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Study of Some Agronomic Traits in Foreign Varieties of Winter Safflower for Varamin Region of Iran (*Carthamus tinctorios* L)

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ABSTRACT

Carthamus tinctorius L., respectively, named safflower, is world's oldest crop belonging to the compositae family which originated in the Middle East. Safflower is an annual oilseed crop which is well adapted to dry hot climates and is tolerant to drought and salinity. In order to study of Some agronomic traits in foreign varieties of vinter safflower, an experiment was carried out in simple lattice design (5*5) in two replication in the crop growing seasons 2012-2013, in Varamin region of Iran. For comparison, data analysis and statistical software MSTAT-C and to draw graphs using Excel software. The results showed that, Treatment effects on the grain yield, oil yield, oil content and number head in per plant was significant at the ($p<0.01$). In main comparing cultivars, it was found that the highest grain yield have a varieties (IL-111) with 3650 ($kg.ha^{-1}$), and the lowest grain yield have a varieties of Rio-70 with 2323 ($kg.ha^{-1}$). Also the highest oil yield have a varieties (IL-111) with 1152 ($kg.ha^{-1}$) and had the lowest Rio-70 (672.5 $kg.ha^{-1}$).

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INTRODUCTION

Safflower (*Carthamus tinctorius* L.) has been grown since ancient times (4500 BC) in Egypt, Morocco, China and India to obtain carthamin from the flowers, a dye that may be either yellow or red. It is a drought tolerant plant and suitable for growing in dry and marginal areas (Li and Mündel, 1996). Safflower has been cultivated in Iran for centuries in small quantities for the extraction of dye from its florets, while its importance, as an oil seed crop, has only been realized since 1970 (Ahmadi and Omidi, 1997). Iran is one of the richest germplasm sources of safflower.

Safflower (*Carthamus tinctorius* L.) is an oilseed crop which is grown throughout the semiarid region of the temperate climates in many areas of the world for use as vegetable and industrial oils, spices, and birdfeed. Safflower has a long history of cultivation as an oilseed crop and as a source of red dye (carthamin). Carthamin is extracted from its flowers and it is used for treatment in the form of infusion, for circulatory system related diseases 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 (Li and Mündel, 1996). Safflower petals have immense medicinal and therapeutic properties as revealed Chinese researchers. Petals of safflower from India were analyzed for carthamin (red pigment) (0.83%), oil(5.0%), protein(1.9%), ash(10.4%), fiber(12.2%) and fatty acid compositions. The petal oil was shown, for the first time, to contain some short chain fatty acids(10:02,12:0 and 14:0),gamma linolenic acid along with fatty acids such as palmitic, stearic, oleic and alpha linolenic acids. Similary the petals were rich in Ca (530mg), Mg (287mg) and Fe (7.3mg/100g)(Nagaraj *et al*.,2001). 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 flower (Weiss, 2000). Abel *et al*. (1976) showed that the number of head per plant or number of seeds per head or both traits could be responsible for high yielding safflower lines. Omidi *et al*.(2009) reported that the seed yield per plant is significantly correlated with seed yield per plot, biomass, number of capitula, 100-seed weight, number of secondary branches and oil yield per plant. The results showed a positive correlation between kernel% and oil content, therefore selection for high oil content can be based on thin-hull seeds. Digming and Yuguang (1993) in a study of 30 safflower cultivars, reported that the number of effective branches, main stem diameter, diameter of top seed, 1000 seed weigh, oil content and angle of the first

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branch were the six principal components. Consentino *et al*. (1997) showed that the number of head per plant and seeds per head were significantly and positively correlated. Jajarmi, *et al*.(2008) in study of more than 90 Iranian safflower genotypes reported a significant correlation between seed yield and oil yield (r=0.89) and the number of seeds per pod (r=0.8). Yazdi-Samadi and Abd-Mishani(1989) grouped all 1618 Iranian and American safflower genotypes into 5 clusters according to their similarities and reported that the of lines from USA and Iran and other eastern countries were classified into same cluster, as they had similar genetic base. Mokhtassi, (2007) found a correlation between seed yield and oil yield (r=0.89) and the number of seeds per pod (r=0.8) that was closely related to high-yield genotypes. Johnson *et al*.(2001) indicated that seed yield was positively correlated with seed weight, and plant height. Deharo *et al*., (1991), in a study of 199 safflower genotypes collected from 37 different countries, showed that the oil percent varied by genotype and environmental conditions. The objective of this research was to evolution of some morphological traits in foreign varieties of winter safflower for Varamin region of Iran.

MATERIALS AND METHODS

This experiment was carried out in simple lattice design (5*5) in two replication in the crop growing seasons 2012-2013, in Varamin region of Iran. Data analysis was based on simple lattice model of statistical design and main comparison was performed using Duncan's multiple range tests. The study was carried out from 25 safflower (C. *tinctorius* L.) genotypes (Table 1). The preparing of the ground was done as: plow, disc, tabulation and stack atmosphere in spring and winter. All operations were performed in a mechanical way to deal with weeds and for a farm pest; the spraying was done three times. So that the first time was with Thrips, the second with Desis and the third one was with DinoKarp spraying pesticides. Each plot was sown 4 plant lines in 1th May. Each plot had four rows with five meter long and tow meter wide. Characters were examined on twenty plants randomly selected in the mid–rows of plots. For determination of agronomic traits of each experimental plot, 10 plants were randomly selected and their morphological characteristics were measured. After harvesting the following parameters were investigated: Grain yield, Oil Content, Oil yield and Number of head per plant. The safflower seeds with hull were dried at 40 °C for 4 hours under vacuum to less than 5% moisture content and then milled to desired particle size by a mortar. Oil was extracted from 15 grams of each seed powder in Soxhlet extractor for 6 hours using hexane as a solvent, following the AOCS method Ba 3-38 (AOCS 1993). Oil content of the samples is expressed on a percent basis, based on whole seed. Each treatment was analyzed in triplicate and the figures were then averaged. Data were assessed by analysis of variance (ANOVA) using MSTAT-C software program. Main comparison was performed using Duncan's multiple range ($p<0.05$) tests.

Table 1: Treatments used in the experiment.

Row	Genotype	Source
1	Syrian	Mexico
2	PI-537598	USA
3	Gila	Mexico
4	Lesaf	Mexico
5	Dinger	Mexico
6	697	Mexico
7	Cw-4440	Mexico
8	PI 250536	Mexico
9	Hartman	Mexico
10	Kino-76	Mexico
11	LRV-51-51	Mexico
12	S-541	USA
13	Quirigo-88	Mexico
14	Mante81	Mexico
15	CW-88	Mexico
16	Saffire	Canada
17	Rio-70	USA
18	CW-74	USA
19	S-555	USA
20	Finch	USA
21	Bacum92	simit
22	S-0023	simit
23	IL-111	Iran
24	LRV-5151	Iran
25	K.W.2	Iran

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RESULTS AND DISCUSSION

Oil Content:

The important economic trait for safflower genotypes is the oil content of seeds which affecting the success of safflower introduction in new areas (Bassil & Kaffka, 2002). Many factors such as genotype, ecology, morphology, physiology and agronomic practices influence the oil content and fatty acid synthesis of crops (Cosge *et al*. 2007). The results of analysis for oil content showed that there were significant differences among 25 genotypes for seed the oil content ($P < 0.01$) and the oil content of 25 different genotypes varied from 24.45 to 31.55% are in Fig 1, the highest seed oil content was obtained from IL.111 genotype (31.55%, respectively). On the other hand, the lowest (22.45%) was obtained from the CW-88 genotype (Fig 1). Bayraktar & Ülker (1992) reported that the Oil content of safflower cultivars varied between 34.55 to 38.99%. Camas *et al*., (2005) also explained that the oil content of safflower varied between 24.5 to 27.2%. Our finding established that our results are lower than Bayraktar & Ülker (1992), but it is higher than Camas *et al*., (2005).

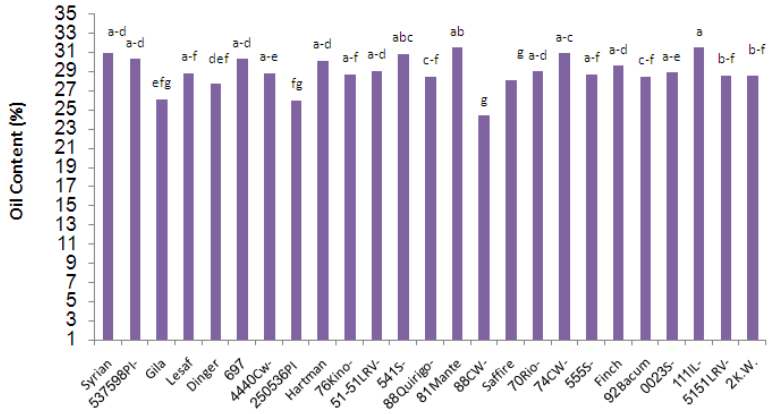

Fig. 1: Main comparison of safflower in 25 Varieties.

Oil yield:

The results of analysis for oil yield showed that there were significant differences among 25 genotypes for seed the oil content ($P < 0.01$) and the oil yield of 25 different genotypes varied from 672.5 to 1152 ($Kg.h^{-1}$) are in Fig 2, the highest seed oil yield was obtained from IL.111 genotype (1152 $Kg.h^{-1}$, respectively). On the other hand, the lowest (672.5 $Kg.h^{-1}$) was obtained from the Rio-70 genotype (Fig 2). Narkhede and Patil, (1990), by using the Eberhart and Russell method (1966), showed that the Indian variety (J. S. LF-48) had the highest adaptability and stability for grain and oil seed yields.

Grain Yield:

The results of analysis for grain yield showed that there were significant differences among 25 genotypes for seed the oil content ($P < 0.01$) and the oil yield of 25 different genotypes varied from 2323 to 3650 ($Kg.h^{-1}$) are in Fig 3, the highest seed oil yield was obtained from IL.111 genotype (3650 $Kg.h^{-1}$, respectively). On the other hand, the lowest (2323 $Kg.h^{-1}$) was obtained from the Rio-70 genotype (Fig 3). This Result is in agreement with studies by Azari (1993), Motalebipour (1994), Soltani (2000), Pasebaneslam (2001) and Alhani (1999) that reported the superiority and adaptability of L. R. V. 51. 51 for seed oil and grain yields. Banai (1998) in a study of the yielding ability and adaptability of twelve chickpea varieties reported that variety 12-60-31 with its high yielding ability was classified in group A (+), on the basis of the Eberhart and Russell method (1966).

Number of head (capitula) per plant:

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 flower(Weiss,2000). Abel *et al*.(1976) showed that the number of head per plant or number of seeds per head or both traits could be responsible for high yielding safflower lines.The results of analysis for grain yield showed that there were significant differences among 25 genotypes for seed the oil content ($P < 0.01$) and the oil yield of 25 different genotypes varied from 6.9 to 17.35 are in Fig 4, the highest seed oil yield was obtained from IL.111 genotype (17.35, respectively). On the other hand, the lowest (6.9) was obtained from the S-0023 genotype (Fig 4). Consentino *et al*. (1997) showed that the number of head per plant and seeds per head were significantly and positively correlated.

Fig. 2: Main comparison of sofflower in 25 Varieties.

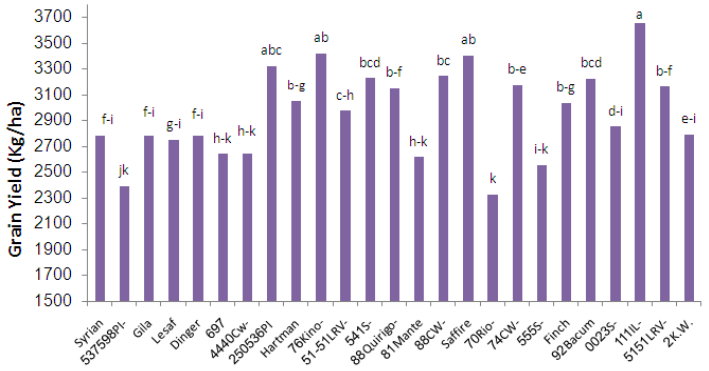

Fig. 3: Main comparison of sofflower in 25 Varieties.

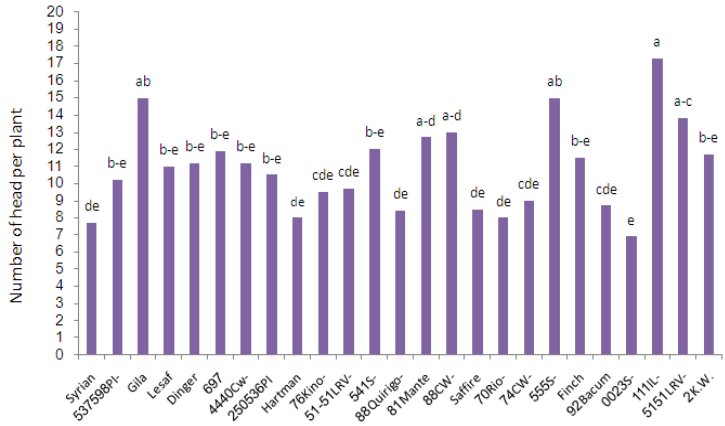

Fig. 4: Main comparison of sofflower in 25 Varieties.

Conclusion:

As a conclusion, between different varieties of safflower, there are significant differences in these experiments, the highest seed oil yield was obtained from IL.111 genotype (1152 $Kg.h^{-1}$, respectively) and also the highest seed oil yield was obtained from IL.111 genotype (1152 $Kg.h^{-1}$, respectively). Recommended the study be repeated in Varamin and similar areas, so as to reach more reliable results.

REFERENCES

Abel, G.H. and M.F. Discroll, 1976. Sequential traits development and breeding for high yield. Crop Sci., 16: 213-216.

Ahmadi, R. and A.H. Omidi, 1997. Evaluation of 25 Safflower (*Carthamus tinctorius* L.) Genotypes for Their Morphoagronomic Characters. Proceeding of IV International Safflower Conference. Italy, pp: 218-221.

AOCS., 1993. Official methods and recommended practices of the American Oil Chemists, Society, AOCS Press, Champaign, U.S.A.

Azari, A., 1993. Evaluation of Winter Safflower Lines for Qualitative and Quantitative Traits. Annual Report of Oilseeds Research Department. Seed and Plant Improvement Institute. Karaj, Iran, p: 5.

Banai, A., 1998. Study of Yielding Ability and Adaptability of 12 Chickpea Varieties. *Seed and Plant*, 13: 1-7.

Consentino, S., V. Copani and M. Camarata,1997. Relations between meteorological parameters yield and seed oil content in safflower in Mediterranean environment. IV International Safflower Conference, Italy, pp: 149-155.

Deharo, A., M. Del Rio, J.C. Lopez Garcia, M.A. Garcia, M.J. Palomares and J. Fernandes Martines, 1997. Evaluation of the World Collection of Safflower for Oil Quality and Other Seed Characters. Sesame and Safflower Newsl., 6: 94-99.

Digming, K. and J. Yuguang, 1993. Principal component agricultural properties of 30 safflower cultivars. Third International Safflower Conference, China, pp: 520-527.

Eberhart, S.A. and W.A, Russell, 1966. Stability Parameters for Comparing Varieties. Crop Science, 6: 36-40.

Jajarmi, V., A.M. Azizi, Sadlu and A.H. Omidi, 2008. The effect of density, variety, and planting date on yield and yield components of safflower.7th International Safflower Conference., pp: 520-527.

Johnson, R.C., P.B. Ghorpade and V.C. Bradley, 2001. Evaluation of the USDA core safflower collection for seven quantitative traits. V International Safflower Conf.USA., pp: 143-149.

Li, D. and H. Mundel, 1996. Safflower Promoting the Conservation and Use Underutilized and Neglected Crops. 7. IPGCPR, Catersleben / IPGR, Rome, Italy, p: 83.

Mokhtassi, B., 2007. Yield components, leaf pigment contents, patterns of seed filling, dry mat ter , LAI and LAID of some safflower(*Carthamus tinctorius* L.) genotypes in Iran. Pakistan Journal Biological Sciences, 10(9): 1406-1413.

Motallebipour, S., 1994. Study of Winter Safflower Varieties for Oil and Grain Yields. Annual Report of Oilseeds Research Department. Seed and Plant Improvement Institute. Karaj, Iran. 7-p.

Nagaraj, G., G.N. Devi and Srinivas, 2001. Safflower petals and their chemical composition. Proceeding of the Fifth International Safflower Conference, Williston, ND-USA., pp: 23-27.

Narkhede, B.N. and A.M. Patil, 1990. Phenotypic Stability in Safflower. Journal of Maharashtra Agricultural University, 15(1): 95-96.

Omidi, A.H., H. Khazaei and S. Hangbo, 2009. Variation for some important agronomic traits in 100 spring safflower (*Carthamus tinctorius* L).2009.American – Eurasian. J. Agric.& Environ. Sci., 5(6): 791-795.

Pasebaneslam, B., 2001. Determination of Optimum Planting Time for L.V.51.51 Safflower Line. Annual Report of Oilseeds Research Department. Seed and Plant Improvement Institute. Karaj, Iran, p: 7.

Soltani, A., 2000. Evaluation of Native and Exotic Safflower Varieties for Oil and Grain Yields and Cold Tolerance. Annual Report of Oilseeds Research Department. Seed and Plant Improvement Institute. Karaj, Iran. 5-p.

Weiss, E.A., 2000. Oilseed Crops. Blackwell Publishing Limited, London.

Yazdi Samadi, U., B.C. Abd-mishani, 1989. Cluster analysis in safflower. Second International Safflower Conference INDIA, 9-13 Jan., pp: 119-126.