COVER CROP COMBINATIONS INFLUENCE ON VEGETABLE PRODUCTIVITY

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Cropping rotations, cover crop type, and supplemental nutrients improve nutrient availability in organic production systems. Vegetable crops differ in their nutrient needs so alternative strategies for nutrient cycling with cover crops (CCs) are required. We utilized planned cropping rotations (bean→corn→broccoli, repeat), a variety of different winter (kale, winter wheat, or hairy vetch) and summer (buckwheat, proso millet, or black bean) CCs to assess their roles in nutrient cycling, weed management, and vegetable crop performance over a six-year period. Vegetables evaluated included transplanted broccoli and seeded snap beans and sweet corn grown in the planned rotation. Nitrogen additions (feather meal) for broccoli and sweet corn supplemented the CC cycling and attempted to meet the vegetable crops N requirements not supplied by the rotations. This presentation provides detailed suggestions on how to use and evaluate nutrient management strategies for enhance crop performance in irrigated organic cropping systems.

Winter CCs were established in September after vegetable crop residues were soil incorporated. Cover crops were measured prior to transplanting broccoli (late April) and again prior to seeding snap beans and sweet corn (late May). Summer CCs were planted in June. The winter CC and summer CC were planted such that there were nine (9) different combinations used to assess CC performance and influences on vegetables (Table 1). Organic N fertilizer (feather meal; 13% N) was broadcast and incorporated 30 days after transplanting broccoli or seeding sweet corn, at 50 and 100 lbs. N/A, respectively. During six seasons (2016-2021; 2 vegetable rotation cycles), we evaluated cover crop productivity, weed pressure, and vegetable (broccoli, green bean, sweet corn) crop performance.

Table 1. Average productivity of broccoli, green beans and sweet corn in different winter (WCC) and summer (SCC) cover crop combinations (2016-2021).

	Broccoli Mkt Head (#/A)			Bean Pod Wgt (Ibs./A)			Sweet Corn Ears (doz./A)		
	Black	Proso	Buck-	Black	Proso	Buck-	Black	Proso	Buck-
	Bean	Millet	wheat	Bean	Millet	wheat	Bean	Millet	wheat
Kale	6,016	5,592	7,012	2787	4243	3317	1206	1603	1404
Wheat	6,508	6,701	7,846	2832	4199	3734	1400	1509	1599
Vetch	8,783	8,856	10,062	1461	3414	2966	1111	1647	1634
Sign. (0.05) WCC** SCC ^{ns}				WCC ^{ns} SCC ^{ns}			WCC** SCC ^{ns}		

Kale CC's consistently produced the least amount of biomass (< 4,000 lbs./A) even though establishment was considered good to excellent. Winter wheat CC varied from 6-9,000 lbs. fresh biomass/acre, while vetch generally produced the most biomass (6-13,000 lbs. fresh biomass/acre). Biomass differences depended on when it was mowed and incorporated or how much fall growth occurred in WCC's. Broccoli yield was significantly improved when grown in vetch CC compared to wheat or kale (Table1). Broccoli yield differences with WCCs were attributed to improvements in head size (weight/diameter) and head quality (more marketable heads). Broccoli yields was not affected by summer CC's. Neither winter nor summer CC's had a significant effect on bean pod weight during the study though legume

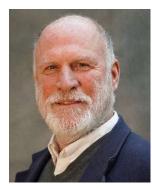
based CC's did tend to suppress pod yield. Beans were heavily inoculated with rhizobia and performance reflected this relationship. Sweet corn yield (doz. ears/A) were also significantly better when grown in vetch CC compared to wheat or kale (Table 1). Summer CCs had less impact on corn productivity (Table 1).

Weed growth in June also changed relative to the type of CC grown (Table 2). Weed biomass in kale CC was significantly lower than in wheat CCs even when biomass production was low. Summer CCs of millet and buckwheat established quickly and both produced significantly more biomass than black bean, which was important in summer weed management (Table 2). Too much legume (vetch+bean) in the mix significantly increased weed pressure. Arid, calcareous soils are low in organic matter (1.36% OM at the start of the study). After six years of CC and vegetable residue additions, soil organic matter levels increased by 22-38 percent (Table 2). Vetch and buckwheat increase soil OM levels more compared to other winter or summer CCs.

	Weed F	Pressure (S	% total)		Organic Matter (% 个)				
	Black	Proso	Buck-		Black	Proso	Buck-		
	Bean	Millet	wheat		Bean	Millet	wheat		
Kale	31	19	26		22.2	24.2	27.9		
Wheat	36	31	28		24.4	25.1	29.3		
Vetch	41	16	20		34.9	34.4	38.8		
Sign. (0.05) WCC** SCC* WCC*** SCC*									

Table 2. Weed pressure (% of total biomass) and percent (%) change in soil OM (2016-2021).

Conclusions: Both WCCs and SCCs and the addition of supplemental organic fertilizer is important when trying to improve vegetable productivity, manage weeds, and improve soil organic matter and nitrogen availability. Summer CCs are not commonly used in many organic systems as they take farm space that reduces options for vegetables. However, used in combination with winter CCs, production approaches can be developed that enhance soil fertility and quality, optimize vegetable crop productivity, minimize weed pressure, and that have long-term sustainability for growers.



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