Cauliflower Transplant Production Using Organic Media, 2008

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Introduction

Successful transplant production begins with selecting good growing media. Healthy vigorous transplants will be less susceptible to insects, diseases and transplant shock, leading to improved overall crop performance. Formulating organic potting mixes is especially challenging. Organic sources of nitrogen, such as compost, can be inconsistent. Compost chemical, biological and physical characteristics can change over time with storage; as a result, nitrogen (N) mineralization and availability to plants can be unpredictable. An alternative to traditional thermophillic compost is vermicompost. Vermicompost has more soluble nitrogen than thermophillic compost. Past research in the Rangarajan lab has shown improved transplant growth and crop yields with vermicompost compared to thermophillic compost. Other nutrient amendments in organic potting mixes may include alfalfa meal, soybean meal and blood meal. The object of this project is to create an improved potting media for organic vegetable transplant production. Here, we tested five different potting media for growth and productivity of cauliflower.

Transplant production

Cornell University now has an organically-managed greenhouse at the Guterman Research Facility. It is being operated to comply with all the NOFA-NY (local certifier) and NOP requirements. This greenhouse space was used for all organic transplant experiments.

Organic N amendments were added to two different base or background mixes, the Cornell base and a Grower's mix. The Grower's mix was Sunshine Organic Blend (SunGro) plus Fertrell 5-5-3 (12 lbs/yd^3). Sunshine Organic Blend ingredients are Canadian sphagnum peat moss, coarse grade perlite, gypsum, dolomitic lime, and a long-lasting wetting agent. The Cornell base mix consisted of sphagnum peat moss, coarse grade perlite, vermiculite and dolomitic lime (1.1 lbs/yd^3). Sphagnum peat moss was broken up in a soil mixer (Sprout Waldron, Model B-28, Muncy, PA) and placed in covered plastic barrels. A 70% peat, 15% vermiculite and 15% perlite mix was made in large quantities then lime was added as a separate step.

Vermicompost (Worm Power, Avon, NY) and blood meal mix (Fertrell, Bainbridge, PA) were added to both of the base mixes (Table 1). The transplant producer was interested in supplementing the Grower's mix with blood meal to improve plant growth. Treatment mixes were placed into 200-cell flats one week prior to seeding and watered. Before planting, sub-samples of all potting mix treatments were sent to the University of Massachusetts Soil and Plant Tissue Testing Laboratory, Amherst, MA, for chemical analysis (Table 2). Cauliflower seedling production started on May 22. Organic cauliflower seed cv. 'Cassius' (Seedway, Elizabethtown, PA) was planted in these mixes.

The plants were grown at 75º F day and 65º F nights. Plants were watered daily and no additional nutrients were added. Cauliflower plants were placed in a cold frame outside ten days prior transplanting. Plant growth during transplant production was assessed by measuring above ground dry biomass. Four plants were cut from each treatment at soil level on June 9, June 18, June 27, then dried and weighed,

Table 1. Organic transplant media evaluated for the production of cauliflower.

Treatment	Formulation
Grower mix	Sunshine SunGro Organic Blend plus Fertrell 5-5-3 (12 lbs/yd^3)
Grower mix plus Blood meal mix	Grower mix with blood meal, green sand and rock phosphate (7 lbs/yd^3)
Cornell base mix plus Dairy vermicompost 10% (v/v)	Cornell base mix plus dairy vermicompost
Cornell base mix plus Dairy vermicompost 10% (v/v) plus Blood meal mix	Cornell base mix plus dairy vermicompost and blood meal, green sand and rock phosphate (7 lbs/yd^3)
Cornell base mix plus Dairy vermicompost 20% (v/v)	Cornell base mix plus dairy vermicompost

On July 9, cauliflower was transplanted mechanically on a farm in Central New York. In-row spacing was 21 inches and between-row spacing was 30 inches. The grower added Neptune's Harvest fish emulsion (1 gallon/acre) and Vitazyme (13 oz. /acre) during transplanting. A midseason above ground biomass was recorded from field plots on August 5. Heads were judged as mature and harvested when 5 to 7 inch diameter, had creamy white curd color and wrapper leaves were starting to open. Because maturity was uneven, harvests occurred on September 19, 25 and October 9. First, whole plants were cut at the soil level, and weighed. Then, stems and leaves were trimmed and head weight and diameter recorded.

Results and Discussion

All treatment media had nutrient levels and analysis that was appropriate for vegetable transplant production (Table 2). Nitrate-N and ammonium-N were most affected by amendment choice (Table 2). Vermicompost increased nitrate-N by about 600 mg/kg when added to a mix. Blood meal increased ammonium-N by about 300 mg/kg when added to a mix.

Transplants with the highest biomass were grown in media amended with blood meal and 10% vermicompost (Figure 1). Doubling the vermicompost rate to 20% did increase plant biomass compared to controls, but the 10% vermicompost amendment was no different than the base mix. Plants grown in media amended with blood meal were significantly larger than controls by end of the growth period (Figure 1). Grower mix and Cornell base mix plus 10% vermicompost produced transplants of similar size (Figure 1).

Despite differences in transplant size, the plants quickly recovered in the field with no significant differences in midseason biomass (Table 3). This type of field recovery has been observed in tomato transplant trials as well.

Total above ground biomass, head yield, harvest index and head diameter per plant were not significantly different among treatments (Table 3). Transplant survival and crop development were highly variable and required three separate harvest dates. Low transplant survival overall prohibited an accurate assessment of treatment performance.

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Table 2. Nutrient analysis of organic potting media 2008.

Media	Bulk density(g/ cm3)	Coarse frag	pH	EC (ds/M)[y]	% total N	mg/kg Nitrate-N	mg/kg Ammonium-N	% OM	% Estimated organic C	Carbon/ N ratio
Grower's mix	0.15	3.5	6.4	2.25	0.97	198	233	55.9	30.2	31.1
Grower's plus BM [z]	0.22	8.2	6.8	1.93	1.07	200	526	56.8	30.7	28.7
Cornell base plus 10% vermicompost	0.19	4.5	5.1	1.99	1.3	688	52	59.7	32.2	24.8
Cornell base plus 10% vermicompost plus BM	0.31	5	6.4	2.74	1.85	608	359	57.3	30.9	16.7
Cornell base plus 20% vermicompost	0.31	5	6.2	4.61	1.95	1302	58	63	34	17.4

[y]dS/m =1mmho/cm = 1 mS/cm = 1000 uS/cm

[z]BM equals Blood meal, rock phosphate and green sand (7 lbs/yd^3 of each)

Table 3. Organic Cauliflower Transplant Size and Yield per Plant Grown in Five Media, 2008.

Media	Mid season dry wt(g)	Plant[x] wt (kg)	Trimmed wt(kg)	Avg Diameter (cm)	Harvest Index[y]
Grower mix	5.23[z]	2.0	1.0	18.0	0.47
Grower mix + bloodmeal mix	8.54	2.2	1.1	18.6	0.49
Cornell base mix + 10% vermicompost	4.98	2.0	0.9	18.1	0.47
Cornell base mix + 10% verm + bloodmeal mix	8.63	2.0	1.0	16.3	0.50
Cornell base mix + 20% vermicompost	6.77	2.1	1.1	19.5	0.49

Seeds were sown on 5/22/08 in 200 cell trays and were grown at 75º Fday and 65º F night temperatures. Cauliflower was transplanted on 7/9/08.

[x] Harvested on 9/19, 9/25 and 10/9.

[y]Harvest index is trimmed weight divided by total above ground biomass.

[z]Treatments were not significantly different ($p =< 0.05$).

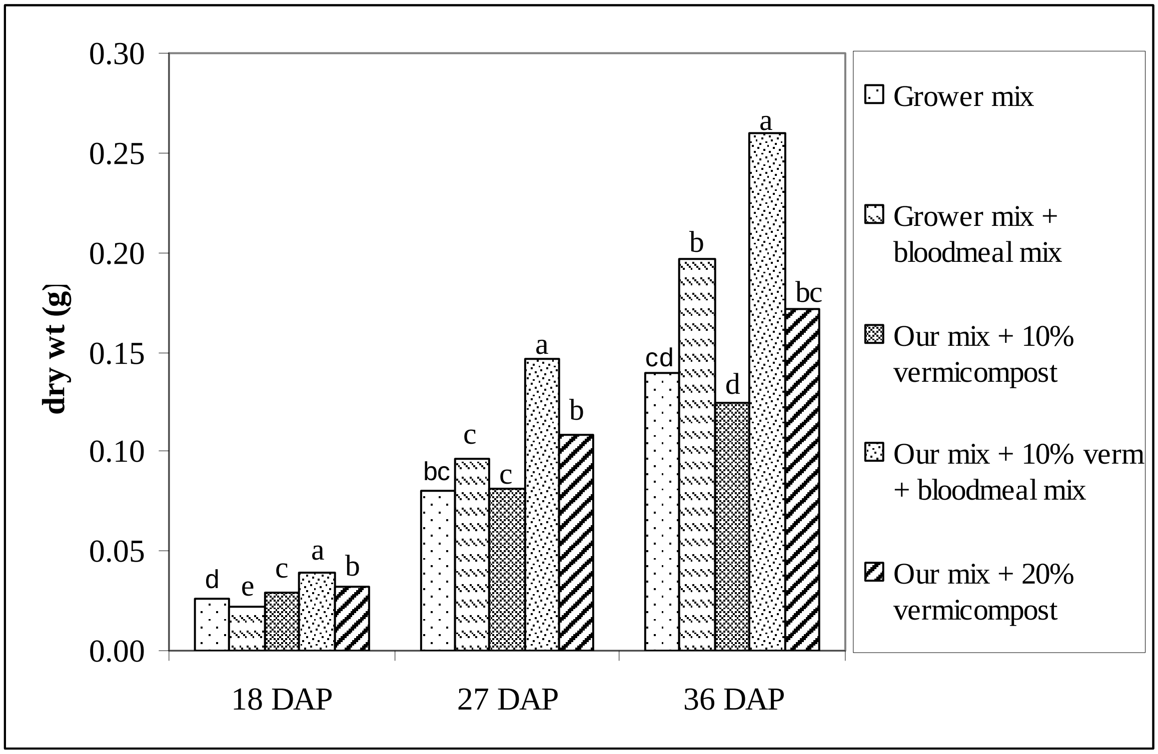

Figure 1. Seeds were sown on 5/22/08 in 200 cell trays and were grown at 75º F day and 65º F night temperatures. DAP = days after planting cauliflower seed. Columns labeled by a different letter on the same plant date are significantly different at $p<0.05$.

Figure 1. Blood meal enhances transplant growth when amended to grower's transplant mix. A. Grower's mix, B. Grower's mix + 7 lb. blood meal. 19 DAP

Figure 2. A. Cornell base mix, B. Cornell base mix + 7lb blood meal, C. Cornell base mix + 10% vermicompost, D. Cornell base mix + 10% vermicompost + blood meal. 19 DAP

Figure 3. Six row transplanter and individual cauliflower transplant.

Figure 4. Experimental plots immediately after transplanting.

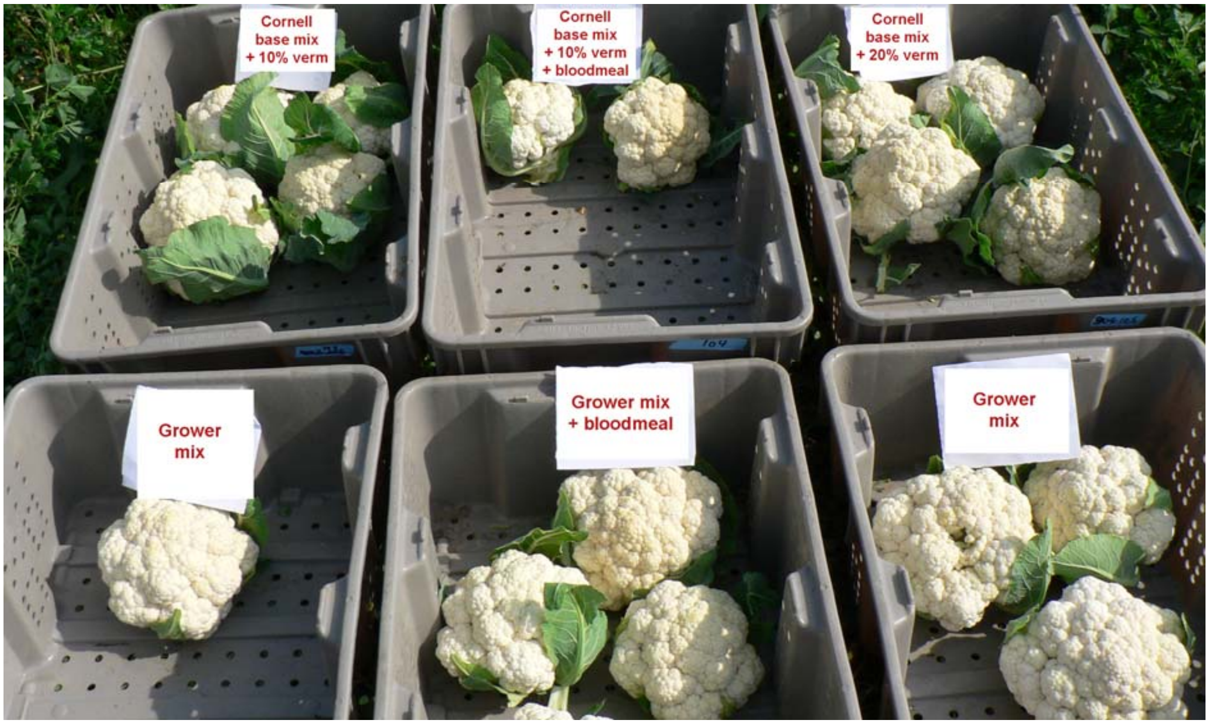

Figure 5. Cauliflower plants were transplanted on 7/9/08 and harvest on 9/25/08. Head labeled Grower mix on bottom left was produced from a transplant grown at 75º F day and 65º F night temperatures. Heads on the bottom right were produced from a transplant grown at 75º F day and 55º F night temperatures.