	IS 22986	Sudan	Caudatum	78.41	245.92	2.82	
171	IS 27034	Sudan	Durra	96.43	309.23	3.78	
172	IS 29187	Swaziland	Guinea-caudatum	98.84	276.67	2.84	
173	IS 29233	Swaziland	Kafir	92.45	187.99	2.92	
174	IS 29239	Swaziland	Kafir	86.56	202.77	3.05	
175	IS 29241	Swaziland	Kafir-caudatum	88.90	257.13	2.68	
176	IS 29269	Swaziland	Guinea-caudatum	88.04	238.81	2.88	
177	IS 29304	Swaziland	Guinea-kafir	99.61	285.25	2.84	
178	IS 29314	Swaziland	Durra-caudatum	104.11	277.82	2.54	

Appendix Table 1. Continued.

J or g or g g 190 IS 2826 Systalind Gaudatum-biodar 810.4 282.43 2.83 181 IS 28165 Systan Arbityalite Biodar 55.24 71.51 2.83 182 IS 24159 Finanzina Curea 7.34 2.84.19 2.84 183 IS 24756 Tranzina Curea 7.34 2.84.19 <	SI. no.	Identity	Country of origin	Race	Days to 50% anthesis	Plant height	100-seed weight
1790 83 24826 Swaziland Causatum-booker 88.04 287.43 2.52 181 18 2463 Symar Arab Rouble Bicolar 65.26 177.19 2.03 181 18 2478 Tarvania Cuinaa 68.55 298.50 2.36 188 18 2477 Tarvania Cuinaa 194.01 2.42 2.57 188 18 2422 Tarvania Cuinaa 194.01 2.32 2.57 188 18 2022 Tarvania Cuinaa 194.01 2.34 2.47 189 18 2022 Tarvania Cuinaa 194.01 2.34 2.47 180 197.71 Ugarda Cuinae-caudum 194.02 2.41 2.42 180 18 3144 Ugarda Cuinae-caudum 84.03 2.41 2.42 198 18 3144 Ugarda Cuinae-caudum 84.03 2.41 2.42 198 18 3144 Ugarda Cuinae caudum 84.03 2.42.9 2.62 <th></th> <th></th> <th></th> <th></th> <th>d</th> <th>cm</th> <th>g</th>					d	cm	g
180 15.28283 Swarland Caudatum 97.24 292.58 293 181 15.24139 Tartania Guinaa 73.46 305.97 2.26 182 15.24139 Tartania Guinaa 73.46 305.97 2.26 181 15.24218 Tartania Guinaa 17.24 2.05.21 2.26 181 15.24218 Tartania Guinaa 17.44 2.01.17 3.15 181 15.1020 Tartania Guinaa 7.44.8 2.01.17 3.15 181 15.1020 Tartania Guinaa 7.44.8 2.01.17 3.15 182 15.7131 Uganda Guinaa-anafatum 9.16.3 2.01.24 3.26 182 15.31184 Uganda Guinaa-anafatum 9.16.3 2.04.24 2.04 183 15.31184 Uganda Guinaa-anafatum 9.16.3 2.04.24 2.02 184 15.31144 Uganda Guinaa-anafatum 8.16.3 2.01.24	179	IS 29326	Swaziland	Caudatum-bicolor	88.04	267.43	2.52
191 IS 2183 Dynan Arab Fagable Bieder 65.26 178.16 2.09 183 HS 34775 Tanzania Guinoa 65.65 299.50 2.65 184 HS 24775 Tanzania Guinoa 10.77 2.94 3.33 185 HS 30023 Tanzania Guinoa 104.01 30.33,2 2.37 186 HS 30023 Tanzania Guinoa 60.40 7.43 2.83 3.42 187 HS 25222 Topo Guinoa caudolum 7.43 2.83 2.44 188 HS 1144 Uganda Guinoa caudolum 7.43 2.83 2.47 189 HS 1144 Uganda Guinoa caudolum 84.03 301.44 7.44 184 HS 1144 Uganda Guinoa caudolum 84.03 301.44 7.44 184 HS 1144 Uganda Guinoa caudolum 84.03 301.44 2.44 184 HS 1144 Uganda Guinoa caudolum 84.03	180	IS 29335	Swaziland	Caudatum	97.24	232.58	2.83
182 182 4139 Tarcama Gunea 73.46 95.67 2.36 184 16 24218 Tarcama Gunea 10.77 294.89 3.23 185 16 30.022 Transma Gunea 10.07 294.89 3.23 186 16 30.022 Toga Gunea-curistan 10.42 3.14 3.14 187 187.0022 Toga Gunea-curistan 10.42 20.76 3.14 189 18 77.13 Uganda Gunea-curistan 17.43 20.75 3.12 189 18 77.73 Uganda Gunea-curistan 8.13 20.53 2.27 180 18 77.75 Uganda Gunea-curistan 8.13 2.04 3.24 180 18 77.75 Uganda Gunea-curistan 8.13 2.84 3.26 181 18 49.65 Uparda Gunea-curistan 8.13 2.26 2.67 181 18 49.65 Uparda Gunea-curistan 7.72 2.31 2.27 <td>181</td> <td>IS 21863</td> <td>Syrian Arab Republic</td> <td>Bicolor</td> <td>65.26</td> <td>178.19</td> <td>2.99</td>	181	IS 21863	Syrian Arab Republic	Bicolor	65.26	178.19	2.99
188 18.2.4170 Tarcama Oursea 00.05 200.05 200.05 186 15.300/3 Tarcama Oursea 101.01 303.12 2.57 186 15.300/3 Tarcama Oursea 101.01 303.12 2.57 187 15.26222 Togo Guinos caudatum 7.43 2.03.14 3.42 180 15.7131 Uganda Durne-caudatum 7.83 2.04.4 2.27 180 15.7131 Uganda Caunea-caudatum 8.78 2.04.4 2.27 191 15.8114 Uganda Gaunea-caudatum 8.71 2.24.4 2.24 103 15.8136 Uganda Gaunea-caudatum 8.05.5 2.47.02 2.35 105 15.8378 United States of America Exclor 7.1.7 2.00.4 2.34 105 15.856 United States of America Exclor 7.1.7 2.31.0 2.34 106 15.056 United States of America Exclor 7.1.	182	IS 24139	Tanzania	Guinea	73.46	305.97	2.36
18.4 18.2 Add 19. Tanzama Guines 110.77 29.4.89 3.23 186 15.3002 Thaland Guines-audalum 77.43 230.76 3.15 187 15.222 Togo Guines-audalum 70.43 230.76 3.15 188 15.120.04 Turkey Bicolar 77.43 203.81 2.42 189 15.171 Uganda Caudatum-backet 7.431 176.09 2.02 190 15.8777 Uganda Guines-audatum 8.411 2.02.00 2.02 191 15.8143 Upanda Guines-audatum 8.413 2.02.00 2.44 192 15.1144 Upanda Guines-audatum 8.61 2.02.00 2.44 198 15.1144 Upanda Elocar 7.12 201.12 2.44 198 15.1144 Upanda Elocar 7.12 201.12 2.02 198 15.1144 Upanda Elocar 7.12 2.01 2.02 <td>183</td> <td>IS 24175</td> <td>Tanzania</td> <td>Guinea</td> <td>68.55</td> <td>299.50</td> <td>2.66</td>	183	IS 24175	Tanzania	Guinea	68.55	299.50	2.66
18b IS 33223 Tonzonia Guinoa 104.01 30.312 2.27 187 IS 26022 Topo Guinos-courdstum 104.49 261.61 3.45 189 IS 26022 Topo Guinos-courdstum 104.49 261.61 3.45 189 IS 7131 Ugarda Durns-courdstum 67.88 252.44 2.24 189 IS 1014 Ugarda Guinos-courdstum 61.31 23.44 2.75 191 IS 1016 Ugarda Guinos-courdstum 68.13 21.44 2.76 192 IS 1016 Uparda Guinos courdstum 68.71 2.24 3.05 193 IS 470 Unitod States of America Guinos-courdstum 68.13 211.89 2.44 194 IS 6030 Unitod States of America Guinos-courdstum 61.33 211.81 2.24 198 IS 6060 Unitod States of America Guinos-courdstum 61.33 211.81 2.24 199 IS 6050 Unitod States o	184	IS 24218	Tanzania	Guinea	110.77	294.89	3.23
180 18.10302 Thailand Caudam 77.43 220.7 3.42 188 18.12804 Turkey Binolor 72.43 263.81 2.44 188 18.731 Uganda Dura caudatum-boolor 74.31 176.96 2.247 190 18.8777 Uganda Caudatum-boolor 74.31 176.96 2.247 191 18.9104 Uganda Guinae caudatum 96.03 2.341 2.365 192 18.31045 Uganda Guinae caudatum 98.71 228.47 2.365 193 18.5174 Unindi States of America Biolor 73.72 190.44 2.66 196 18.602 Unindi States of America Biolor 96.33 2.21.82 2.26 198 18.508 Unindi States of America Biolor 96.3 2.21.82 2.26 199 18.502 Unindi States of America Biolor 96.3 2.21.82 2.26 190 18.5026 Unindi States of America <	185	IS 33023	Tanzania	Guinea	104.01	303.12	2.57
187 18.2 https:// Topo Outine-couldtum 104.42 2018.18 3.4.4 189 16 12204 Turkey Elocitor 72.4.3 252.6.4 256.7 191 18 5176 Ugarda Guidac couddum 81.01 23.4.4 2.76 192 18 3176 Ugarda Guidac couddum 81.01 23.4.4 2.76 193 18 3178 Ugarda Guidac couddum 80.71 226.20 2.47 194 18 3178 Undra States of America Elocitor 73.7 23.12 2.90 196 18 500 Unida States of America Elocitor 73.7 23.12 2.90 197 18 500 Unida States of America Elocitor 70.7 23.12 2.52 198 18 5060 Unida States of America Elocitor 70.7 2.91 2.85 201 18 1060 Unida States of America Caudatum State 3.91 3.82 3.26 218 18 20870 Unida States of America	186	IS 10302	Thailand	Caudatum	77.43	230.76	3.15
188 IS 12004 Turkey Bicklor 72.43 228.8 2.64 190 IS 8777 Uganda Caudatum-bicklor 74.31 176.96 2.87 190 IS 8777 Uganda Caudatum 94.03 301.24 3.24 192 IS 37045 Uganda Caudatum 94.03 301.24 3.24 193 IS 37045 Uganda Caune-caudatum 98.71 282.6 2.34 194 IS 602 United States of America Bicolor 73.72 190.40 2.66 195 IS 721 United States of America Bicolor 73.72 120.81 2.33 196 IS 600 United States of America Bicolor 73.72 120.81 2.34 205 IS 1006 United States of America Guidas Caudatum 60.77 22.82 2.34 205 IS 2076 United States of America Guidas Caudatum 90.63 322.71 2.05 205 IS 2070 United States of America </td <td>187</td> <td>IS 26222</td> <td>Тодо</td> <td>Guinea-caudatum</td> <td>104.92</td> <td>261.81</td> <td>3.42</td>	187	IS 26222	Тодо	Guinea-caudatum	104.92	261.81	3.42
189 B. 7/31 Ugarda Dura-culation 67.88 292.64 2.87 191 B. 8010 Ugarda Guinac-culation 81.81 224.44 2.76 191 B. 30104 Ugarda Guinac-culation 81.31 224.44 2.76 192 B. 3104 Ugarda Guinac-culation 98.57 24.782.20 2.47 193 B. 3147 United States of America Guinac-culation 99.71 220.82 2.47 196 S.600 United States of America Giolof 73.72 29.11 2.86 197 IS.600 United States of America Biolof 73.72 29.12 2.83 198 IS.600 United States of America Guinac-culation 10.38 221.82 2.82 199 IS.600 United States of America Guinac-culation 10.38 221.82 3.26 21 IS.1000 United States of America Guinac-culation 10.38 222.10 3.39 221 IS.2007<	188	IS 12804	Turkey	Bicolor	72.43	263.81	2.64
1910 IS 5777 Uganda Caudatum-skoler 74.31 176.96 2.02 192 IS 31048 Uganda Caudatum 94.03 301/44 2.364 193 IS 31048 Uganda Culnea-caudatum 98.05 247.62 2.47 193 IS 31446 Uganda Culnea-caudatum 99.71 2.05 2.47 196 IS 502 United States of America Bicolor 7.372 205.11 2.26 197 IS 505 United States of America Bicolor 7.372 25.11 2.05 198 IS 505 United States of America Bicolor 7.372 2.05 2.26 199 IS 1050 United States of America Guadatum-bocobr 10.816 2.17.07 2.25 191 United States of America Guadatum-bocobr 10.816 2.07.06 2.05 192 IS 1020 United States of America Guadatum-bocobr 10.816 2.07.05 2.53 193 United States of America	189	IS 7131	Uganda	Durra-caudatum	87.88	250.45	2.87
191 IS 3016 Uganda Guinea-caudatum 91 91 24.41 2.76 193 IS 31186 Uganda Guinea-caudatum 98.55 9474 2.64 193 IS 31446 Uganda Guinea-caudatum 98.55 9474 2.65 186 IS 602 United States of America Bicolor 73.72 10.04 2.56 187 IS 600 United States of America Bicolor 73.72 2.01 2.53 198 IS 500 United States of America Bicolor 87.47 2.29.28 2.22 200 IS 1020 United States of America Guinea-caudatum 67.73 2.04.39 2.24.4 201 IS 1020 United States of America Guinea-caudatum 103.42 20.56 2.05.5 2.06 2.07.5 2.8.3 202 IS 2067 United States of America Guinea-caudatum 96.8 3.02.10 3.3.9 203 IS 2067 United States of America Guinea-caudatum 66.45 144.4.4 </td <td>190</td> <td>IS 8777</td> <td>Uganda</td> <td>Caudatum-bicolor</td> <td>74.31</td> <td>176.96</td> <td>2.92</td>	190	IS 8777	Uganda	Caudatum-bicolor	74.31	176.96	2.92
192 193 193 194 Upanda Coulatium 94.03 01/4 3.44 194 183 198 Uganda Cuinae-audatium 98.15 347.82 3.05 194 183 194.43 Unted States of America Guinae-audatium 88.15 347.82 3.04 197 115.003 United States of America Bicolor 7.37.2 20.14 22.83 198 15.003 United States of America Bicolor 67.47 22.83 22.82 198 15.003 United States of America Bicolor 67.17 21.08 2.25 198 15.004 United States of America Guidatum 90.81 2.10.83 3.06 191 United States of America Guidatum 90.82 2.97.06 2.53 203 15.2062 United States of America Guidatum 90.82 2.21.0 3.33 204 15.2067 United States of America Guidatum 93.83 2.22.10 3.32	191	IS 8916	Uganda	Guinea-caudatum	81.91	234.41	2.76
133 US 31186 Uganda Guinas-audetum 98.55 94782 0.66 185 15.473 United States of America Guinas-Audetum 99.71 226.60 2.47 186 15.473 United States of America Bicolor 73.72 190.49 2.53 187 IS 605 United States of America Bicolor 73.72 2.93 2.52 198 IS 505 United States of America Guidaum-bicolor 84.13 2.13.89 2.44 200 IS 7120 United States of America Guinac caudatum 60.69 2.17.77 2.65 201 IS 1069 United States of America Guinac caudatum 0.066 310.88 2.26 203 IS 2067 United States of America Guidatum-bicolor 103.82 227.5 3.87 206 IS 2067 United States of America Guidatum 66.45 144.44 2.40 207 IS 2067 United States of America Bicolor 67.74 227.1 27.5 3.87 <td>192</td> <td>IS 31043</td> <td>Uganda</td> <td>Caudatum</td> <td>94.03</td> <td>301.24</td> <td>3.24</td>	192	IS 31043	Uganda	Caudatum	94.03	301.24	3.24
194 US 51446 Uganda Gamaa-caudatum 99.71 202.80 2.47 195 IS 472 United States of America Guinea-kafir 71,14 208.68 2.34 196 IS 602 United States of America Bicolor 73,72 231.12 2.33 197 IS 603 United States of America Bicolor 87,47 228.28 2.05 190 IS 905 United States of America Bicolor 80.59 217.27 2.05 201 IS 10989 United States of America Guidatum-bicolor 103.62 227.00 2.53 202 IS 12065 United States of America Caudatum-bicolor 103.62 227.03 3.39 205 Iso 2067 United States of America Guidatum 72.77 227.35 3.27 206 IS 20670 United States of America Guidatum 66.45 144.34 2.40 207 IS 87713 United States of America Guidatum 77.77 227.35 3.27	193	IS 31186	Uganda	Guinea-caudatum	98.55	247.82	3.05
No. Control States of America Bicolor Control State	194	IS 31446	Uganda	Guinea-caudatum	89.71	262.60	2 47
International International Decisional 73.72 100.40 2.65 197 18.603 United States of America Bicolor 73.72 231.12 2.63 198 18.668 United States of America Bicolor 87.47 228.28 2.52 198 18.985 United States of America Caudatum-bicolor 84.13 21.88.99 2.44 201 15.10989 United States of America Caudatum-bicolor 80.09 217.27 2.65 203 15.20282 United States of America Caudatum-bicolor 103.82 287.00 2.53 203 15.20282 United States of America Caudatum 00.88 322.10 3.39 205 15.20679 United States of America Caudatum 76.70 203.11 3.02 204 15.20679 United States of America Bicolor 65.60 203.39 2.54 204 15.20470 United States of America Bicolor 77.77 27.35 3.27 20	195	IS 473	Linited States of America	Guinea-kafir	71 14	208.6	2.34
Instruct Deck	106	15 602	Linited States of America	Bicolor	73.72	190./9	2.54
Inst. Local 10.12 20.112 20.112 20.112 188 IS 008 United States of America Caudatum-bicolor 87.47 229.22 213.88 2.44 1990 IS 312 United States of America Giona 60.59 217.27 2.65 201 IS 10960 United States of America Caudatum bicolor 103.82 287.06 2.53 203 IS 20622 United States of America Caudatum bicolor 103.82 287.06 2.53 204 IS 20624 United States of America Caudatum bicolor 103.82 287.06 2.53 205 IS 2073 United States of America Caudatum 76.70 2.06.11 3.02 206 IS 2073 United States of America Guines-caudatum 76.70 2.06.11 3.02 208 IS 20743 United States of America Bicolor 63.64 229.45 2.71 211 IS 2016 United States of America Bicolor 77.74 180.08 2.12	107	10 002	Lipited States of America	Bicolor	73.72	231.12	2.00
180 150.06 United States of America Caudatum-bicolor 64.13 213.83 2.44 200 IS 3121 United States of America Guinea-caudatum Bicolor 80.59 217.27 2.65 201 IS 1096 United States of America Guinea-caudatum 671.3 210.38 3.06 203 IS 2062 United States of America Guinea-caudatum 90.66 310.68 2.28 204 IS 20637 United States of America Guinea-caudatum 90.83 322.10 3.39 205 IS 20679 United States of America Guinea-caudatum 76.77 227.35 3.27 206 IS 20707 United States of America Guinea-caudatum 76.70 20.611 3.02 207 IS 20740 United States of America Bicolor Bicolor 63.64 226.15 2.91 211 IS 20810 United States of America Bicolor Bicolor 77.74 180.85 2.12 213 IS 20810 Papublic of Yernen Dura 83.41 277.76 5.71 214 IS 20814	100	13 003	United States of America	Dicolor	13.12	201.12	2.90
199 19980 19980 19980 19980 19980 213.58 214 201 IS 121 United States of America Bicolor 80,59 217.27 2.66 201 IS 1206 United States of America Guinea-caudatum 60,66 210.88 3.06 201 IS 20825 United States of America Guinea-caudatum 80,66 310.88 2.26 203 IS 20120 United States of America Guinea-caudatum 77.7 227.35 3.27 206 IS 20173 United States of America Guinea-caudatum 76.70 206.11 3.02 208 IS 20173 United States of America Guinea-caudatum 76.70 206.11 3.02 210 IS 20140 United States of America Bicolor 77.74 180.85 2.21 211 IS 20140 United States of America Bicolor 77.74 180.85 2.21 211 IS 20140 United States of America Bicolor 77.74 180.85 2.21	190	13 000	United States of America	Coudatum bicolor	07.47	229.20	2.52
Abb Is 3 (2) Of Initial Status of Annuncial Biodorf 00.539 21/27 2.85 201 IS 10966 United States of America Gaudatum-bicolor 103.62 287.06 2.53 203 IS 20052 United States of America Caudatum 99.83 322.10 3.39 204 IS 20032 United States of America Caudatum 76.77 227.35 3.27 206 IS 20097 United States of America Guinee-caudatum 76.70 206.11 3.02 208 IS 20727 United States of America Bicolor 66.45 229.15 2.91 211 IS 20740 United States of America Bicolor 77.74 100.85 2.12 212 IS 12944 Venozula Caudatum-bicolor 17.74 100.85 2.99 214 IS 2841 Republic of Yemen Dura-caudatum 50.36 2.26.15 2.91 214 IS 2849 Republic of Yemen Dura-caudatum 50.36 164.86 2.99	199	15 995	United States of America		84.13	213.89	2.44
And Is 10866 Onited States of America Outmen-caudatum 0.1.3 210.88 3.006 202 IS 20667 United States of America Caudatum 90.66 310.88 2.26 203 IS 20632 United States of America Gaunaa-caudatum 72.77 227.35 3.27 206 IS 20679 United States of America Gaunaa-caudatum 72.77 227.35 3.27 206 IS 20713 United States of America Gaudatum 66.45 144.34 2.40 209 IS 20717 United States of America Bicolor 65.60 203.99 2.54 209 IS 20710 United States of America Bicolor 63.64 22.615 2.91 211 IS 20816 United States of America Bicolor 77.74 180.65 2.42 214 IS 23991 Republic of Yemen Durra-caudatum 63.64 22.615 2.91 214 IS 23991 Republic of Yemen Durra-caudatum 67.65 179.63 27.70 </td <td>200</td> <td>15 3121</td> <td>United States of America</td> <td>BICOIOr</td> <td>80.59</td> <td>217.27</td> <td>2.00</td>	200	15 3121	United States of America	BICOIOr	80.59	217.27	2.00
202 IS 12/06 United States of America Durar-caudatum 90.66 31.08 2.26 203 IS 20062 United States of America Caudatum 99.83 322.10 3.39 204 IS 20079 United States of America Caudatum 77.77 227.35 3.27 206 IS 20697 United States of America Guinea-caudatum 76.70 206.11 3.02 208 IS 2077 United States of America Bicolor 65.53 229.85 2.71 201 IS 20740 United States of America Bicolor 77.74 180.85 2.12 211 IS 20810 United States of America Bicolor 77.74 180.85 2.12 213 IS 23991 Republic of Yemen Dura 83.41 277.76 5.71 214 IS 23991 Republic of Yemen Dura-caudatum 67.65 179.63 2.70 214 IS 23991 Republic of Yemen Dura-caudatum 67.05 179.64 2.56	201	IS 10969	United States of America	Guinea-caudatum	67.13	210.88	3.06
204 IS 20052 United States of America Quadatum 90.05 310.86 2.45 205 IS 20632 United States of America Guadatum 72.77 227.35 3.27 206 IS 20670 United States of America Guadatum 66.45 144.34 2.40 207 IS 20713 United States of America Bicolor 65.60 203.99 2.54 208 IS 20740 United States of America Bicolor 63.63 229.85 2.71 210 IS 20740 United States of America Bicolor 77.74 180.85 2.12 211 IS 20816 United States of America Bicolor 77.74 180.85 2.12 213 IS 23991 Republic of Yemen Durra-caudatum 63.68 246.85 2.99 215 IS 28131 Republic of Yemen Durra-caudatum 67.05 179.63 2.70 216 IS 28439 Republic of Yemen Durra-caudatum 67.05 179.63 2.75	202	IS 12706	United States of America	Caudatum-bicolor	103.62	267.06	2.53
204 IS 20063 United States of America Galuatum 99.93 322.10 3.39 205 IS 20677 United States of America Guae-caudatum 77.7 227.35 3.27 206 IS 20671 United States of America Guae-caudatum 66.45 144.34 2.40 207 IS 20713 United States of America Bicolor 65.60 203.99 2.54 208 IS 20740 United States of America Bicolor 65.61 228.55 2.91 211 IS 20743 United States of America Bicolor 7.74 180.85 2.12 213 IS 23891 Republic of Yemen Durra 83.41 277.76 5.71 214 IS 23892 Republic of Yemen Dura-caudatum 63.68 246.85 2.99 215 IS 28141 Republic of Yemen Dura-caudatum 67.05 174.86 2.36 216 IS 28491 Republic of Yemen Dura-caudatum 67.05 174.83 2.90 215<	203	IS 20625	United States of America	Durra-caudatum	90.66	310.88	2.26
205 IS 2067 United States of America Caudatum 72.77 22.75 3.27 206 IS 2067 United States of America Guida-caudatum 76.70 206.11 3.02 208 IS 20740 United States of America Bicolor 66.60 203.99 2.54 209 IS 20740 United States of America Bicolor 63.64 228.15 2.91 210 IS 20740 United States of America Bicolor 77.74 180.85 2.12 212 IS 12081 United States of America Bicolor 77.74 180.85 2.12 214 IS 23991 Republic of Yemen Durra 83.41 277.76 5.71 214 IS 23931 Republic of Yemen Durra-caudatum 57.63 246.85 2.99 216 IS 28439 Republic of Yemen Durra-caudatum 67.05 179.63 2.70 218 IS 28449 Republic of Yemen Durra-caudatum 67.05 215.64 2.55 217 <td>204</td> <td>IS 20632</td> <td>United States of America</td> <td>Caudatum</td> <td>99.83</td> <td>322.10</td> <td>3.39</td>	204	IS 20632	United States of America	Caudatum	99.83	322.10	3.39
206 IS 20097 United States of America Caudatum 66.45 144.34 2.40 207 IS 20773 United States of America Bicolor 65.60 20.89 2.54 208 IS 20774 United States of America Bicolor 69.53 229.85 2.71 201 IS 20740 United States of America Bicolor 63.64 226.15 2.91 211 IS 20816 United States of America Bicolor 77.74 180.85 2.12 213 IS 23891 Republic of Yemen Durra 83.41 27.76 5.71 214 IS 28399 Republic of Yemen Durra-caudatum 87.67 285.82 4.73 216 IS 28141 Republic of Yemen Durra-caudatum 67.05 179.63 2.70 218 IS 28449 Republic of Yemen Durra-caudatum 67.05 215.64 2.55 211 IS 28441 Republic of Yemen Durra-caudatum 70.5 215.64 2.55 211	205	IS 20679	United States of America	Guinea-caudatum	(2.17	227.35	3.27
207 IS 20713 United States of America Bicolor 65.60 203.99 2.54 209 IS 20740 United States of America Bicolor 63.63 229.85 2.71 210 IS 20740 United States of America Bicolor 63.64 226.15 2.91 211 IS 20816 United States of America Bicolor 7.74 180.85 2.12 212 IS 13294 Venezuela Caudatum-bicolor 117.36 320.62 2.60 213 IS 28381 Republic of Yemen Durra-caudatum 63.68 246.65 2.99 215 IS 28141 Republic of Yemen Durra-caudatum 67.05 179.83 2.70 216 IS 28449 Republic of Yemen Guinea-caudatum 67.05 215.84 2.60 210 IS 28441 Republic of Yemen Durra-caudatum 67.05 215.64 2.55 221 IS 28441 Republic of Yemen Durra-caudatum 70.98 245.19 3.60 222	206	IS 20697	United States of America	Caudatum	66.45	144.34	2.40
208 IS 2072 United States of America Bicolor 65.60 228.99 2.54 209 IS 20740 United States of America Bicolor 63.64 226.15 2.91 210 IS 20743 United States of America Bicolor 77.74 180.85 2.12 211 IS 20816 United States of America Bicolor 77.74 180.85 2.12 213 IS 23891 Republic of Yemen Durra 83.41 27.76 5.71 214 IS 28911 Republic of Yemen Durra-caudatum 63.68 246.85 2.99 215 IS 28141 Republic of Yemen Durra-caudatum 67.05 176.68 2.76 216 IS 28449 Republic of Yemen Guinea-caudatum 67.05 176.64 2.55 211 IS 28471 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 220 IS 2849 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 221	207	IS 20713	United States of America	Guinea-caudatum	76.70	206.11	3.02
209 IS 20740 United States of America Bicolor 69.53 229.85 2.71 210 IS 20743 United States of America Bicolor 77.74 180.85 2.12 211 IS 20816 United States of America Bicolor 77.74 180.85 2.12 213 IS 23891 Republic of Yemen Durra 83.41 277.76 5.71 214 IS 23992 Republic of Yemen Durra-caudatum 63.68 246.85 2.99 215 IS 28141 Republic of Yemen Durra-caudatum 87.65 179.63 2.70 216 IS 28449 Republic of Yemen Durra-caudatum 67.05 179.63 2.70 218 IS 28449 Republic of Yemen Guinea-caudatum 67.42 242.98 3.00 220 IS 28614 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 221 IS 28949 Republic of Yemen Durra-caudatum 70.88 245.19 3.50 224	208	IS 20727	United States of America	Bicolor	65.60	203.99	2.54
210 IS 20743 United States of America Bicolor 63.64 226.15 2.91 211 IS 20816 United States of America Bicolor 77.74 180.65 2.12 212 IS 32991 Republic of Yemen Durra 83.41 277.76 5.71 214 IS 23991 Republic of Yemen Caudatum 63.68 246.85 2.99 215 IS 28131 Republic of Yemen Durra-caudatum 50.36 174.86 2.36 216 IS 28389 Republic of Yemen Durra-caudatum 67.05 179.63 2.70 218 IS 28451 Republic of Yemen Guinea-caudatum 67.05 215.64 2.55 220 IS 28451 Republic of Yemen Durra-caudatum 70.98 225.88 2.60 221 IS 2849 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 222 IS 2849 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 223 IS 29101 Republic of Yemen Durra-caudatum 70.98 245.19 3.	209	IS 20740	United States of America	Bicolor	69.53	229.85	2.71
211 IS 20316 United States of America Bicolor 77.74 180.85 2.12 212 IS 13294 Venezuela Caudatum-bicolor 117.36 320.62 2.60 213 IS 23891 Republic of Yemen Durra - caudatum 63.68 246.85 2.99 215 IS 28141 Republic of Yemen Durra - caudatum 50.36 164.86 2.36 216 IS 28313 Republic of Yemen Durra - caudatum 67.05 179.63 2.70 218 IS 28449 Republic of Yemen Guinea-caudatum 65.42 242.98 3.00 220 IS 28614 Republic of Yemen Durra - caudatum 70.98 252.68 2.50 221 IS 28649 Republic of Yemen Durra - caudatum 70.98 245.19 3.50 222 IS 28649 Republic of Yemen Durra - caudatum 70.98 245.19 3.50 223 IS 29100 Republic of Yemen Durra - caudatum 76.62 241.81 4.98 224 IS 31706 Republic of Yemen Durra - caudatum 68.41	210	IS 20743	United States of America	Bicolor	63.64	226.15	2.91
212 IS 13294 Venezuela Caudatum-bicolor 117.36 320.62 2.60 213 IS 23991 Republic of Yemen Dura 83.41 277.76 5.71 214 IS 23992 Republic of Yemen Caudatum 63.68 246.85 2.99 215 IS 28113 Republic of Yemen Durra-caudatum 50.36 164.86 2.36 216 IS 28393 Republic of Yemen Durra-caudatum 67.05 179.63 2.70 218 IS 28449 Republic of Yemen Guinea-caudatum 67.38 243.90 2.94 219 IS 2841 Republic of Yemen Durra-caudatum 67.05 215.64 2.55 221 IS 2844 Republic of Yemen Durra-caudatum 70.98 245.19 3.60 222 IS 2849 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 223 IS 29010 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 225 IS 31706 Republic of Yemen Durra-caudatum 76.62 241.81 4.98	211	IS 20816	United States of America	Bicolor	77.74	180.85	2.12
213 IS 23891 Republic of Yemen Dura 83.41 277.76 5.71 214 IS 23992 Republic of Yemen Dura-caudatum 63.68 246.85 2.99 215 IS 28141 Republic of Yemen Dura-caudatum 67.67 286.82 4.73 216 IS 28313 Republic of Yemen Dura-caudatum 67.05 179.63 2.70 218 IS 28449 Republic of Yemen Guinea-caudatum 66.42 243.90 2.94 219 IS 28614 Republic of Yemen Guinea-caudatum 67.05 215.64 2.55 220 IS 28614 Republic of Yemen Dura-caudatum 70.98 245.99 2.50 221 IS 28747 Republic of Yemen Dura-caudatum 70.98 245.19 3.50 2224 IS 29091 Republic of Yemen Dura-caudatum 76.62 241.81 4.98 225 IS 31706 Republic of Yemen Dura-caudatum 76.62 241.81 4.98 225 IS 31714 Republic of Yemen Dura-caudatum 76.62 241.81 4	212	IS 13294	Venezuela	Caudatum-bicolor	117.36	320.62	2.60
214 IS 23992 Republic of Yemen Caudatum 87.67 285.82 4.73 215 IS 28111 Republic of Yemen Durra-caudatum 50.36 164.86 2.36 217 IS 28393 Republic of Yemen Durra-caudatum 67.05 179.63 2.70 218 IS 28449 Republic of Yemen Guinea-caudatum 67.05 179.63 2.94 219 IS 28614 Republic of Yemen Guinea-caudatum 67.05 215.64 2.55 221 IS 28747 Republic of Yemen Durra-caudatum 70.98 252.58 2.50 222 IS 28849 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 224 IS 29091 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 225 IS 31706 Republic of Yemen Durra-caudatum 66.41 206.06 3.90 226 IS 3161 Zambia Caudatum 106.67 107.61 2.76 228 IS	213	IS 23891	Republic of Yemen	Durra	83.41	277.76	5.71
215 IS 28141 Republic of Yemen Durra-caudatum 87.67 285.82 4.73 216 IS 28313 Republic of Yemen Durra-caudatum 67.05 179.63 2.70 218 IS 28349 Republic of Yemen Guinea-caudatum 67.05 179.63 2.70 218 IS 28451 Republic of Yemen Guinea-caudatum 67.38 243.90 2.94 220 IS 28614 Republic of Yemen Durra-caudatum 67.05 215.64 2.55 221 IS 28747 Republic of Yemen Durra-caudatum 70.98 252.58 2.50 222 IS 28649 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 224 IS 29010 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 225 IS 31706 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 226 IS 31714 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 226 IS 31651 Zaire Caudatum-bicolor 117.36 264.22	214	IS 23992	Republic of Yemen	Caudatum	63.68	246.85	2.99
216 IS 28313 Republic of Yemen Durra-caudatum 50.36 164.86 2.36 217 IS 28389 Republic of Yemen Durra-caudatum 67.05 179.63 2.70 218 IS 28449 Republic of Yemen Guinea-caudatum 67.05 243.90 2.94 219 IS 28614 Republic of Yemen Durra-caudatum 67.05 215.64 2.55 221 IS 28747 Republic of Yemen Durra-caudatum 70.98 252.58 2.50 222 IS 28849 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 224 IS 29010 Republic of Yemen Durra-caudatum 70.88 245.19 3.50 225 IS 31706 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 226 IS 31714 Republic of Yemen Durra-caudatum 61.54 206.06 3.90 227 IS 32215 Republic of Yemen Durra-caudatum 61.54 206.06 3.90 226 IS 31714 Republic of Yemen Durra-caudatum 778 264.22 <td>215</td> <td>IS 28141</td> <td>Republic of Yemen</td> <td>Durra-caudatum</td> <td>87.67</td> <td>285.82</td> <td>4.73</td>	215	IS 28141	Republic of Yemen	Durra-caudatum	87.67	285.82	4.73
217 IS 28899 Republic of Yemen Dura-caudatum 67.05 179.63 2.70 218 IS 28449 Republic of Yemen Guinea-caudatum 67.38 243.90 2.94 219 IS 28614 Republic of Yemen Dura-caudatum 67.05 215.64 2.55 221 IS 28747 Republic of Yemen Dura-caudatum 70.98 252.58 2.50 222 IS 28849 Republic of Yemen Dura-caudatum 70.98 245.19 3.50 223 IS 29010 Republic of Yemen Dura-caudatum 70.98 245.19 3.50 224 IS 29100 Republic of Yemen Dura-caudatum 76.62 241.81 4.98 225 IS 31764 Republic of Yemen Dura-caudatum 68.41 200.76 4.85 226 IS 31761 Republic of Yemen Dura-caudatum 68.41 200.52 2.65 228 IS 32651 Zambia Caudatum-bicolor 117.36 264.22 2.66 229 IS 24953 Zambia Guinea-caudatum 100.67 307.61 2.75	216	IS 28313	Republic of Yemen	Durra-caudatum	50.36	164.86	2.36
218 IS 28449 Republic of Yemen Guinea-caudatum 67.38 243.90 2.94 219 IS 28451 Republic of Yemen Guinea-caudatum 65.42 242.98 3.00 220 IS 28614 Republic of Yemen Durra-caudatum 67.05 215.64 2.55 221 IS 28747 Republic of Yemen Durra-caudatum 70.98 252.58 2.50 222 IS 289091 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 224 IS 29100 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 225 IS 31714 Republic of Yemen Durra-caudatum 61.54 206.06 3.90 227 IS 32245 Republic of Yemen Durra-caudatum 68.41 200.52 2.65 228 IS 31651 Zaire Caudatum-bicolor 117.36 264.22 2.66 229 IS 23216 Zambia Guinea-caudatum 105.67 307.61 2.75 232 <	217	IS 28389	Republic of Yemen	Durra-caudatum	67.05	179.63	2.70
219 IS 28451 Republic of Yemen Guinea-caudatum 65.42 242.98 3.00 220 IS 28614 Republic of Yemen Durra-caudatum 67.05 215.64 2.55 221 IS 28747 Republic of Yemen Durra-caudatum 70.98 252.58 2.50 222 IS 29091 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 224 IS 29100 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 225 IS 31706 Republic of Yemen Durra-caudatum 61.54 206.06 3.90 226 IS 31714 Republic of Yemen Durra-caudatum 68.41 200.52 2.65 228 IS 31651 Zaire Caudatum 77.83 264.22 2.56 229 IS 23216 Zambia Bicolor 108.17 258.42 2.78 231 IS 24953 Zambia Guinea-caudatum 105.67 307.61 2.75 232 IS 19676 <td< td=""><td>218</td><td>IS 28449</td><td>Republic of Yemen</td><td>Guinea-caudatum</td><td>67.38</td><td>243.90</td><td>2.94</td></td<>	218	IS 28449	Republic of Yemen	Guinea-caudatum	67.38	243.90	2.94
220 IS 28614 Republic of Yemen Durra-caudatum 67.05 215.64 2.55 221 IS 28747 Republic of Yemen Durra-caudatum 70.98 252.58 2.50 222 IS 28849 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 223 IS 29010 Republic of Yemen Durra-caudatum 70.62 241.81 4.98 225 IS 31706 Republic of Yemen Durra-caudatum 61.64 290.76 4.85 226 IS 31714 Republic of Yemen Durra-caudatum 61.54 206.06 3.90 227 IS 32245 Republic of Yemen Durra-caudatum 77.83 264.22 2.65 228 IS 3161 Zaire Caudatum-bicolor 117.36 264.29 2.61 230 IS 24939 Zambia Guinea-caudatum 105.67 307.61 2.75 232 IS 19676 Zimbabwe Kafir 112.94 250.18 2.68 234 IS 29733	219	IS 28451	Republic of Yemen	Guinea-caudatum	65.42	242.98	3.00
221 IS 28747 Republic of Yemen Durra-caudatum 70.98 252.58 2.50 222 IS 28849 Republic of Yemen Durra-caudatum 59.20 169.47 2.86 223 IS 29091 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 224 IS 29100 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 225 IS 31706 Republic of Yemen Durra-caudatum 61.54 206.06 3.90 226 IS 31714 Republic of Yemen Durra-caudatum 68.41 200.52 2.66 228 IS 31651 Zaire Caudatum 17.83 264.22 2.61 230 IS 24939 Zambia Guinea-caudatum 105.67 307.61 2.75 231 IS 24953 Zambia Guinea-caudatum 105.67 307.61 2.61 233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe </td <td>220</td> <td>IS 28614</td> <td>Republic of Yemen</td> <td>Durra-caudatum</td> <td>67.05</td> <td>215.64</td> <td>2.55</td>	220	IS 28614	Republic of Yemen	Durra-caudatum	67.05	215.64	2.55
222 IS 28849 Republic of Yemen Durra-caudatum 59.20 169.47 2.86 223 IS 29091 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 224 IS 29100 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 225 IS 31706 Republic of Yemen Durra-caudatum 61.54 200.66 3.90 226 IS 31714 Republic of Yemen Durra-caudatum 68.41 200.52 2.65 228 IS 31651 Zaire Caudatum-bicolor 117.36 264.22 2.56 229 IS 24939 Zambia Guinea-caudatum 105.67 307.61 2.75 231 IS 24953 Zambia Guinea-caudatum 100.01 284.32 3.09 233 IS 19676 Zimbabwe Kafir 112.94 250.18 2.88 234 IS 29689 Zimbabwe Guinea-caudatum 99.61 288.94 2.56 237 IS 29774 Zimbabwe	221	IS 28747	Republic of Yemen	Durra-caudatum	70.98	252.58	2.50
223 IS 29091 Republic of Yemen Durra-caudatum 70.98 245.19 3.50 224 IS 29100 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 225 IS 31706 Republic of Yemen Durra-caudatum 94.46 290.76 4.85 226 IS 31714 Republic of Yemen Durra-caudatum 61.54 206.06 3.90 227 IS 32245 Republic of Yemen Durra-caudatum 68.41 200.52 2.65 228 IS 31651 Zaire Caudatum-bicolor 117.36 264.22 2.66 230 IS 24939 Zambia Guinea-caudatum 105.67 307.61 2.75 232 IS 12302 Zimbabwe Kafir 100.01 284.32 3.09 233 IS 29689 Zimbabwe Kafir 112.94 250.18 2.88 234 IS 29689 Zimbabwe Guinea-caudatum 99.61 288.94 2.56 237 IS 29773 Zimbabwe	222	IS 28849	Republic of Yemen	Durra-caudatum	59.20	169.47	2.86
224 IS 29100 Republic of Yemen Durra-caudatum 76.62 241.81 4.98 225 IS 31706 Republic of Yemen Durra-caudatum 94.46 290.76 4.85 226 IS 31714 Republic of Yemen Durra-caudatum 61.54 206.06 3.90 227 IS 32245 Republic of Yemen Durra-caudatum 68.41 200.52 2.65 228 IS 31651 Zaire Caudatum-bicolor 117.36 264.29 2.61 230 IS 24939 Zambia Guinea-caudatum 105.67 307.61 2.75 231 IS 24953 Zambia Guinea-caudatum 100.01 284.32 3.09 233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe Kafir 112.94 250.18 2.38 234 IS 29689 Zimbabwe Guinea-caudatum 99.61 288.94 2.56 237 IS 29772 Zimbabwe	223	IS 29091	Republic of Yemen	Durra-caudatum	70.98	245.19	3.50
1S Si Si Tröb Republic of Yemen Durra 94.46 290.76 4.85 226 IS 31714 Republic of Yemen Durra-caudatum 61.54 206.06 3.90 227 IS 32245 Republic of Yemen Durra-caudatum 68.41 200.52 2.65 228 IS 31651 Zaire Caudatum 77.83 264.22 2.66 229 IS 23216 Zambia Caudatum-bicolor 117.36 264.29 2.61 230 IS 24939 Zambia Bicolor 108.17 258.42 2.78 231 IS 24953 Zambia Guinea-caudatum 105.67 307.61 2.75 232 IS 12302 Zimbabwe Caudatum 100.01 284.32 3.09 233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe Guinea-durra 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum	224	IS 29100	Republic of Yemen	Durra-caudatum	76.62	241.81	4.98
226 IS 31714 Republic of Yemen Durra-caudatum 61.54 206.06 3.90 227 IS 32245 Republic of Yemen Durra-caudatum 68.41 200.52 2.65 228 IS 31651 Zaire Caudatum-bicolor 117.36 264.22 2.56 229 IS 24939 Zambia Caudatum-bicolor 117.36 264.29 2.61 230 IS 24939 Zambia Bicolor 108.17 258.42 2.78 231 IS 24953 Zambia Guinea-caudatum 105.67 307.61 2.75 232 IS 12302 Zimbabwe Caudatum 100.01 284.32 3.09 233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe Kafir 112.94 250.18 2.88 235 IS 29772 Zimbabwe Guinea-caudatum 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum <	225	IS 31706	Republic of Yemen	Durra	94.46	290.76	4.85
227 IS 32245 Republic of Yemen Durra-caudatum 68.41 200.52 2.65 228 IS 31651 Zaire Caudatum-bicolor 117.36 264.22 2.56 229 IS 23216 Zambia Caudatum-bicolor 117.36 264.29 2.61 230 IS 24939 Zambia Bicolor 108.17 258.42 2.78 231 IS 24953 Zambia Guinea-caudatum 105.67 307.61 2.75 232 IS 12302 Zimbabwe Caudatum 100.01 284.32 3.09 233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe Kafir 112.94 250.18 2.88 235 IS 29714 Zimbabwe Guinea-caudatum 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 238 IS 29914 Zimbabwe Caudatum 83.77	226	IS 31714	Republic of Yemen	Durra-caudatum	61.54	206.06	3.90
228 IS 31651 Zaire Caudatum 77.83 264.22 2.56 229 IS 23216 Zambia Caudatum-bicolor 117.36 264.29 2.61 230 IS 24939 Zambia Bicolor 108.17 258.42 2.78 231 IS 24953 Zambia Guinea-caudatum 105.67 307.61 2.75 232 IS 12302 Zimbabwe Caudatum 100.01 284.32 3.09 233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe Kafir 112.94 250.18 2.88 235 IS 29714 Zimbabwe Guinea-durra 84.20 201.84 2.33 236 IS 29733 Zimbabwe Guinea-caudatum 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 238 IS 29950 Zimbabwe Guinea-caudatum 70.81 16	227	IS 32245	Republic of Yemen	Durra-caudatum	68.41	200.52	2.65
229 IS 23216 Zambia Caudatum-bicolor 117.36 264.29 2.61 230 IS 24939 Zambia Bicolor 108.17 258.42 2.78 231 IS 24953 Zambia Guinea-caudatum 105.67 307.61 2.75 232 IS 12302 Zimbabwe Caudatum 100.01 284.32 3.09 233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe Kafir 112.94 250.18 2.88 235 IS 29714 Zimbabwe Guinea-durra 84.20 201.84 2.33 236 IS 29733 Zimbabwe Guinea-caudatum 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 238 IS 29914 Zimbabwe Guinea-caudatum 70.81 164.36 3.18 240 IS 30079 Zimbabwe Durra-caudatum 70.81 164.36 3.22 241 IS 30031 Zimbabwe Durra-c	228	IS 31651	Zaire	Caudatum	77.83	264.22	2.56
230 IS 24939 Zambia Bicolor 108.17 258.42 2.78 231 IS 24953 Zambia Guinea-caudatum 105.67 307.61 2.75 232 IS 12302 Zimbabwe Caudatum 100.01 284.32 3.09 233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe Kafir 112.94 250.18 2.88 235 IS 29714 Zimbabwe Guinea-durra 84.20 201.84 2.33 236 IS 29733 Zimbabwe Guinea-durra 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 238 IS 29914 Zimbabwe Guinea-caudatum 99.19 291.74 2.39 239 IS 29950 Zimbabwe Guinea-caudatum 70.81 164.36 3.18 240 IS 30079 Zimbabwe Durra-caudatum 70.81 164.36 3.22 241 IS 30231 Zimbabwe Durra-caud	229	IS 23216	Zambia	Caudatum-bicolor	117.36	264.29	2.61
231 IS 24953 Zambia Guinea-caudatum 105.67 307.61 2.75 232 IS 12302 Zimbabwe Caudatum 100.01 284.32 3.09 233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe Kafir 112.94 250.18 2.88 235 IS 29714 Zimbabwe Kafir-durra 84.20 201.84 2.33 236 IS 29733 Zimbabwe Guinea-durra 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 238 IS 29914 Zimbabwe Guinea-caudatum 99.19 291.74 2.89 239 IS 29950 Zimbabwe Guinea-caudatum 70.81 164.36 3.18 240 IS 30079 Zimbabwe Durra-caudatum 70.81 164.36 3.22 241 IS 30021 Zimbabwe Durra-caudatum 101.16 261.26 3.22 242 IS 30231 Zimbabwe Ka	230	IS 24939	Zambia	Bicolor	108.17	258.42	2.78
232 IS 12302 Zimbabwe Caudatum 100.01 284.32 3.09 233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe Kafir 112.94 250.18 2.88 235 IS 29714 Zimbabwe Kafir-durra 84.20 201.84 2.33 236 IS 29733 Zimbabwe Guinea-durra 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 238 IS 29914 Zimbabwe Guinea-caudatum 83.77 172.17 2.39 239 IS 29950 Zimbabwe Guinea-caudatum 70.81 164.36 3.18 240 IS 30079 Zimbabwe Durra-caudatum 84.48 186.41 2.78 241 IS 30022 Zimbabwe Durra-caudatum 101.16 261.26 3.22 242 IS 30231 Zimbabwe Kafir 101.16 276.03 276	231	IS 24953	Zambia	Guinea-caudatum	105.67	307.61	2.75
233 IS 19676 Zimbabwe Kafir 95.48 190.88 3.54 234 IS 29689 Zimbabwe Kafir 112.94 250.18 2.88 235 IS 29714 Zimbabwe Kafir-durra 84.20 201.84 2.33 236 IS 29733 Zimbabwe Guinea-durra 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 238 IS 29914 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 239 IS 29950 Zimbabwe Guinea-caudatum 70.81 164.36 3.18 240 IS 30079 Zimbabwe Durra-caudatum 84.48 186.41 2.78 241 IS 30021 Zimbabwe Durra-caudatum 101.16 261.26 3.22 242 IS 30231 Zimbabwe Kafir 101.16 276.03 276	232	IS 12302	Zimbabwe	Caudatum	100.01	284.32	3.09
234 IS 29689 Zimbabwe Kafir 112.94 250.18 2.88 235 IS 29714 Zimbabwe Kafir-durra 84.20 201.84 2.33 236 IS 29733 Zimbabwe Guinea-durra 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 238 IS 29914 Zimbabwe Guinea-caudatum 99.19 291.74 2.39 239 IS 29950 Zimbabwe Guinea-caudatum 70.81 164.36 3.18 240 IS 30079 Zimbabwe Durra-caudatum 84.48 186.41 2.78 241 IS 30022 Zimbabwe Durra-caudatum 101.16 261.26 3.22 242 IS 30231 Zimbabwe Kafir 101.16 276.03 276	233	IS 19676	Zimbabwe	Kafir	95.48	190.88	3.54
235 IS 29714 Zimbabwe Kafir-durra 84.20 201.84 2.33 236 IS 29733 Zimbabwe Guinea-durra 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 238 IS 29914 Zimbabwe Guinea-caudatum 83.77 172.17 2.39 239 IS 29950 Zimbabwe Guinea-caudatum 70.81 164.36 3.18 240 IS 30079 Zimbabwe Durra-caudatum 84.48 186.41 2.78 241 IS 30092 Zimbabwe Durra-caudatum 101.16 261.26 3.22 242 IS 30231 Zimbabwe Kafir 101.16 276.03 2.76	234	IS 29689	Zimbabwe	Kafir	112.94	250.18	2.88
236 IS 29733 Zimbabwe Guinea-durra 99.61 288.94 2.56 237 IS 29772 Zimbabwe Guinea-caudatum 99.19 291.74 2.88 238 IS 29914 Zimbabwe Caudatum 83.77 172.17 2.39 239 IS 29950 Zimbabwe Guinea-caudatum 70.81 164.36 3.18 240 IS 30079 Zimbabwe Durra-caudatum 84.48 186.41 2.78 241 IS 30092 Zimbabwe Durra-caudatum 101.16 261.26 3.22 242 IS 30231 Zimbabwe Kafir 101.16 276.03 276	235	IS 29714	Zimbabwe	Kafir-durra	84.20	201.84	2.33
20010 LorseLinnolationCalination001012001042001042100237IS 29772ZimbabweGuinea-caudatum99.19291.742.88238IS 29914ZimbabweCaudatum83.77172.172.39239IS 29950ZimbabweGuinea-caudatum70.81164.363.18240IS 30079ZimbabweDurra-caudatum84.48186.412.78241IS 30092ZimbabweDurra-caudatum101.16261.263.22242IS 30231ZimbabweKafir101.16276.032.76	236	IS 29733	Zimbabwe	Guinea-durra	99.61	288.94	2.56
238 IS 29914 Zimbabwe Caudatum 83.77 172.17 2.39 239 IS 29950 Zimbabwe Guinea-caudatum 70.81 164.36 3.18 240 IS 30079 Zimbabwe Durra-caudatum 84.48 186.41 2.78 241 IS 30092 Zimbabwe Durra-caudatum 101.16 261.26 3.22 242 IS 30231 Zimbabwe Kafir 101.16 276.03 2.76	237	IS 20700	Zimbabwo	Guinea-caudatum	99.91	200.04	2.00
239 IS 29950 Zimbabwe Guinea-caudatum 70.81 164.36 3.18 240 IS 30079 Zimbabwe Durra-caudatum 84.48 186.41 2.78 241 IS 30092 Zimbabwe Durra-caudatum 101.16 261.26 3.22 242 IS 30231 Zimbabwe Kafir 101.16 276.03 276	238	IS 2001/	Zimbabwo	Caudatum	89.19	170 17	2.00
240 IS 30079 Zimbabwe Durra-caudatum 84.48 186.41 2.78 241 IS 30092 Zimbabwe Durra-caudatum 101.16 261.26 3.22 242 IS 30231 Zimbabwe Kafir 101.16 276.03 276	230	10 200 14	Zimbabwo	Guinea-caudatum	70.81	16/ 36	2.00
241 IS 30092 Zimbabwe Durra-caudatum 101.16 261.26 3.22 242 IS 30231 Zimbabwe Kafir 101.16 276.03 276	240	10 29900 19 20070	Zimbabwa	Durra-caudatum	10.01 QA AQ	104.00	0.10
242 IS 30231 Zimbabwe Kafir 101.16 276.03 2.76	241	12 30003	Zimbabwo	Durra-caudatum	101 16	261.26	2.10
	242	IS 30231	Zimbabwe	Kafir	101.16	276.03	2 76

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