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NEW LINES OF *AMARANTHUS* OBTAINED AT V.R.D.S. BUZĂU

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Abstract

The conservation and revaluation of biodiversity initiated by S.C.D.L. Buzau and Genetics and Breeding Laboratory aimed to study Amaranthaceae species. These species were neglected until now both scientifically and as crop. The appeareance of these species is not known but it is well known that were here since ancient times. A proof is the existence of endemic populations and a wide range of biotypes which contains 16 species of Celosia and Amaranthus with origin in the Romanian geographic area.The research of S.C.D.L. Buzau during 2005-2012 highlighted new valuable data, especially in what concerns their multiple uses and wide range of expressivity of these species. This study of 3 new obtained lines is a step towards this species. Data and germplasm source accumulated till now guarantee that in the future we can enrich scientific data.

Key words: *biodiversity, biotype, endemic, expression, germplasm.*

INTRODUCTION

Modern possibilities to inform people nowadays and free travelling abroad since 1990 highlighted new valuable data about *Amaranthaceae* family. Altough for many people this species is considered a weed, the scientists proved otherwise, that this can be a valuable food, an exceptional medicinal herb, an important biomass resource and last but not least a real ornamental plant. In the past, in our country, this plant was collectively known as ″red amaranth″, being used in Romanian households in various dishes and wild amaranth cultivars were used in animal feed. As the time passed this edible plant was neglected and nowadays we rarely find it in traditional households. (Figure 1)

Starting 2005, Breeding Laboratory of V.R.D.S. Buzau studied this species creating and implementing a specifical breeding program for this species.

The main objectives of this program were:

-preservating genetic sources and enriching countinously the general collection field with new genotypes

-valuable genotypes breeding for obtaining new creations with phenotypical expression specific for uses direction

-gathering a database for better knowing the species.

Figure 1. Amaranthus seedlings lines

MATERIALS AND METHODS

Breeding works started with a documentation program focused on national and international achievements. After this study we concluded that nationally this species is little known compared with international top achievements.

Genetic autochthonous heritage was inventoried and 16 species were discovered in spontaneous flora, many belonging to *Amaranthus retroflexus*, *Amaranthus liividus* and *Amaranthus blitoides* species. Worldwide we found that are over 800 species of *Amaranthus*.

The next step aimed to form a collection field which has presently 20 valuable genotypes from local and foreign origins. After intensively breeding works, 3 of them were promoted in the work field: L1, *Amaranthus retroflexus*, L4, *Amaranthus caudatus*, L5, *Amaranthus cruentus*. These lines correspond D.U.S. criteria demonstrating distinctness, homogeneity and stability as for were undergone to conservative selection program. Crop establishment was made by seedlings grown on 70 holes alveolar pallets on red grounded nutritional turf substrate. Seedlings production is similar to the other vegetable species production, to mention that seedlings were thinned after spring and a single plant was left per hole. This work was necessary because of the extremely small size of the seeds, making imposible the introduction only of one seed in a hole. Field crop establishment was made on 1,4 m shaped land using L 445 tractor in aggregate with MMS 1,2. Planting was made in equidistant rows spaced at 70 cm and 35-40 cm distance between plants per row. The crop did not require special care works, were only manually and mechanical breed and irrigated. Was not necessary to apply chemical or biological treatements against pests and diseases or soil and foliar fertilization. The 3 crops displayed original potentiall for successfully ecological cultivation.

RESULTS AND DISCUSSIONS

Breeding works ended obtaining until now 3 new valuable lines with different application directions. Also a rich germplasm collection was gathered containing valuable lines in different breeding state, one of them grown for the first time in our country and would be presented in our future works.

The obtained lines are the following:

L1-*Amaranthus retroflexus*

This line (Figure 2) comes from an endemic local population discovered in the Buzau mountain side, Lopatari locality composed from rare villages placed 700-800 m altitude. The residents used it in the past as edible plant especially to prepare soups. As the plant matured, it lost its juiciness becoming string and being used for animal feed. After specifically selection works we limited the main characteristics variability, we eliminated atypical biotypes and the species performances dramatically increased. The main use of the line is the edacious one because of its exception properties : juiciness of shoots and leaves, yield potential, over 22 t/ha and last but not least red or garnet natural colour present all over the plant.

Figure 2. Seedling details: entire plant, upper and underside of the leaf

Figure 3. L1 crop and inflorescence detail

L4- *Amaranthus caudatus*

This line (Figure 3 and 4) was cultivated also for the first time in our country, was purchased through a biologic material exchange with a private Dutch collector. This species is collectively called ″elephant trunk″, similar

varieties existed in our country too but called ″turkey crest″. Initially this cultivar presented many biotypes but after a rigouros selection atypical biotypes were eliminated, the main biotype that respected criteria required by ″variety″ notion was maintained.
In the breeding program, the main objective for this line was aimed on ornamental use of the plant that was successfully accomplished. The possibility of using this line like an edible plant is not excluded but we mention that the edible vegetative mass yield is smaller than the one obtained at L1 and more restricted concerning period of time. It can be used with that purpose until flowering.

Figure 4. Seedling details: entire plant, upper and underside of the leaf

Figure 5. L4 crop and inflorescence detail

L5-*Amaranthus cruentus*
This line (Figure 5 and 6) comes from the same place as line 4. This line was also cultivated from the first time in our country since 2006. At the beginning it behaved as a large main characters variability cultivar and after the implementation of the breeding program we limited these characters variability to a normal state. The aim of breeding was to use the plant as an ornamental one but we did not exclude other uses, especially alimentary one. This plant is vigorous, remarkable by its erect spike inflorescence intense red garnet coloured, extremely beautiful. (Figure 7). The studies undertaken until now showed that this biologic creation and also the previous ones did not require special technologies, L4 and L5 could be cultivated in protected grounds and ornamental pots mentioning that their size dramatically diminished in pots compared with natural field conditions.

Figure 6. Seedling details: entire plant, upper and underside of the leaf

Figure 7. L5 crop and inflorescence detail

The main characteristics of *Amaranthus* lines in seedling state are presented in table 1 and the main characteristics of the plants in table nr.2:

Table 1. The main characteristics of Amaranthus seedlings lines

Characteristics/lines	L1	L4	L5
Sowing date	3.04.2012	3.04.2012	3.04.2012
Spring date	9.04.2012	9.04.2012	9.04.2012
Planting date	23.05.2012	23.05.2012	23.05.2012
Seedling height (cm)	20	22	24
Collar diameter (mm)	4	3	4
Number of leaves	16	10	12
Leaf lenght (cm)	3	5,7	6
Stalk lenght (cm)	2,3	2,3	2

The undertaken research demonstrate that all 3 obtained lines produce a large number of seeds, L5 ranks first after L4 and the last being L1. We conclude that seed maturation is phased starting with inflorescence base to the top. All the lines preserve germination ability because of seed body covered with a glassy and chitin integument that confers long storage period. According to the conducting tests made in 2005 and restored on the same seed batch in 2012 germination percentage meanwhile has been decreased averagely for all the lines with 5%.
The seeds sizes are too small, L1 has a seed of 1-1,2 mm diameter (Figure 8), L 4 (Figure 9) presents a very shiny seed of 1 mm diameter and L5 (Figure 10) has a smaller seed of 0,8 mm, slightly flattened similar with grains of sand.

Figure 8. L1 seeds detail

Figure 9. L4 seeds detail

Figure 10. L5 seeds detail

Table 2. The main characteristics of the plants

Character/line	L1	L4	L5
Plant height (cm)	85	165	115
Stem height (cm)	6	28	16
Number of shoots/plant	12	3	7
Plant diameter (cm)	70	55	75
Inflorescence colour	greenish-red	purple red	garnet-red
Inflorescence length (cm)	12	78	38
Number of inflorescence ramifications	4	6	8
Seeds colour	black	rose-white	black

CONCLUSIONS

Research carried out in 2005-2012 ended until now with the following results:

-a germplasm collection was gathered at this species from collection field and work field.

-breeding works for L1, L4 and L5 lines ended and would be registered and proposed at I.S.T.I.S. for patenting and seed production and broad range multiplication.

-a valuable database was gathered which would contribute successfully at breeding works.

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PLANT PRODUCTION SYSTEMS


EX·TERRA·AVRVM