Data Article

International Winter Wheat nurseries data: Facultative and Winter Wheat Observation Nurseries and International Winter Wheat yield trials for semi-arid and irrigated conditions

Mesut Keser\textsuperscript{a,\ast}, Beyhan Akin\textsuperscript{b}, Fatih Ozdemir\textsuperscript{c}, Pietro Bartolini\textsuperscript{d}, Asma Jeitani\textsuperscript{e}

\textsuperscript{a}International Center for Agricultural Research in the Dry Areas (ICARDA), Ankara, Turkey
\textsuperscript{b}International Maize and Wheat Improvement Center (CIMMYT), Izmir, Turkey
\textsuperscript{c}Bahri Dagdas International Agricultural Research Institute (BDIARI), Konya, Turkey
\textsuperscript{d}International Center for Agricultural Research in the Dry Areas (ICARDA), Florence, Italy
\textsuperscript{e}International Center for Agricultural Research in the Dry Areas (ICARDA), Beirut, Lebanon

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\textbf{Abstract}\n
This data paper describes the content of 16 datasets collected under the International Winter Wheat Improvement Program (IWWIP), an alliance between Turkey-CIMMYT-ICARDA (TCI), during the 2015–2016, 2016–2017, 2017–2018 and 2018–2019 seasons. Data was collected from the Facultative and Winter Wheat Observation Nursery (FAWWON) and the International Winter Wheat Yield Trials (IWWYT) conducted under semi-arid and irrigated conditions across different countries. Data on all nurseries was collected during the growing season by IWWIP’s team and cooperators in their local environments. It was compiled at the end of the wheat season by IWWIP’s team. Multi-locational data can be used to select advanced lines that fit to collaborators’ growing environment. The selected germplasm can either be used as a parent in their breeding programs or be released as a variety in their country.

\textsuperscript{\ast} Corresponding author.
E-mail address: M.Keser@cgiar.org (M. Keser).

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| Specifications Table                                      |
|----------------------------------------------------------|
| **Subject**                                              |
| Agronomy and Crop Science                                |
| **Specific subject area**                                |
| Winter wheat improvement, germplasm exchange             |
| **Type of data**                                         |
| Tables                                                   |
| Biplots                                                  |
| **How data were acquired**                               |
| • Data for genotypes/advanced lines in multi-locations, yields, disease screening and traits were collected by IWWIP's team and local cooperators through field trials and laboratory screenings. |
| • The Molecular Markers study was outsourced to a private company. |
| • The yield and ranking biplots were made using Genstat software. |
| **Data format**                                          |
| Tables in CSV files                                      |
| Biplots in PNG and Pdf files                             |
| **Parameters for data collection**                        |
| Parameters for data collection are not always standardized among the cooperators, particularly field measurements and observation data, as each cooperator might use different evaluation scales or data collection methods. All relevant details are described thoroughly in the CSV file “DataDictionary_ElementDescription” of each dataset. |
| **Description of data collection**                        |
| The data was collected by IWWIP's team and cooperators at local level each with their personnel and labor organization. Data compilation was performed by IWWIP's team. |
| **Data source location**                                 |
| The data was collected by IWWIP's team and cooperators at local level. A detailed list of the cooperators involved in the experiment is provided in the CSV file “Cooperators” of each dataset. The file also includes the coordinates of each research station. The cooperators operate in the following countries: |
| • Afghanistan                                            |
| • Algeria                                                |
| • Armenia                                                |
| • Austria                                                |
| • Azerbaijan                                             |
| • Bulgaria                                               |
| • Canada                                                 |
| • Croatia                                                |
| • France                                                 |
| • Georgia                                                |
| • Germany                                                |
| • Hungary                                                |
| • Iran                                                   |
| • Italy                                                  |
| • Kazakhstan                                             |
| • Kenya                                                  |
| • Lebanon                                                |
| • Lithuania                                              |
| • Morocco                                                |
| • Pakistan                                               |
| • Romania                                                |
| • Russia                                                 |
| • Serbia                                                 |
| • South Africa                                           |
| • Spain                                                  |
| • Switzerland                                            |
| • Tajikistan                                             |
| • Turkmenistan                                           |
| • Turkey                                                 |
| • Ukraine                                                |
| • Uzbekistan                                             |

(continued on next page)
Data accessibility

All 16 datasets are available as open access files on MEL dataverse.

Season 2016
18th International Winter Wheat Trial - Semi Arid condition (18IWWYT-SA): https://hdl.handle.net/20.500.11766.1/FK2/QHKBSK
19th International Winter Wheat Yield Trial - Irrigation condition (19IWWYT-IRR): https://hdl.handle.net/20.500.11766.1/FK2/QWBP59
23rd Facultative Winter Wheat Observation Nurseries - Semi Arid condition (23FAWWON-SA): https://hdl.handle.net/20.500.11766.1/FK2/7027BL
23rd Facultative Winter Wheat Observation Nurseries - Irrigation condition (23FAWWON-IRR): https://hdl.handle.net/20.500.11766.1/FK2/SOQZIZ

Season 2017
19th International Winter Wheat Trial - Semi Arid condition (19IWWYT-SA): https://hdl.handle.net/20.500.11766.1/FK2/OEK62N
20th International Winter Wheat Yield Trial - Irrigation condition (20IWWY-IRR): https://hdl.handle.net/20.500.11766.1/FK2/R01X8
24th Facultative Winter Wheat Observation Nurseries - Semi Arid condition (24FAWWON-SA): https://hdl.handle.net/20.500.11766.1/FK2/IDX1ZA
24th Facultative Winter Wheat Observation Nurseries - Irrigation condition (24FAWWON-IRR): https://hdl.handle.net/20.500.11766.1/FK2/2S1RLL

Season 2018
20th International Winter Wheat Trial - Semi Arid condition (20IWWYT-SA): https://hdl.handle.net/20.500.11766.1/FK2/6513P
21st International Winter Wheat Yield Trial - Irrigation condition (21IWWYT-IRR): https://hdl.handle.net/20.500.11766.1/FK2/1TNRPD
25th Facultative Winter Wheat Observation Nurseries - Semi Arid condition (25FAWWON-SA): https://hdl.handle.net/20.500.11766.1/FK2/63QUK
25th Facultative Winter Wheat Observation Nurseries - Irrigation condition (25FAWWON-IRR): https://hdl.handle.net/20.500.11766.1/FK2/EB7YDS

Season 2019
21st International Winter Wheat Trial - Semi Arid condition (21IWWYT-SA): https://hdl.handle.net/20.500.11766.1/FK2/RPERGO
22nd International Winter Wheat Yield Trial - Irrigation condition (22IWWYT-IRR): https://hdl.handle.net/20.500.11766.1/FK2/10UCHP
26th Facultative Winter Wheat Observation Nurseries - Semi Arid condition (26FAWWON-SA): https://hdl.handle.net/20.500.11766.1/FK2/VCOACL
26th Facultative Winter Wheat Observation Nurseries - Irrigation condition (26FAWWON-IRR): https://hdl.handle.net/20.500.11766.1/FK2/L6SRZ

Value of the Data

- The experiments are conducted in multiple locations and in diverse growing environments providing information on the performance of the genotypes tested in those environments including disease resistance, quality attributes and molecular data in some years. The collected data is free for use by breeding programs and breeders for their evaluations and decisions on genotypes.
- The breeding and research programs, which are cooperators in IWWIP and obtain germplasm from IWWIP, benefit greatly through access to the data on germplasm that has been generated over diverse regions and environments.
- In general, the observation nurseries are targeted to identify adapted genotypes that can be potentially used as parents in the breeding programs of the corresponding NARS, while the yield trials are primarily distributed to identify widely adapted genotypes to be released in the corresponding countries and to be used in future crosses at IWWIP. Multi-locational data can be used to select advanced lines that fit to their growing environment. The selected germplasm can be used as a parent in breeding programs or be released as a variety in the corresponding country.
1. Data Description

This article describes 16 datasets collected under the International Winter Wheat Improvement Program (IWWIP), an alliance between Turkey-CIMMYT-ICARDA (TCI), during the 2015–2016, 2016–2017, 2017–2018 and 2018–2019 seasons.

Datasets FAWWON-SA and FAWWON-IRR contain the data collected from the Facultative and Winter Wheat Observation Nursery (FAWWON) trials implemented under semi-arid and under irrigated conditions, respectively.

Datasets IWWYT-SA and IWWYT-IRR contain the data collected from the International Winter Wheat Yield Trial (IWWYT) trials conducted under semi-arid and under irrigated conditions, respectively (Figs. 1 and 2).

The link provided with each dataset (referring to the specification table) redirects the user to a series of data files. These are presented either in CSV format (in the case of tables), or PNG and Pdf formats (in the case of biplots). A summary of the data files content is found in Table 1.

![Fig. 1. Grand means of International Winter Wheat Yield Trials under irrigated conditions in a year and highest and lowest location mean yield in the same year.](image1.png)
**Fig. 2.** Grand means of International Winter Wheat Yield Trials under semiarid conditions in a year and highest and lowest location mean yield in the same year.

**Table 1**
Summary of data files.

| Data File Name                  | Data File Format | File Variables                                      | File General Description                                                                 |
|---------------------------------|------------------|-----------------------------------------------------|------------------------------------------------------------------------------------------|
| Data Dictionary: Introduction   | CSV              | Description, Summary, Start Date, End Date, Authors, Co-authors. | Background explanatory data about the dataset.                                           |
| Data Dictionary: Element Description | CSV          | Element_DisplayName, Description, Unit, Data Type etc. | Explanation of each variable/column and any code used inside the dataset.               |
| Data Dictionary: Unique Identifier | CSV            | Element_DisplayName, Unique_Identifier, Source etc.  | Reference links to an online resource for elements, terms, and concepts used in the dataset. |
| Cooperators                     | CSV              | Country, Institution, Geographical coordinates etc.  | Data about the cooperators involved in the experiment.                                   |
| Cultivars                       | CSV              | Name of the nursery, Accession number etc.           | General data about the cultivars.                                                       |
| Selected                        | CSV              | Selection results associated to the cooperators code | Data about the selection results.                                                       |
| Heading Days                    | CSV              | Days to Heading, Days to maturity                    | Data about days to heading and days to maturity collected in each trial site.           |
| Plant Height                    | CSV              | Plant height                                         | Data about plant height measured in each trial site.                                    |
| Yield Diseases                  | CSV              | Yield, Yellow Rust, Leaf Rust, Stem Rust, Septoria, Powdery Mildew etc. | Yield data gathered from each trial site. Data on disease susceptibility.                 |
| Miscellaneous                   | CSV              | Test Weight, Thousand Kernel Weight, Winter Kill, Lodging etc. | Data on other miscellaneous traits collected only by a limited number of cooperators. |

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2. Experimental Design, Materials and Methods

Based on the yield trial performance, short stature high-yielding germplasm developed by IWWIP and contributed by the cooperators is included into FAWWON for irrigated environments. Whereas entries with resistance to moisture stress are included in FAWWON for semiarid environments. The germplasm in this nursery may have variable height and some tall lines may also be included.

In addition, each year interested breeding programs submit their new cultivars and advanced breeding lines to IWWIP for inclusion into international testing. Once in Turkey, the material goes through quarantine inspection before being planted for primary evaluation on small plots in locations highly conducive to the key diseases. Germplasm with disease resistance and general adaptation traits is multiplied and yield-tested during a second year.

The next step is selecting the elite germplasm proven to perform well in FAWWON to be included in IWWYT. The objective of this nursery is to identify broadly adapted high-yielding germplasm, which can be potentially used as cultivars and parent material [1].

In IWWYT, the genotypes in each trial were planted using alpha lattice design in two replications in a plot size of 5 m length, six rows with 0.2 m spacing between rows. FAWWONs are planted as 1 m two rows with checks every 20.
Data on all nurseries is collected during the growing season by IWWIP’s team and cooperators in their local environments. Cooperators use either hardcopy sheets or more recently electronic files. At the end of the wheat season, the data is assembled by IWWIP’s team in Ankara in a single spreadsheet and made available on IWWIP’s website. The datasets described in this article were curated by ICARDA’s Data Management Team, following the standards of the General Dataset Curation Guide (GDCG) [2] and subsequently published through DataverseMEL.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this paper.

CRediT Author Statement

Mesut Keser: Conceptualization, Methodology, Data curation, Writing – review & editing, Supervision; Beyhan Akin: Conceptualization, Methodology, Data curation, Writing – original draft; Fatih Ozdemir: Conceptualization, Methodology, Writing – original draft; Pietro Bartolini: Data curation, Writing – original draft; Asma Jeitani: Data curation, Writing – original draft.

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Alexey Ivanovich Morgunov (CYMMIT) was involved in the conceptualization, methodology and data collection processes, although not directly involved in writing the present paper.

References

[1] A.I. Morgounov, F. Ozdemir, M. Keser, B. Akin, T.S. Payne, H.J. Braun, International Winter Wheat improvement program: history, activities, impact and future, (2019). doi:10.15302/J-FASE-2019261.
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