

**EXPERIMENTAL RESULTS REGARDING MORPHOLOGICAL,  
BIOLOGICAL AND YIELD QUALITY OF *AMARANTHUS  
HYPOCHONDRIACUS* L. SPECIES UNDER THE CENTRAL PART OF  
ROMANIAN PLAIN CONDITIONS**

**REZULTATE EXPERIMENTALE PRIVIND CARACTERISTICILE  
MORFOLOGICE, BIOLOGICE ȘI DE CALITATE A RECOLTEI LA SPECIA  
*AMARANTHUS HYPOCHONDRIACUS* L. ÎN CONDIȚIILE DIN PARTEA  
CENTRALĂ A CÂMPIEI ROMÂNE**

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**Abstract:** The paper presents the results of research made in 2007 year at the Biobasis within USAMV-Bucharest Campus regarding morphological and biological characteristics, chemical composition and yield quality of *Amaranthus hypochondriacus* species. It worked with 5 different cultivars, coming from the world collection: Manna de Montana, Rio san Lorentzo, Nepal, Guarijio and New-Mexico. The duration of the vegetation period was of 130-147 days, the late cultivar was Manna de Montana, with a vegetation period of 147 days, and most early proved to be the Rio San Lorentzo cultivar with 135 days of vegetation. The height of *Amaranthus hypochondriacus* plants varied between 132.8 cm for New-Mexico cultivar and 75.3 cm for Nepal cultivar. The productivity of *Amaranthus hypochondriacus* cultivars was illustrated by grain yields of 11.1-25.3 q/ha, data which mirror an important adjustment capacity to the cropping condition in the area and resistance to drought and high temperatures. The chemical composition of grains was following: 16.95% proteins; 62.02% starch; 5.56% lipids; 4.68% fibres and 3.67% ash.

**Rezumat:** Lucrarea prezintă rezultatele cercetărilor efectuate în anul 2007, în Biobaza din campusul USAMV București, referitor la caracteristicile morfologice, biologice și de calitate a recoltei la specia *Amaranthus hypochondriacus*. S-a lucrat cu 5 soiuri provenite din colecția mondială: Manna de Montana, Rio san Lorentzo, Nepal, Guarijio și New-Mexico. Perioada de vegetație a fost cuprinsă între 130 și 147 zile, cel mai târziu soi a fost Manna de Montana cu 147 zile de vegetație și cel mai precoce s-a dovedit a fi Rio san Lorentzo cu o perioadă de 135 zile de vegetație. Înălțimea plantelor speciei *Amaranthus hypochondriacus* a variat între 132,8 cm la soiul New-Mexico și 75,3 cm la soiul Nepal. Productivitatea speciei *Amaranthus hypochondriacus* a fost ilustrată prin producții de semințe de 11,1-25,3 q/ha, date ce reflectă o mare capacitate de adaptare și rezistență la cultivarea în condiții de secetă și temperaturi ridicate. Compoziția chimică a semințelor a fost următoarea: proteine 16,95%, amidon 62,02%, lipide 5,56%, celuloză 4,68%, cenușă 3,67%.

**Key words:** *Amaranthus hypochondriacus*, morphology, biology, cultivars, chemical composition.  
**Cuvinte cheie:** *Amaranthus hypochondriacus*, morfologie, biologie, soiuri, compoziție chimică.

## **INTRODUCTION**

*Amaranthus* species has a long, distinguished history as a religious and ceremonial plant and as a food. In fact, its use as an ornamental bloom is a relatively recent development. A native of South America, *amaranthus*' name is derived from the Greek *amarantos*, which means "unfading" and is an appropriate reference to the flower's long-lasting deep red, green or yellow blooms. *Amaranthus hypochondriacus* synonym with *Prince-of-Wales-feather* or *Prince's feather* is widely cultivated as pseudocereal, ornamental, and fodder crops in many tropical to warm-temperate regions of the world. Occasionally, *A. hypochondriacus* occurs as

escapes near the places of cultivation; there are no reliable reports of its successful naturalization in the flora area. The wild progenitor of *Amaranthus hypochondriacus* seems to be *A. powellii* (J. D. SAUER 1967); hybridization with other cultivated taxa (e.g., *A. cruentus*) probably also played some role. The initial cultivated form probably emerged in southwestern North America, within the original range of native *A. powellii* (J. D. SAUER, 1967). The grains are high in lysine and the young leaves are high in iron and calcium. Can be planted after the frost date, requires full sun. The grains can be cooked as a hot cereal or ground and used as flour.

### MATERIAL AND METHOD

The experiments with *Amaranthus hypochondriacus* species were made in the Biobasis within USAMV-Bucuresti Campus, in Didactical Field of Field Crops Department, Faculty of Agriculture Bucharest. The studied cultivars were: *Manna de Montana*, *Rio san Lorentzo*, *Nepal*, *Guarijio* and *New-Mexico* belonging of world collection.

Chemical analysis has been done in the Yield Quality Laboratory of Field Crops Department from the Faculty of Agriculture, with infrared spectrophotometer NIR Instalab 600 which was callibrated of Metron Novi Sad Laboratory. There were performed following chemical analysis: moisture, dry matter content, proteins, starch, lipids, ash and fibre.

### RESULTS AND DISCUSSIONS

The duration of the vegetation period was of 130-147 days, the late cultivar was Manna de Montana, with a vegetation period of 147 days, and most early proved to be the Rio San Lorentzo cultivar with 135 days of vegetation (table 1). Also, the New Mexico cultivars had a longer growing season, about 140 days, but emergence was fastest, after 15 days from sowing.

Table 1

Phenology date of *Amaranthus hypochondriacus* cultivars (USAMVB Experiment Field, 2007)

Cultivars	Sowing data	Emergence data	Number of sowing/emergence days	Harvesting data	Number of emergence /maturity days
Manna de Montana	April 17	May 8	21	October 3	147
Guarijio	April 17	May 4	17	October 2	136
Rio san Lorentzo	April 17	May 7	19	September 18	135
Nepal	April 17	May 4	17	September 19	137
New-Mexico	April 17	May 2	15	September 18	140

Morphological determination for *Amaranthus hypochondriacus* cultivars emphasized the following morphological traits: height of 75.3-132.8 cm; the stalk formed 7-10 knots, 12-42 leaves and a main inflorescence with the length comprised between 27.08-37.7 cm (table 2). The values of grains yields per plants oscillated from 11.8 to 25.8 g and TGW had an average of 1.08 g (table 3).

Even if the temperatures of 2007 year were very high, it resulted good values of grains yields with an average of 18.4 q/ha, being distinguished New-Mexico (25.3 q/ha) and Rio san Lorentzo (23.4 q/ha). The Manna de Montana cultivar had intermediary yield of 20.0 q/ha (figure 1).

The chemical composition of grains was as follows: 16.95% proteins; 62.02% starch; 5.56% lipids; 4.68% fibres and 3.67% ash (table 4). Research emphasized the important influence of experimental year weather conditions on grains chemical composition. In this way, in 2007, an extremely droughty year, with high temperatures, *Amaranthus hypochondriacus* grains accumulated more protein (15.83-17.83%) in comparison with cereals grains (12-14%) and lipids (4.92-6.49%) in comparison with cereals (1.5-4.8%).

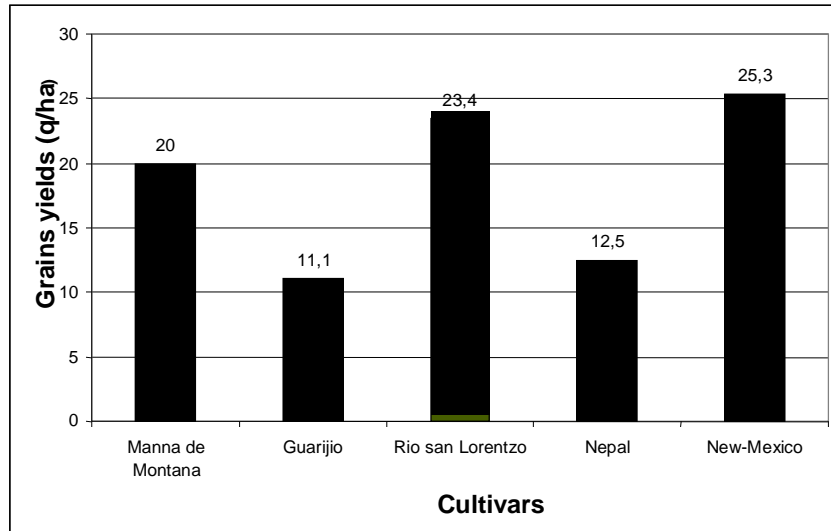


Figure 1. Grains yields of *Amaranthus hypochondriacus* cultivars (USAMVB Experimental Field, 2007)

Table 2

Morphological characteristics of different *Amaranthus hypochondriacus* cultivars (USAMVB Experimental Field, 2007)

Morphological characteristics of plants	Manna de Montana	Guarijio	Rio san Lorentzo	Nepal	New-Mexico
Plants height (cm)	126.5	82.2	88.7	75.3	132.8
Stems colors	Green reddish	Red with green shadows	Green yellowish	Purple red	Green yellowish
Number of leaves/main stem	37	18	42	12	23
Leaves colors	Light green	Green with dark reddish ribs	Green with light reddish shades	Dark reddish	Dark green
Inflorescences length (cm)	27.08	28.5	37.7	26.7	40.1
Inflorescences color and form	Bright green; Straight inflorescence, compacted	Dark red with purple shades, branched inflorescence	Red-purple with light green shades or yellow; straight inflorescence, compacted	Dark red to garnet; lax inflorescence	Green yellowish; straight inflorescence, compacted

Table 3

Grains yields per plant and TGW by *Amaranthus hypochondriacus* cultivars (USAMVB Experimental Field, 2007)

Cultivars	Grains yields per plant (g)	Difference (g)	TGW (g)	Difference (g)
Manna de Montana	18.8	0.3	1.08	0
Guarijio	11.8	-6.7 <sup>000</sup>	0.99	-0.09 <sup>000</sup>
Rio san Lorentzo	23.8	5.3 <sup>***</sup>	1.12	0.04 <sup>*</sup>
Nepal	12.3	-6.2 <sup>000</sup>	0.96	-0.12 <sup>000</sup>
New-Mexico	25.8	7.3 <sup>***</sup>	1.28	0.20 <sup>***</sup>
Average	18.5	Control	1.08	Control
		DL 5%	0.61 g/plant	0.03 g
		DL 1%	0.93 g/plant	0.04 g
		DL 0,1%	1.49 g/plant	0.07 g

Table 4

Proteins, starch, lipids, ash and fibres contents of *Amaranthus hypochondriacus* grains by different cultivars (% d.m.) (USAMVB Experimental Field, 2007)

Cultivars	Proteins	Starch	Lipids	Fibre	Ash
Manna de Montana	17.64	61.21	4.92	4.62	3.31
Guarjio	16.52	62.83	5.17	4.34	3.84
Rio san Lorentzo	17.83	62.55	6.49	4.85	3.93
Nepal	15.83	60.75	5.43	4.66	3.75
New-Mexico	16.94	62.78	5.82	4.93	3.54
Average	16.95	62.02	5.56	4.68	3.67

### CONCLUSIONS

As a consequence of research performed in 2007 year for *Amaranthus hypochondriacus*, following conclusions concerning morphological, biological and yields quality may be emphasized as important:

1. The duration of the vegetation period was of 130-147 days, the late cultivar was Manna de Montana, with a vegetation period of 147 days, and most early proved to be the Rio San Lorentzo with 135 days of vegetation.

2. The heights of *Amaranthus hypochondriacus* plants varied between 132.8 cm for New-Mexico cultivar and 75.3 cm for Nepal cultivar

3. The productivity of *Amaranthus hypochondriacus* cultivars was illustrated by grains yields of 11.1-25.3 q/ha, data which mirror an important adjustment capacity to the cropping condition in the area and resistance to drought and high temperatures.

4. By comparison, at cereals, following chemical composition was achieved: 16.95% proteins; 62.02% starch; 5.56% lipids; 4.68% fibres and 3.67% ash.

5. As a consequence of the effected research, it was issued the conclusion that the *Amaranthus hypochondriacus* cultivars find favourable conditions in the area of the reddish preluvosoil area from the central part of Romanian Plain.

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