Maize Genetics Cooperation Newsletter vol 84 2010

TURDA, ROMANIA
Agricultural Research and Development Station

Characterization of "TURDA" Maize Germplasm for the Chemical Composition of the Grain

Has Voichita , Ioan Has, Ana Copandean

The aim of this research was to evaluate the potential of maize "TURDA" germplasm in according to its grain quality content, such as: protein, oil, fiber, ash and starch concentration. A total of 754 maize samples were evaluated for their grain quality attributes: 265 local populations (landraces) collected in different Romanian regions (Transylvania and Moldavia); 59 synthetics/composites among which 30 synthetics created at ARDS Turda and 29 synthetics acquired from different countries (Spain, Italy, Germany, University of Minnesota, University of Pennsylvania); 430 "TURDA" inbred lines. The concentration of starch, protein, oil, fiber and ash in the ground (flour) sample was determined with a Dickey-John Instalab 600 near-infrared reflectance analyzer, after curve calibration.

The coefficients of phenotypic variation were over 5% for most grain components (Table 1); they were higher for percentage of oil (12.3 to 21.2%), fiber (10.5 to 18.9%) and ash (51.1 to 88.2%).

TABLE 1 - Means values, range of variation, and coefficients of variation (CV) for grain content in TURDA germplasm.

Trait		Grain content				
		Starch	Oil	Protein	Fiber	Ash
Germplasm	Range	%				
Local Populations (Count=265)	Minimum	57.1	3.8	11.2	3.3	0.03
	Mean	64.9	5.4	13.7	5.3	2.3
	Maximum	68.9	9.1	15.6	7.3	7.2
	Variance	3.81	0.44	0.71	0.62	1.38

	Standard Deviation	1.95	0.66	0.84	0.78	1.17
	Standard Error	1.95	0.04	0.05	0.78	0.07
	Confidence Level (95.0%)	0.23	0.08	0.10	0.09	0.14
	C.V.%	3.0	12.3	6.2	14.9	51.1
"Turda" Synthetics (Count=59)	Minimum	60.1	3.5	11.7	3.6	0.01
	Mean	65.9	5.4	13.6	5.4	2.1
	Maximum	72.6	7.3	14.8	6.7	5.8
	Variance	6.86	0.48	0.62	0.32	2.24
	Standard Deviation	2.62	0.79	0.69	0.57	1.50
	Standard Error	0.34	0.09	0.10	0.07	0.19
	Confidence Level (95.0%)	0.68	0.21	0.18	0.15	0.39
	C.V.%	4.0	14.7	5.1	10.5	70.3
Inbred lines (Count=430)	Minimum	52.8	2.4	10.8	2.3	0.01
	Mean	67.5	4.2	13.4	4.9	1.6
	Maximum	72.7	8.0	14.8	7.5	10.6
	Variance	7.73	0.79	1.17	0.85	2.04
	Standard Deviation	2.78	0.89	1.08	0.92	1.42
	Standard Error	0.13	0.89	0.05	0.04	0.07
	Confidence Level (95.0%)	0.26	0.08	0.10	0.09	0.14
	C.V.%	4.1	21.2	8.0	18.9	88.2

They showed protein and oil contents ranging between 11.2 and 15.6% and 3.8 and 9.1%. The range of variation observed for synthetics was larger than in local populations, ranging between 60.1% and 72.6%. Inbred lines were on average the most divergent in grain starch concentration (range value 19.9) as compared to landraces (range value 11.8) and synthetics (range value 12.5). The grain oil and ash content showed high variability among the genotypes.

About 100 genotypes have been characterized by high starch content, with an increased *per se* value, some of them are "TURDA" inbred lines. Among "TURDA" inbred lines were identified some interesting forms with high level of starch content: TC 384AcmsC (72.5%), TE 210 (72.1%), TC 378 (72.0%), TC 182 (71.9%), TD 375 (71.9%).

Local populations showed oil concentration (is in 5.4%) ranging between 3.8% and 9.1%. Among local populations some interesting forms with high level of oil concentration were identified: Blaj (Veza)/01 (7.3%), Iclod/01 (7.0%), Salva/01 (7.1%), Sarmisegetuza/01 (7.1%), and Vanatori/01 (7.1%). The data about synthetics showed a range among the genotypes for oil

concentration of 3.5% to 7.3%. The same range of variation (5.26 and 7.17%) was observed by Berardo et al. (2009) in a collection of 93 landraces. High oil concentrations were found in the following synthetics: Tu Syn 1 (7.1%), Tu Syn 2 (7.0%) and Tu Syn (3) (per se) (1) (7.3%). These high oil local populations and synthetics have a large reduction in the starchy endosperm and most of them are characterized by flint or semi-flint grain type. For this germplasm SMITH (1990) supported that pedigree selection has been used to develop some elite high oil lines.

Inbred lines showed the highest mean value for oil percentage among the genotypes analyzed, some of inbred lines were identified with a high concentration in oil and protein too: TC 344A (7.6 oil and 15.2% protein), TC 334 (7.5 oil and 15.1% protein), TC 106 (7.5 oil and 16.4% protein), T 442 (7.2 oil and 15.6% protein).

Analyses of protein showed that the percentage ranged from a low level of 10.8% for inbred lines to a high level of 15.6% for local populations. Some of local populations were identified with high grain content in protein and oil too: Carnesti/01 (15.5% protein and 6.9% oil), Ghiula/04 (15.2% protein and 6.7% oil), Iclod/01 (15.1% protein and 7.0% oil), Salva/01 (15.5% protein and 7.1 oil), Satu Lung/01 (15.6% protein and 6.7% oil). Work at the University of Illinois has also shown that protein varied from 8-11% in maize (Smith, 1990).

The results of this study emphasized a great variability in the 3 groups of genotypes. As these groups represented only a little part of Turda-Romania available material for a resources program, one can imagine the amount of variability which could be used by breeders. And as expected from a large phenotypic pool of variability, the variability for *per se* performances revealed by local population and synthetics was enough great.