HS-803

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Budless Tomato Transplants[1]

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Budless Tomato Transplants

The loss of apical meristem function in tomato transplants has been present in Florida for many years (Figure 1). Variously called budless, headless, or topless by transplant growers, it may be related to blindness in brassicas, "leaf distortion" in bedding plants, or bud abortion in roses, impatiens, and geraniums.

Figure 1. Five week old budless tomato transplant exhibiting loss of apical meristem.

The budless tomato phenomenon occurs predominantly during mid-October to early January production and is often not readily visible by casual observation. Furthermore, budless plants may be shipped to the field and go unnoticed by the receiver. However, about 30 days after planting, when the crop is pruned, it becomes apparent that the terminal bud is missing. Following pruning, the leaves that are present on the plant may display symptoms reminiscent of 2, 4-D injury (i.e., twisting, downward aspect).

Budless plants have shown up as soon as 12 days after seeding. When observed early, new growth appears slowed or retarded rather than exhibiting actual loss of the apical meristem. Terminal growth continues and will produce up to 5 - 7 leaves before completely stopping. Leaves that are produced prior to loss of apical function seemingly expand and grow normally. Loss of apical meristem activity is imminent when the newest emerging leaf appears sickle shaped and has a deep purple coloration. The cessation of terminal growth does not appear to be associated with necrosis; it simply just stops. Once recognized it is quite likely that the transplant producer will ship several budless crops. After several months the condition will simply go away.

Electron microscopy clearly reveals that normal tomato plants can begin floral initiation as early as 4 weeks after seeding. In budless tomato plants, however, floral initiation has yet to develop even at 8 weeks after seeding (Figures 2 and 3).

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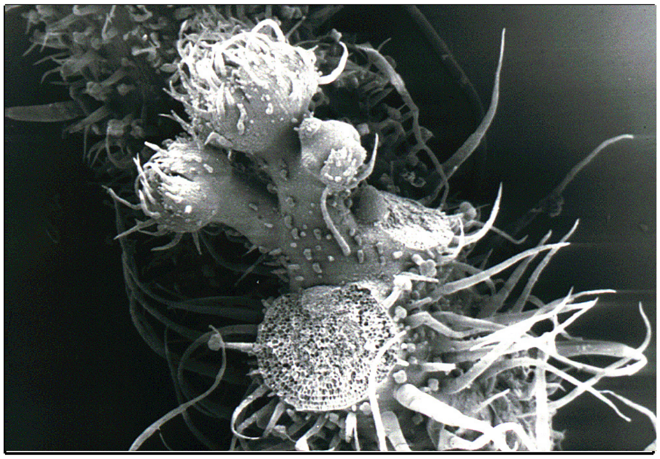

Figure 2. Micrograph of normal bud 8 weeks after seeding, note floral initials and leaf scars. Credits: Hazel Wetzstein, University of Georgia

Figure 3. Micrograph of budless tomato 8 weeks after seeding, note diminished apical meristem (center) and lack of floral initials. Credits: Hazel Wetzstein, University of Georgia

The budless condition appears random, being prevalent some years and absent other years. It may affect some growers and not others. Budlessness may differ in severity across the afflicted production facilities, ranging from a small percentage to over 90%. Most growers believe it is neither cultivar- nor media-specific and it has been found in cherry, plum, and round tomatoes. Australian tomato transplant growers have indicated the budless condition occurs in their spring transplant crop (personal communication).

Due to the erratic appearance of budless tomato transplants, it has been difficult to set up experiments aimed at determining a cause. However, information has been gleaned from experiments that were in progress when budlessness spontaneously appeared.

Figures 4 and 5 are based on data taken from experiments designed to determine fall nitrogen requirements for fresh-market tomato transplants (Vavrina, 1993.) Increasing the rate of nitrogen apparently reduced the expression of budless and/or retarded bud growth. The most influential effect of the N increase on the reduction of budlessness occurred in the 0 to 30 ppm N range.

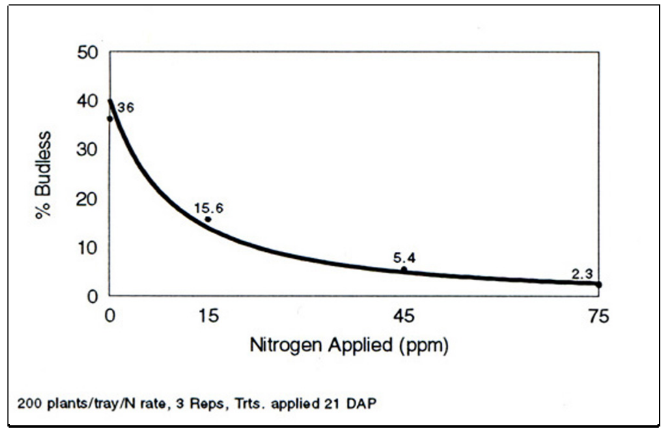

Figure 4. Budless expression in tomato transplant as effected by fertilizer nitrogen rate.

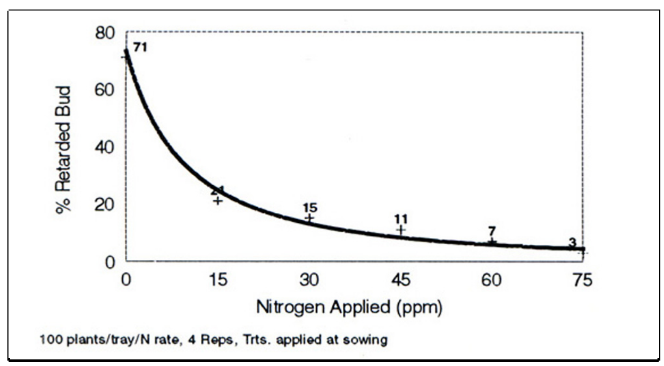

Figure 5. Retarded bud expressionin tomato transplants as effected by fertilizer nitrogen rate.

A study designed to determine the effect of pre-plant nutrient additions to a peat/vermiculite transplant medium showed that phosphorus (P) may play a role in the amelioration of the budless condition in tomato (Table 1). Phosphorus additions dramatically reduced absolute budlessness, but were not effective in reducing accompanying retarded growth of the meristem. Yet more leaves were produced on tomato plants receiving P than on those receiving similar treatments not containing P.

Growers who receive budless tomato transplants are encouraged to reduce pruning to a minimum (Vavrina, 1993). Typically, fresh market tomatoes are pruned of 4 - 6 suckers (i.e., axillary meristems) prior to or just after staking and tying. Without a functioning apical meristem, these lateral meristems would assume the role of redirecting floral initiation and subsequent vertical growth. If removed by pruning, lateral meristem influence on growth would also be interrupted; resulting in delayed fruit production and lower yields (Table 2).

Most recently, Wurr et al. (1996) suggested a temperature by light interaction (high temperature and low light) as a possible cause for blindness in brassicas, but did not provide conclusive evidence to support this claim. These authors stated that broccoli tended to "go blind" mid-February through mid-March. Mid-October tomato transplant production may be subject to the same light intensity and quality as those suggested to "cause" blindness in brassicas. Consistently decreasing temperatures during this time slot may also impact the phenomenon. Wurr et al. (1996) indicated that other researchers working in the area of apical dominance loss have considered carbohydrate to N ratio, hormonal factors, N nutrition, B/Mn/Mg deficiencies, low light /low temperature/pruning, and competition for and distribution of assimilates as possible causes of apical meristem function loss.

Although the cause of and cure for budless tomato transplants have not yet been confirmed, transplant growers should be diligent in observing their crop during the October production slot. If budlessness occurs, the producer should inform the receiver of the condition so that the receiver may prune his crop appropriately.

Transplant growers are encouraged to contact this author if and when budless tomatoes are observed in either field plantings or the plant house. A cooperative effort between growers and university personnel may shed new light on the phenomenon of budless tomatoes

Literature Cited

Vavrina, C.S. 1993 Budless tomato plants: Nitrogen in the house and yield in the field. Florida Vegetable Transplant Growers New 4(1): 2-4.

Wurr, D.C.E., A.J. Hambridge and G.P. Smith. 1996. Studies of the cause of blindness in brassicas. J. Hort. Sci. 71(3): 415-426.

Table 1. Phosphorus effect on budless/retarded bud expression.

Treatment	% Budless	% Retarded Bud	% Normal	# True Leaves
Control	55.1 ab	44.2 bc	0.7 c	2.0 d
+ $CaCO_3$	65.4 a	34.6 c	0.0 c	2.0 d
+ Super P	4.6 d	89.4 a	6.1 ab	3.2 a
+ Trace	36.1 bc	63.0 b	0.9 c	2.0 d
+ $CaCO_3$/P	3.3 d	92.9 a	3.8 bc	2.5 b-d
+ $CaCO_3$/Trace	35.6 c	63.1 b	1.3 c	2.2 cd
+ P/Trace	6.2 d	85.5 a	8.3 a	3.0 ab
+ $CaCO_3$/P/Trace	4.0 d	93.5 a	2.5 bc	2.7 a-c
LSD 0.5	19.6	19.3	4.3	0.5

*Results from trial on media nutritional addtitions run fall 1996.

Table 2. Field pruning effect on budless/retarded bud plant yield, Fall 1992 (z).

# Suckers Pruned	XL Fruit Number	XL Fruit Weight[y]	Total Fruit Number	Total Fruit Weight	Ave. Fruit Weight
Control[x]	6.9 a	3.86 a	7.6 a	4.14 a	0.54 b
0	5.4 ab	3.08 ab	5.9 bc	3.24 ab	0.54 b
2	5.8 a	3.46 ab	6.2 ab	3.63 a	0.57 ab
4	4.2 b	2.59 b	4.4 c	2.67 b	0.60 a
LSD 0.05	1.6	0.96	1.6	0.97	0.04

[z] Field trial was commercially picked prior to second experimental harvest. Data from 5 plants/rep, RCB design, 6 Reps.
[y] All weight in pounds.
[x] Control showed no expression of budless or retarded symptoms and was unpruned.