IRRIGATION METHODS ON GREEN BEANS UNDER CONVENTIONAL VS STRIP-TILLAGE SYSTEMS

Emmanuella Owusu Ansah 1, Olga S. Walsh, Xi Liang2, Ritika Lamichhane3, Howard Nelbl1ing2, Jordan McClintick2, University of Idaho, Parma R&E Center, University of Idaho, Kimberly R&E Center, University of Idaho, Aberdeen R&E Center.

INTRODUCTION

Most green beans (Phaseolus vulgaris L.) are grown for seed production in Idaho. Green beans production continues to increase in the Pacific Northwest (PNW), including Idaho. These green beans are considered the world’s best and most disease-free. Water use efficiency (WUE) is the amount of bean seed produced per unit of water used by the crop. WUE shows a relationship between water use and plant productivity. Ongoing research focuses on identifying the best irrigation water delivery method and amount of water applied to green beans grown under various tillage systems (conventional and strip-tillage).

OBJECTIVE

To determine the effects of water management using three irrigation techniques (furrow, sprinkle and drip) at 50%, 75% and 100% ET under strip tillage (ST) and conventional tillage (CT).

PRELIMINARY RESULTS

Field experiments were conducted at the University of Idaho, Parma, and Kimberly Research and Extension Centers to determine the effects of water management using three irrigation techniques; Furrow (F), Sprinkle (S), and Drip (D) at 50%, 75% and 100% evapotranspiration (ET) under strip tillage (ST) and conventional tillage (CT). The experiments were laid out in a split block randomized complete block design with four replications. Growth parameters assessed were plant height, biomass weight, pod length, plant health and vigor as Normalized Difference Vegetative Index (NDVI).

DISCUSSION

- The highest weight (30.8g) was recorded under strip tillage with sprinkle irrigation at 100% ET and the lowest weight (12.3g) was recorded under conventional tillage with drip irrigation at 75% ET (Figure 1).
- SPAD measures the leaf chlorophyll content. High chlorophyll indicates higher photosynthetic rate and hence growth of bean crops. Strip tillage with drip irrigation at 50% ET had the highest SPAD value with drip irrigation at 75% ET under conventional tillage recording the lowest value (Figure 2).
- NDVI is a measure of the greenness and health of leaves which indicates growth that reflects in biomass weight as shown in Figure 3. Highest NDVI was recorded under Strip tillage with drip irrigation at 100ET% (Figure 4).
- Pod length is a measure of quality in green beans production since the longer pod length indicates more seeds. The highest pod length (5.9cm) was recorded under conventional tillage with furrow irrigation at 100% ET, 75% and 50% ET immediately after. Lowest seed pod lengths were recorded under strip tillage with drip irrigation at 75% ET (4.8cm) and with drip irrigation at 75% (4.9cm) under conventional tillage (Figure 5).
- The highest yield (1.598.3 lbs) was recorded at 100% ET under strip tillage with sprinkle irrigation. Under drip irrigation at 75% ET was higher than 50% ET and 100%ET. This can be attributed to the fact that the moisture level at 50% was insufficient to cause increase in yields. Moreover, the moisture level at 100% was in excess and since moisture levels and nutrients levels are unbalanced, N was likely diluted which led to lower yields. (Figure 6).

CONCLUSION

Based on the 2020 results, it can be concluded that sprinkle and drip irrigation under strip tillage can be effective for increased green beans production, soil moisture conservation, and soil health.