BACKGROUND

- 730,000 acres canola harvested in ND, 2009 (90% US production)
- Canola as a feedstock for biodiesel
  - high monounsaturated (oleic)
  - low saturated fat
  - Cloud point – Temperature wax crystals appear in solution
  - Biodiesel quality may deteriorate rapidly in storage
  - Improved storage with ↑ oxidative stability index
- Concerns: does growing location and/or canola variety impact biodiesel cold flow properties or oxidative stability?

OBJECTIVES

- Characterize variability in canola biodiesel cloud point and oxidative stability among several ND locations and years.
- Two experiments were conducted:
  - Exp. 1 - bulked canola varieties sampled across 2003-2009 were processed and evaluated.
  - Exp. 2 - One canola variety, Interstate Hyola 357, was evaluated at two locations over four production years.

MATERIALS

- North Dakota canola harvest locations.
  - Experiment 1
  - Canola varieties were collected from three locations in each of 2003, 2004, and 2005, and analyzed as one bulked sample per year (Fig 1).
  - Samples were collected and analyzed separately from two or three locations in 2006, or 2008 and 2009, respectively. In 2007, canola biodiesel was processed from two varieties: Liberty 2663 and InVigor 5550 located in Ward county – (7-2 and 7-5)
- Experiment 2:
  - Biodiesel was processed from a single variety, Interstate Hyola 357 RR

BIO DIESEL PROCESSING AND ANALYSIS

- Seed was cleaned according to USDA-GIPSA methods
- Oil content of intact seed was quantified by NIRS
- Biodiesel was produced from seed via, in situ alkaline transesterification (TE)
- Seed was coffee ground and flour was dried at 70°C for 3 h or until 1.0% moisture db.
- TE was conducted in 500 mL Erlenmeyer flasks, 60°C shaker bath, 200rpm, 6 h
- Four equivalent oil wt = ~40g
  - 275:1.1:0.5 molar ratio of methanol : tricaprylglyceride : KOH
  - Biodiesel refined with water washing
  - Biodiesel pooled from duplicated nrr flasks to obtain sufficient volume for analysis
- Fatty acid profiles of canola oil and biodiesel determined by GC

DISCUSSION

- Cloud point (CP) was impacted by year and location (Fig 2A, 2C)
  - CP Temperatures ranged from -0.1 to -2.4°C
- Oxidative stability index (OSI) with ↑ storage, and varied between locations within a year (Fig 2B, D)
- All OSI values met the 3h min standard (3 h), except 2004
- No significant difference in biodiesel fatty acid composition among locations or varieties examined in this study.
- Variability in biodiesel iodine value was 108 to 123.
- (+) relationship between saturation and OSI, and (+) relationship between IV and OSI; although not statistically significant, increasing sample population may increase level of detection
  - Although variation in fatty acid composition was small, the variability in CP and OSI among ND growing locations and years suggests either differences in minor constituents (antioxidants, waxes) or environmental seed stress.

ACKNOWLEDGMENTS, REFERENCES

The authors are thankful for research support from:
- ND Ag Exp Station and ND Center of Excellence for Oilseed Development
- Mukhlies Rahman, NDSU Plant Science and Barry Coleman, Northern Canola Growers Association for kindly providing canola seed
- Harjit Sidhu and Katherine McKinnon for technical support