Lettuce growth and CO_2 emission with organic fertilizers under greenhouse conditions

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Consumer demand for organically grown crops and interest in organic greenhouse production are rising. Greenhouse crop production has a value of $112 million in the United States. Lettuce is of high economic importance in the United States. Nutrient management can be the most important challenge for organic vegetable production. The responses of lettuce (*Lactuca sativa* L. 'Arroyo') to organic nitrogen (N) fertilizers were investigated in a greenhouse. Fertilizers were blood meal (BLO), feather meal (FM), cottonseed meal (CSM), alfalfa meal (ALF), sewage sludge (SEW), compost (COM), cow manure (COW), a chemical fertilizer (CHEM), and a treatment without fertilizer. Amounts of N from fertilizers were 100, 200, 400, or 800 mg per pot. Lettuce yield was higher for plants receiving fertilizers than with no fertilizer and increased with increased N applications, but high applications of blood meal or feather meal suppressed yields. The soil carbon dioxide release was high from fertilizers with high N concentrations. Organic fertilizers with high N increased lettuce growth at lower applications than those with low N content. Proper application of organic fertilizers of various sources and application rates is crucial to reach high yields in organic lettuce production. Amending media with organic fertilizers with low C/N ratio like BLO and FM at higher application rates deter lettuce growth by limiting growth and yield.

Table 1. Fresh weights of shoots of lettuce as a function of nitrogen added and kind of fertilizer

mg N/pot	Shoot fresh wt, g/plant								
	BLO	ALF	CSM	FM	SEW	COM	COW	CHEM	Mean[z]
0	52	52	52	52	52	52	52	52	52
100	85	73	66	82	60	55	57	69	69 b
200	95	82	76	70	66	59	61	78	73 a
400	76	75	74	66	74	65	69	81	73 a
800	36	30	32	39	71	74	75	84	55 c
Mean[z]	73 ab	65 c	62 dc	64 c	67 c	63dc	65 c	78a	
Trend[y]	Q**	Q**	Q**	Q**	Q*	L**	L**	L*	Q**

[z]0N is not considered in statistical analysis except for LSD. Means of columns are averages of 100, 200, 400, and 800 mg N/pot for each fertilizer; means of rows are averages of all fertilizers. Means followed by different letters in rows or in columns are significantly different by Duncan's New Multiple Range Test (P=0.05). LSD (0.05) for the interaction including 0N=3.

[y]Trends are assessments by polynomial contrasts; L=linear, Q=quadratic; *, P≤0.05; **P≤0.01.

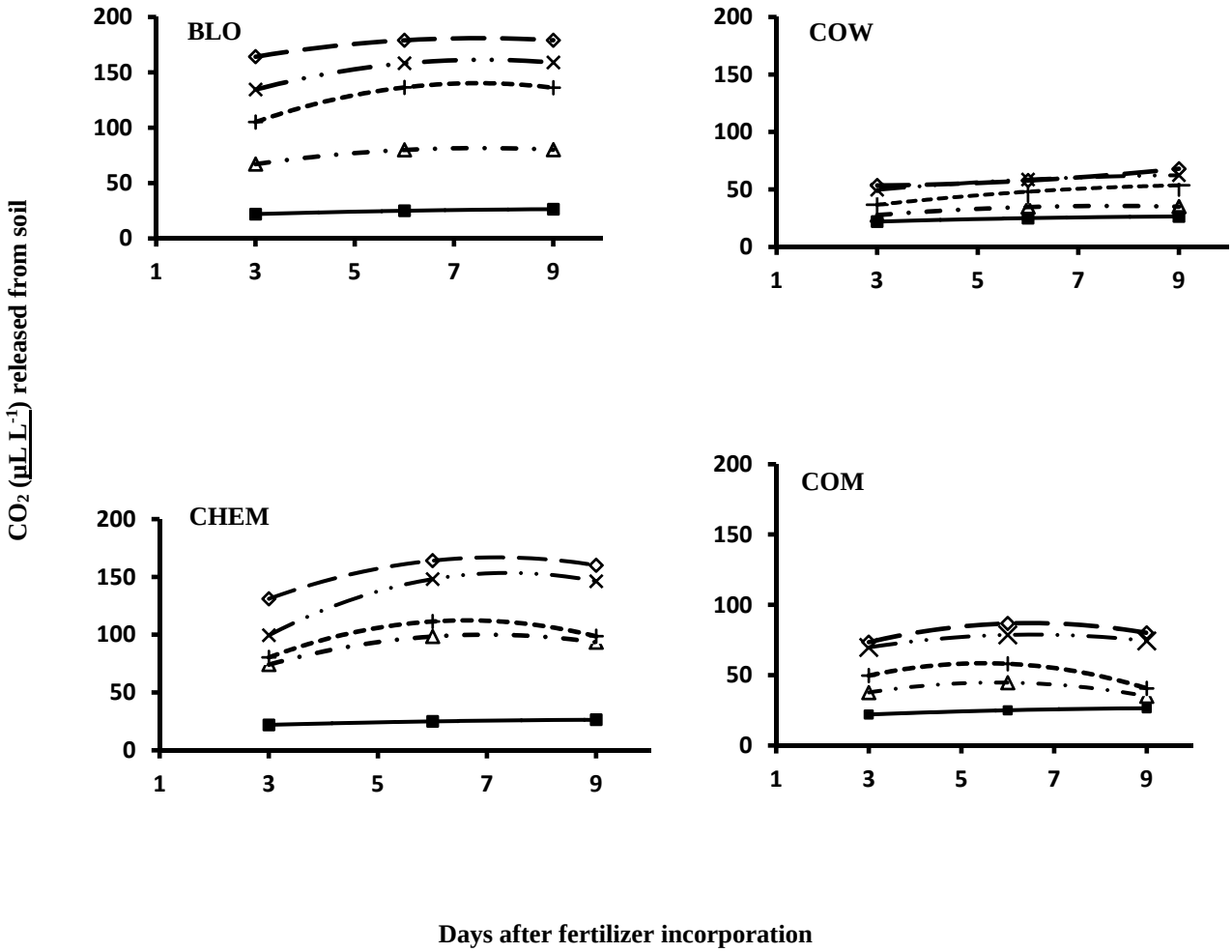

Figure 1**.** Carbon dioxide evolution measured by concentration in headspace following addition of fertilizers. ■0 N, △100 N, + 200, × 400, ◇ 800