

Reducing Seawater Flood Damage to Vegetable Plants

Joseph Masabni, Youping Sun, Genhua Niu*

Seawater flooding caused by hurricanes can devastate home gardens and commercial crops. To minimize the damage, gardeners and farmers can take steps before and after a storm:

- At the start of the growing season, plant the types of vegetables that tolerate salt best.
- After seawater has flooded an area, decide whether to keep or replant the crop, based on the type or variety of vegetable planted and the kind of contamination in the water.
- If the floodwater also contained sewage or animal carcasses, remove all of the plants to avoid infection by disease-causing bacteria and viruses.
- Once the plants have been removed, flush the salts from the soil by plowing the ground and rinsing the soil repeatedly with fresh water.

Texas A&M AgriLife researchers studied the effects of flooding with simulated seawater on vegetable plants. Of the 10 types of vegetables grown, the most tolerant of saltwater flooding were eggplant, spinach, and tomato plants. Less tolerant were broccoli, kale, and two varieties of radishes. The least tolerant were bok choy, Chinese cabbage, and cucumbers.

In the study, seeds of 10 vegetables were sown in a greenhouse and the plants allowed to grow for 4 weeks (Fig. 1). Next, two sets of these seedlings were put in a tub and flooded—one with saltwater and the other with tap water. The flooding immersed the soil but did not touch the leaves. A third group of seedlings was not flooded; it served as the control group.



Figure 1. Seedlings immediately before flooding



Figure 2. Seedlings 2 weeks after flooding with salt water

* Assistant Professor and Extension Horticulturist (Vegetables), Texas A&M AgriLife Extension Service; Research Associate and Associate Professor, Texas A&M AgriLife Research, The Texas A&M University System

The flooded seedlings were moved out of the tub 24 hours later. Then all of the plants were placed on greenhouse benches and allowed to grow for another 12 days.

During that period, the vegetables flooded with tap water grew just as well as the plants not flooded. In contrast, all of the plants flooded with saltwater showed symptoms of injury, and the bok choy and cucumbers were dead (Fig. 2). The saltwater-flooded plants were shorter (Table 1) and weighed less (Table 2) than the other two groups. The crops most likely to survive were eggplant, spinach, and tomato.

Leaf damage after saltwater flooding was minimal for broccoli, kale, and tomato plants; it was slight for eggplant and spinach plants; and moderate for the radishes and Chinese cabbage (Table 3). However, the saltwater damaged more than 90 percent of the ‘Red Crunchy’ radish leaves.

Any period of saltwater flooding will reduce a crop’s yields. The gardener or farmer must decide whether to accept a smaller harvest of eggplant, spinach, and tomato or to dig up and replant them.

Table 1. Effect of saltwater flooding on the increase in height of 10 types of vegetables. The relative reduction was calculated as the percentage of the unflooded group’s height.

Vegetable	Plant height		
	No flooding (cm)	Simulated seawater (cm)	Relative reduction (%)
Bok choy	23.7	Dead	Dead
Broccoli, ‘Packman’	12.4	7.0	43.9
Chinese cabbage, ‘Kaboko’	19.9	5.7	63.4
Cucumber, ‘Spring Swallow’	39.1	Dead	Dead
Eggplant, ‘Amadeo’	24.6	16.4	33.3
Kale, ‘Winterbor’	12.6	5.6	55.7
Radish, ‘Cherry Belle’	23.3	17.1	26.8
Radish, ‘Red Crunchy’	20.2	10.5	48.0
Spinach, ‘Palco’	15.4	10.4	33.6
Tomato, ‘Mega Bite’	14.5	8.7	37.7

The research indicated that the other seven types of vegetables studied are best removed and the crop replanted.

Table 2. Effect of saltwater flooding on the increase in fresh weight of 10 vegetables. Fresh weight (g) was recorded at the end of experiment. Relative reduction was calculated as the percentage of the unflooded group’s weight.

Vegetable	Fresh weight		
	No flooding (g)	Simulated seawater (g)	Reduction (%)
Bok choy	92.5	Dead	Dead
Broccoli, ‘Packman’	50.2	15.3	69.6
Chinese cabbage, ‘Kaboko’	93.6	9.5	87.2
Cucumber, ‘Spring Swallow’	30.6	Dead	Dead
Eggplant, ‘Amadeo’	15.6	6.7	53.8
Kale, ‘Winterbor’	45.2	13.2	68.2
Radish, ‘Cherry Belle’	66.4	18.2	72.6
Radish, ‘Red Crunchy’	66.2	12.3	81.5
Spinach, ‘Palco’	20.1	10.7	40.5
Tomato, ‘Mega Bite’	25.5	9.6	59.6

Table 3. Effects of saltwater flooding on the appearance of 10 types of vegetables. The visual score rated leaf edge burn, leaf discoloration, and leaf death.

Vegetable	Visual score*	
	No flooding	Simulated seawater
Bok choy	5	0.0
Broccoli, ‘Packman’	5	4.8
Chinese cabbage, ‘Kaboko’	5	1.8
Cucumber, ‘Spring Swallow’	5	0.0
Eggplant, ‘Amadeo’	5	3.9
Kale, ‘Winterbor’	5	4.6
Radish, ‘Cherry Belle’	5	2.2
Radish, ‘Red Crunchy’	5	0.6
Spinach, ‘Palco’	5	3.5
Tomato, ‘Mega Bite’	5	4.0

*Leaf damage on a 0–5 scale, 0 = dead; 1 = severe (over 90%); 2 = moderate (50%–90%); 3 = slight (<50%); 4 = minimal; and 5 = none visible

Texas A&M AgriLife Extension Service

AgriLifeExtension.tamu.edu

More Extension publications can be found at *AgriLifeBookstore.org*

Texas A&M AgriLife does not discriminate on the basis of race, color, religion, sex, national origin, disability, age, genetic information, veteran status, sexual orientation or gender identity and provides equal access in its programs, activities, education and employment.

The Texas A&M University System, U.S. Department of Agriculture, and the County Commissioners Courts of Texas Cooperating.