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RESEARCH ON BIOLOGICAL AND MORPHOLOGICAL CHARACTERISTICS AND YIELD QUALITY AT *FAGOPYRUM ESCULENTUM* MOENCH. SPECIES UNDER THE CONDITIONS OF THE CENTRAL PART OF ROMANIAN PLAIN

MARIA TOADER, GH.V. ROMAN

University of Agronomic Sciences and Veterinary Medicine of Bucharest

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Abstract

The paper presents the results of the research made in 2004-2007 yiers at Moara Domneasca Experimental Field, regarding morphological and biological characteristics, chemical composition and yield quality of Fagopyrum esculentum Moench. species. In natural condition of reddish preluvosoil area, the duration of the vegetation period of buckwheat was of 80-90 days, excepting the year 2007, when due to drought and high temperatures, the duration reduced less then 70 days. In the same context, the maximum plants height varied between 37 and 52.2 cm, the values being lower in the year 2007. Buckwheat grains yields were around 6.4 q/ha in the year 2007, year less favourable to agricultural crops, and were about 15 q/ha in the other two experimental years (2004 and 2006). The chemical composition of buckwheat grains was the following: 10.05-11.99% moisture, 88.01-90% dry matter, out of which: 14.20-16.30% proteins; 62.91-67.92% starch; 3.14-4.12% lipids; 9.27-10.65% fibre; 2.04-2.80% ash. There are remarked the superior values of the protein content (in average 15.24%) and over 16% for the best variants, in comparison with cereals grains (10-14%).

INTRODUCTION

Common buckwheat (*Fagopyrum esculentum* Moench.) or „black wheat" is a crop which belongs of the *Polygonaceae* family. Since the chemical composition and use of grains in humen diet and feeding are similar to cereals, buckwheat is considered a pseudocereal. This species has been a crop of secondary importance in many countries but, at present, it is promoted as alternative crop in organic farming system. Buckwheat grains with the dehulled groats can cooked as porridge, and the flour used in the preparation of bread, biscuits, pancakes, mixed breakfast cereals, soups, cakes. Buckwheat proteins are of excellent quality and has higher content in essential aminoacid lysine, unlike common cereals. Small leaves and shoots are used as leafy vegetables, the flowers and green leaves are used for rutin extraction for medicine treatments. The presence of pollinators greatly increases the yield. The nectar of buckwheat flowers makes a dark colored honey with a high quality. The buckwheat grains have importance because that does not

contain gluten, so they can be used as bakery products by persons suffering from celiac disease and having allergy to gluten. Buckwheat is a short season crop that does well on low-fertility or acidic soils, but the soil must be well drained. Too much fertilizer, especially nitrogen, will reduce yields. In hot climates, it can only be grown by sowing late in the season, so that it will bloom in cooler weather. Buckwheat is sometimes used as a green manure, as a plant for erosion control, or as wild fauna cover and feed.

MATERIAL AND METHODS

On period 2006-2007, in the Moara Domneasca Experimental Field were organized researches upon *Fagopyrum esculentum* species, where there was studied a biological material of different origin, respectively Moara Domnească cultivars collection but also the ones from Germany, Greece, Slovenia and Poland. The comparative crops were organized based on the multi-stage block method, with randomized variants in 4 replications. The distance between rows was of 25 cm and the sowing density was of 350 germinable grains/m². Chemical analyses were made in the Yield Quality Laboratory of the Field Crops Department, Faculty of Agriculture, University of Agronomic Sciences and Veterinary Medicine Bucharest, with a spectrophotometer NIR, Instalab 600. This equipment uses the infrared technology for determination of different chemical compounds of cereals and pseudocereals grains. The calibration of spectrophotometer for buckwheat was effectuated by the Metron Group Laboratory from Novi Sad.

RESULTS AND DISCUSSION

In natural conditions of reddish preluvosoil area, the vegetation period of *Fagopyrum esculentum* Moench. species was of 80-90 days, excepting the year 2007, when due to the drought and high temperatures, the period reduced less than 70 days. In the Moara Domneasca Experimental Field conditions, according to the data from Table 1, buckwheat plants had between 76 and 95 days for sowing-maturity period, and between 63 and 88 days from emergence to maturity.

Regarding the phenology data, it can be observed that plants of Greak cultivars needed to emergence 8-12 days, and their from Germany and Poland, they needed 6-13 days. The apparition of first fruits was noted during 16-30 June, respectively, 41-55 days after emergence, dignifying Germany cultivar, as early in May with 12-19 days compared with the Greak cultivar. Flowering period was longer, in average, 22-25 days and the maturity was noted at 51-55 days after bloom, with small differences between variants. The stage of harvesting was noted during 10-31 July time interval, respectively 6-9 days after the apparition of first fruits (table 1).

In the same context, the maximum plants heights varied between 36.9 and 52.2 cm, the values being lower in the year 2007 (figure 1).

Table 1

Phenology data at *Fagopyrum esculentum* plants, depending on cultivars
(Moara Domneasca Experimental Field, 2004-2007)

Phenology data (limits)	Cultivars (provenience of seeds)			
	Romania	**Poland**	**Germany**	**Greece**
Sowing data	25-27 April	25-27 April	25-27 April	25-27 April
Emergence data	4 -7 May	3-8 May	3-8 May	5-7 May
Number of sowing/emergence days	7-12	6-13	6-13	8-12
Flowering data	31 May -2 June	29 May -2 June	28-30 May	3-4 June
Number of emergence/flowering days	24-31	27-30	20-27	22-31
Date of first fruits apparition	18-25 June	18-24 June	18 June	16-30 June
Maturity data (70% mature inflorescences)	13-27 July	10-23 July	10-23 July	14-31 July
Number of flowering/maturity days	43-54	42-53	43-54	41-55
Vegetation period (number of sowing/maturity days)	79-91	76-87	76-87	80-95
Vegetation period (number of emergence/maturity days)	67-84	63-81	63-81	68-88
Plants height at harvesting (cm)	42.3-51.3	37.2-46.5	36.9-49.2	38.8-52.2

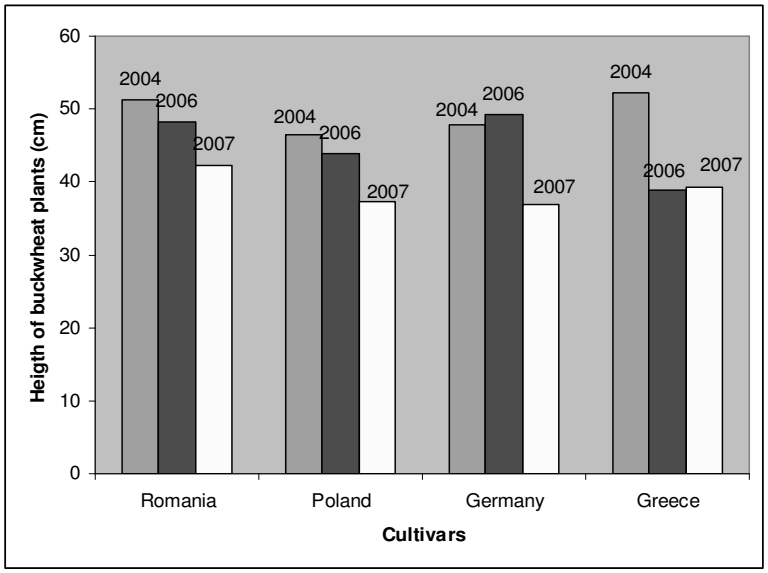

Fig. 1. *Fagopyrum esculentum* plants heigth, depending on cultivars (Moara Domneasca Experimental Field, 2004-2007)

The level of the Thousand Grains Weight (TGW) was about 22.3 g, and the yields, in average, of 15 q/ha. The highest value was obtained at German cultivars, of 19.60 q/ha (2006) and the smallest was obtained at Polish cultivars, of 6.40 q/ha (figure 2).

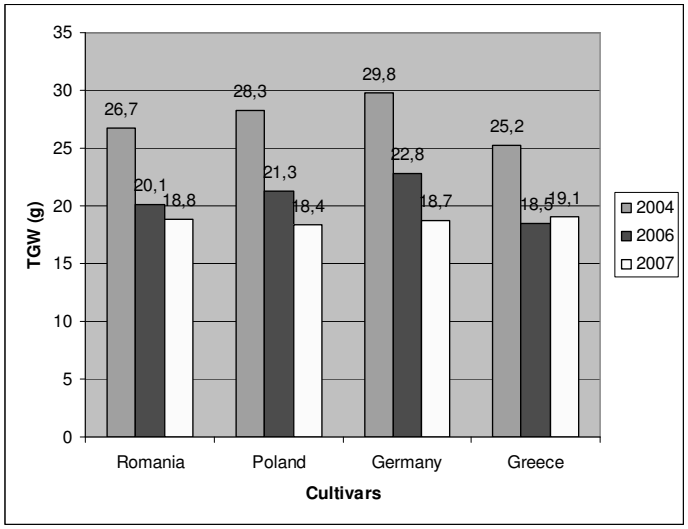

Fig. 2. TGW of *Fagopyrum esculentum* grains, depending on cultivars (Moara Domneasca Experimental Field, 2004-2007)

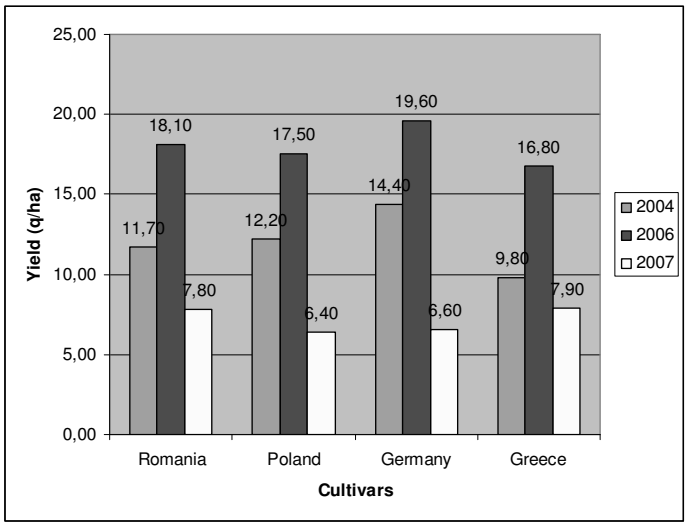

Fig. 3. Grains yields by *Fagopyrum esculentum*, depending on cultivars (Moara Domneasca Experimental Field, 2004-2007)

The chemical composition of grains was the following: 10.05-11.99% moisture, 88.01-90% dry matter, out of which: 14.20-16.30% proteins; 62.91-67.91% starch; 3.14-4.12% lipids; 9.27-10.65% cellulose; 2.08-2.58% ash (table 2).

There are remarked the higher values of protein content (in average 15.24%) and over 16% for the best variants, in comparison with cereals (10-14%). The chemical composition of buckwheat grains was strongly influenced by weather condition. So, in the case of 2004, a favourable year, the average protein content was of 15.37% and in the year 2007, the protein content increased to over 16%.

Table 2

Proteins, starch, lipids, fibre and ash contents of *Fagopyrum esculentum* grains (% d.m.), depending on cultivars

(Moara Domneasca Experimental Field, 2004-2007)

Cultivars (provenience of grains)	**Proteins**	**Starch**	**Lipids**	**Fibre**	**Ash**
Year 2004					
Romania	14.97	64.20	3.97	10.24	2.14
Poland	15.67	62.91	3.82	10.21	2.12
Germany	15.59	63.62	4.12	10.41	2.04
Greece	15.25	63.51	3.91	10.65	2.05
Average (2004)	**15.37**	**63.56**	**3.95**	**10.37**	**2.08**
Year 2006					
Romania	14,28	66.75	3.25	10.06	2.18
Poland	14,37	67.43	3.14	9.72	2.21
Germany	14,46	67.91	3.17	10.31	2.61
Greece	14,20	67.82	3.18	9.27	2.13
Average (2006)	**14,32**	**67.47**	**3.18**	**9.84**	**2.28**
Year 2007					
Romania	16.08	67.59	3.72	10.16	2.55
Poland	15.87	67.83	3.24	10.10	2.40
Germany	15.90	67.87	3.29	10.40	2.60
Greece	16.30	67.92	3.61	10.20	2.80
Average (2007)	**16.03**	**67.80**	**3.46**	**10.21**	**2.58**
Average (2004-2007)	**15.24**	**66.27**	**3.53**	**10.14**	**2.31**

CONCLUSIONS

1. In the natural condition of reddish preluvosoil area in the central part of Romanian Plain, the vegetation period of *Fagopyrum esculentum* species was of 80-90 days, excepting the year 2007, when due to drought and high temperatures, the period reduced to less than 70 days.
2. The maximum plants heights varied between 36.9 and 52.2 cm, the values being lower in the year 2007.
3. Buckwheat grains yields were about 6.4 q/ha in 2007, year less favourable to agricultural crops and there were about 15 q/ha in the other two experimental years (2004 and 2006).
4. There are remarked the superior values of the protein content (in average 15.24%) and over 16% for the best analyzed variants, in comparison with cereals (10-14%).
5. The buckwheat grains chemical composition was strongly influenced by weather condition. So, in the case of the year 2004, a favourable year, the average value for protein content was of 15.5% and in 2007, the value for protein content increased to over 16%.
6. As a consequence, it was issued the conclusion that *Fagopyrum esculentum* species find favourable conditions in the area of the reddish preluvosoil area from the central part of Romanian Plain.
7. This species, strongly promoted by scientific trends which support biodiversity and organic agricultural system may contribute to the diversification of agricultural crops and of agroalimentary products, with a source of aliments rich in proteins of high assortment quality.

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