Organic Fertilizer Trial on Broccoli

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Objective: To evaluate the performance of organic fertilizer for broccoli production under mild summer temperatures along the coast.

Methods: The trial was conducted in cooperation with Dick and Bill Peixoto at the Redman Ranch in Watsonville. Each plot was two 40-inch beds wide by 50 feet long and was replicated three times in a randomized complete block design. The field was transplanted on May 9 with the variety Greenbelt. The first harvest was on July 12, 64 days after transplanting. The field was sprinkler irrigated throughout the season. Fertilizer rates and application dates are shown below. Preplant applications were shanked into the beds prior to transplanting. Top dress applications were scattered on top of the bed and scratched into the bed top with a four-tined harrow. Soil samples were collected by collecting soil from 8 probes per plot, 12 inches deep. The soil was kept cool in an ice chest, taken to the laboratory and extracted into 2M KCl on the same day. The KCl extract was maintained frozen and sent to the DANR Analytical Laboratory at UC, Davis for nitrate and ammonium analyses. Yield was collected on three dates and plant biomass samples were collected on July 17.

Fertilizer application schedule

	Materials	lbs N/A Preplant May 8	lbs N/A topdress May 31	lbs N/A topdress June 7	lbs N/A topdress June 14	lbs N/A Total
1	Untreated	0	0	0	0	0
2	Meat Meal 8-5-1	45	45	45	45	180
3	Meat Meal 8-5-1	90	0	45	45	180
4	Meat Meal 8-5-1	135	0	0	45	180
5	Feather Meal 12-0-0	45	45	45	45	180
6	Feather Meal 12-0-0	90	0	45	45	180
7	Feather Meal 12-0-0	150	0	0	45	180
8	Blood Meal 13-0-0	45	45	45	45	180
9	Blood Meal 13-0-0	90	0	45	45	180
10	Blood Meal 13-0-0	135	0	0	45	180
11	Guano/Chicken 7-0-0	45	45	45	45	180
12	Guano/Chicken 7-0-0	90	0	45	45	180
13	Guano/Chicken 7-0-0	135	0	0	45	180

Results: Guano/chicken applied as 90-45-45 or 135-45 lbs N/A application pattern gave the highest yield (table 1). Blood meal applied as 135-45 gave the second highest yield. In general, applying a greater amount of fertilizer early (i.e. 135-45 or 90-45-45) gave higher yields. The yield correlated with the higher levels of nitrate and ammonium in the soil of the guano/chicken and blood meal treatments early and later in the growth cycle (tables 2 and 3, figure 2). The total N in the plant biomass at harvest generally correlated with total yield, and the soil quick test nitrate generally correlated with the laboratory tests. The rapid time to harvest (64 days) and moderate soil temperatures (figure 1) favored guano/chicken, the more quick release material, in this trial.

Table 1. Number and weight of broccoli per plot on three harvest dates, as well as total yield and biomass of the tops.

	July 12		July 17		July 21		Total	Total	
Treat	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	Mean Head Wt.
Untreated	4.0	2.31	5.3	2.43	9.6	4.11	19.0	8.87	0.29
Meat Meal 45-45-45-45	13.0	6.16	23.3	10.21	28.0	12.48	64.3	28.86	0.45
Meat Meal 90-45-45	16.7	7.58	25.6	11.13	19.3	8.25	61.6	26.96	0.43
Meat Meal 135-45	20.0	10.48	20.3	9.02	20.3	9.65	60.6	29.15	0.48
Feather Meal 45-45-45-45	16.6	7.78	24.3	11.15	24.3	9.75	65.3	28.68	0.44
Feather Meal 90-45-45	25.3	11.96	27.3	12.35	25.3	11.13	78.0	35.44	0.45
Feather Meal 135-45	42.0	23.93	26.3	13.30	20.0	9.07	88.3	46.30	0.52
Blood Meal 45-45-45-45	32.3	18.51	35.3	17.75	21.3	10.18	89.0	46.45	0.52
Blood Meal 90-45-45	33.3	16.78	30.6	13.87	23.0	9.93	87.0	40.58	0.47
Blood Meal 135-45	44.0	20.75	38.6	19.23	14.7	6.65	97.3	46.63	0.49
Guano/Chicken 45-45-45-45	27.3	15.51	36.3	20.40	20.3	9.90	84.0	45.81	0.55
Guano/Chicken 90-45-45	39.6	25.03	47.3	26.45	17.3	8.67	104.3	60.15	0.57
Guano/Chicken 135-45	54.6	30.48	36.3	19.70	18.3	7.67	109.3	57.85	0.52
LSD (0.05)	21.8	13.87	12.4	7.58	14.3	6.49	23.4	16.81	0.14

Table 2. Soil nitrate-nitrogen (ppm on a dry weight basis) over the season

Treat	5/21	5/31	6/7	6/14	6/22	7/3	7/9
Untreated	3.32	2.98	1.84	1.44	3.72	1.57	1.20
Meat Meal 45-45-45-45	9.52	4.65	2.29	1.35	2.28	1.68	1.07
Meat Meal 90-45-45	6.92	3.88	2.44	1.12	3.55	1.19	1.05
Meat Meal 135-45	8.85	7.22	4.99	2.20	2.33	0.98	1.00
Feather Meal 45-45-45-45	5.41	4.70	1.85	0.99	2.01	1.22	0.97
Feather Meal 90-45-45	9.51	5.81	4.16	0.79	1.79	1.63	1.36
Feather Meal 135-45	12.46	6.24	8.96	4.22	2.42	1.81	1.08
Blood Meal 45-45-45-45	5.29	4.84	2.92	5.36	4.57	3.47	1.18
Blood Meal 90-45-45	20.40	11.43	2.13	0.96	3.55	7.4	1.70
Blood Meal 135-45	13.81	14.86	5.94	2.21	23.48	8.6	6.46
Guano/Chicken 45-45-45-45	7.90	8.35	3.40	6.24	8.47	1.73	2.98
Guano/Chicken 90-45-45	20.69	18.24	6.51	1.50	19.44	4.54	1.84
Guano/Chicken 135-45	41.46	22.17	4.02	3.08	6.69	2.23	2.05
LSD (0.05)	11.79	8.21	5.87	5.06	20.71	n.s.	4.35

Table 3. Soil ammonium-nitrogen (ppm on a dry weight basis) over the season

Treat	5/21	5/31	6/7	6/14	6/22	7/3	7/9
Untreated	7.20	0.22	0.48	0.39	0.55	0.33	0.32
Meat Meal 45-45-45-45	7.92	1.31	0.79	0.67	1.00	1.06	0.50
Meat Meal 90-45-45	10.08	0.28	0.51	0.60	4.36	0.39	0.32
Meat Meal 135-45	16.66	0.48	0.64	3.72	1.11	0.75	0.32
Feather Meal 45-45-45-45	10.25	0.43	0.49	0.28	0.81	0.43	0.31
Feather Meal 90-45-45	12.09	1.87	1.77	0.26	1.24	0.63	0.60
Feather Meal 135-45	31.72	0.31	1.04	0.37	0.29	0.62	0.31
Blood Meal 45-45-45-45	7.32	0.77	1.46	4.89	13.72	1.68	0.58
Blood Meal 90-45-45	21.93	0.49	0.44	1.09	4.25	8.28	0.44
Blood Meal 135-45	10.27	0.52	0.48	0.26	0.85	0.59	0.84
Guano/Chicken 45-45-45-45	7.47	0.54	0.79	4.00	11.87	3.40	5.51
Guano/Chicken 90-45-45	9.66	2.06	0.70	0.26	12.25	5.53	0.90
Guano/Chicken 135-45	31.12	6.95	0.83	0.28	24.18	0.68	1.20
LSD (0.05)	20.46	3.71	n.s.	4.63	12.14	6.24	4.51

Table 4. Plant tissue nitrogen and nitrate levels

	6/14	7/3	7/17		
Treat	Total N %	Total N %	Total N %	Plant Biomass T/A	Total lbs N/A in Biomass
Untreated	2.79	1.60	1.43	1.97	57.6
Meat Meal 45-45-45-45	2.49	1.75	2.34	4.37	208.9
Meat Meal 90-45-45	3.56	1.67	2.61	4.06	212.2
Meat Meal 135-45	3.51	1.86	2.71	3.96	217.0
Feather Meal 45-45-45-45	3.10	1.70	2.66	3.35	178.0
Feather Meal 90-45-45	2.51	1.78	2.57	3.77	193.6
Feather Meal 135-45	3.79	1.84	2.95	4.66	281.5
Blood Meal 45-45-45-45	3.88	2.27	2.90	3.64	212.5
Blood Meal 90-45-45	3.01	1.74	2.68	4.17	221.9
Blood Meal 135-45	4.67	2.59	2.87	4.33	248.5
Guano/Chicken 45-45-45-45	4.67	2.66	3.35	4.32	294.9
Guano/Chicken 90-45-45	3.02	2.63	2.73	5.11	277.0
Guano/Chicken 135-45	3.23	2.12	2.74	4.99	272.9
LSD (0.05)	1.64	0.80	1.01	0.80	124.2

Table 5. Quick test soil nitrate-nitrogen (ppm)

Treat	6/14	6/22	7/3	7/9
Untreated	2.5	0.8	0.0	0.0
Meat Meal 45-45-45-45	0.3	0.3	0.8	0.0
Meat Meal 90-45-45	0.0	3.3	0.0	0.7
Meat Meal 135-45	8.3	0.3	0.3	0.0
Feather Meal 45-45-45-45	0.0	0.0	0.0	0.0
Feather Meal 90-45-45	0.3	0.0	0.3	0.0
Feather Meal 135-45	6.6	3.3	0.8	1.7
Blood Meal 45-45-45-45	7.8	3.1	2.5	1.7
Blood Meal 90-45-45	0.0	0.3	8.3	11.7
Blood Meal 135-45	0.3	17.0	17.0	13.3
Guano/Chicken 45-45-45-45	0.3	8.3	1.6	5.0
Guano/Chicken 90-45-45	6.3	23.3	5.0	0.0
Guano/Chicken 135-45	3.6	4.1	2.0	0.0
LSD (0.05)	n.s.	18.7	15.3	12.1

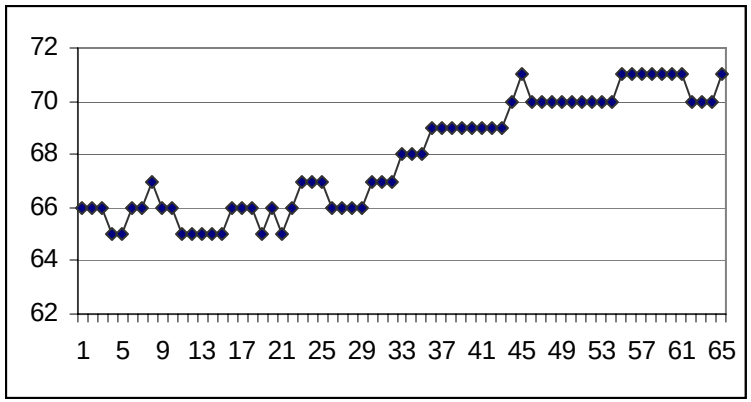

Figure 1. Soil temperatures from transplanting to 1st harvest

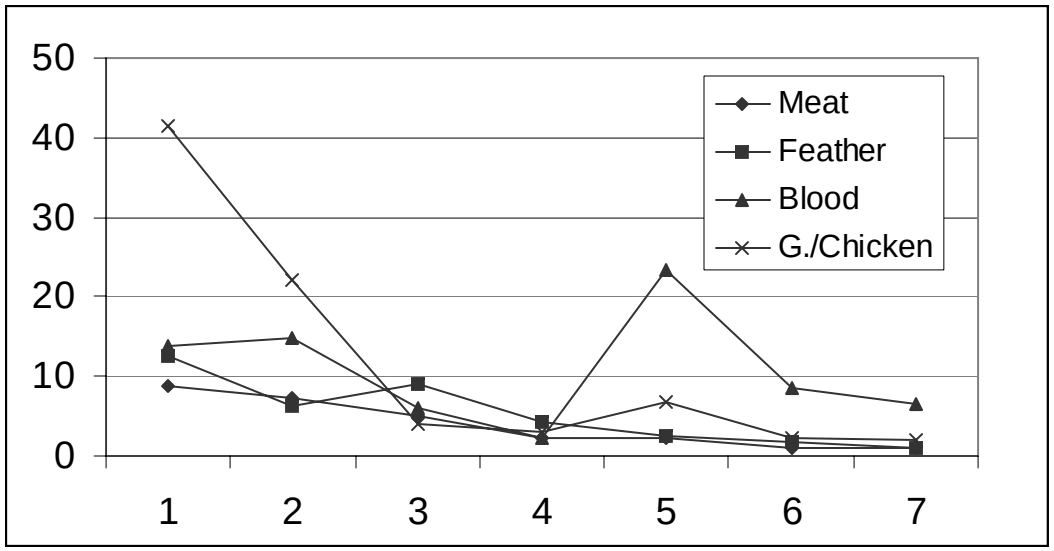

Figure 2. Nitrate-N in soil of 135-45 application pattern of various fertilizers on seven sampling dates.