



Safflower

germplasm collection directory

Z. Zhang and R. C. Johnson, compilers



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PREFACE

Safflower (*Carthamus tinctorius* L.) is a multipurpose crop species which can be used as an edible oil, as well as for medicinal and industrial applications. It is an important underutilized crop, and through additional research involving genetic resources, has a high potential for further expansion and development. This Directory was developed by IPGRI in cooperation with the International Safflower Germplasm Advisory Committee (ISGAC). It provides information on safflower germplasm collections held by different genebanks around the world. This information was gathered from databases, literature, and answers to questionnaires. As some collections may have been inadvertently overlooked and collection attributes may have changed over time, the information provided may not always be entirely accurate or complete.

Users are encouraged to provide feedback to the compilers so corrections and additions can be made in future editions. It is hoped that the Directory can serve as a source of information to enhance the conservation and use of safflower germplasm. The compilers would like to thank those who provided information and support to make the Directory possible, in particular, Dr P. S. Reddy, former Chairman of ISGAC, who initiated the effort to gather information.

AUSTRALIA

Australian Temperate Field Crops Collection
Private Bag 260 Horsham
Victoria 3401

Telephone : (61-3) 5362 2111
Fax: (61-3) 5362 2187
Email: allan.Mcintyre@nre.vic.gov.au

Curator/Person in charge: Allan D McIntyre

Details of collection: 425 accessions of *Carthamus tinctorius* from Afghanistan, Argentina, Australia, Canada, China, Egypt, Spain, Ethiopia, France, Hungary, India, Iran, Iraq, Israel, Jordan, Japan, Kenya, Morocco, Pakistan, Poland, Portugal, Romania, Susan, Soviet, Syria, Turkey and United States of America. They are mostly cultivars and breeding lines.

Maintenance of collection: Medium-term storage at 2°C, 15% RH and 40 m³ of storage space. Seeds with 5% moisture content are kept in laminated aluminium packets.

Long-term storage at -18°C, 15% RH, 5% moisture content, and 128 m³ of storage space. Seeds are kept in laminated aluminium packets.

Duplication of collection: Accessions are duplicated in backup storage at CSIRO Plant Industries, Canberra.

Availability: Small quantities are available.

Quarantine: Seed entering Australia must undergo post-entry quarantine grow out and inspection.

Evaluation: Some basic characterization available.

Documentation: Partial passport data available.

BULGARIA

Institute of Introduction and
Plant Genetic Resources "K.Malkov"
Sadovo, Plovdiv District

Telephone : 2221/2251/2252

Curator/Person in charge:

Details of collection: 9 accessions of *Carthamus tinctorius*.

Maintenance of collection: Long-term storage at -18 °C, 40% RH and 4 - 7 % moisture content.
Seeds are kept in glass jars.

Duplication of collection: No information.

Availability: Fully available.

Quarantine: No information.

Evaluation: No information.

Documentation: Partial passport data are available.

CANADA

Plant Gene Resources of Canada
Agriculture & Agri-Food Canada
Saskatoon Research Centre
107 Science Place
Saskatoon, Saskatchewan S7N0X2

Telephone : (1-306) 956-7691
Fax: (1-306) 956-7246
Email: Richardsk@em.agr.ca

Curator/Person in charge: Dr. Ken Richards, Research Manager
Dr. Axel Diederichsen, Curator

Details of collection: 34 accessions of *Carthamus tinctorius* from Canada (4), India (29)
and United States of America (1).

- Maintenance of collection:** Long-term storage at -20 °C, 6 - 8 % moisture content, and 173 m³ of storage space. Seeds are kept in manila bags.
- Duplication of collection:** 25 accessions are duplicated at Agriculture Food & Nutrition, New Delhi, India; 4 accessions are duplicated at National Bureau of Plant Genetic Resources, New Delhi, India.
- Availability:** Fully available.
- Quarantine:** No information.
- Evaluation:** Not evaluated, however, the data on paper for some accessions for the recently released Canadian cultivars were obtained.
- Documentation:** Partial passport data are available, and constantly being updated. A new computer database system is being developed and should be available on Internet by 1998. All data on Canadian version of USDA-GRIN are available.

CANADA

Lethbridge Research Station
Agriculture Canada
P.O. Box 3000, Main Lethbridge
Alberta T1J 4B1

Telephone: (1-403) 3274561
Fax: (1-403) 3823156

Curator/Person in charge:

Details of collection: 456 accessions of *Carthamus tinctorius*.

Maintenance of collection: No information.

Duplication of collection: No information.

Availability: Fully available.

Quarantine: No information.

Evaluation: No information.

Documentation: Passport data available.

CHINA

Institute of Crop Germplasm Resources
CAAS
30 Bai Shi Qiao Road
Beijing

Telephone: (86-10) 62186628
Fax: (86-10) 62186629

Curator/Person in charge: Lu Xinxiong

Details of collection: 178 accessions of *Carthamus tinctorius* from various regions in China.

Maintenance of collection: Long-term storage at -18 °C, 57% RH, and 5-6% moisture content. Seeds are kept in sealed cans.

Duplication of collection: All accessions are duplicated at the National Genebank in Qinghai.

Availability: Based on mutual exchanges.

Quarantine: National Plant Quarantine Regulations.

Evaluation: Agroeconomic characters on plant, seed and flower.

Documentation: Partial passport data are available. The database system is developed with dBase.

CHINA

Institute of Industrial Crops
Xinjiang Academy of Agricultural Sciences
38 Nanchang Road Ulumuqi,
Xinjiang

Telephone: (86-991) 4841547

Fax: (86-991) 4840693

Curator/Person in charge: Wang Zhaomu

Details of collection: 2650 accessions of *Carthamus tinctorius* from 52 countries.

Maintenance of collection: Short-term storage at 10°C and 8-9% moisture content. Seeds are kept in paper bags and glass jars.

Duplication of collection: Partially duplicated at the Institute of Crop Germplasm Resources of CAAS, Beijing.

Availability: Partial availability for exchange.

Quarantine: Quarantine certificate is required.

Evaluation: Agroeconomic characters have been evaluated.

Documentation: The data are documented on data sheets.

CHINA

Institute of Oil Crops Research
Yunnan Academy of Agricultural Sciences
Longtou Street, Kunming
Yunnan 650205

Telephone : (86-871) 5893841

Fax: (86-871) 5893201

Curator/Person in charge: Yang Jianguo

Details of collection: 2784 accessions of *Carthamus tinctorius* from 42 countries.

- Maintenance of collection:** Short-term storage at room temperature. Seeds are kept in paper bags and glass jars.
- Duplication of collection:** Partially duplicated at the Institute of Crop Germplasm Resources of CAAS, Beijing.
- Availability:** Partial availability for exchange.
- Quarantine:** Quarantine certificate is required.
- Evaluation:** Agroeconomic characters have been evaluated.
- Documentation:** The data are documented on data sheets.

CHINA

Beijing Botanical Garden
Institute of Botany of CAS
Xiangshan, Beijing 100093

Telephone : (86-10) 62591431
Fax: (86-10) 62592686
Email: lidj@ns.ibcas.ac.cn

- Curator/Person in charge:** Li Dajue
- Details of collection:** 2071 accessions of *Carthamus tinctorius* from over 40 countries.
- Maintenance of collection:** Short-term storage at 18°C. Seeds are kept in aluminum bags.
- Duplication of collection:** All accessions are duplicated at the Institute of Industrial Crops of Xinjiang Academy of Agricultural Sciences, Ulumuqi, Xinjiang and the Institute of Oil Crops of Yunnan Academy of Agricultural Sciences, Kunming, Yunnan.
- Availability:** Available.
- Quarantine:** Required.

Evaluation: 30 characters on plant, seed and flower.

Documentation: The data are documented with dBase system.

ETHIOPIA

Plant Genetic Resources Centre
PO Box 30726
Addis Ababa

Telephone : (251-1)612244
615607
Fax: (251-1)613722
Email: biod-et@telecom.net.et

Curator/Person in charge:

Details of collection: 197 accessions of *Carthamus tinctorius* from various agro-ecological zones within the country.

Maintenance of collection: Short-term storage at 10 °C, 34% RH and 5 - 7 % moisture content. The storage space is 225 m³ and other 100 m³ being installed.

Duplication of collection: Not duplicated.

Availability: Available based on national/institutional material transfer agreements.

Quarantine: No information.

Evaluation: 120 accessions were characterized for 26 agro-morphological characters based on the descriptor list published by International Plant Genetic Resources Institute (IPGRI, formally IBPGR).

Documentation: The data are computerized with dBase IV, but will be moved to Access II. The data are available on request.

GERMANY

Federal Centre for Breeding Research for
Cultivated Plants (BAZ) - Genebank
Bundesallee 50
D-38116 Braunschweig

Telephone : (49-531) 596600/617
Fax: (49-531) 596365
Email: l.frese@bafz.de

Curator/Person in charge: Dr. L. Frese

Details of collection: 1 accession of *Carthamus lanatus* and 122 accessions of *Carthamus tinctorius*.

Maintenance of collection: Long-term storage at -10 °C and uncontrolled RH; Medium-term storage at 3°C and 30% RH. The storage space is 370 m³ and seeds are kept in sealed cans.

Duplication of collection: Not duplicated.

Availability: 46 accessions are available and another 77 accessions need regeneration before distribution.

Quarantine: According to national rules

Evaluation: Partially done, mainly oil content and fatty acid composition.

Documentation: Passport data are available as printout or computer files in ECP/GR data exchange format. Data and seeds are available without any restrictions.

GERMANY

Institut für Pflanzengenetik und
Kulturpflanzenforschung, Genebank
Corrensstrasse 3
Gatersleben D-06466

Telephone : (49-39) 4825229
Fax: (49-39) 4825155
Email:boerner@ipk-gatersleben.de

Curator/Person in charge: Dr. A. Borner

- Details of collection:** 1 accession of *Carthamus arborescens*; 5 accessions of *Carthamus glaucus* from Israel; 17 accessions of *Carthamus lanatus* from Bulgaria, France, Georgia, Italy, Kazakhstan, Kyrgyzstan, Turkmenistan and Tunisia; 44 accessions of *Carthamus tinctorius* from former Czechoslovak, Germany, Spain, Ethiopia, Hungary, Japan, Libyan, Morocco, Poland, Democratic People's Republic of Korea, Romania, Sudan, Slovakia, Tajikistan, Tunisia and United States of America; 1 accession of *C. rhiphaeus*; and 9 accessions of *Carthamus* sp. (not yet determined) from Cyprus, Spain, Greece, Turkey and Uzbekistan.
- Maintenance of collection:** Long-term storage at -15 °C, 70% RH and 5 - 6 % moisture content. Seeds are kept in paper bags.
- Duplication of collection:** No information.
- Availability:** Fully available.
- Quarantine:** No information.
- Evaluation:** Done for flowering time, flower color, plant height, days to maturity.
- Documentation:** Passport data available (printout, diskette files) or via WWW-Server: <http://fox-serv.ipk-gatersleben.de> for viewing or downloading. The database system is developed under Foxpro.

INDIA

National Bureau of Plant Genetic
Resources – NBPGR
Pusa Campus
New Delhi

Telephone : (91-11)5731845
Fax: (91-11)5731945, 5785619
Email: nbpgr@x400nicgw.nic.in

Curator/Person in charge: D. P. Patel, NBPGR Regional Station, Akola

Details of collection: 2393 accessions of *Carthamus tinctorius* from India and some other countries.

- Maintenance of collection:** Storage at -20 °C and 3-5% moisture content. Seeds are kept in laminated aluminium packets.
- Duplication of collection:** All accessions are duplicated at NBPGR Regional Station, Akola.
- Availability:** Fully available.
- Quarantine:** On receipt of seeds, they are observed for rust spores. If rust spores are encountered in routine quarantine examination, specific salvaging techniques are used to make them spore free.
- Evaluation:** 24 characters were evaluated, including days to 50% flowering, flower color, days to maturity, rosette leaf length, rosette leaf width, stem leaf length, stem leaf width, outer involucre bracts (OIB) length, OIB diameter, spinescence, growth habit, plant height, height up to first primary branch, primary branches, angle of first primary branch, capitula number, capitulum length, capitulum diameter, capitulum shape, shelling ratio, seed weight, seed yield, oil content, and harvest index.
- Documentation:** Computerized. The data were analyzed for variability parameters (min., max. mean, standard deviation), correlation and regression, frequency, etc.

INDIA

Project Coordinating Unit of Safflower
Mahatma Phule Krishi Vidyapeeth (MPKV)
91, Bhavani Peth, Agricultural School
Cormpound, Solapur-413002

- Curator/Person in charge:** S. P. Methre and D. M. Hedge
- Details of collection:** 7525 accessions of *Carthamus tinctorius* including 4630 indigenous accessions and 2895 exotic accessions from 44 countries.
- Maintenance of collection:** No information.
- Duplication of collection:** No information.

Availability: No information.

Quarantine: No information.

Evaluation: No information.

Documentation: No information.

MEXICO

Instituto Nacional de Investig.
Agrícolas, Station de Iguala
Iguala

Telephone : (52-595) 42400
42877

Fax: (52-595) 42964

Email: inifap@inifap.conacyt.mx

Curator/Person in charge: Dr. Juan Manuel Hernandez Casillas

Details of collection: 1504 accessions of *Carthamus tinctorius* from India (791), Pakistan (61), Kashmir (10), Afghanistan (25), Iran (109), Turkey (70), Greece (1), Iraq (10), Jordan (12), Syria (8), Lebanon (1), Kuwait (19), Israel (12), Jerusalem (7), Egypt (220), Sudan (30), Kenya (6), Algeria (1), Morocco (8), Ethiopia (23), Spain (22) and Portugal (58).

Maintenance of collection: Seeds are kept in aluminum foil packets at 0-5°C without moisture content control. Seed moisture content is about 8%. The storage space is 77.6 m³.

Duplication of collection: 30% of the collection has been duplicated at "Valle del Yagui" Agricultural Research Station. Contact: Dr. Norman Borlaug Km 12 Apdo. Postal 515, Cd. Obregon, Son. C. P. 85000. Phone: (52-641) 45680.

Availability: Restricted due to a low seed quantity in storage.

Quarantine: Phytosanitary certificate is required.

Evaluation: Evaluation was done on 85 accessions at "Valle del Yaqui"

Agricultural Research Station.

Documentation: Data are available on request in the form of copies of registration field book.

ROMANIA

Gene Bank of Suceava
Bulevardul 1 Decembrie 1918 No. 17
Suceava, 5800

Telephone : (40-30) 227087
Fax: (40-30) 227087
Email:genebank@assist.cccis.ro

Curator/Person in charge: Biologist Silvia Strajeru, Director, Suceava Genebank

Details of collection: 24 accessions of *Carthamus tinctorius*.

Maintenance of collection: Medium-term storage at 4°C, uncontrolled RH, 7-8% moisture content and storage space 72 m³ x 4 cells = 288 m³. Seeds are kept in glass jars.

Duplication of collection: 12 accessions (accession number: 4620, 4621, 4622, 4623, 4624, 4625, 4626, 4627, 4628, 4629, 4630, 4631) are duplicated at Faculty of Agriculture, Iasi in a field collection.

Availability: Restricted.

Quarantine: When the samples are moved for exchange, they must be accompanied by the "Phytosanitary Certificate" and by the "Declaration of the Exporter."

Evaluation: No information.

Documentation: Computerized in DBF format, in according to IPGRI descriptors.

RUSSIAN FEDERATION

N.I. Vavilov Institute of Plant Industry
Bolshaya Morskaya Street 42-44
St. Petersburg

Telephone : (314)2234/4848

Curator/Person in charge: Tatiana E. Vakhrusheva

Details of collection: 429 accessions of *Carthamus tinctorius* from 41 countries.

Maintenance of collection: Medium-term storage at 4°C and 7-8% moisture content. Seeds are kept in glass jars or bottles. Short-term storage at room temperature in paper bags and metal boxes. In future, the accessions will be stored in laminated aluminium bags under long-term conditions at -18°C and 6% moisture content.

Duplication of collection: All accessions are duplicated at Kuban Experimental Station of VIR (Krasnodar Region) and Uzbek Research Institute of Plant Industry Tashkent, Uzbekistan.

Availability: Available on request to breeders and for scientific or educational purposes.

Quarantine: International Quarantine Certificate is needed.

Evaluation: Characterization and evaluation are performed according to the national list of descriptors.

Documentation: Evaluation data are recorded manually. Passport data are computerized and are available on Internet (www.dainet.de/genres/vir). Preparation of a catalogue of the safflower collection is currently underway.

SLOVENIA

Biotechnical Faculty- Agronomy Dep
University of Ljubljana
Jamnikarjeva 101, PO Box 486
Ljubljana

Telephone : (061) 123-1161
Fax: (061) 123-1088
Email: Alenka.Zupan@uni.lj.si

Curator/Person in charge: Alenka Zupancic

Details of collection: 14 accessions of *Carthamus tinctorius* from Germany (1), Romania (12) and unknown origin (1).

Maintenance of collection: Short-term storage at 5°C and 8% moisture content. Seeds are kept in glass containers.

Duplication of collection: None.

Availability: Not currently available.

Quarantine: Official phytosanitary examination. No specific quarantine requirements.

Evaluation: Evaluation data are not available.

Documentation: Data stored with a system called MEDPLANT, not yet available.

SPAIN

Centro de Conservacion de Recursos
Fitogeneticos (INIA)
Apartado de Correos 1045
Alcala de Henares, Madrid

Telephone : (91)8896969/70
Fax: (91)8819287

Curator/Person in charge: Luis Ayerbe

Details of collection: 6 accessions of *Carthamus tinctorius*.

| | |
|-----------------------------------|--|
| Maintenance of collection: | Medium-term storage at -4°C, 55% RH and 5 - 7 % moisture content. Seeds are kept in glass jars (82 mm in diameter and 170 mm in height). |
| Duplication of collection: | No information. |
| Availability: | Not available. |
| Quarantine: | No information. |
| Evaluation: | No information. |
| Documentation: | No information. |

SWITZERLAND

Pro Specie Rara Sortenzentrale
Postfach 95

| | |
|-----------------------------------|--|
| Curator/Person in charge: | Bartha Bela |
| Details of collection: | 1 accession of <i>Carthamus tinctorius</i> . |
| Maintenance of collection: | No information. |
| Duplication of collection: | No. |
| Availability: | Fully available. |
| Quarantine: | No information. |
| Evaluation: | No information. |

Documentation: Passport data are available.

TURKEY

Aegean Agricultural Research
Institute (AARI)
P.O. Box 9
Menemen, Izmir

Telephone : (542)11552
Fax: (542)12792
Email: aari@service.raksnet.com.tr

Curator/Person in charge: Directorate, AARI

Details of collection: 27 accessions of *Carthamus tinctorius* collected from Turkey and maintained at AARI.

Maintenance of collection: Long-term storage at -20°C and medium-term storage at 0°C. Moisture content of seed at storage is about 6%. Initial moisture content of the accessions is tested before storage and the moisture-proof containers are used for storage.

Duplication of collection: There is no duplication of the collections, but duplication of all accessions in Ankara is planned, and facilities are available there.

Availability: Collections are available freely for research depending on the quantity requested and regeneration needs. For the exchange of material the regulation of plant genetic resources of Turkey are followed.

Quarantine: The International Quarantine Regulations apply. The District Quarantine Service is responsible for the procedure.

Evaluation: None of the safflower accessions is characterized or evaluated.

Documentation: Passport and storage information has been recorded and documented by AARI PGR Data Base Management System.

UNITED STATES OF AMERICA

USDA-ARS-NPA
National Seed Storage Laboratory
1111 South Mason Street
Fort Collins, CO 80521-4500

Telephone: (970)495-3200
Fax: (970)221-1427
E-mail: nsslw@ars-grin.gov

Curator/Person in charge: Dr. Loren E. Wiesner

Details of collection: 1964 accessions of *Carthamus* spp., including
4 accessions of *C. lanatus*
2 accessions of *C. oxyacanthus*
1 accessions of *C. palaestinus*
1954 accessions of *C. tinctorius*
3 accessions of *C. spp.*

Maintenance of collection: Long-term storage at -18°C and 4-7% moisture content. Seeds are kept in sealed aluminum foil containers.

Duplication of collection: The National Seed Storage Laboratory provides duplication of 1937 accessions for the Regional Plant Introduction Station, Pullman, WA.

Availability: Fully available through the Regional Plant Introduction Station, Pullman, WA 99163, USA.

Quarantine: No information.

Evaluation: See data for *Carthamus* on GRIN (See below).

Documentation: Data are available from the National Plant Germplasm System Germplasm Resources Information System Network (GRIN). <http://www.ars-grin.gov/npgs/aboutgrin.html>

UNITED STATES OF AMERICA

Western Regional Plant Introduction Station
USDA-ARS, Washington State Univ.
59 Johnson Hall
Pullman, WA 99164-6402

Telephone : (1-509) 3351502
Fax: (1-509) 3356654
Email: w6vb@ars-grin.gov

Curator/Person in charge: Vicki Bradley/ R.C. Johnson

Details of collection: 2288 accessions of *Carthamus tinctorius*
3 accessions of *Carthamus glaucus*
1 accession of *Carthamus glaucus* ssp. *Alexandrinus*
1 accession of *Carthamus glaucus* ssp. *Glandulosus*
7 accessions of *Carthamus lanatus*
4 accessions of *Carthamus lanatus* ssp. *Turkestanicus*
1 accession of *Carthamus nitidus*
90 accessions of *Carthamus oxyacantha*
3 accessions of *Carthamus palaestinus*
3 accessions of *Carthamus tenuis*
9 accessions of *Carthamus* sp.

Maintenance of collection: Medium-term storage at 4°C.

Duplication of collection: Most accessions are duplicated at the National Seed Storage Laboratory, Fort Collins, CO 80521-4500 USA.

Availability: Fully available.

Quarantine: No information.

Evaluation: Evaluation data are available on relative time of flowering, degree of branching, growth habit of the accession, head size, plant height, iodine no., seed oil content, amount of spines, flower color, flowering day, fatty acids and some other attributes.

Documentation: All data are available on request through the Germplasm Resources Information Network (GRIN) (www.ars-grin.gov/npgs/) or contact the curator at above address or email.



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