

The Effect of Two Direct Seed Drill Openers, Straw Management, and Seeding Rate on the Performance of Spring Canola and Mustard.

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INTRODUCTION

Concerns over soil erosion, soil quality, and sustainability of farming have induced a significant number of Pacific Northwest growers to adopt direct seeding practices. In addition, the desire to reduce fuel costs has accelerated interest in these one and two pass seeding systems. Direct seeding systems have the potential to reduce soil erosion, increase water use efficiency, reduce weed problems, and increase profitability. The increasing acreage of direct seeded crops has highlighted the need to have suitable crop rotations that reduce weed and disease pressures. To expand the use of conservation farming technologies, growers need non cereal rotation crops, and Brassicaceae crops are good candidates to fill this niche in the dry land regions of the Pacific Northwest.

In 1999 personnel from the University of Idaho Rapeseed, Canola & Mustard Program and the Parker Research Farm designed and built an experimental seeder suitable for one pass direct seeding. This drill has five Flexi Coil Stealth paired row shank openers with a 10 inch spacing, a variable rate Barber fertilizer box, and a Hege cone seed distribution system. Fertilizer is placed between and below the paired rows.

In 2004 funding was received from the Pacific Northwest Canola Research Program to construct a single disk opener direct seed plot drill. This drill was also designed and constructed by personnel from the Rapeseed, Canola & Mustard Program and the Parker Research Farm. Five Case IH SDX openers are arranged on 20 inch centers on two offset tool bars/gangs, resulting in a 10 inch row spacing. This drill also has a variable rate Barber fertilizer box and a Hege cone seed distribution system. Either seed or fertilizer can be applied through the openers, and the drill is used in a two pass fashion to apply fertilizer and place seed.

Experimental Drills at the University of Idaho



MATERIALS AND METHODS

Our primary objectives were to determine whether seeding rates and straw management interact with opener type. In addition we hoped to gain information on optimum agronomic practices for Brassicaceae crop relating to seeding rate and straw management in direct seed systems.

To investigate the effect of these two drill openers and straw management, an experiment was designed where 'Clearwater' spring canola (*Brassica napus*), 'Pacific Gold' oriental mustard (*Brassica juncea*) and 'IdaGold' yellow mustard (*Sinapis alba*) were planted into three straw management treatments: (1) no straw treatment, (2) mowed straw, where straw was flail mowed to less than 1 inch above ground level, and (3) harrow, where ground was harrowed to break up straw residue and the top ¼ inch of soil. Two drill openers were used: (1) a Flexi Coil Stealth shank opener, planting paired rows 2 inches apart with 10 inch spacing on center between paired rows, and (2) a Case IH SDX disk opener, planting a single row with 10- inch spacing between rows. Fertilizer placement was 1 inch below the seed and between the pair rows with the Flexi Coil opener. A two pass operation was used with the Case IH SDX drill that placed the fertilizer between the seed rows and 1 inch below the seed. A dry, urea plus ammonium phosphate ammonium sulfate blended fertilizer (31 10 0 7) was used, and all treatments received the same rate of fertilizer, 250 lbs. per acre.

Each cultivar was planted at three seeding rates. To account for seed size differences between the species, seeding rates were approximately 5.0, 7.5, and 10.0 lbs. per acre for canola, 2.5, 5.0 and 7.5 lbs. per acre for oriental mustard, and 6.5, 9.0, and 11.5 lbs. per acre for yellow mustard. The complete trial was a split split block design with opener type and residue treatments assigned to main blocks or strips, cultivars assigned subplots, and seeding rates assigned sub subplots. Each plot was 5 ft x 16 ft. Trials were planted at Genesee, Idaho on May 15, 2006 and May 10, 2007. The previous crop in both years of the trial was spring barley.

Flexi Coil Stealth Opener Drill



RESULTS

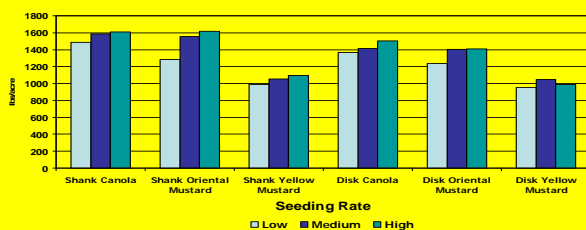
As expected, plant stand counts differed by seeding rate in both years, with higher seeding rates resulting in high higher plant populations. In 2006, the shank opener produced significantly higher plant populations than the disk opener (4.0 plants per foot of row versus 3.4 plants per foot of row), but no difference was seen in 2007. IdaGold reached 50% bloom in 43 days after planting, while Pacific Gold took 48 days, and Clearwater took 53 days. None of the other treatments had an effect on days to bloom.

The growing season in 2006 was hotter and drier than average, especially during May, and yields in 2006 were lower than in 2007 (843 lbs. per acre and 1545 lbs. per acre, respectively). No difference was seen in seed yield between plots planted with the disk or shank openers in the first year of the study, but a significant difference was observed after the second year and when the data was averaged over both years. The plots planted with the shank opener had an average seed yield of 1364 lbs. per acre and the disk opener plots had an average yield of 1258 lbs. per acre. Straw treatment did not have an effect in 2006, but did in 2007 with the mow treatment yielding better than the harrowed or untreated plots. Averaged over both years, no difference was found, and the straw treatments yielded within 100 lbs. per acre of each other. Seeding rate had an effect on yield in 2007 and when both years were averaged; the low seeding rates resulting in lower yields (1218 lbs. per acre) than the medium and high seeding rates (1344 and 1371 lbs. per acre, respectively). Clearwater and Pacific Gold produced significantly higher seed yields (1494 and 1417 lbs. per acre, respectively) than IdaGold (1021 lbs. per acre), which is typically for the higher rainfall zones of the Palouse region. No significant interactions between treatments were seen in the combined two year data set.

Case IH SDX Opener Drill



Yield of Canola, Oriental Mustard, and Yellow Mustard Seeded with Two Drills at Three Seeding Rates



CONCLUSIONS

Neither drill opener had problems with the levels of straw residue encountered in this study, an observation supported by the limited differences between straw treatments. Differences in yields between the openers did not appear to be due to differences in plant populations; in one year the Flexi Coil opener produced higher populations but not better yields, and in the other year it produced better yields but not higher populations. Both types of openers appear to be acceptable for spring canola and mustard seeding; although the use of the Flexi Coil shank opener did produce higher yields in 2007. The paired row of the Flexi Coil opener might offer an advantage in some years over the single row of the disk opener, because each plant in a paired row system is farther from its neighbor, which should reduce intra crop plant competition, especially during early growth stages and perhaps all season. The yield difference also could be related in part to fertilizer placement, since the Flexi Coil opener placed the fertilizer near the seed rows, and the two pass system used with the Case IH opener resulted in the fertilizer being banded between the rows, which placed it farther from the plants. The Flexi Coil opener also resulted in a higher degree of soil disturbance. With either opener, very low seeding rates should be avoided, but no advantage was seen for high rates when compared to intermediate rates.