Changes in Phenolics and Protein Content during Seed Dermination of *Carthamus tinctorius* L.

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ABSTRACT

Semintele de *Carthamus tinctorius* L., sunt recunoscute pentru potentialul lor energetic. Capacitatea lor germinativa alaturi de alte caracteristici ce tin de variabilitatea genetica au fost putin studiate. Astfel, in acest sens in cadrul acestei lucrari ne-am propus sa studiem mobilizarea rezervelor din semintele soiului de sofranel Brigea, pe parcursul procesului de germinatie, in vederea stabilirii punctelor de cumul maxim ai caracteristicilor analizate.

The used biological material consists of safflower seeds in different germination stages (seeds – S I, seedlings–SII, plantlets–SIII, plants without roots–SIV, roots–SV). The extracts were obtained using phosphate buffer pH 7. Plant extracts were subjected to the following analysis: spectrophotometrically determination of total protein content, phenolic and flavonoid content.

With regard to the total protein content of the analyzed extracts, the highest values were and 9.1 g/100g FW, recorded in S III stage. Also, the total flavonoid content during the germination stages ranged between 0.08g and 0.21g rutin equivalent (RE) / 100g FW. The highest value of phenols during seed germination was performed in the S III with 1.08 g gallic acid equivalent (GAE).

The obtained results show that the bioaccumulation of phenolics and protein content in safflower during seed germination is influenced by the germination stage, impunand investigatii viitoare asupra procesului de germinatie si a posibilitatii de valorificare in domenii conexe.

Keywords: *germination seeds, in vitro, safflower extracts.*

INTRODUCTION

Carthamus tinctorius L., commonly known as safflower, is a member of the *Compositae* family. Cultivated mainly for its seed, safflower plant with high seed oil contents is considered to be one of the good options as feed-stock alternative material for biodiesel production (Mushtaq, 2014). Also, there are studies regarding the components of safflower, its seeds containing numerous polyphenolic compounds, flavonoids and serotoninins (Young, 2009).

AIMS AND OBJECTIVES

The objective of this study was to highlight the variation of protein accumulation and total

phenolic content during seed germination, and to determine the stage of maximum accumulation of these characteristics for future use in human or animal nutrition.

MATERIALS AND METHODS

The biologic material was represented by the seeds of safflower (*Chartamus tinctorius* L.) in different stages of germination.

The seeds were obtained from plants cultivated in the field in the Giurgiu – Ruse region, after the cultivation of the Bridgea cultivar. These were subjected to a surface sterilization protocol using mercuric chloride 1% for 8 minutes,

Tab. 1. Changes in seed reserves in different stages of germination

No.crt	Germination stages	Total protein content g/100g FW	Total phenolic content g GAE/100g FW	Total flavonoid content (g RE/100g FW)
1	SI	1.45 ± 0.41	1.23 ± 0.05	0.21 ± 0.01
2	S II	4.67 ± 0.33	0.80 ± 0.02	0.16 ± 0.01
3	S III	9.10 ± 1.41	1.08 ± 0.05	0.2 ± 0.01
4	S IV	4.31 ± 0.38	0.52 ± 0.01	0.08 ± 0.00
5	S V	4.55 ± 0.21	0.35 ± 0.01	0.11 ± 0.00

Note: The results are expressed as mean ± standard deviation

followed by rinsing 5 times with double distilled water. The seeds germinated in glass tubes on filter paper with distilled water, at 25°C at a 12h light/dark photoperiod. After germination, the seeds were removed, and the fresh plant material was subjected to extraction. The analyzed germination stages were: seeds (S I), seedlings (S II), plantlets (S III), plants without roots (S IV), roots (S V).

The plant extracts were obtained using phosphate buffer pH 7 and were subjected to subsequent analyses. Thus, there were determined the following: polyphenol content using the Folin-Ciocalteu method (Singleton, 1999), flavonoid content using a method adapted after Zhishen (1999), and total protein content by the Bradford method. The results were expressed as g/100 g fresh material (FW).

RESULTS AND DISCUSSION

The obtained results (Table 1) showed that the maximum accumulation of the biochemical parameters analysed is in the S III germination stage. With regard to the protein content, that our results for protein contents appear to be like other published results, who showed higher than those calculated for whole seeds.

The bioaccumulation of phenols during seed germination was performed in the following order: S III > S I > S II > S IV > S V.

CONCLUSION

The obtained results show that the bioaccumulation of phenolics and protein content in safflower during seed germination is influenced by the germination stage, varying from one state to the other, without having to follow a defined path.

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