crop near Davenport, WA on July 10th of 2020. This was planted into fallow using a Fabro double disc drill achieved excellent stand counts. Fall stand counts did not show a significant difference in canola establishment between the two treatments (Fig. 1). The canola oat crop did have a higher average stand count of canola at 4.74 plants/ft^2 than monocropped canola at 3.83 plants/ft^2 and showed less variability in stand establishment. There was also no significant difference in winter survival percentage between treatments in both our overall stand counts and individual plants (Figs. 2 & 3). Mono-cropped canola had an average winter survival of 26.5 percent while the companion cropped system had an average just over 24 percent. This disappointing survival rate may be contributed to drought stress caused by excessive overall plant populations that depleted the soil water supply during early fall. The fact there appears to be no significant advantage to mono-cropped canola and that oats may increase stand establishment of winter canola is encouraging for the prospects of companion cropping in eastern Washington. This especially holds true for growers interested in integrating livestock to their cropping systems. We intend to pursue future research into the seeding rates of both canola and oats in a companion crop system as well as the impact of grazing livestock in the system as well.

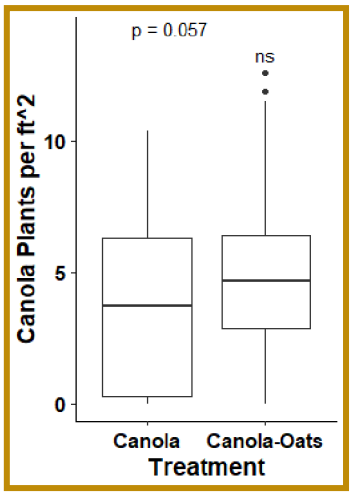

Figure 1.

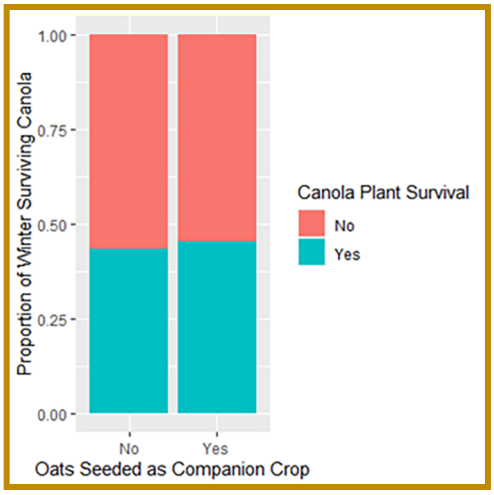

Figure 2.

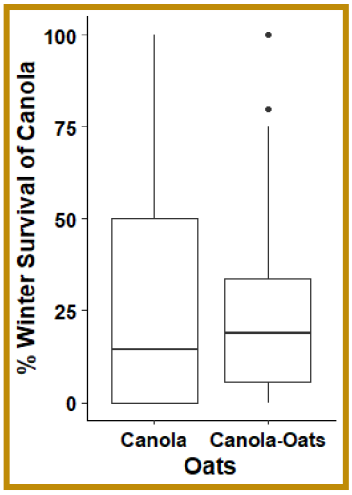

Figure 3.

Peaola Intercropping as a Pest and Beneficial Insect Management Tactic

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Monoculture production systems dominate modern industrial agriculture. However, intercropping cash crops may increase productivity while reducing fertilizer input through the inclusion of legumes. One intercrop of interest in the inland Pacific Northwest is peaola (pea-canola). Peas and canola have complimentary above and below ground architectures and have been successfully intercropped at the field scale in Canada. Most intercropping research has focused on seeding rates and fertility. Intercropping strategies have additional benefits as pathways to manage pest insects, pathogens, and beneficial species. By providing pollinator resources and two very different host plant species, peaola intercropping may support more beneficial species while also reducing the risks of pest outbreaks. In 2020 we completed field surveys from a replicated large scale peaola trial near Colfax, WA where we measured the abundance of pests and beneficials among pea, canola, and intercropped peaola. To complete these surveys, in June 2020 we used

sweep nets to collect all insects and identified them to functional group (pollinator, parasite, predator, herbivore).

At our field trial site, pest herbivores (mostly pea aphids) were significantly higher in Pea only plots ($P < 0.001$, GLMM, Fig. 1). Beneficial insects, including pollinators, parasitoid wasps, and ladybugs, were significantly higher in Peaola trails compared to either peas or canola ($P = 0.0107$, GLMM, Fig 2). Consequently, even though Peaola contained peas and was located at the same site, the intercropping strategy greatly reduced the threat of pea aphids. This was likely driven by the presence of more beneficial insects in peoala, including two primary biocontrol agents for aphids (wasps and ladybugs). In terms of LER (Land Equivalence Ratio) Peaola trials did not have significantly higher yield than monoculture peas or canola ($P = 0.849$, GLMM, Fig 3) Given that Peaola may require fewer pest management inputs (Fig. 1, Fig. 2), this intercropping strategy may be profitable in years or locations where pest outbreaks occur. Further research may be able to demonstrate if canola yield is proportionally higher due to higher pollinator abundance, and if reduced reliance on pesticides for control of dry pea pests (aphids) may be an economic and ecological benefit of Peaola.

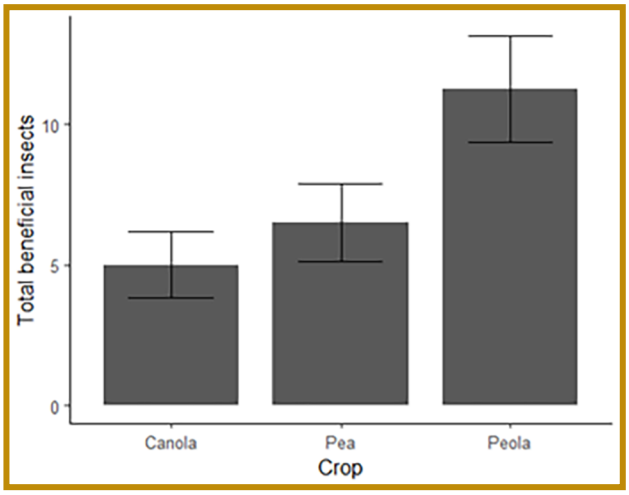

Figure 1. Average counts of beneficial insects (and estimated standard errors) based on 2020 field survey. Bars with error bars that do not overlap are significantly different. Output estimates from negative binomial generalized linear mixed model.

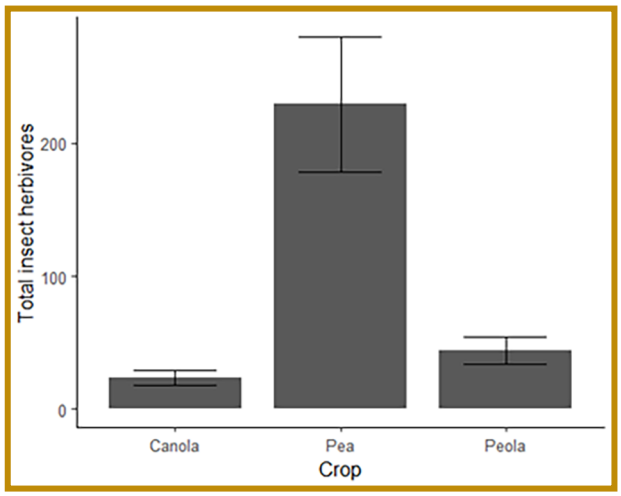

Figure 2. Average counts of insect herbivores (and estimated standard errors) based on 2020 field survey. Bars with error bars that do not overlap are significantly different. Output estimates from negative binomial generalized linear mixed model.

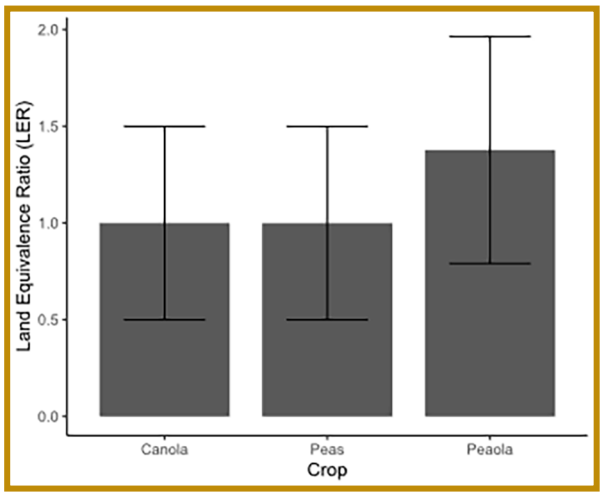

Figure 3. Land Equivalence Ratios (LER) for both canola seed and dry pea seed (and estimated standard errors) based on 2020 field trial. Bars with error bars that do not overlap are significantly different. Output estimates from negative binomial generalized linear mixed model.

Canola Rotation Effects on Soil Microbiology and Subsequent Wheat Yield

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We are investigating the effects of canola, winter triticale, and winter wheat on soil fungal and bacterial communities and the grain yield of subsequent spring wheat. The study was initiated in 2016 on the Ron Jirava farm west of Ritzville. These