

AGRICULTURAL RESEARCH FOUNDATION

FINAL REPORT

FUNDING CYCLE 2018-2020

TITLE: Quinoa Varieties and Planting Dates for the Willamette Valley

RESEARCH LEADER: Kristine Buckland

COOPERATORS: N/A

EXECUTIVE SUMMARY:

An increasing number of growers are producing quinoa in Oregon's Willamette Valley, but little research has been done on the crop in this region. We proposed evaluating ten different quinoa varieties for yield and general viability over four planting dates in the Willamette Valley. In both years, the earliest planting date had the highest yield, but also required more hand weeding to keep the plots clean enough for harvest. Most of the seed produced in this trial (95.79%) was not viable due to a persistent lygus bug problem in the field. The trial for 2019 will be conducted in a different field and monitored closely for lygus.

OBJECTIVES:

The objective of this project is to determine the best quinoa varieties and planting dates for the Willamette Valley, Oregon.

PROCEDURES:

The 2018 quinoa trial was conducted in a 0.5 acre field at OSU's North Willamette Research and Extension Center in Aurora, OR. The plots included 10 quinoa varieties (Table 1) in 2018 and 14 varieties in 2019, planted on four different dates (Table 2). The seed was sourced from Wild Garden Seed (Philomath, OR), Adaptive Seed (Sweet Home, OR), Washington State University, or Oregon State University. Some of the varieties are not currently commercially available.

Table 1. Quinoa varieties 2018 and 2019.

2018 Varieties	Source	2019 Varieties	Source
Oro de Valle	OSU	Oro de Valle	OSU
Cherry Vanilla	Wild Garden Seed	Cherry Vanilla	Wild Garden
Ivory	Wild Garden Seed	Ivory	Wild Garden
Mint Vanilla	Wild Garden Seed	Mint Vanilla	Wild Garden
Red Head	Wild Garden Seed	Red Head	Wild Garden

Bio Bio	Wild Garden Seed	Bio Bio	Wild Garden
		Kaslala Multicolor	Wild Garden
Kaslaea	WSU	Kaslaea	WSU
Titicaca	WSU	Cocoa Cherry	WSU
Puno	WSU	Peppermint	WSU
QQ74	WSU	Buffy	WSU
		Chadmo	Adaptive Seeds
		Dave 407	Adaptive Seeds
		Linares	Adaptive Seeds



Picture 1. Establishing quinoa trials. Earlier planting dates to the right (green portion of the field) and later ones to the left (freshly planted ground).



Picture 2. Aerial view of quinoa variety and planting date trial. The quinoa on the right is more mature and beginning to senesce while the quinoa on the left is still in the early flowering stages

The planting dates were spaced one month apart, beginning in mid-March each year. The second, third, and fourth planting dates were in the mid-April, mid-May, and mid-June, respectively. Plants were periodically throughout both summers to assess seed flowering and head development (Table 3). Plots were maintained by hand weeding and irrigated as needed until harvest. Harvests were conducted separately on each planting date and spaced one month apart, beginning in late-July 2018 and mid-August 2019. Quinoa was cut at ground level for samples taken from each plot. Samples were dried in a greenhouse (weather dependent) or drying oven and weighed. Seed heads were stripped off of quinoa stalks and run through a small plot combine (Wintersteiger nurserymaster elite 2000) to separate seeds from chaff.

Table 3. Planting dates and crop phenological development.

Planting Date 2018	Flowering Period 2018	Planting Date 2019	Flowering Period 2019
Mar 31	Late June	Mar 22	Mid-late June
Apr 24	Mid-July	Apr 18	Early July
May 18	Late July	May 16	Late July

June 14

August

June 4

Late July-Early August

SIGNIFICANT ACCOMPLISHMENTS TO DATE:

In 2018, the first planting date required significantly more weeding (estimated at 166 hours per acre compared with 41 hours per acre in May and June planting dates) than the other planting dates. Weed pressure decreased greatly with each later planting date, likely due to increasingly dry conditions as the season progressed. Similar results were noted in year 2019, however primary weeding was accomplished with tractor mounted cultivation equipment and therefore time to cultivate was not recorded.

In 2018, Red Head, Ivory, and Kaslaea varieties had the highest yields, and planting date one had the highest yield of the four dates. A high amount of lygus bug pressure decreased yield in all plots. An estimated average of 4.21% of the seed produced on the quinoa panicles was alive as measured after seed set. In 2019, seed set was much improved with the trail of insecticidal controls and grain was harvested from each planting date successfully. Seed cleaning was managed by hand as equipment was unavailable. Presently, seeds are still being cleaned for final yield analysis across all planting dates. Figure 1 shows yield as a function of planting date and variety for two of the most well developed varieties. Similar to 2018, early planting dates had greatest yields. Later plantings were cut and removed from the field before full seed development due to impending rains and thus resulted in lower yields.

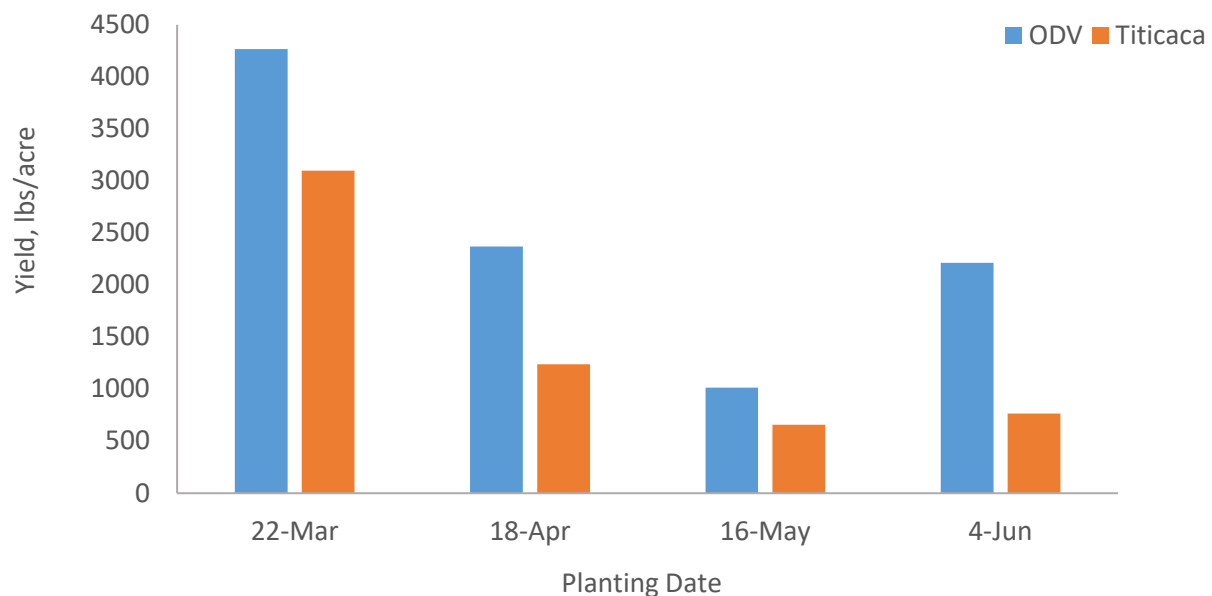


Figure 1. Yield results for Oro de Valle and Titicaca in 2019 over four planting dates.

Because of the significant yield reductions in 2018, we planned a small lygus trap cropping study in 2019 to evaluate the effects of perimeter planting with potential trap crops on lygus observed on quinoa plants (Picture 3). In this smaller study, we planted small areas of quinoa surround by one of four border rows: lacey phacelia, sorghum-sudan grass (Picture 3), and buckwheat. Over 3 sample dates, we evaluated the incidence of lygus both within the trap crop and on quinoa. Results showed a strong preference of lygus to pacelia in the middle of the season, with quinoa and buckwheat also hosting adults (Figure 2). The results of counting immatures show quinoa and lacey phacelia plants had highest counts over any other species (Figure 3). Further exploration of this interaction is needed to refine systems for use at field scale.



Picture 3. Quinoa grown with perimeter trap crops to evaluate potential for reduction in lygus populations.

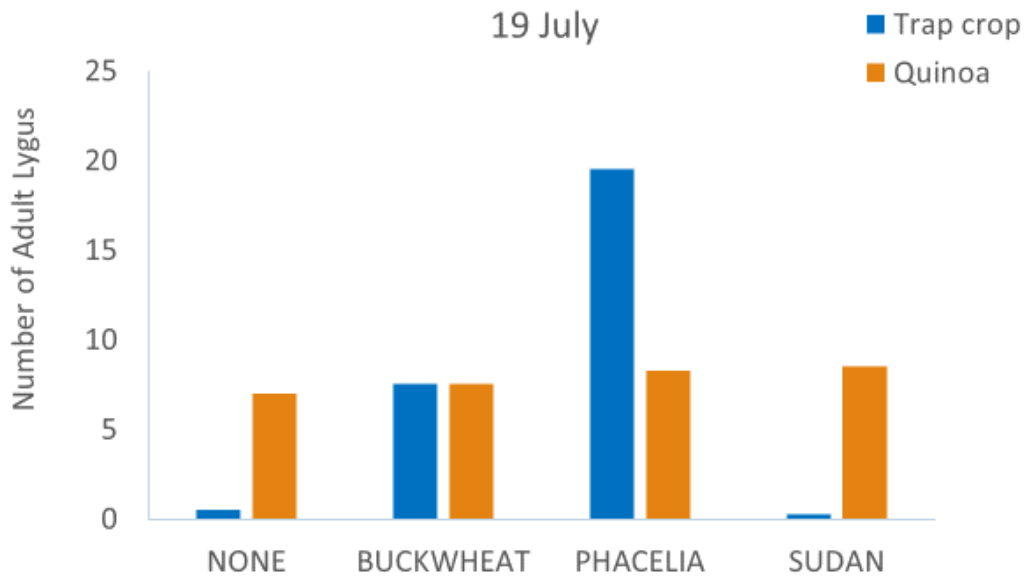


Figure 2. The number of adult lygus per sample area.

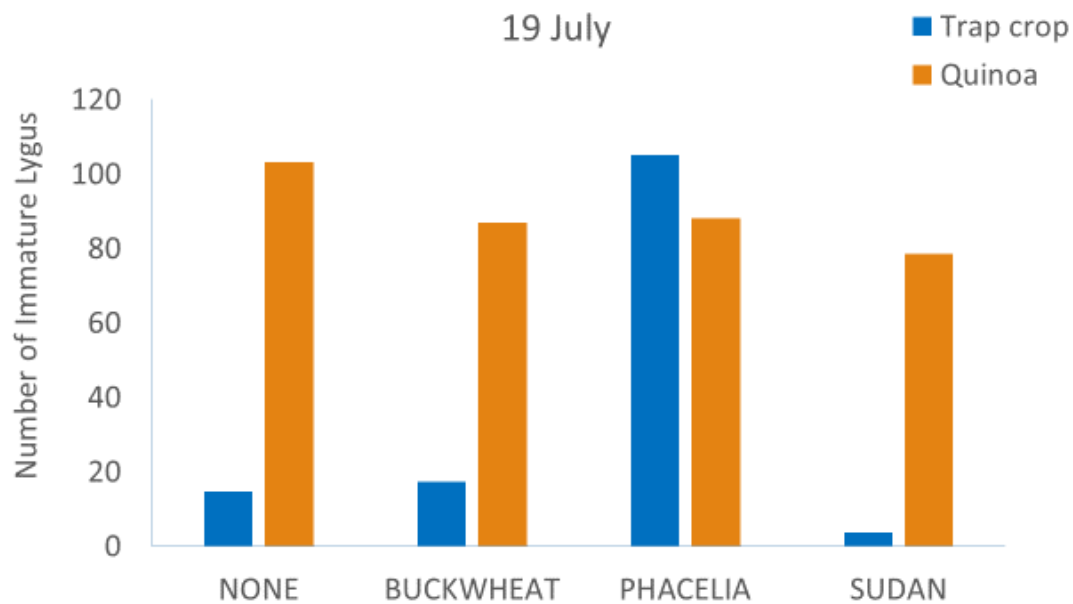


Figure 3. The number of immature lygus per sample area.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM:

No additional funding received for this project during the term.

FUTURE FUNDING POSSIBILITIES:

We have submitted an additional project request that will involve quinoa production as well as a project researching market potential for locally produced quinoa. Recent connections within the region while presenting results of this project are promising on multiple opportunities for further research on this crop and pest control methods tested here as well. We are targeting a submission to Western SARE in 2020.