

Tips and Tricks for Summer-Harvested Broccoli and Cauliflower

In a world where customers expect any product at any time, the seasonality of vegetable production is constantly being expanded. But, it can be hard to produce quality heads of broccoli and cauliflower in the summer time. With the heat, head formation becomes lumpy, fuzzy, discolored, less uniform or predictable, and sometimes they bolt straight to setting seed. The blame for bolting brassicas is often placed on warm temperatures, but the true trigger is often the cold.

Brassicas are adapted to cooler environments, and are mostly winter annuals or biennials. That means that they typically need to experience some accumulation of chill hours to go reproductive and flower, called “vernalization”. We don’t typically want that to happen in a standard production cycle for crops like cabbages, choys, kohlrabi, Brussels sprouts, kale, collards and other spicy greens like arugula. The same goes for the Brassica root crops like turnips, rutabagas, and radishes. But we do want that to happen for broccoli and cauliflower (including Romanesco types). At least, we want them to *start* making flowers.

The broccoli and cauliflower heads that we harvest are an elaborate scaffolding to support hundreds of tiny white and yellow flowers. The process to reach that point begins when plants are small, in their “juvenile period”. Broccoli becomes receptive to chill hours after they have 4 leaves, and cauliflower accumulates chill hours between 4 and 12 leaves. Once at the juvenile stage, broccoli then needs to accumulate 2-4 weeks of temperatures below 60-70 F, depending on variety. Cauliflower needs 1-6 weeks and can vernalize with temperatures into the 80’s, depending on variety. If cauliflower (and Romanesco) gets too big before getting enough chill hours, they won’t make a head. You will get a lot of leaves with nothing in the middle.

If vernalization happens too early in the spring before the broccoli or cauliflower plants are large enough to support a commercially acceptable product, this is called buttoning. These tiny little heads can also form on plants stunted by cabbage maggots because they vernalize but are suppressed from getting big by the maggots. Conversely, the quality and bolting issues that occur in summer broccoli and cauliflower happens after a properly-timed vernalization period at the right juvenile stage, but is driven by heat stress. The plants are primed and ready to go reproductive in parallel with the weather. In the summer, they can be stimulated to race through head formation to immediately create flowers in response to hot temperatures. In the fall, this is a slower and more predictable process.

So, the ideal schedule for raising broccoli and cauliflower is to maintain seedlings above 70-ish F in the greenhouse, above their vernalizing temperatures. Then transplant them early enough to accumulate vernalizing temperatures below 70-ish F at night and on cool days, with enough warmer daytime temperatures to encourage vegetative growth over a few weeks to initiate flower stalk formation at a gradual pace.

Some ways to reign in rapid flowering are to limit daytime high temperatures experienced by the plants. In organic systems, plants benefit from the shading created by low tunnel insect nettings that are deployed to prevent flea beetles and caterpillars from ravaging plants. In baresoil systems, overhead irrigation, or soil-wetting drip irrigation can generate a short-lived micro-climate of cooler air from evaporation of the applied moisture. In plasticulture systems, white-on-black plastic (white side up!) reflects far less radiant heat than standard black plastic mulch, and some growers will lay white plastic rows first for their spring plantings so that plants forming heads later that summer do not heat up too much, and then lay black plastic for their summer plantings to encourage a little more heat later in the fall to push head formation along. However, planting into black plastic mulch mid-summer can result in higher transplant stress and death. White-on-black plastic is a good option all season for broccoli and cauliflower. You can harvest a summer broccoli or cauliflower and replant cucumbers or zucchini right into the same mulched rows for fall supply when spring plantings get too beat up.

Combining some of these horticultural ideas with a good variety bred for the harvest window is a winning combination. Resources released by the Eastern Broccoli Project, Sakata, Enza Zaden and Johnny’s make variety selection easier. Broccoli varieties that might work well for the summer slot are Abrams, Bay Meadows, BC1764, Belstar, Burney, Diplomat, DuraPak16, Eastern Crown, Emerald Crown, Imperial, Lieutenant, SV2062, and Tradition. Cauliflower varieties that might work well for the summer slot are Alcalá, Bishop, EarliSnow, Flamenco, Moonshine, Melrose, Nebula, Paxton, Prestique, Puntoverde (Romanesco type), Snow Crown, Synergy, and Twister.

You *must* harvest in the morning to maintain quality in the summer time, and maintain them in covered containers or shade to limit them from heating up. Depending on your market, broccoli and cauliflower benefit from additional cooling to 35 F with cold water, forced air, ice slurries or vacuum and a cold chain from the farm on through distribution channels. Sturdy waxed packaging is an important component of these post-harvest and market systems.



Typical heat stress symptoms in broccoli can all be seen in these heads. In most varieties, uneven bead sizes and colors produce irregular florets growing at different rates (left). Sometimes the bead size and color disparity were highly patterned when the heat comes later in head development (right). Bract leaves growing through the head is a common symptom in all broccoli.



Typical heat stress symptoms in cauliflower are more subtle, but include pinkish-purple discoloration (left), and worm-like growths on the curds (right) that are analogous to bead size differences in broccoli. Note, the brown spotting on the head to the left is bruising from being placed upside down in the harvest bins, but a purple hue surrounds that area of the head. Bracts through the heads is much less common in cauliflower, but does happen in extreme situations.