RESEARCH REGARDING BIOLOGY, ECOLOGY AND PRODUCTIVITY OF *CARTHAMUS TINCTORIUS* L. SPECIES UNDER THE CENTRAL PART OF ROUMANIAN PLAIN CONDITIONS

CERCETĂRI PRIVIND BIOLOGIA, ECOLOGIA ŞI PRODUCTIVITATEA SPECIEI *CARTHAMUS TINCTORIUS* L. ÎN CONDIŢIILE DIN PARTEA CENTRALĂ A CÂMPIEI ROMÂNE

Alina Maria IONESCU*, Gheorghe Valentin ROMAN*

University of Agronomic Sciences and Veterinary Medicine Bucharest
Coresponding author: Alina Maria Ionescu, email: trutaalina9@yahoo.com

Abstract: *The main objective of the research was to study the biology, ecology and productivity of a less common species of agricultural crops – safflower (Carhtamus tinctorius* L.*), with the aim to evaluate the adaptability of the species on natural conditions* of *the Southern part of Romania and to the organic agriculture conditions. The experiment was organized in the Moara Domneasca Experimental Field, situated in reddish preluvosoil area from central part of Romanian Plain; it was organized based on the multi-stage block method with randomized variants in 4 replications. Sowing took place on 10th of April 2008 and the sowing parameters were: 50 cm spacing between rows, with a density of 22 plants/m²; the sowing depth was of 3-4 cm. Carthamus tinctorius plants emerged 7 days after sowing, the beginning of inflorescences apparition was at 11th of June, 56 days after emergence, the first seeds formed 77 days after emergence, and full maturity was attainig at 112 days after emergence. Upon harvest, the plants had a height of 75.8 cm and a number of 18 capitulum per plants, that contained around 293.17 seeds, which means an average of 15.43 seeds/capitula. The average value of the 1000-seed weight was of 32.71 g and the yield was of 1917.91 kg/ha.*

Rezumat: *Obiectivul principal al cercetătilor de faţă a fost studierea biologiei, ecologiei şi productivităţii speciei Carthamus tinctorius* L. *cu scopul cunoaşterii adaptabilităţii la condiţiile naturale din partea de sud a României şi de cultivare în sistem ecologic. Astfel, experienţa a fost organizată în Câmpul Experimental Moara Domnească, situat în zona preluvosolului roşcat din partea centrală a Câmpiei Române, fiind organizată după metoda blocurilor etajate cu variantele randomizate, în 4 repeteţii. Data semănatului a fost 10 aprilie 2007, respectându-se parametrii semănatului, şi anume: distanţa între rânduri de 50 cm, densitatea de 22 pl/m²; adâncimea de semănat de 3-4 cm. Plantele de şofrănel au răsărit după 7 zile de la semănat, iar începutul formării inflorescenţelor, atât pe axul principal, cât şi din mugurii axiali a corespuns datei de 11 iunie, deci la 56 de zile după răsărire; seminţele au început să se formeze la aproximativ 77 zile de la răsărit şi au atins maturitatea deplină la 112 zile de la răsărit. La recoltare, plantele aveau o înălţime de 75,8 cm, un număr de 18 capitule pe plantă, care conţineau aproximativ 293,17 de seminţe rezultând o medie de 15,43 seminţe/capitul. Masa a 1000 de seminţe a avut o valoare medie de 32,71 g, iar producţia pe hectar a fost de 1917.91 kg.*

Key words: *Carthamus tinctorius, morphology, biology.*
Cuvinte cheie: Carthamus tinctorius, morfologie, biologie.

INTRODUCTION

Safflower, *Carthamus tinctorius* L., is a member of the *Asteraceae* family, cultivated mainly for its seed, which is used as edible oil and as birdseed. Traditionally, the crop was grown for its flowers, used for coloring and flavoring foods and making dyes, especially before cheaper aniline dyes became available, and in medicines.

Safflower is a highly branched, herbaceous, thistle-like annual or winter annual,

usually with many long sharp spines on the leaves. Plants are 30-150 cm tall with globular flower heads (capitula) and, commonly, brilliant yellow, orange or red flowers. Achenes are smooth, four-sided and generally lack pappus.

Safflower is one of humanity's oldest crops, but generally it has been grown on small plots for the grower's personal use and it remains a minor crop with world seed production around 800 000 t per year. Oil has been produced commercially and for export for about 50 years, first as an oil source for the paint industry, now for its edible oil for cooking, margarine and salad oil. Over 60 countries grow safflower, but over half is produced in India (mainly for the domestic vegetable oil market). Production in the USA, Mexico, Ethiopia, Argentina and Australia comprises most of the remainder. China has a significant area planted to safflower, but the florets are harvested for use in traditional medicines and the crop is not reported internationally.

MATERIAL AND METHOD

The main objective of the research was to study the biology, ecology and productivity of a less common species of agricultural crops – safflower (*Carthamus tinctorius* L.), with the aim to evaluate the adaptability of the species on natural conditions in Southern part of Romania and to the organic agriculture conditions.

The experiment was organized in the Moara Domneasca Experimental Field, situated in reddish preluvosoil area from central part of Romanian Plain; it was organized based on the multi-stage block method with randomized variants in 4 replications.

Sowing took place on 10th of April 2008, and the sowing parameters were: 50 cm spacing between rows; density of 22 plants/m^2; sowing depth of 3-4 cm.

The cultural practices performed during the vegetation period concerned the manual weeding works, carried out as often as necessary.

During the vegetation period there were effected observations and measurements concerning: the emergence data; the dynamics of plants height; the dynamics of leaves, floral buds, flowers and seeds formation; the stages of maturity.

RESULTS AND DISCUSSIONS

Phenological observations. In our research, we sowed on 10th of April and plants reached the harvest maturity after 112 days of vegetation, more specific on 7th of August.

The inflorescence appeared across 11 of June, corresponding to 56 days after emergence, the formation of seeds began after 03th of July (77 days after sowing), and seeds maturity stage was attended at 7th of August, 112 days after emergence.

Dynamics of plants height. Regarding the dynamics of plants height, it could find that plants evolved relatively slowly at the beginning of the growing season (April 17-May 21), so that on May 21, by a corresponding number of 35 days from sowing, plants reached 16.6 cm height, resulting an average growth rate of 0.47 cm/day (figure 1).

In the second phase of the intense growth, carried out over a period of 36 days, between May 21 and June 26, safflower plants reached 62.6 cm height, therefore an increase of 46 cm, with an average of 1.27 cm/day. Finally, in the third stage, at the end of the vegetation, the increase was slower, so that over a period of 41 days, it was attended a height of 75.8 cm, with an increase of 13.2 cm over the entire period, and an average rate of 0.32 cm/day.

Dynamics of leaves growing. In the research conditions, the *Carthamus tinctorius* plants formed on the main stem around 47 leaves. Leaves formation was conducted over a period of 92 days of vegetation, resulting in an average rate of 1.95 days/leaf. The rate of leaf formation was slower in the first 35 days of growing season (April 21-May 21); at this stage were formed 17 leaves, with an average rate of 2.05 days/leaf. In the next phase of the intense

height growth of the stem (May 21-June 26), leaf formation was more alert, so that over a period of 36 days were formed 25 leaves, with an average rate of 1.44 days/leaf (table 1).

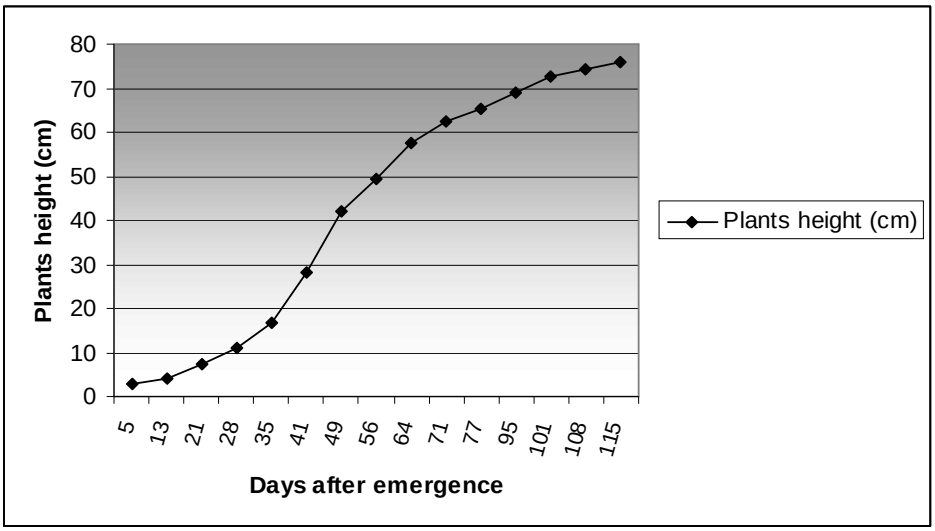

Figure 1. Dynamics of plants height at *Carthamus tinctorius*

Table 1

Dynamics of leaves growing at *Carthamus tinctorius* species

Date	Number of leaves		Days	
	After emergence	From the apparition of the previous leaf	After emergence	From the apparition of the previous leaf
21.04.2008	3	0	5	0
29.04.2008	5	2	13	7
7.05.2008	8	3	21	8
14.05.2008	12	4	28	7
21.05.2008	17	5	35	7
27.05.2008	24	6	41	6
4.06.2008	30	6	49	7
11.06.2008	35	5	56	7
19.06.2008	39	4	64	6
26.06.2008	42	3	71	7
3.07.2008	44	2	77	6
18.07.2008	47	3	95	18
24.07.2008	38	0	101	0
31.07.2008	31	0	108	0
7.07.2008	28	0	112	0

Dynamics of inflorescence, flowering and fruits formation. The inflorescence appeared at 56 days after emergence, the maximum flowering stage (50% flowered plants) being marked at 64 days after emergence; seeds formation began after the 3th of July and the maturity (considered at a 12% humidity content) was attended at 48 days after flowering.

Table 2

Dynamics of inflorescence, flowers and fruits growing at *Carthamus tinctorius* species

Date	Dimension of the main inflorescence (cm)	Phenophase	Days after emergence
11.06.2008	1.2	Apparition of inflorescence	56
17.06.2008	2.1		62
03.07.2008	3.2	Beginning of seeds formation	77
08.07.2008	3.9		82
24.07.2008	4.7		101
31.07.2008	5.1		108
7.08.2008	5.2	Full maturity	112

Upon harvest, plants had 75.8 cm height and a number of 18 capitulum per plants that contained around 293.17 seeds, which means an average of 15.43 seeds/capitulum. 1000 seeds weight had an average value of 32.05 g, and seed moisture was of 12.04% at harvesting (table 3). The seeds yield was evaluated at 1534.9 kg/ha.

Table 3

The moisture and 1000 seeds weight (TGW) at *Carthamus tinctorius* seeds

Variant	TGW (g)	Moisture (%)	Dry matter (%)
V_1	33.05	12,13	87.87
V_2	31.90	11.92	88.08
V_3	30.56	12,15	87.85
V_4	32.71	12.05	87.95
Average	32.05	*12,06*	*87.93*

CONCLUSIONS

1. In the reddish preluvosoil area from Romanian Plain, safflower plants had a vegetation period of 112 days from sowing; at maturity stage safflower plants were 75.8 cm tall, having an average growth rate of 0.67 cm/day and a number of 47 leaves.

2. The inflorescence appeared at 56 days after emergence, the maximum flowering stage (50% flowered plants) being marked at 64 days after emergence and the maturity (considered at 12% humidity content) was attended at 48 days after flowering.

3. Upon harvest, the plants had a height of 75.8 cm and a number of 18 capitula per plants that contained around 293.17 seeds, which means an average of 15.43 seeds/capitula. The average value of the 1000-seed weight was 32.71 g and the yield was of 1917.91 kg/ha.

BIBLIOGRAPHY

1. BAVEC F., BAVEC MARTINA, 2006 - Organic Production and Use of Alternative Crops, Ed. CRC Press, New York.
2. MUNTEAN L. S., BORCEAN I., AXINTE M., ROMAN GH. V., 2003 - Fitotehnie, Ed. Ion Ionescu de la Brad, Iaşi.
3. STAN T. N., 2006 - Cultura plantelor aromatice, condimentare şi mai puțin răspândite, Ed. Ion Ionescu de la Brad, Iaşi.