ON-FARM EVALUATION OF PEAOLA INTERCROPPING

A MPSG ON-FARM NETWORK PROJECT

Brent VanKoughnet of Agri Skills Inc. was contracted to complete a field scale evaluation of intercropping canola and field peas (often referred to as peaola) using three different nitrogen fertility regimes.

The trial was located south and east of Carman, Manitoba. Certified Agassiz peas and Clearfield 5525 canola were planted May 5 with a Concord air drill on 10-inch spacing. Soil moisture conditions were ideal. Soil and air temperatures were warm at the time of seeding but turned cool in the days following. Each treatment was 800 to 1200 feet long by 40 feet wide and replicated six times.

A base fertility application of 35 lbs P_2O_5, 10 lbs K_2O and 15 lbs S per acre was banded perpendicular to the treatments prior to seeding. The base fertilizer application also provided 20 lbs of N per acre. Canola and pea seed were each metered through different tanks on the air drill but delivered through the same seed boot, at the same depth (approximately 1–1.5 inches) in a single pass seeding operation. Additional N (28-0-0) was dribble banded on the soil surface a day after seeding, just before a significant rainfall, at various rates for peaola and canola treatments (Table 1).

Table 1. Pea –canola intercrop treatment combinations

Treatment	Pea seeding rate (lbs/ac)	Canola seeding rate* (lbs/ac)	Total nitrogen fertilizer (lbs N/ac)
Peas	180	None	20
Peaola 20	110	4	20
Peaola 50	110	4	20+30 = 50
Peaola 80	110	4	20+60 = 80
Canola	None	6	20+90 = 110

*Canola seeding rates were approximately 1 lb above intended target rates.

Crop emergence was slow due to the cool conditions. A frost on May 30 thinned the canola stand when canola was at cotyledon to two-leaf stage. Fortunately the higher than unintended seeding rate (extra 1 lb of seed) helped compensate for the early weather challenges. Plant densities were within acceptable ranges for both pea and canola (Table 2).

Table 2. Plant stand of pea –canola intercrop treatments (June 5)

Treatment	Canola plants/m²	Peas plants/m²
Peas	None	75
Peaola 20/50/80	27–28	40–42
Canola	52	None

As growing conditions improved in June, both peas and canola progressed well through mid-season stages. Odyssey herbicide was applied on June 10 with peas at the six node stage and canola at the five leaf to pre-bolting stage. There was some limited stunting of the peas from the herbicide application.

All treatments were sprayed with a combination of Lance and Priaxor on June 28. Peas were at an early flowering stage and canola was at 20–40% bloom. The staging for fungicide application was almost ideal for both crops. The canopy was getting very thick and the potential for disease was considered high.

Peaola in full flower

Shortly after fungicide application there was clear evidence of peas climbing canola branches. The weight of peas and canola did compress the canopy at harvest to within a foot of the ground but did not ever go flat to the ground (Table 3).

The field was sprayed with pre-harvest glyphosate on August 8 to facilitate direct harvesting. The crop was mature enough for harvest on August 22 but wet field conditions delayed harvest until August 27. It is expected that the canola alone treatment was adversely affected by wind in the period between August 22 and 27 with losses estimated to be up to five bushels. The canola within the peaola was not vulnerable because of how tightly knitted it was with the peas.

Table 3. Crop and pod height of pea and canola prior to harvest

Treatment	Canopy height July 14	Canopy height August 22	% of pods above 6 inches
Peas	37 –38 inches	10 inches	0
Peaola 20	Peas at 38 to 42 inches Canola at 50 to 52 inches	16 inches	
Peaola 50		12–18 inches (variable)	100
Peaola 80		12–18 inches (variable)	100
Canola	52–54 inches	36 inches	100

A 35-foot strip was direct harvested with a MacDon FlexDraper header down the centre of each treatment. Combine settings were set at the same wind, concave and rotor speed as for canola alone. To calculate the individual yield contribution of peas and canola from the peaola, the entire production from all six replicates of each treatment combined, screened and weighed.

CONCLUSIONS

Production and Operational Considerations

Seeding presented a couple of unique challenges. Depending on seeder configuration, it is difficult to safely place enough P, K and S fertilizer during the seeding operation without risking seedling injury. Without mid-row banding there is likely a need for a separate fertilizer application, especially if applying N. Determining the ideal seed depth can also be challenging. There was some trade-off planting the

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Table 4. Mean seed yield of pea-canola intercrop treatments

	Canola yield (bu/ac)	Pea yield (bu/ac)	Peas % weight	Land Equivalency Ratio*
Peas	0.0	74.7	100%	1.00
Peaola 20	22.9	34.0	64%	1.04
Peaola 50	27.6	28.6	55%	1.09
Peaola 80	30.0	24.7	50%	1.10
Canola	38.9	0.0	0%	1.00

*The land equivalency ratio compares the yield of multiple crops grown in combination to the same crops grown in monoculture. A value greater than 1 indicates that more land would be required to produce the same yield using monoculture compared to intercropping.

Table 5. Economic return of pea-canola intercrop treatments

Gross Revenue	Canola @ $10 per bu	Peas @ $8 per bu	Gross Total	Gross less N costs Based on N @ $0.40/lb
Peas	$0	$598	$598	598
Peaola 20	$229	$272	$501	501
Peaola 50	$276	$229	$505	493
Peaola 80	$300	$197	$498	474
Canola*	$389	$0	$389	353

*Losses due to excessive shattering, estimated at 5 bushels was not accounted for in this analysis.

canola a little deeper than normal and planting the peas a little shallower. This challenge would be magnified if soil conditions were dry.

By mid-season right through to harvest, the peas climbed the canola plants and knitted together as one very dense canopy. At harvest the peaola canopy did crunch down to 12–18 inches but still kept pods well above the ground for a relatively simple direct harvest. The peaola harvest was far simpler than for the peas alone, which were flat to the ground.

Separating the peas from the canola was slow but manageable with a simple rotating corn screen with medium mesh screens. With the right set up you could almost keep up with the combine.

AGRONOMIC OBSERVATIONS

With the right combination of pea and canola varieties, fungicide and harvest timing can align pretty closely. The slight stunting of peas from the relatively late application of Odyssey likely helped synchronize the timing for the fungicide application. Canola had some catching up to do after the cool weather in the early spring.

Ordinarily one would not consider adding Lance to Priaxor on a pea field or adding Priaxor to Lance on a canola field. While it was an expensive combination, peaola created a high disease pressure environment where it was likely that the combination for the full spectrum of disease control was beneficial. There was very little evidence of disease at harvest in spite of the dense canopy and conducive environmental conditions.

As expected, increasing levels of N shifted the proportional yield response of peas and canola within the mix: increased N encouraged more canola yield response. It was somewhat unexpected that the low N peaola combination would be comparable to the other treatments. Further work is required to confirm if this is repeatable.

The most unexpected result was the exceptional yield of peas on their own. It is unknown whether that is a one-time result or the new normal for pea yields with new available varieties and management practices.

ECONOMIC CONSIDERATIONS

Table 5, above, provides a basic calculation of the gross revenue and gross revenue less nitrogen costs.

Clearly the revenue from 75 bu/ac of peas with no nitrogen costs is considerably higher than for peaola or canola. Even if potential canola losses due to shattering from direct harvest are factored back in, the additional $50 revenue is not enough for canola alone to be competitive with the returns of peaola or peas on their own for this trial.

Peaola results do demonstrate a promising comparable return. Perhaps what is most interesting is that the low rate of N on peaola provided a similar gross return and a better net return when compared to the peaola with higher N rates. This is an advantage in both economic return and economic risk management. Unfortunately peaola is not covered through crop insurance but can be covered by certain hail insurance providers.

This project will be repeated in 2016. ■

HARVEST

Peas on left, Peaola on right →

← Canola on left, Peaola on right