
Optimizing quinoa production systems for Ontario - A physiology-based approach to improved agronomics

A Data Management Plan created using DMP Assistant

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Project abstract:

Quinoa is a pseudo-cereal crop known for its high protein content and other health-promoting nutritional properties. Canada imports about \$70 million worth of quinoa annually. Over the past six years, Katan Kitchens has invested significant resources in developing quinoa as a new crop for Ontario. While progress has been made, there are still important questions to be answered. Specifically: 1) There is a substantial yield gap between the best recent quinoa crops produced in Alberta under irrigation (approx. 3000 kg / ha) and typical Ontario yields (600 – 1100 kg / ha); 2) Quinoa appears to be susceptible to near-barrenness (low harvest index) under certain environmental conditions, producing a lot of total crop biomass but with little grain; and 3) Quinoa crops are often observed to suffer a period of apparent nutrient deficiency during early grain filling, exhibiting yellowing (chlorosis) of the leaf canopy. The proposed work will build our understanding of the physiological basis of yield determination in this new crop, to inform development of improved agronomic recommendations suitable for the Ontario growing environment. This represents one part of an established collaborative effort between agronomists, geneticists and breeders to develop quinoa as a viable alternative crop for Ontario.

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Data collection

Provide an overview of the data that will be generated, collected or acquired to support this project. If data will be acquired from a third party, specify the source.

Various agronomy and physiology field trials were conducted in 2018 through 2021. Data collected included crop canopy light interception, crop canopy NDVI (greenseeker), above ground biomass, seed number, seed weight, seed yield.

Edit: lygus bug nymph and adult counts were added to the project

A single controlled environment study was also performed (data collection on single plants rather than field plots). Shoot biomass, seed weight, seed number.

What method(s) of data collection will be employed?

NDVI - via handheld greenseeker

canopy interception - via handheld ceptometer

aboveground biomass - destructive harvests of shoots, dried then weighed

seed yield - combine harvest or hand harvest + threshing; followed by seed cleaning in both cases

counting seeds by hand to determine 1000-seed weight

sweep nets used to collect insects - counts of lygus bug nymphs and adults performed

What types of data will be included?

All numeric data

What software or digital formats will be used to collect, manage and analyze the data?

All data are entered or uploaded into Excel files for organizing and preparing for analysis.

SAS used for analysis (various procedures)

Provide an indication of the scope of the data?

Data from 100 to 200 field plots, depending on the year. Also, 48 plants in a controlled environment study.

Data storage

Estimate the size of data storage that will be required.

Less than 1 MB

Where will your data be stored during the collection, collation and analysis phases of the project?

In the first two years, data were stored on department server (backed up), as well as on lab computer hard drive and PIs computer. All are PW protected.

Later, all data also stored to MSTeams channel instead of server.

What backup strategy will be employed?

Backed up from lab computer to server or MSTeams weekly

How will your data files be organized? What file naming conventions will you use? A brief overview or example would be adequate.

Excel files are named by year and data type (e.g., 2020 Field Trials). Each experiment then has multiple tabs within the Excel workbook: one for plot plans, treatment descriptions and agronomy instructions; one for data and field notes; one for data organized for SAS, often with SAS results and graphs included.

What metadata will be developed for your data? Will there be supplemental documentation prepared to assist with the interpretation and analysis of your data?

Treatment descriptions and plot plans are adequate to interpret the data. Where response variables are calculated from other columns, the calculations remain in the data sheet to provide further guidance.

Data archiving and preservation

Will you deposit your data in the UG data repository or an external data repository? If you are opting to not archive your data in a repository, where will your data be housed after completion of your project?

The data will be archived in the Agri-Environmental Research Data Repository at the University of Guelph for long-term preservation.

Discuss any data transformations that will be needed so your data is preserved in appropriate, non-proprietary formats.

None required. I am reluctant to convert to .csv files because some information required to interpret the data such as plot plans would be lost.

If some of your data will not be preserved, how long will you retain it? Will the non-preserved data be destroyed?

All data are included in the archived files

Sharing and reuse

Will the data that you archive in a data repository be made available for sharing and reuse by other researchers?

Yes.

Explain which version of your data or subset of your data will be shared.

The single-plot or single-plant data. This is the basic dataset and permits all types of analysis.

When will your data be available for discovery by other researchers? Will you impose an embargo on publication of your data? If so, please provide details on the duration of the embargo.

The data from the experiment designated QN01 can not be shared until the manuscript is published.

Will you limit who can access your data? If so, who will that be and why are you limiting the data's reuse?

Anyone can access.

Are there specific license terms you will assign to users of your data?

Only that they acknowledge the source (PI) in any publication making use of the data.

Restrictions/limitations

Are there limitations or constraints on how you manage your data resulting from legal, ethical or intellectual property concerns?

None

Would your data need to be anonymized or de-identified before being shared with others?

No.

Confidential information

What information do you want to include in your DMP that should not be publicly shared?

N/A