CARTHAMUS TINCTORIUS L., THE QUALITY OF SAFFLOWER SEEDS CULTIVATED IN ALBANIA.

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Abstract**:** *Safflower, Carthamus tinctorius L., is a member of the family Compositae or Asteraceae, cultivated mainly for its seed, used for production of edible oil which has the highest polyunsaturated/saturated ratios of any oil available. It is nutritionally similar to olive oil, with high levels of linoleic or oleic acid, but much less costly [1]. The meal left after oil extraction is used for animal feed. Crude protein varies: from 16- 17% for undecorticated meal. In Albania grows as wild plant the Carthamus lanatus L., which is the most popular species of safflower. This study intends to draw attention to a number of species originating from Italy and cultivated in experimental condition in Albania. Where expression of the major character(s) evaluated is affected by environmental factors such as day length and temperature, the location is described geographically. It's hoped that the information compiled will contribute to: (1) identifying constraints in and possible solutions to the use of the crops, (2) identifying and selecting varieties with interest for further cultivation. Also, authors intend to contribute to improvement of the potential qualities of these crops through increased use of the available varieties. Study is focused especially on analyzing the content of oil, protein, fiber and moisture, in safflower seeds, conducted under AOAC-sixteenth Edition methods. Three varieties are used: BENNO 2 (with oil and protein content respectively: 31.26 and 16.36%), SAFF 2002 (with oil and protein content respectively 33.11 and 16.80%), MONTOLA 2000 (with oil and protein content respectively 33.45 and 16.19%). Maximal value of moisture for all varieties is 7%. BENNO 2 has the highest value of fiber content (24.26%). Suggestions and recommendations are given for the producers in order to increase the oil and protein content in safflower seeds. In addition, it is hoped that article will form a valuable reference source for all those scientists involved in conservation, research, improvement and promotion of Carthamo.*

Key words: safflower, oil seed, Carthamus tinctorius L.

INTRODUCTION

Safflower is an annual plant from the *Compositae* family. In literature, it is referred to as cultivated (*Carthamus tinctorius* L.) and wild species (*C. lanatus*L.). Africa and Asia are mentioned as places of origin, with the Mediterranean as the main region of distribution. Safflower is an important aromatic and medicinal plant. Due to high oil content in seed, it is also cultivated as an oil crop. The seed contains nearly 30-40% oil 15-20% protein, and 35-45% hull fraction The proteins from safflower seeds are of good nutritional quality.

However the quality as well as quantity of oil and proteins in safflower seeds is different in different environmental conditions. In the present investigation, they were analyzed for moisture, protein, oil and crude fiber, three varieties of safflower: MONTOLA 2000, SAFF 2002 and BENNO 2 cultivated in Albania. The aim was to study the expression of the major character(s) evaluated affected by environmental factors.


Figure 1.Safflower planation

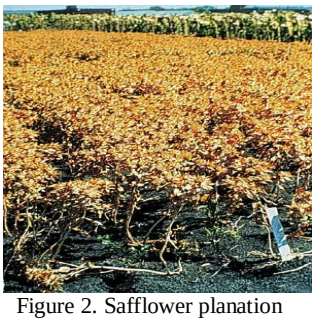


Figure 2. Safflower planation

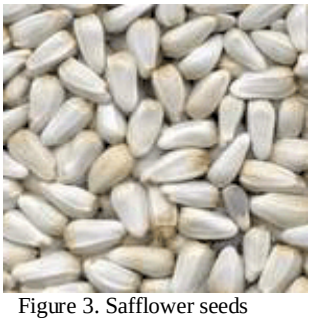


Figure 3. Safflower seeds

MATERIAL AND METHODS

Plant Material

Three safflower cultivars (Montola 200, Saff 2002, Benno 2), provided by Agricultural Research Institute in Italy, were used as plant materials.

Experimental Procedures

The experiment was conducted in Lushnja , located in Southeast of Albania. Sowings were performed on 15-16 th March 2005. The experimental design was a randomized complete block design with three replications. Sowing rates were 15 kg ha^{-1}. Individual plot size was 2.4x 3 m= 7.2 m^2. Row spacing was 60 cm and intra row spacing was 12-15 cm after decollation. Plants were harvested on 10 th July 2005. Samples of each plot were obtained to determine seed yield, plant height, , number of branches per plant, number of seeds per head, 1000-seed weight, oil content, protein, fiber and moisture content.

Determination of Seed Oil Content

Reference: AOAC Official Method no. 920.39, Sixteenth Edition.

The seeds were oven-dried at 40°C for 4 hours, using a ventilated oven, up to a moisture content of about 5%, and then they were ground with a Warring blender. Four grams of dried safflower seeds were extracted with petroleum ether for 6 hours in a Soxhlet system according to the AOCS method (AOCS, Sixteenth Edition). The oil extract was evaporated by distillation at a reduced pressure in a rotary evaporator at 40°C until the solvent was totally removed.

Determination of protein content

Reference: AOAC Official Method no. 954.01, Sixteenth Edition.

Seed **protein** content was calculated by multiplying total nitrogen content with factor 6.25. Total nitrogen content was determined by the micro-Kjeldahl method.

Determination of seed moisture content

Reference: AOAC Official Method no. 934.01, Sixteenth Edition.

The sample is heated under specific conditions for 90 min at 130 ^{0}C champions, and the loss of weight is used to calculate the water content of the sample

Determination of crude fiber content.

Reference: AOAC Official Method no. 989.03, Sixteenth Edition.

The champion is subject to successive treatments with acid and alkaline. Residue dried at 600 ^{0}C for 2h and then it is weighted. The lost of weight represents fiber content.

RESULTS AND DISCUSIONS

Mean values of seed yield and quality components for the safflower cultivars tested are shown in *Table 1*.

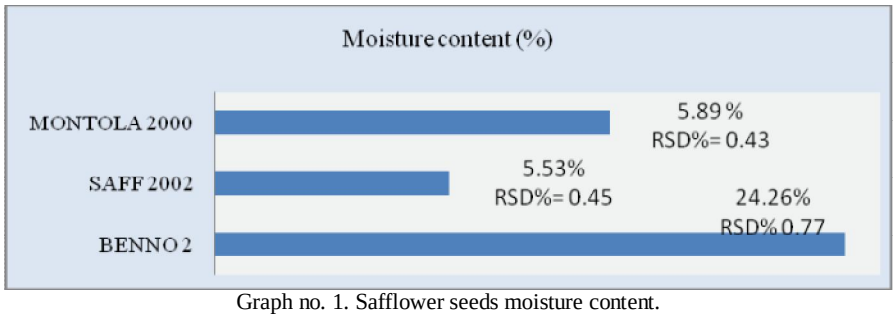
Table 1.

Mean values of plant height, number of branch per plant, number of heads per plant, 1000-seed weight, seed weight per head, seed weight per plant and efficiency for each safflower cultivar.

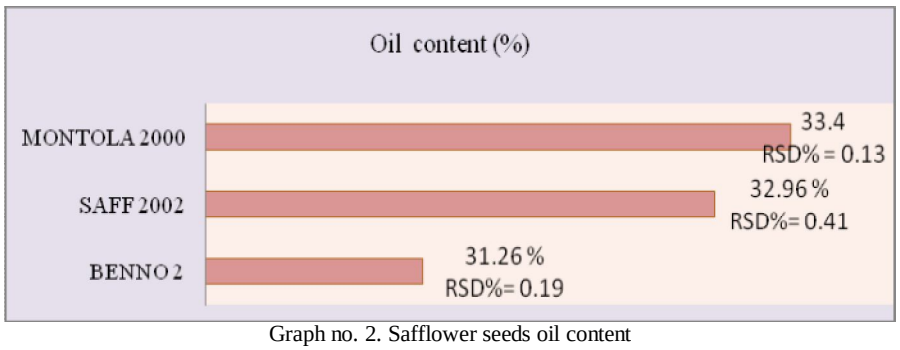
Varieties	Plant height (cm)	No of branch per plant	No of heads per plant	1000 seed weight (g)	Seed weight per head (g)	Seed weight per plant (g)	Efficiency (kv/ha)
BENNO (2)	117.1	9.7	20.7	44.79	7.3	15.125	16.78
SAFF (2002)	122.7	10.9	25	43.26	4.95	12.25	15.39
MONTOLA 2000	112.9	11.2	24.7	43.59	3.16	7.75	12.75

The results of variance analysis revealed significant differences among the cultivars, as well as the environments and the performance of cultivars being differential over locations. Also notice that in terms of plant height, cultivars have the approximate height, which represents the interests of the possibility for harvest mechanization.

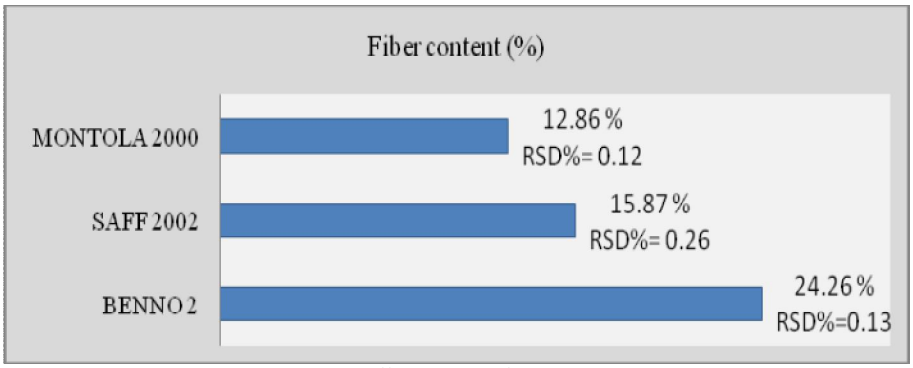
All results about quality parameters as moisture, oil, fiber and protein content at safflower seeds are shown below:



Graph no. 1. Safflower seeds moisture content.

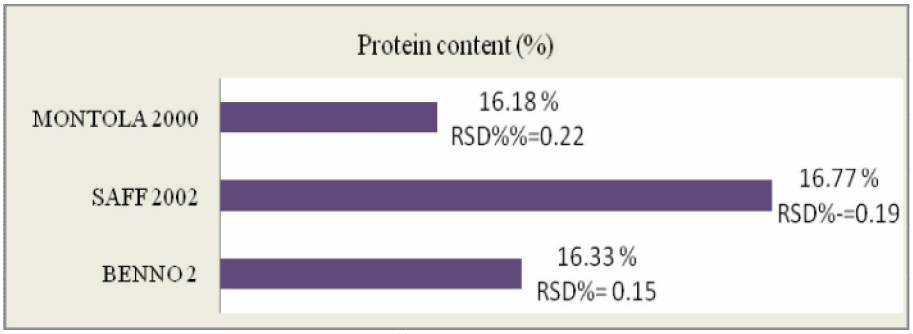


Graph no. 2. Safflower seeds oil content



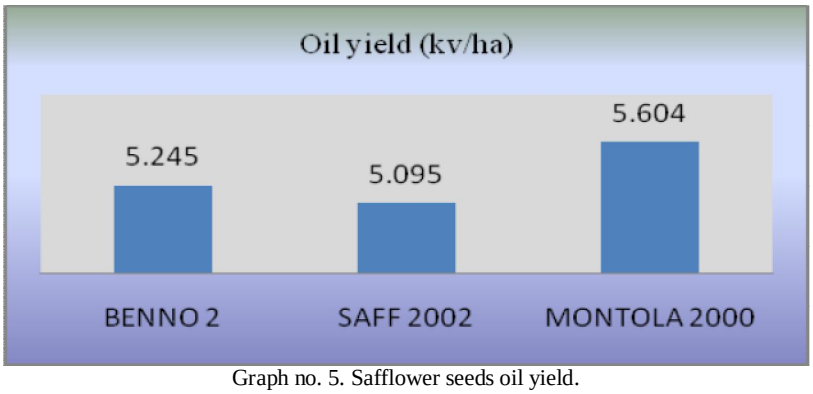
Graph no. 3. Safflower seeds fiber content.

• Maximum value of fiber content on safflower seeds is 24.26%. For the lowest fiber content differs variety Montola 2000, considering it as positive quality as varieties with low fiber content result in a low percentage of moisture.



Graph no. 4. Safflower seeds protein content.

Seed Protein content is found to be around 16-17%, there are no significant differences between safflower varieties.



Graph no. 5. Safflower seeds oil yield.

The evaluated parameters varied among the cultivars. Cv. Montola 2000 was found to be superior than the other two cultivars with its higher seed yield (16.78 kv ha-1), oil content (33.4%) and oil yield (560 kg ha-1).

Based on the results of correlation analyses on all agronomic traits tested, the elationships between different characters of safflower were identified (*Table 2*)

Table 2.

Correlation coefficients for some plant characteristics in the safflower cultivars tested.

2	**3**	**4**	**5**	**6**	**7**			
1			-0.11	0.49	0.44	0.45	0.51	0.95
2				0.13	0.06	-0.04	-0.11	-0.12
3					0.11	0.17	0.34	0.51
4						0.53	0.37	0.44
5							0.29	0.39
6								0.72
7								-

1: Seed yield, 2: Plant height, 3: Number of branch per plant, 4: Number of seed per head, 5: 1000-seed weight, 6: Oil content, 7: Oil yield.

CONCLUSIONS

The success of safflower introduction in new areas will largely depend on the extent of improvement made in yield and oil content. The seed yield of a cultivar might vary because of light, water, precipitation, temperature, humidity and nutrient competition. The flowering Plant height, number of branches per plant, , seeds per head, 1000 seed weight and oil content are the most important morphological characteristics concerning seed yield because of a direct correlation between these characteristics and seed yield as confirmed by results of the correlation analyses in our case.

Oil content of seeds is a very important economic trait for safflower cultivars and considered one of the most important factors affecting the success of safflower introduction in new areas.

The result from the present study indicated that seed yield, yield components, oil, protein, moisture and fiber content of seed of safflower have been affected significantly by the cultivars and growing conditions. In our case, safflower showed generally good adaptation to Albanian conditions. High values for oil content and seed yield observed in the present study encouraged the introduction and cultivation of this plant in Albania. Among the investigated cultivars, cv. *Montola 2000* is recommended for cultivation in different locations of Albania since it has significantly high yield performance and oil content. However, further experimental data are required to support these positive results. Thus, the main objective of the present study was to examine the adaptation ability, seed yield, yield components, oil, protein and fiber content of three commercial safflower cultivars under Albanian conditions. Further studies are currently underway to elucidate the appropriate cultivation requirement of safflower under Albanian conditions.

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