Summer Cover Crop Influence on Fall Vegetable Production

RFR-A1351

Ray Kruse, graduate student
Ajay Nair, assistant professor
Department of Horticulture

Introduction

At the 2012 Fruit and Vegetable Field Day held at the Iowa State University Horticulture Farm, Ames, Iowa, one of the major challenges highlighted by commercial vegetable growers was "weed management." Growers called for research on sustainable and environmentally conscious (less herbicide) ways of weed management. Use of cover crops to suppress weeds was one of the outcomes of the discussion. The goal of this project was to evaluate and study what advantages exist under Iowa growing conditions for four cover crops to satisfy farmer's goals. The four cover crops studied were: Buckwheat (cool season broadleaf), Cowpea (warm season broadleaf), Oats (cool season grass), and Sorghum Sudangrass (warm season grass).

Materials and Methods

The control treatment for the study was a no-cover crop plot left fallow for 1 to 2 months to simulate what industry was practicing between an early spring and a fall vegetable crop. The study also investigated the effect of planting date on vegetable crop growth and yield. Two planting dates, planting immediately or after one week of cover crop termination, was tested.

The entire plot was tilled in May 2013 to uproot weeds and prepare the soil. On June 2, 2013 the plot was tilled again for the final seedbed preparation and to finely chop the remaining and emerging weeds. Cover crops also were seeded the same day using a drop spreader and lightly tilled-in to incorporate the cover crop seeds. Solid set irrigation was installed and used as needed to supply water to the cover crops. In early August, above ground biomass was taken using 50 cm × 50 cm quadrats from four locations within each treatment across all four replications. The biomass was sorted into three groups consisting of cover crop, broadleaf weeds, and grass weeds. The cover crop and weed biomass was dried and weighed. On August 6, 2013 cover crop plots were flail mowed, and tilled to a depth of approximately 6-8 in. The control treatment was tilled with the rest of the treatments at cover crop seeding. Raised beds with plastic mulch were made and the first half of each treatment plot was planted the same day with two crops, cabbage (cv. Caraflex) and lettuce (cv. Adriana). On August 14, the second half of each plot was planted. The experiment design was a split plot with four replications. The whole plot factor was the cover crop and planting date was the subplot factor.

Fertigation was applied using 21-5-20 fertilizer to achieve a goal of 50 lb/acre within each bed. Transplant health was graded on a visual scale two weeks after transplanting. Lysimeters were installed for analysis of leaching soil nitrate. Soil samples were taken three times during the growing season. Lettuce was harvested mid-September. Cabbage was harvested at the beginning of November. Both crops were separated into marketable and non-marketable categories.

Results and Discussion

The use of irrigation was not the preferred choice to establish the cover crops but the early summer's dry conditions combined with the coarse sandy soil texture of the plot would otherwise not permit the cover crops to grow until their termination date. Weed suppression by the cover crops was experienced in all of

the treatments relative to the control (Figure 1). Almost all of the plots had more grass weed biomass than broadleaf regardless of treatment. The crop that suppressed the most weeds compared with the control was buckwheat. Not represented in the information was the buckwheat treatment also had vigorous cover crop regrowth by seed after cover crop termination. Hand weeding was necessary to suppress the volunteer cover crop regrowth.

Lettuce yield was not different between the control and the broadleaf cover crops (Figure 2). A yield advantage was observed between the planting date of lettuce and cover crop termination, with a yield increase occurring by waiting a week after cover crop termination. There was a yield decrease when comparing the grass cover crop treatments with the control treatment. The yield decrease was not as great when the lettuce was planted directly into the terminated grass-type cover crop treatments as opposed to waiting a week to plant the lettuce. The cowpea treatment matured 2 to 3 weeks ahead of the rest of the treatments.

The fall season was not favorable for cabbage production and yields were low overall (Figure 3). Out of all the treatments in this study, vegetables planted after cowpea cover crop yielded the greatest marketable crop. Between the two planting dates, a yield increase was observed when the cabbage was planted directly into the terminated cowpea treatment compared with waiting a week. This is contrary to how lettuce responded to planting into cowpea.

Acknowledgements

We would like to thank Nick Howell and the farm crew for their help with the plot in collecting data. We also would like to thank my graduate and undergraduate colleagues in the Sustainable Vegetable Production Lab.

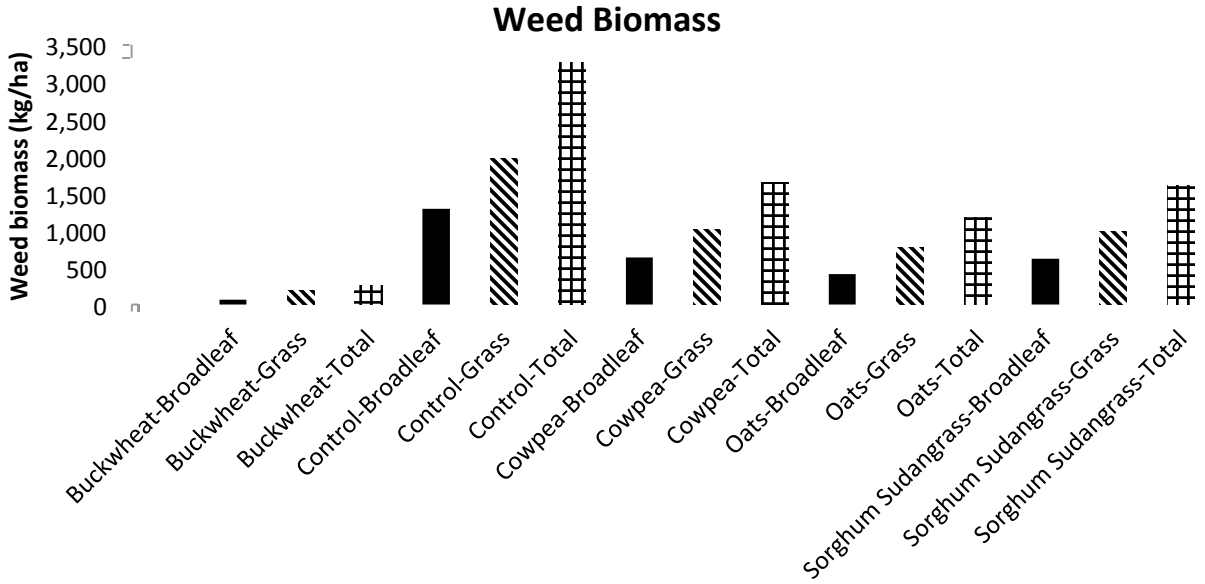

Figure 1. Effect of cover crop on weed biomass. Total represents the combined biomass of broadleaf and grass weeds.

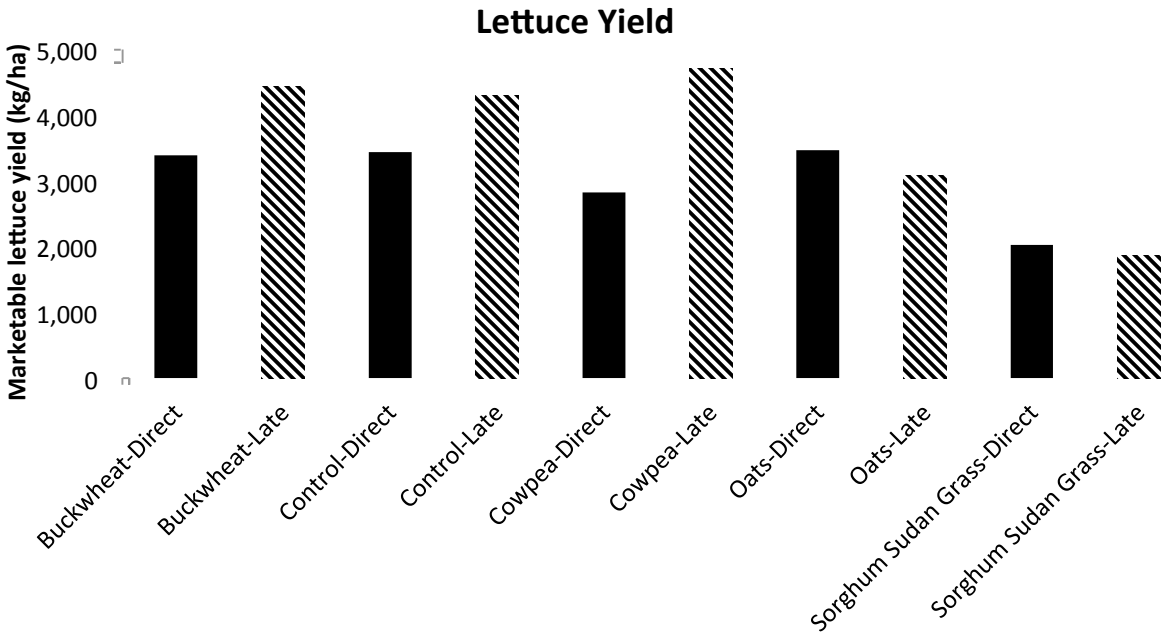

Figure 2. Effect of cover crop on marketable lettuce yield. Direct and late represent two lettuce planting dates (immediately/direct or one week after cover crop termination/late).

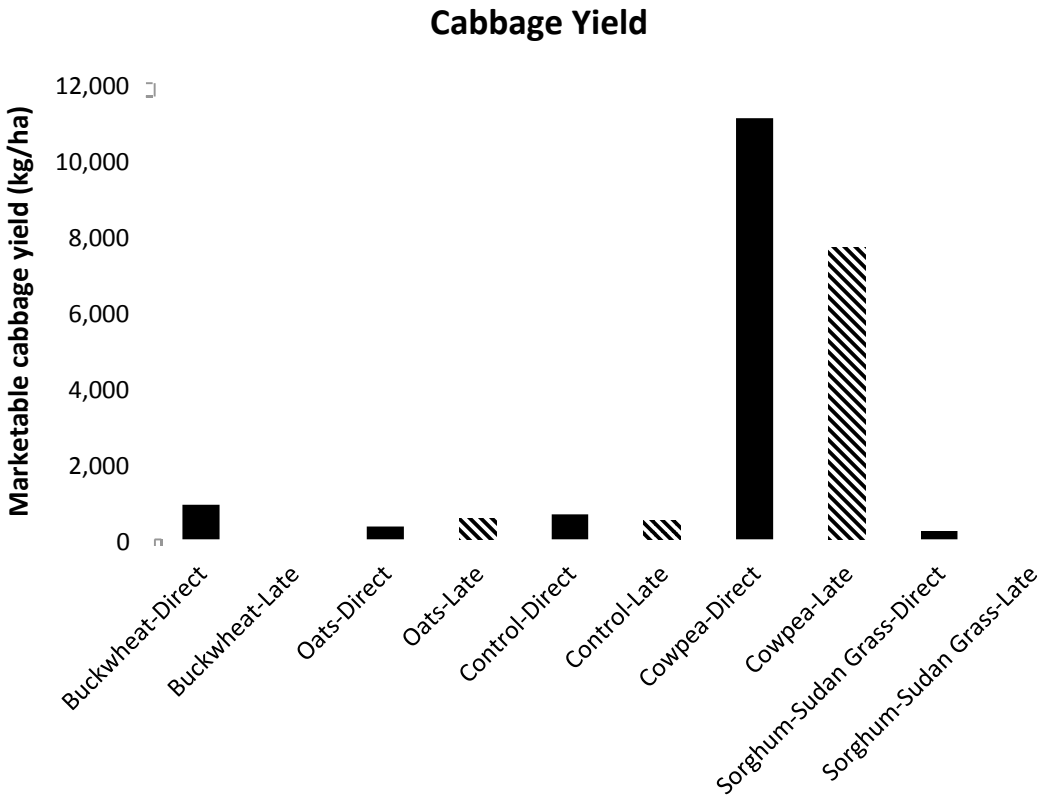

Figure 3. Effect of cover crops on marketable cabbage yield. Direct and late represent two cabbage planting dates (immediately/direct or one week after cover crop termination/late).