AENSI Journals

Advances in Environmental Biology

ISSN-1995-0756 EISSN-1998-1066

Journal home page: http://www.aensiweb.com/aeb.html

The Survey of Yield and Components Yield in Winter Safflower Cultivar (*Carthamus tinctorios* L)

[1]Samaneh Adeli and [2]Younes Sharghi

[1]Department of Agriculture, Islamshahr Branch, Islamic Azad University, P.O. Box: 33135-369, Tehran, Iran
[2]Ass. Professor, Department of Agriculture, Islamshahr Branch, Islamic Azad University, P.O. Box: 33135-369, Tehran, Iran

ARTICLE INFO

Article history:
Received 15 April 2014
Received in revised form 22 May 2014
Accepted 25 May 2014
Available online 15 June 2014

Keywords:
Safflower, Cultivar, Grain Yield
Harvest Index

ABSTRACT

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. Iran is one of the richest germplasm sources of safflower. The main of 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 2013, in Varamin region of Iran. .Treatment effects on the grain yield, harvest index, plant high and biological yield was significant at the 1 % ($p<0.01$). 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 ($kg.ha^{-1}$).

To Cite This Article: Samaneh Adeli and Younes Sharghi, The Survey of Yield and Components Yield in Winter Safflower Cultivar (*Carthamus tinctorios* L). ***Adv. Environ. Biol., 8(9)****: 840-843, 2014*

INTRODUCTION

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 [12]. 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 [15]. 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 [4]. Iran is one of the richest germplasm sources of safflower.

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) [18]. 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 [1,15]. 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 [24]. Abel *et al.* [2] 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.* [20] 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. Consentino *et al.* [8] showed that the number of head per plant and seeds per head were significantly and positively correlated. Jajarmi, *et al.* [13] 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). Digming and Yuguang [10] 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 branch were the six principal components. Yazdi-Samadi and Abd-Mishani [26] grouped all 1618 Iranian and American safflower genotypes into 5 clusters according to their

Corresponding Author: Younes Sharghi, Ass.Professor, Department of Agriculture, Islamshahr Branch, Islamic Azad University, P.O. Box: 33135-369, Tehran, Iran.
E-mail: sharghi@iiau.ac.ir

Advances in Environmental Biology, 8(9) Special 2014, Pages: 840-843

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, [16] 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*. [14] indicated that seed yield was positively correlated with seed weight, and plant height. Deharo *et al*., [9], 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 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 [5]. 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 Spss software program. Main comparison was performed using Duncan's multiple range ($p<0.05$) tests.

Table 1: Treatments used in the experiment.

Cultivar	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

RESULTS AND DISCUSSION

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 grain yield of 25 different genotypes varied from 2323 to 3650 ($Kg.h^{-1}$) are in Fig 3, the highest seed grain 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 (Table 2). This Result is in agreement with studies by Azari [6], Motalebipour [17], Soltani [22], Pasebaneslam [21] and Alhani [3] that

Advances in Environmental Biology, 8(9) Special 2014, Pages: 840-843

reported the superiority and adaptability of L. R. V. 51. 51 for seed oil and grain yields. Banai [7] 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.

Harvest index:

The results of analysis for harvest index showed that there were significant differences among 25 genotypes for seed the oil content ($P < 0.01$) and the harvest index of 25 different genotypes varied from 18.6 to 23.9 %) are in Table 2, the highest harvest index was obtained from Hortman genotype (23.9%, respectively). On the other, the lowest (18.6 %) was obtained from the S-541 genotype (Table 2). This Result is in agreement with studies by Azari [6], Motalebipour [17], Soltani [22], Pasebaneslam [21] for harvest index**.**

Plant high:

The results of analysis for plant high showed that there were significant differences among 25 genotypes for seed the oil content ($P < 0.01$) and the plant high of 25 different genotypes varied from 88.7 to 118.8(cm) are in Table 1, the highest plant high was obtained from S-541 genotype (118.8 cm, respectively). On the other, the lowest (88.7 cm) was obtained from the Mante81 genotype (Table 2). Yazdi Samadi and Abde Mishani [25] studied 1858 Iranian and foreign lines in irrigation free condition in Karaj announced that the plant height is so changeable and its changing range is from 20 to 90 cm. Also they found out that Iranian lines are the shortest samples.

Biological yield:

The results of analysis for biological yield showed that there were significant differences among 25 genotypes for seed the oil content ($P < 0.01$) and the biological yield of 25 different genotypes varied from 12450 to 16040 ($Kg.ha^{-1}$) are in Table 1, the highest biological yield was obtained from IL-111 genotype (16040 Kg.ha-1, respectively). On the other, the lowest (12450) was obtained from the S-555 genotype (Table 2). Plaisted and Peterson [23] presented a method for characterizing the stability of yield performance when several varieties were tested at a number of locations within one year, the variety with the smallest mean value being a stable variety.

Table 2: Mean values of Cultivars in different agronomic traits of Safflower.

Cultivar	Grain Yield ($Kg.ha^{-1}$)	Harvest Index %	Plant High (Cm)	Biological Yield ($Kg.ha^{-1}$)
Syrian	2778 f-i	20.7 b-h	96.15 c-g	13420 g-j
PI-537598	2390 jk	18.7 fgh	93.30 d-g	12750 j
Gila	2779 f-i	21 b-g	90 efg	13220 ij
Lesaf	2751 g-i	21.5 a-g	90.3 efg	12790 j
Dinger	2778 f-i	21.9 a-f	92.8 efg	12710 j
697	2640 h-k	19.3 e-h	89.55 fg	13670 f-j
Cw-4440	2640 h-k	19.7 d-h	90.85 efg	13370 g-j
PI 250536	3320 abc	21.6 a-g	98.45 c-f	15370 bcd
Hartman	3051 b-g	23.9 ab	107.2 bc	12740 j
Kino-76	3420 ab	23.2 abc	96.25 c-g	14720 c-f
LRV-51-51	2973 c-h	21.1 b-g	95.10 c-g	14150 e-i
S-541	3226 bcd	18.6 fgh	118.8 a	14390 a
Quirigo-88	3150 b-f	20.2 c-h	105.6 bcd	15600 bc
Mante81	2614 h-k	19.7 d-h	88.70 fg	13300 hij
CW-88	3243 bc	21.5 a-g	97.95 c-g	15110 b-e
Saffire	3399 ab	22.5 a-e	85.65 g	15070 b-e
Rio-70	2323 k	18.5 fgh	89.10 fg	12500 ij
CW-74	3175 b-e	21.4 a	92.35 efg	14850 j
S-555	2556 i-k	18.9 gh	99.45 c-f	12450 e-i
Finch	3032 b-g	21.2 b-g	89.30 fg	14290 d-i
Bacum92	3225 bcd	20.4 c-h	102.5 b-e	15830 bc
S-0023	2852 d-i	20.3 c-h	88.30 fg	14030 e-i
IL-111	3650 a	22.7 a-d	106.6 bc	16040 b
LRV-5151	3161 b-f	21.9 a-f	111.7 ab	14430 d-h
K.W.2	2792 e-i	19.3 e-h	99.45 c-f	14450 d-g

In each column, means with similar letter are not significantly different ($P<0.01$).

Conclusion:

As a conclusion, between different varieties of safflower, there are significant differences in these experiments, the highest grain yield was obtained from IL.111 genotype (3650 $Kg.h^{-1}$, respectively) Recommended the study be repeated in Varamin and similar areas , so as to reach more reliable results [3].

REFERENCES

[1] Abdullah, N., Al-Dhaibani, Fathy S. EL-Nakhlawy, Samir, G. Alsolaimani, F.a., Almehmadi, 2013. Nickel uptake from Enriched Sewage Sludge Amended Soil by Cabbage (*Brassica oleracea* L.) through Phytoremediation Technology, Advances in Environmental Biology, 7(9): 2311-2318.
[2] Abel, G.H. and M.F. Discroll, 1976. Sequential traits development and breeding for high yield. Crop Sci., 16: 213-216.
[3] Adeli, A., M.J. Mirhadi, Y. Sharghi, 2013. Study of Some Agronomic Traits in Foreign Varieties of Winter Safflower for Varamin Region of Iran (*Carthamus tinctorios* L), Journal of Applied Science and Agriculture, 8(7): 1185-1189.
[4] 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.
[5] AOCS., 1993. Official methods and recommended practices of the American Oil Chemists, Society, AOCS Press, Champaign, U.S.A.
[6] 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. 5-p.
[7] Banai, A., 1998. Study of Yielding Ability and Adaptability of 12 Chickpea Varieties. *Seed and Plant,* 13: 1-7.
[8] 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.
[9] 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.
[10] Digming, K. and J. Yuguang, 1993. Principal component agricultural properties of 30 safflower cultivars. Third International Safflower Conference, China, pp: 520-527.
[11] Eberhart, S.A. and W.A, Russell, 1966. Stability Parameters for Comparing Varieties. Crop Science, 6: 36-40.
[12] Etemadi, M.E., M. Sam Daliri , A.A. Mousavi. 2013. The Effect of Seeding Rate on Yield and Yield Component of Canola Three Varieties in Iran North, Advances in Environmental Biology, 7(1): 198-200.
[13] 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.
[14] 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.
[15] Li, D. and H. Mundel, 1996. Safflower Promoting the Conservation and Use Underutilized and Neglected Crops. 7. IPGCPR, Catersleben / IPGR, Rome, Italy. 83-p.
[16] 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.
[17] 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.
[18] 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.
[19] Narkhede, B.N. and A.M. Patil, 1990. Phenotypic Stability in Safflower. Journal of Maharashtra Agricultural University, 15(1): 95-96.
[20] 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.
[21] 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, 7-p.
[22] 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.
[23] Plaisted, R. L., Peterson L. C. 1959. A Technique for Evaluating the Ability of Selection to Yield Consistently in Different Locations and Seasons. American Potato Journal, 36: 381-385.
[24] Weiss, E.A., 2000. Oilseed Crops. Blackwell Publishing Limited, London.
[25] Yazdi Samadi, B., Siroos Abde Mishani, 1970. Crop Breeding Center, Tehran University Press.
[26] Yazdi Samadi, U., B.C. Abd-mishani, 1989. Cluster analysis in safflower. Second International Safflower Conference INDIA, 9-13 Jan., pp: 119-126.