EVALUATION OF LOCAL MAIZE LANDRACES FROM BUCOVINA IN ORDER TO USE IN THE MAIZE BREEDING PROGRAMS FOR COLD AND WET AREAS OF ROMANIA

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Abstract .*Bucovina, the Carpatic territory, is a very heterogeneous ecogeographyc space, where, during about 300 years, after the maize introduction (XVII century) natural and artificial selection determined a high diversification of local variety.*
It is obvious that this long period has favored an active genetic process of population formation, stoped in 1957 /1962 by the very quick introduction, on more than 90% of maize cultivated area of corn hybrid seeds.
The evaluation of maize genetic resources in Bucovina (1993-1999) has remarked a very high genetic diversity (flint type 100%), generally good fitness ability to local environment (maturity, cold tolerance), superficial and weak lodging, susceptibility to lodging and ear diseases.
It is necessary to be mentioned some deficiency recorded during the evaluation of the local maize resources, such as limited size of collected and reproduced sample, the characterization based on phenotipical and physiological criteria, the loss of many breeding valuable genes. All these reasons have determined a high level of genetic drift and genetic erosion , the loss of many samples as well as the existence in 2009 of only 823 local populations coming from Bucovina, stored in Suceava Genebank.

Keywords: *maize landraces, genetic drift, genetic erosion, local populations*

Introduction

It is recognized that a collection value is given by the level of its utilization not by the number of the accessions. Although the sharing of benefits through their redistribution is important, more direct ways of realizing benefits are needed, such a wider evaluation enhancement and utilization of local germplasm.

The relief of Romania is distributed harmoniously: the mountains form an arch in the central part of the country and represent 31% of the total surface (237.500 km^2). In the mountain areas maize old landraces can be met up to 800-900 m altitude (Căbulea I. şi colab., 1998) . Over here, maize represents a traditional food for people and an important animal fodder.

Bucovina region situated in the north-eastern part of Romanian Carpathian Mountains is an echogeographyc space where we have met during the collecting expeditions a high diversification of local maize varieties. In these missions we identified one complex racial (corn flint): 3 races (Cincantin, Hanganesc, and Moldovenesc) and 3 subraces (Cincantin x Hanganesc, Hanganesc x Moldovenesc, Cincantin x Moldovenesc).

Being convinced that the level of its utilization gives a collection value, the maize resources could be utilized, both directly through the conservation of farmer's locale maize varieties (Cristea, 1980) and, indirectly, in an intermediate stage when are used by plant breeders to develop new hy-

brids or to broaden the base of plant maize breeding regional program for the cool and wet areas (Murariu Danela, 1998).
Analysis of climatic frequencies or of average climate can provide information that may suggest caution in making decisions on agronomic genotypes growing early or late and appropriateness of investment products for the conservation (Gontariu I. 2005).

Materials and methods

The biologic material was represented by 3 races (Hanganesc, Moldovenesc and Cincantin), including 20 maize local landraces, coming from Bucovina (table 1).I used like standards three early hibrids (Sv. 95, Sv. 99 and Sv 108).

Table 1: Origin site of the maize samples studied

No.	Collecting site (district/village)	Altitude	Accession name	No.	Collecting site (district/village)	Altitude	Accession name
1	Suceava/Brodina (L1)	725	Brodina 1	11	Suceava/Moldovita (L11)	726	Moldovita 1
2	Suceava/Capu Campului (L 2)	745	Capu Campului	12	Suceava/Paltinoasa (L12)	645	Paltinoasa 12
3	Suceava/Ciocanesti (L3)	765	Ciocanesti	13	Suceava/Pirtesti (L13)	586	Pirtesti 96
4	Suceava/Clit (L4)	704	Clit 106	14	Suceava/Pojorita (L14)	825	Pojorita 11
5	Suceava/Crucea (L5)	723	Crucea 239	15	Suceava/Putna (L15)	698	Putna 1
6	Suceava/Frumosu (L6)	685	Frumosu 10	16	Suceava/Radauti (L16)	702	Radauti
7	Suceava/Gura Putnei (L7)	765	Gura Putnei	17	Suceava/Vama (L17)	802	Vama
8	Suceava/Malini (L8)	564	Malini 1	18	Suceava/Vatra Moldovitei(L18)	725	Vatra Moldovitei 11
9	Suceava/Min. Humor (L9)	702	Min. Humor	19	Suceava/Vicovu de Jos (L19)	698	Vicovu de Jos
10	Suceava/Marginea (L10)	785	Marginea 104	20	Suceava/Voronet (L20)	678	Voronet

We determined the resistance to low temperature with the coldtest index after Debbert (1988), Rotari and Comarov (1992) method, such us:

The seeds of the each sample are sown in two physiological vase using 30 grains. Plants are grown 14 h in light (10-15.000 lx,) and 10 h in dark. After 14-15 days at emergence of the third leaf, one vase from each sample is transferred at 4-5^{0} C in dark and 8-9^{0}C in light. The samples are kept in these conditions 7 days. At the end of the stress period, the samples are transferred in the initial conditions. At this temperature, the plants are kept 14-15 days. After this period we cut 20 plants from each vase, and we determine the dry weight. After that we determine Ki index (proportion between the dry weight of the samples stressed and the samples grown in the normal conditions.)
When Ki> 0,85 very resistant plants to the low temperature;
0,80-0,85 resistant plants to the low temperatures
0,6-0,79 medium resistant plants to the low temperatures
0,4-0,59 low resistant plants to the low temperature

< 0,4 weak plants to the low temperatures

The variability of the maize landraces was appreciated by means of the variation amplitude and the coefficient of variation. Also we determined the simple correlation between the studied characters (amino-acid contents and coldtest index) (Ceapoiu N., 1968).

Results and discussions

The results of this study emphasized a high coefficient of variation and variation amplitude for coldtest index at the 20 local landraces studied. (table 2)

Table 2: The dispersion indexes on the 20 maize landraces for the analyzed characters

Character	Min. value.	Collecting site	Max.value	Collecting site	Variation amplitude	Coefficient of variation
Coldtest index	0,41	Suceava/ Malini	0,98	Suceava/ Pojorita	0,57	17,42
Coldtest index	0,35	Suceava/ Pirtesti	0,96	Suceava/Vama	0,61	17,00

For the identification of local maize landraces with resistance to low temperature the coldtest index was determined. The values of the coldtest index show that the 13 samples coming from the villages situated between 700-830 m. altitude are resistant and very resistant to low temperatures. Also we can see that the extra earliness maize hybrids (Sv. 95, Sv.99 and Sv.108) created at the Agricultural Research Station Suceava show a medium resistance and a low resistance to the low temperatures. (figure 1)

The laboratory assay indicates that the Bucovina maize local landraces are richer in protein content than the maize hybrids (table 3):

Table 3: Biochemical content of the maize samples coming from Bucovina

Accession name of the maize samples	Lisine	Fats	Proteine	Starch
1	*2*	*3*	*4*	*5*
Brodina 1	0,32	4,11	12,63	71,24
Capu Campului	0,3	4,48	13,81	71,59
Ciocanesti	0,37	4,82	13	70,89
Clit 106	0,36	4,61	13,25	71,94
Crucea 239	0,37	4,43	14,81	69,49
Frumosu 10	0,38	4,6	12,15	71,35
Gura Putnei	0,36	4,3	11,95	67,95
Malini 1	0,35	4	12,9	70,25
Min. Humor	0,37	3,99	13,72	69,69
Marginea 104	0,37	4,5	11,29	67,29
Moldovita 1	0,36	4,01	11,95	70,92
Paltinoasa 12	0,29	4,6	11,77	71,82
Pirtesti 96	0,4	4,05	12,79	67,81
Pojorita 11	0,42	3,82	13,12	71,82
Putna 1	0,31	2,39	13,44	70,15

1	2	3	4	5
Radauti	0,35	2,94	15,12	70,04
Vama	0,37	2,94	11,35	67,04
Vatra Moloditei 11	0,36	4,85	10,99	65,91
Vicovul de Jos	0,38	2,68	12,63	66,14
Voronet	0,4	4,94	13,81	68,05
Sv 1	0,38	4,66	13,13	70,54
Sv 95	0,29	4,59	10,16	71,94
Sv 99	0,38	4,84	11,5	71,24
Sv 108	0,38	4,72	11,56	71,24

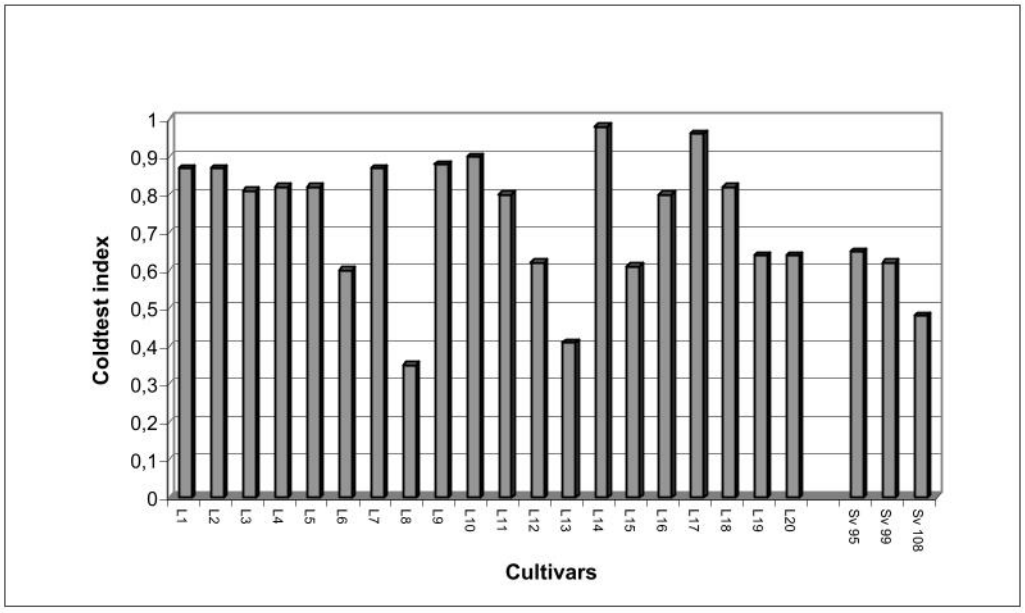

Figure 1. The coldtest index values of some maize landraces from Bucovina

The determination of the some amino acid contents (asparagine, treonine, serine, proline, methionine, arginine, glicine, leucine, etc.) at the samples studied permitted the emphasize of some correlation between the amino acids content (especially methyonine and arginine) and the coldtest index. (fig.2).

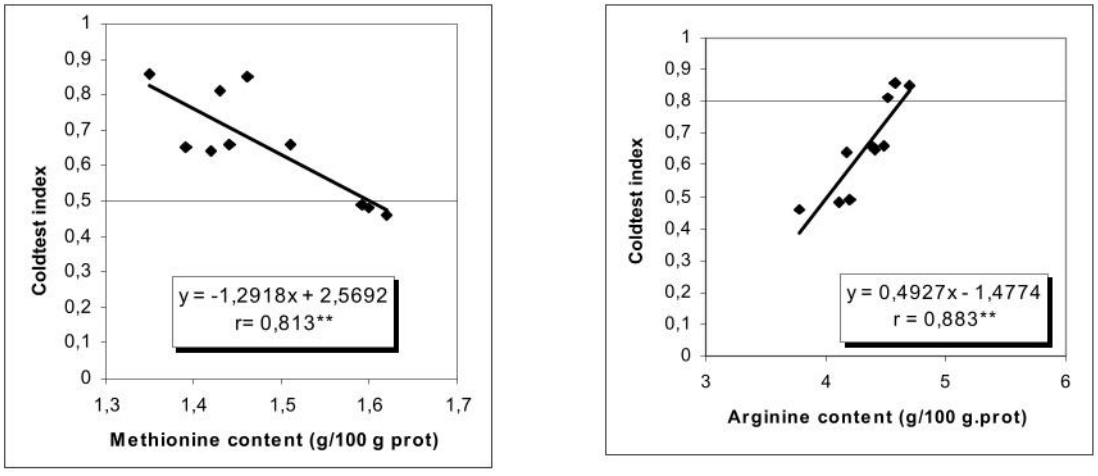

Figure 2. Regression line for the correlation between the amino acid contents (methionine and arginine) and coldtest index

Conclusions

The results of this research evidence the following aspects:

1. The study of the 20 local maize landraces has led to the identification of one sample from Pojorita village (825 m. altitude),belonging to the race "Hanganesc", with a high proteine content (13,15%) and very resistant to the low temperatures.
2. The correlation between the amino-acid contents and the coldtest index could be a selection criteria for the identification of some maize landraces resistant to low temperatures (below 4^0 C).

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