Turkish Journal of Agricultural and Natural Sciences
Special Issue: 2, 2014

TÜRK
TARIM ve DOĞA BİLİMLERİ
DERGİSİ

TURKISH
JOURNAL of AGRICULTURAL
and NATURAL SCIENCES

www.turkjans.com

Determination of Some Agronomıcal Characteristics of Local Flint Corn (*Zea mays* L. indurata) Genotypes in The Black Sea Region of Turkey

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Abstract

In this study, 84 flint corn (Zea mays L. indurata) genotypes were used. Twelwe agronomical characteristics of 84 flint local corn genotypes were examined. Local corn genotypes were collected from 12 cities in the Black Sea Region in 2008 and field and laboratuary studies were completed in 2009. Variance analysis showed that there were high variations in most of the agronomical characteristics. At this study, plant height, ear height, stalk diameter, number of leaf per plant, ear length, ear diameter, number of row per ear, number of kernel rows per ear, rachis diameter, kernel weight in ear, grain yield per plant ranged between 102-374 (cm), 25-203 (cm), 8.7-40.4 (mm), 7.6-16.2 (number), 9.7-23.0 (cm), 31.7-49.8 (mm), 8-16 (number), 15-58 (number), 15.7-31.6 (mm), 23.6-186.8 (g), 26.9-197.7 (g/plant) respectively. It was concluded that local corn genotypes collected from The Black Sea Region could form a rich genetic base in improvement programmes.

Keywords: Corn, local genotypes, agronomical characters

Introductıon

In Turkey, corn cultivation area is 592.000 ha, corn production is 4.25 million tons and corn yields is 71.8 kg/ha. Corn has the third highest cultivation area and production and it is the highest yield in cereals at Turkey (Anonymous 2011).

Maize local populations often exhibit high levels of phenotypic variability. Landraces are commonly identified by their local name or other unique traits they posses that are different from improved varieties. In a broad sense, landraces are crop genetic resources that have evolved continuously under natural and farmer selection practices rather than in the collections of gene banks or plant breeding programs (Zeven, 1998).

Most maize diversity remains undescribed, poorly understood and under utilized in modern plant improvement largely because of the difficult of identifying useful genetic variants hidden in the background of low yielding local varieties or lines (Tanksley and McCouch, 1997). Although local varieties have not been extensively used by breeders because of their other undesirable agronomic traits, they can serve as sources of new desirable traits to enhance performance of germplasm under abiotic stresses such as drought, low soil fertility and acid soils (Beck et al., 1997). Information about the impact of smallholder farmer selection on abiotic stress tolerance of maize is mostly lacking. Farmers' local varieties collected from marginal environments may possess some unique physiological attributes that may not be present in germplasm not exposed to abiotic stress (Blum and Sullivan, 1986).

In Turkey, Ilarslan et al. (2002) found considerable genetic variation formorphological and agronomic traits in a collection of Turkish maize landraces

Materıal And Method

Seeds of eighty-four genotypes accessions originating from Black Sea Region of Turkey were obtained from 12 cities (Figure 1 & Table 1). The experimental material comprised of eighty-four local flint corn which were sown in the experimental area of Black Sea Agricultural Research Institute, Samsun, during

spring 2009 in augmented complete design. Two seeds per hill were sown by keeping plant-to-plant and row-to-row distances of 20cm and 70cm, respectively and thinned to one seedling few days after germination. All measurements were done on randomly selected 10 individuals from each row, but the plants at the edge of rows were excluded. Ten characters which were reported to be the most heritable and discriminatory morphological variables for racial classification.

Mean values, standard error and variation indices were computed for each independently and for all accessions. Principal Components Analysis (PCA) as outlined according to Pinheiro de Carvalho et al. (2004) and was used as an objective method to summarise variability of the 84 genotypes of local flint corn.

Results and Discussion

For grain yield per plant and most of its components (PLHT, EHT, SD, ELP, EL, ED, RPE, NKR, RD, KWE), there was very variation among the maize varieties (Table 2).

In the study, plant height, ear height, stalk diameter, number of leaf per plant, ear length, ear diameter, number of row per ear, number of kernel rows per ear, rachis diameter, kernel weight in ear, grain yield per plant ranged between 102-374 cm, 25-203 cm, 8.7-40.4 mm, 7.6-16.2 number, 9.7-23.0 cm, 31.7-49.8 mm, 8-16 number, 15-58 number, 15.7-31.6 mm, 23.6-186.8 g, 26.9-197.7 g/plant respectively (Table 2.)

The high values of variance component due to accessions in the studied traits were not surprise since these morphological traits have been reported in the literature that they are highly heritable traits (Kurt, 1996; Lucchin ve ark., 2003; Akyürek, 1993, Saha ve Mukherjee, 2002, Hartings ve ark., 2008, Cömertpay, 2008, Santacruz-Varela ve ark., 2004, Yu ve ark., 2004, Magorokosho, 2006, Pinheiro de Carvalho ve ark., 2008, Beyene ve ark., 2005). Furthermore, it can be expected that different characters and different intensity of selection were most likely applied to each of the studied accession depending on corn races and particular agronomic trait of interest. Also, high component of variance due to within races indicate that some of the accessions within races may have already evolved as 'land races' after many years of farmer's selection and farming practices.

Conclusion

At future maize kernel collections from Black Sea Region of Turkey corn participations to provide the different aims of maize genetic resources, the results of the present study and earlier studies could be used as a reference data. It was concluded that local corn genotypes collected from The Black Sea Region could form a rich genetic base in improvement programmes.

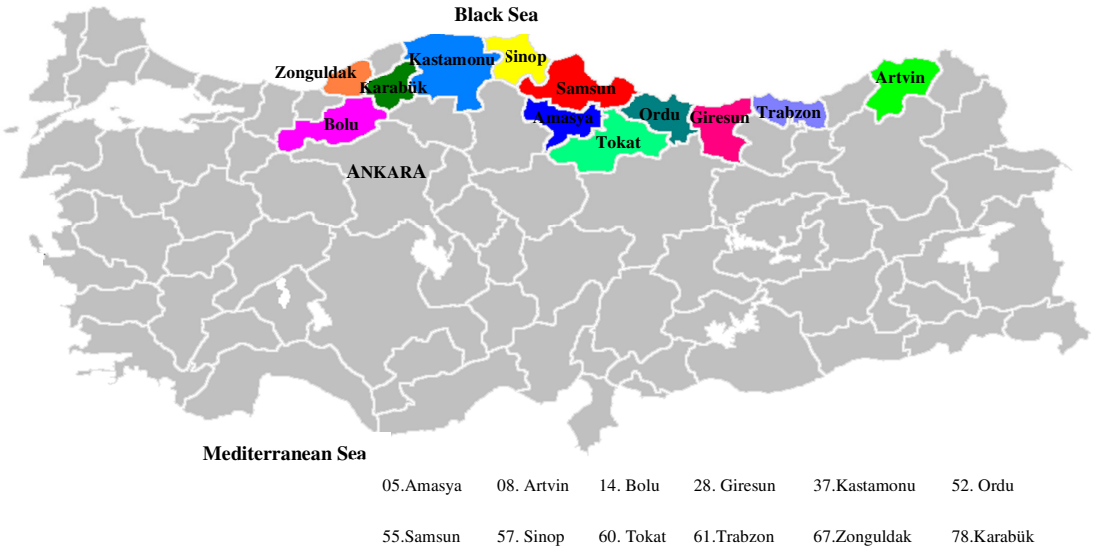

Figure 1. Map showing the geographical regions in Turkey and the locations of Black Sea Region flint corn accessions

Table 1. Geographical information on Black Sea Region of Turkish flint corn accessions

Cities	Genotype	Code	County	Village	Altitude (meter)	Color
SAMSUN	G63	TR55S01	Tekkekoy	Center (KTAE)	7	Yellow
	G64	TR55S02	Atakum	Engiz	10	Yellow
	G65	TR55S03	Center	Hacınaipli	850	White-Yellow-Black
	G66	TR55S04	Center	İmamlı	697	White
	G67	TR55S05	Center	---	128	Yellow
	G68	TR55S06	Center	---	128	Yellow
	G69	TR55S07	Kavak	Alaçam	881	Yellow
	G70	TR55S08	İlkadım	Derecik	123	Yellow
	G71	TR55S09	Center	Hacınaipli	850	White
	G72	TR55S10	Vezirkoprü	İncesu	317	Yellow
	G73	TR55S11	Center	-	128	Yellow
	G74	TR55S12	Center	Hacınaipli	850	Yellow
	G75	TR55S13	Center	-	128	Yellow
	G76	TR55S14	Terme	Çardak	20	Yellow
	G190	TR55S15	Atakum	Yukarı Engiz	82	Yellow-Black-White
	G191	TR55S16	Atakum	Yukarı Engiz	82	Purple
ZONGULDAK	G77	TR67S01	Devrek	Ozpınar	215	Yellow
	G78	TR67S02	Eregli	Daglıca	511	Yellow
	G79	TR67S03	Devrek	Ozpınar	628	Yellow
	G80	TR67S04	Devrek	Yazıcık	336	White
	G81	TR67S05	Eregli	Daglıca	468	White
	G82	TR67S06	Devrek	Egerci	192	White
	G83	TR67S07	Kozlu	Dagkoy	545	Yellow
	G84	TR67S08	Devrek	Yazıcık	328	White
	G85	TR67S09	Devrek	Yazıcık	346	Yellow
	G86	TR67S10	Devrek	Ozpınar	215	Yellow
KASTAMONU	G87	TR37S01	Center	Pehlivan	685	Brown
	G88	TR37S02	İhsangazi	Baskoy	832	Yellow
	G89	TR37S03	Araç	Vakıfakkeçi	473	Yellow
	G90	TR37S04	İhsangazi	Baskoy	864	White
	G91	TR37S05	Taskoprü	Çepni	650	Yellow
KASTAMONU	G92	TR37S06	Center	Çavundur	623	White
	G93	TR37S07	İhsangazi	Baskoy	832	Yellow
	G94	TR37S08	Araç	Vakıfakkeçi	484	Yellow
	G95	TR37S09	İhsangazi	Baskoy	832	Yellow
	G96	TR37S10	Center	Çakıllı	835	Yellow
	G97	TR37S11	Araç	Vakıfakkeçi	484	Yellow
	G193	TR37S12	Taskoprü	Uzunkavak	620	White
KARABÜK	G98	TR78S01	Safranbolu	Yukarıçiftlik	819	Yellow
	G99	TR78S02	Eskipazar	Ova	896	Yellow
	G100	TR78S03	Safranbolu	Yazı	640	Yellow
	G101	TR78S04	Eskipazar	Ova	896	White
	G102	TR78S05	Safranbolu	Düzce	780	Yellow
	G103	TR78S06	Safranbolu	Düzce	780	Yellow
	G104	TR78S07	Eskipazar	Ova	896	Light Burgundy
	G105	TR78S08	Ovacuma	Koseler	392	Yellow
	G106	TR78S09	Safranbolu	Yukarıçiftlik	819	Yellow
	G107	TR78S10	Safranbolu	Düzce	780	Yellow
GİRESUN	G108	TR28S01	Bulancak	Kısla	680	Yellow
	G109	TR28S02	Center	----	350	White
	G110	TR28S03	Bulancak	Kısla	680	Yellow
	G111	TR28S04	Gorele	Hürriyet mh.	60	Yellow
	G112	TR28S05	Bulancak	Kısla	680	Yellow (Dark)
	G113	TR28S06	Gorele	Center	15	Red
	G114	TR28S07	Bulancak	Kısla	680	Yellow
	G115	TR28S08	Bulancak	Kısla	680	Yellow
	G116	TR28S09	Bulancak	Kısla	680	Yellow (Dark)
	G117	TR28S10	Center	----	340	Yellow

Table 1 (Continued)

TOKAT	G118	TR60S01	Turhal	Center	493	Yellow
	G119	TR60S02	Erbaa	Yenimahalle	212	Yellow
	G120	TR60S03	Turhal	Sarıçiçek	1400	Yellow
	G121	TR60S04	Almus	Atakoy	1180	Yellow
	G122	TR60S05	Turhal	Center	493	White
	G123	TR60S06	Turhal	Center	493	Yellow
ORDU	G124	TR52S01	Fatsa	Yukarı Mah.	400	White
	G125	TR52S02	Fatsa	Asagı mah.	350	White
	G126	TR52S03	Fatsa	Yukarı Mah.	400	Yellow
	G127	TR52S04	Fatsa	Ilıca Center	300	Red
	G128	TR52S05	Fatsa	Ilıca Center	300	White
	G129	TR52S06	Fatsa	Ilıca Center	300	Yellow
	G192	TR52S07	Kumru	Center	550	White
BOLU	G130	TR14S01	Seben	Susuz	1035	Bordo
	G131	TR14S02	Goynük	Center	754	Yellow
	G132	TR14S03	Mudurnu	Sarıyer	876	White
	G133	TR14S04	Yeniçag	Saray	1058	White
AMASYA	G134	TR05S01	Center	Kovabayır	550	Yellow
	G135	TR05S02	Center	-	392	Yellow
	G136	TR05S03	Goynücek	Ulusu	500	White
	G137	TR05S04	Center	Tokuncak	510	Yellow
ARTVİN	G138	TR08S01	Center	---	580	White
	G139	TR08S02	Center	---	580	Yellow
	G140	TR08S03	Center	---	580	Yellow
SİNOP	G141	TR57S01	Gerze	Bolalı	638	Yellow
	G142	TR57S02	Gerze	Bolalı	638	Yellow

Table 2. Range, mean, standard error, mean squares and coefficient of variation for the 11 phenotypic traits measured in 84 flint maize varieties at grown at Samsun in 2009 main season.

Trait	Minimum	Maximum	Mean	Std Error	CV (%)
PLHT	102.00	374.00	229.39	2.97	26.8
EHT	25.00	203.00	75.32	1.78	48.7
SD	8.76	40.40	20.10	0.35	36.2
ELP	7.6	16.2	11.78	0.13	23.5
EL	9.7	23.0	16.97	0.17	22.7
ED	31.72	49.80	37.98	0.20	12.1
RPE	8.00	16.67	11.32	0.12	23.5
NKR	15.00	58.00	33.19	0.46	31.0
RD	15.77	31.67	22.26	0.15	16.7
KWE	23.68	186.86	83.22	1.71	46.42
GYPP	26.99	197.73	105.93	10.86	24.34

PLHT= plant height (cm), EHT = ear height (cm), SD = stalk diameter (mm), ELP = number of leaf per plant, EL = ear length (cm), ED = ear diameter (mm), RPE = number of row per ear, NKR = number of kernel rows per ear, RD = rachis diameter (mm), KWE = kernel weight in ear (g/ear), GYPP = grain yield per plant (g/plant)

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