Planting Date, Herbicide, and Soybean Rotation Studies with Field Pennycress (Thlaspi arvense L.)

Winthrop B. Pippen, Billee John, Mary E. Pippen, and Terry Isbell

1School of Agriculture, Western Illinois University, Macomb, IL 61455, USA
2Southern Illinois University, Edwardsville, IL 62025, USA
3National Center for Agricultural Crops Utilization Research, USDA, ARS, Peoria, IL, 61604, USA

INTRODUCTION

Development of diverse and renewable feedstocks for the production of fuel will become a market certainty for the U.S. agriculture sector. However, displacement of crops that produce the world’s food from tillable land is a concern. One approach to solve both needs for food and fuel is to rotate both types of crops through the same growing season, and no impact on subsequent soybeans, pennycress offers

MATERIALS AND METHODS

Plant Date Study: Pennycress line ‘Patton’ was planted in Macomb, IL, over 9 separate weeks in the fall of 2009 from September 1st to November 3rd (Figure 1). Each planting date plot consisted of 9 drilled rows 1.5 cm apart and 3.5 m long. Each planting date was replicated 4 times and maintained by hand weeding. One square meter was harvested by hand from each plot in late May and early June and analyzed for seed yield, total oil content, and oil constituents. Weather data was collected at the planting site. Herbicide Trials: In fall 2008 and 2009, the pennycress line ‘Patton’ was drilled into 10 plots measuring 3.1 m by 4.5 m. Just prior to flowering in early April of the following spring, rates of half, 1x, and 2x labeled rate were applied for each of the herbicides containing the active ingredients alachlor (Intrro), pendimethalin (ProwlH2O), and clopyralid (Stinger). Each rate was replicated three times with plots receiving no herbicides serving as a control. Plants were evaluated 14 days after herbicide application for plant injury. Sub-samples were harvested from each plot measuring 1.5 m by 3.0 m and analyzed for seed yield, total oil content, and oil constituents.

RESULTS AND DISCUSSION

Plant Date Study: The first five planting dates occurring in September were not found to be significantly different from each other in terms of total seed oil content (Figure 2). However, as soil temperatures declined throughout the fall (Figure 3), stand establishment declined resulting in a significant decrease in seed and total oil yields. The percentage of seed oil constituents remained constant for the September planting dates, with erucic acid levels declining and oleic acid levels increasing towards the later planting dates (Figure 4). The early establishment of the September planting dates also allowed for harvest on May 24th, while later planting dates were harvested on June 11th (Figure 5).

Herbicide Trials: The 2010 growing season was extremely wet and cool resulting in a poor stand establishment leading to very low yields overall (Figure 6). However, 2009 resulted in significant differences between herbicide applications (Figure 7). Herbicide injury was noticed on all treated plots (Figure 8), however only 1x and 2x rates of clodopyralid (Stinger) resulted in significant yields when compared to the control. No significant differences were found in total seed oil or oil constituents across all herbicide treatments.

Soybean Rotation Studies: All five planting dates of soybeans following pennycress resulted in slightly higher yields when compared to the control plots (Figure 9). The slight bud increase following pennycress may have been the result of increased soil moisture due to higher ground cover. Soybeans were planted directly, without any pre-treatment (Figure 10). No significant differences could be found in either seed oil or protein profiles between soybeans following fallow ground and soybeans following pennycress (Table 1).

CONCLUSIONS

Identifying an ideal September planting season will significantly improve a producer’s chance of harvesting high yielding pennycress prior to planting soybeans. Applications of alachlor and pendimethalin based herbicides show promise as helping control weeds and minimizing impacts on pennycress seed yield. No adverse effects have been seen in soybeans following pennycress production. With excellent biodiversity properties, a very short growing season, and no impact on subsequent soybeans, pennycress offers tremendous opportunities for producers to diversify and capitalize on diminishing the US demand for foreign based oils.

LITERATURE CITED


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