Winter Oilseed Grower Bulletin #9: Using harvest aids to advance pennycress maturity.

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One of the principal concerns we have about integrating pennycress into the corn-soybean rotation has to do with harvest timing. Harvest timing can be split into two components: determining when pennycress itself is ready for harvest, which we explored in grower bulletin #6, and decreasing the time it takes for pennycress to mature. Our current lines of pennycress usually reach physiological maturity in mid-June, this reflects that yield and oil content have reached their maximum values. However, plant moisture is a major barrier to harvest. At physiological maturity, pennycress plant moisture is around 60%, but in order to easily mechanically harvest, plant moisture needs to be at or below 14% moisture. Once pennycress reaches physiological maturity, it takes about two weeks for it to naturally senesce to harvest maturity when it can be mechanically harvested (Cubins, 2019). It is advantageous to harvest as close to physiological maturity as possible to maximize the growing degree days that can be captured by the summer annual crop that follows pennycress (Moore, 2019).

One strategy to shorten the time between physiological and harvest maturity is by applying a harvest aid. The main ways to approach this are by swathing or applying a chemical desiccant at physiological maturity (Seepaul et al., 2018). Both of these processes cause plant dehydration and can decrease the amount of time to harvest maturity and increase plant phenological uniformity at harvest. In this experiment, five treatments and two controls were compared to assess pennycress response to harvest aid (Table 1). This research was conducted in Rosemount, MN during the 2019 growing season and utilized 'IO217' (*Ta-ind-2*), a reduced shatter pennycress line described in Chopra et al. 2020. Treatments were applied on July 1, 2019 and pennycress was harvested at on July 8, 2019. Data collected included seed moisture at physiological and harvest maturity, biomass moisture at physiological and harvest maturity, seed yield, and seed oil content. We found that seed moisture was similar across treatments both at physiological maturity and at harvest maturity (Fig. 1). However, there were significant differences between biomass moisture at physiological maturity and harvest maturity

Table 1. Harvest aid treatments and rates

Treatment	Rate (qt ac^{-1})
Defol (sodium chlorate)	2
	4
Diquat (diquat dibromide)	1
	2
Swath	
Control: Physiological maturity (PM)	
Control: Harvest maturity (HM)	

(Fig. 1). Unsurprisingly, the plant biomass at physiological maturity had the highest moisture content. When pennycress was sampled at harvest maturity, all treatments except Defol (2 quarts per acre) and the control were below the moisture threshold for mechanical harvest. There were no differences between seed yield and oil content across all treatments (not shown), which was expected since treatments were applied after physiological maturity. These results only represent one year of data collection and a second year of data was collected in 2020 and will be presented once samples have been analyzed and compiled.

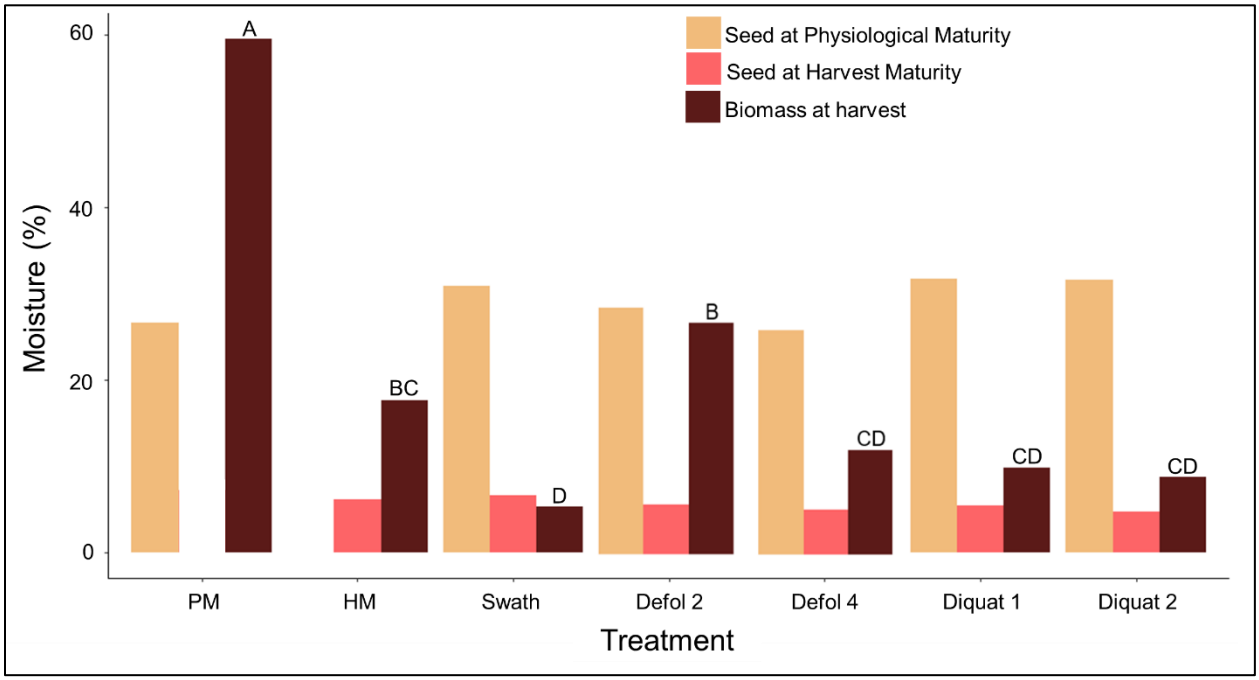

Figure 1. Seed and biomass moisture (%) with respect to treatment and sampling time. Within the "Biomass at harvest" variable, treatments that share a letter are not significantly different from each other. There were no significant differences in moisture content of seed sampled at physiological or harvest maturity.

Another consideration for this experiment is cost. It can be expensive to apply a harvest aid if the benefit is not clear. At this time, we would not recommend for a harvest aid to be applied to pennycress to hasten harvest. However, 2019 was an abnormal growing season and pennycres matured nearly three weeks later than usual, so it will be interesting to compare 2019 with 2020 once that data is available. One of the goals of the pennycress breeding program is to make pennycress naturally senesce earlier in the season, so it may be worthwhile to revisit this experimental question once we have early-maturing germplasm to work with.

References:

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