Intercropping: Wheat-Lupin

Project duration: May 2020 – September 2020
Objectives: To evaluate intercropping potential for Wheat and Lupin
Collaborators: PCDF

Background
Lupin is a leguminous crop that produces high protein seeds similar in shape and size to peas. As a nitrogen-fixing crop, lupin makes a promising crop for a cereals intercrop. As with a pea-cereal intercrop, the large seed size for lupin makes separating with cereals crops feasible, although cracks and chips can be a difficulty. For an overview of lupin cultivation, see this Government of Western Australia e-guide.

Figure 1: Lupin, clockwise from top-left: (a) maturing pod; (b) plant with pods; (c) lupin intercrop with wheat (red dashed line shows the height difference between lupin and wheat; (d) dry lupin seeds.

Results

The wheat yield (bu/ac) for treatments is show in Figure 2. The lupin yield (lb/ac) is shown in Figure 3.

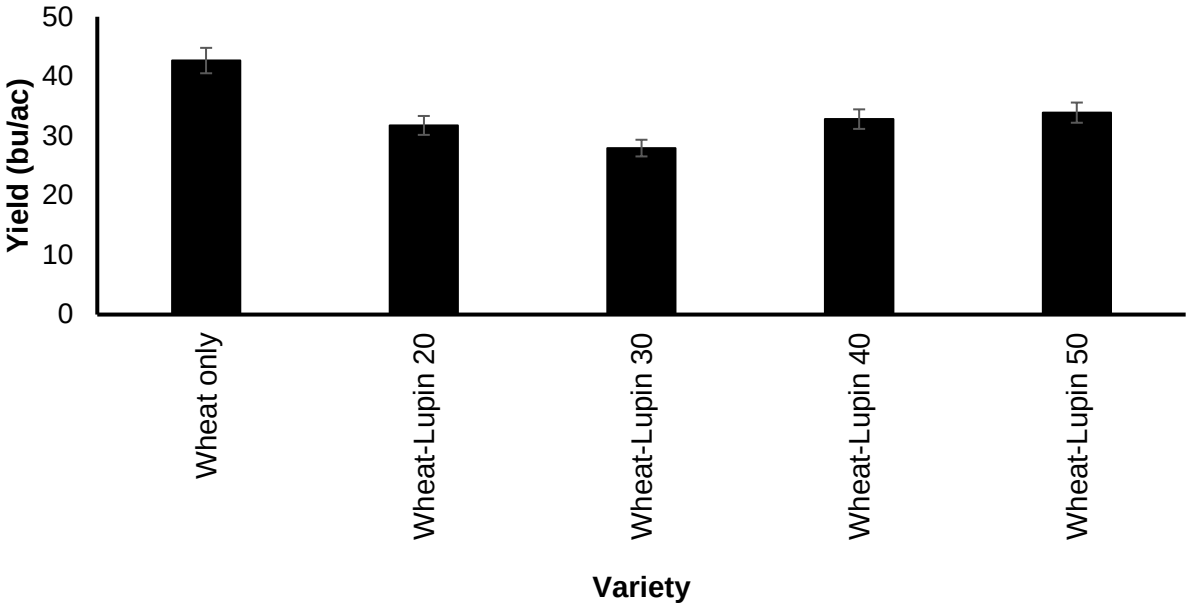

Figure 2: Wheat yield (bu/ac) by treatment.

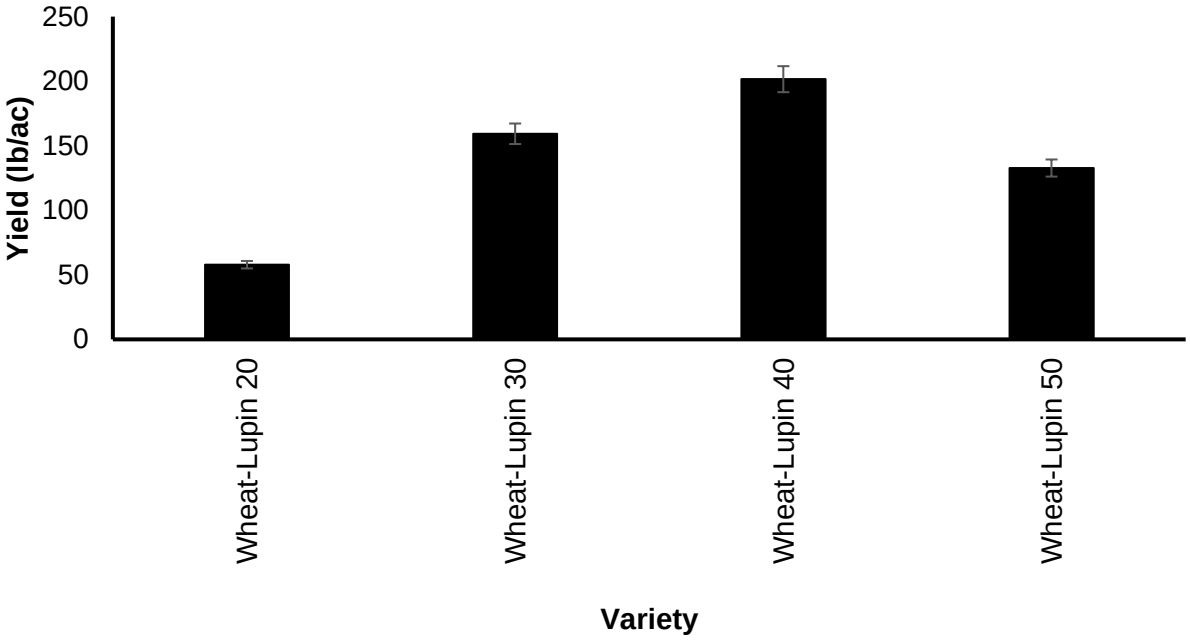

Figure 3: Lupin yield (lb/ac) by treatment.

The reliability of the results is low, due to the high percent CV for both wheat and lupin (Table 1). The overall yield is poor, relative to the five-year average for the Roblin area from 2014-2019 (59.6 bu/ac). This was seen even in the check (42.6 bu/ac), suggesting a fertility error. Lower yields for lupin intercrops is likely due to the lack of inoculant placed with the lupin. No lupin-specific inoculant was available, and PCDF hopes to secure some lupin-specific inoculant for 2021.

Table 1: Summary of statistical information for wheat and lupin yield

Entry	Wheat yield (bu/ac)	Lupin yield (lb/ac)	Statistical significance: Wheat	Statistical significance: Lupin*	
Wheat only	42.6	-	No statistical differences	-	B
Wheat-Lupin 20	31.8	57.8		A	B
Wheat-Lupin 30	28.0	159.2		A	B
Wheat-Lupin 40	32.8	201.5		A	-
Wheat-Lupin 50	33.9	132.7		A	B
CV (%)	25.2	53.2			
LSD (0.05)	14.8	1.8			

* Treatments not marked with the same letter are statistically different from other treatments.

Herbicides for lupin are limited, and no herbicides are registered for both lupin and wheat, making intercropping more challenging. Good weed control prior to seeding is crucial. The trial was hand-weeded.

Materials and methods

Experimental Design: Random Complete Block Design
Wheat variety: AC Goodeve VB
Entries: 5
Seeding: May 22
Harvest: Sep 11
Treatments: 5

Table 2: Treatments

	Wheat	Lupin
Treatment 1	90 lb/ac	-
Treatment 2	90 lb/ac	20 lb/ac
Treatment 3	90 lb/ac	30 lb/ac
Treatment 4	90 lb/ac	40 lb/ac
Treatment 5	90 lb/ac	50 lb/ac

Data collected Date Collected
Emergence: Wheat: May 25-26, Lupin: May 24-25
Wheat Heading: Jul 7-9
Lupin Flowering: Jul 6-9
Stand rating: Jul
Vigor Rating: Jul
Yield: Oct 30
Moisture: Oct 30

Agronomic info
Previous year's crop: Barley Silage
Soil Type: Erickson Loam Clay

Landscape: Rolling with trees to the east
Seedbed preparation: Heavy harrowed

Table 3: Fertility Information

	Available	Added	Type
N	61 lb/ac	128 lb/ac	46-0-0
P	47 ppm	10 lb/ac	11-52-0-0
K	393ppm		
Inoculant added; no herbicide applied (hand weeded)			