



# Intercropping corn with field peas or soybeans for use as silage



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## ABSTRACT:

The objective of this study was to evaluate forage production and compare nutrient content of intercropped corn/legume silages. Forage production was determined by harvesting 3 m by 7.7 m plots (n = 4). Corn was seeded at 79,000 seeds/ha and intercropped with 408,000, 538,000, or 815,000 seeds/ha of field peas; or corn intercropped with 272,000, 359,000, or 544,000 seeds/ha of soybean. All forages were harvested on a common date. Subsamples of forage were utilized in a laboratory scale ensiling study. Forage samples were stored in vacuum bags for 28 d prior to determination of pH, DM, and nutrient analysis. Intercropping field peas with corn decreased forage production compared to corn alone ( $P = 0.007$ ). The lower field pea seeding rate resulted in greater forage production ( $P = 0.002$ ) than either of the higher seeding rates which did not differ ( $P = 0.65$ ). Intercropping soybean with corn increased ( $P < 0.001$ ) forage production over corn alone. Intercropping corn with field peas increased silage CP ( $5.8$  vs.  $4.5 \pm 0.13$ ;  $P < 0.001$ ) compared to corn alone. Including field peas at the lower and higher rate increased ( $P < 0.001$ ) silage CP compared to the mid-rate and corn alone. Inclusion of soybeans increased silage CP over corn alone ( $5.9$  vs  $4.5 \pm 0.16$ ;  $P < 0.001$ ). The middle seeding rate of forage soybean resulted in the greatest silage CP ( $P < 0.001$ ). All rates of field pea inclusion resulted in decreased ( $P = 0.03$ ) silage pH ( $3.8$  vs  $3.9 \pm 0.04$ ) compared to corn alone. Intercropping soybeans resulted did not affect ( $P = 0.81$ ) silage pH ( $3.9 \pm 0.04$ ) compared to corn alone. Lodging contributed to the decreased yield of intercropped corn and field peas. Further research is needed prior broader recommendation related to intercropping corn and legumes for silage.

## INTRODUCTION:

Corn silage is a popular feed source for livestock that is high in energy, however it lacks crude protein. Intercropping can be used to maximize crude protein along with lower inputs, lower cost of production and better silage quality (Geren et al. 2008). Previous research has demonstrated potential for intercropping corn with either field peas or grain soybeans may improve forage production as well as silage crude protein content over corn alone (Ostlie and Neville, 2019). The objective of this project was to evaluate forage production, nutrient content, and silage pH following simulated ensiling of corn alone versus corn intercropped with field peas or soybeans at three seeding rates.

## AKNOWLEDGEMENTS:

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## PROCEDURES:

- Forage plots 3.3 m by 7.7 m were established (n = 4/ treatment)
- Treatments:
  - All plots contained corn seeded at 79,000 seeds/ha
  - Field peas were inter-seeded at one of three rates
    - 408,000; 538,000; 815,000 seeds/ha
  - Soybeans were inter-seeded at one of three rates
    - 272,000; 359,000; 544,000 seeds/ha
- All plots were harvested on a common date in September of 2019 using a plot scale silage chopper.
- Lab scale ensiling study was initiated on the day of harvest
- Forage samples of respective treatments were stored in vacuum bags for 28 days.
- Vacuum seal bags were opened with pH, dry matter, and nutrient content determined.
- Data were analyzed with contrasts including:
  - Corn alone vs field pea inclusion (average of all seeding rates)
  - Corn alone vs soybean inclusion (average of all seeding rates)
  - Increasing rate of field pea
  - Increasing rate of soybean



## RESULTS:

### Forage Production:

- Intercropping field peas with corn decreased forage production ( $P = 0.007$ ) compared to corn alone
  - Lower seeding rates resulted in greater forage production ( $P = 0.002$ ) than either of the higher field pea seeding rates
- Regardless of seeding rate intercropping soybeans with corn increased forage production ( $P < 0.001$ ) over corn alone

### Silage Nutrient Content:

- Intercropping corn with field peas resulted in an increase ( $5.8$  vs.  $4.5 \pm 0.13$ ;  $P < 0.001$ ) in silage crude protein compared to corn alone
- Inclusion of soybeans led to an increase ( $5.9$  vs  $4.5 \pm 0.16$ ;  $P < 0.001$ ) in silage crude protein over corn alone
- The middle seeding rate of soybeans resulted in the greatest crude protein content ( $P < 0.001$ )

### Silage pH:

- Field pea inclusion decreased silage pH compared to corn alone ( $P = 0.03$ ;  $3.8$  vs  $3.9 \pm 0.04$ , respectively)
- Intercropping soybeans into corn did not impact ( $P = 0.81$ ) final silage pH

## DISCUSSION:

Lodging was a major contributing factor to the decreased yield of intercropped corn and field peas. Visual estimates approximated 25% of forage pea biomass was unharvested. It is possible that this loss of forage may have offset the decreased forage production observed in the field peas treatments.

## CONCLUSION:

The results of this study appear to indicate that improvements in silage yield and nutrient content are highly variable depending on forage legume source. Lodging was a major contributing factor to the decreased yield of intercropped corn and field peas. Further research evaluating seeding rates, irrigation practices, and other agronomic management decisions are needed prior to broad recommendation of intercropping corn with field peas or soybeans.

## LITERATURE CITED:

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