

The effect of termination time on fava biomass and nitrogen contribution to soil

Amelia Zepeda, California State University, Chico

Cover cropping is a growing practice in California agroecosystems. Diverse cropping systems in California requires different managements such as time of planting and termination of cover crop. This study aims to provide information that helps CA growers manage their winter cover crops.

A field trial was established at the USDA Natural Resources Conservation Service Plant Materials Center (PMC) at Lockeford, CA. Two fava bean varieties (bell bean and windsor) were planted in two side-by-side randomized complete block with four replications in November of 2019 and 2020. Four termination times (treatments) were randomized within each experiment. The fava bean varieties were sampled from corresponding plots based on its life cycle (flowering, first pod, full-pod, and maturity stages). After sampling, the plot was terminated with a mower and fava residues were left on the surface. The fava bean variety samples were dried, weighed, ground, and analyzed for N and ¹⁵N compositions. After the last sampling, sudangrass (*Sorghum X drummondii*) was planted in the same field. Sudangrass was sampled when it was roughly 2ft tall in the summer of 2020, and dried, weighed, ground, and analyzed for N in a Leco CN analyzer. In 2021, sudangrass was sampled at the same stage as year one (2019) , mowed and a 2nd sample was taken after a regrowth and when the grass was about 2 ft tall.

In 2019 (year one), averaged over four replications, bell bean accumulated 274, 1007, 1725 and, 4713 kg ac-1 and fixed 33, 57, 44, and 45% of its N from the atmosphere (%Ndfa) at flowering, first-pod, full-pod and maturity, respectively. In the same year, windsor accumulated 817, 2554, 3658 and 5738 kg ac-1 and fixed 33, 57, 44, and 45% of its N from the atmosphere at flowering, first-pod, full-pod and maturity, respectively. In this year, total N benefits of bell bean were 4, 14, 21, and 52 kg N/ac-1 and the total N benefits of windsor was 11, 39, 45, and 66 kg N ac-1 at flowering, first-pod, full-pod and maturity, respectively. Averaged over two varieties, sudangrass accumulated 3597, 3252, 6619 and 4471 kg/ha-1 dry mass and windsor 3949, 3427, 6568, and 5915 kg N ac -1. The sudangrass N content from the bell bean plots were 23, 23, 41 and 36 kg/ha-1. The sudangrass from the Windsor plots had an N content of 36,38,52,51kg/ha-1 from plots that were terminated at flowering, first-pod, full-pod and maturity, respectively. The results suggest that the fava bean %Ndfa increased after the first sampling date but remained similar across the other three sampling dates. The total N from fixation (biomass x %N x %Ndfa) increased throughout the season and maximized at the last sampling date. Two fava bean varieties had a similar pattern in %Ndfa, and total N from fixation throughout the season and maximized at the last sampling. Sudangrass biomass production in response to the fava bean termination times was inconsistent. However, it seems that terminating the fava bean after the full-pod stage increased biomass production of the sudangrass. Higher biomass production of sudangrass in the late-terminated fava bean plots could be associated with more available nitrogen from the fava bean found in the soil. Lower sudangrass biomass could be associated with the N in the fava bean plants being held up within the plant and not having the time to break down to be usable within the soil for the sudangrass.