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Pruning Determinate Tomatoes

Amy Ivy—ENYCHP

Determinate tomatoes have a bushy growth habit that is best managed using the stake and weave system. Minimal pruning is necessary but some is helpful. The tomatoes in this picture, taken in mid-June, would benefit from some thinning to make harvesting more efficient as the plants continue to grow this summer, but how much is enough?

Up close, these tomatoes have very dense growth towards the tops of the plants. Some light thinning of the largest leaves and a few shoots would help. If time allows, more of the lowest leaves could also be removed so that none touch the ground and air can flow more freely under the plants.

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These determinate tomatoes are pruned too heavily. Indeterminate tomatoes can be pruned very hard since they will continue to grow and set fruit. Determinate tomatoes have a 'determined' amount of growth and do best when pruned lightly and kept more like a bushy hedge.

Phosphite Fungicides for Potatoes

Submitted by Crystal Stewart—ENYCHP

Here is a great article from the Univ. Wisconsin Vegetable Crop Update from June 10, 2017 posted by Amanda Jane Gevens. We have seen mixed results with phosphorous acid fungicides for different diseases but when it does work, it seems to do a good job.

Considering Phostrol (and other like fungicides) for Potato Disease Control

How do the phosphorous acid fungicides differ from phosphoric acid compounds?

Both phosphor**ic** acid (H3PO4) and phosphor**ous** acid (H3PO3) are agrochemicals useful in crop production. Under normal plant growth conditions, both agrochemicals dissociate and exist as corresponding anions, **phosphate** and **phosphite**, consecutively.

The distinction between the two: phosphate is a nutrient source of P essential for plants, and phosphite helps control diseases caused by oomycetes (water mold pathogens). Phosphate and phosphite are not equivalent inside the plant. Phosphoric acid or phosphate cannot function as phosphorous acid or phosphite and *vice versa*. Since phosphites are systemic and very stable in plants, they should not be applied frequently. To manage the development of phosphite-resistant oomycetes, care should be taken to alternate or mix phosphites with other effective fungicides. The fungicide labels for phosphorous acids typically do not provide a season limit per acre/crop because they are exempt from the requirement of tolerances.

How do phosphorous acids work as fungicides?

Phosphorous acids can control diseases caused by oomycete (water mold) pathogens such as *Phytophthora erythroseptica* (pink rot) and *Phytophthora infestans* (late blight). Pythium is typically not controlled with phosphorous acids. These pathogens are fungus-like but differ in their cell wall structure and nuclear contents of cell walls.

Phosphorous acid has both direct and indirect effects on oomycetes. It directly inhibits a particular process in the metabolism of oomycetes; it indirectly stimulates the plant's natural defense response against pathogen attack in a systemic (xylem and phloem) manner. It should be noted, however, that even though this group of fungicides is considered at low risk for resistance development in the pathogens (FRAC Group 33), that phosphonate-resistant oomycetes have been reported.

Phosphorous acid compounds including Phostrol, Prophyt, Rampart, FungiPhite, K-Phite, Fosphite, Phiticide (Crop-phite), Confine Extra, and Alude can be very effective in managing pink rot and late blight of potato, especially in the case of Ridomil-resistant mefenoxam/metalaxyl-resistant) late blight or pink rot strains. I provided 2 figures, below, from Dr. Jeff Miller's research farm (2010) which demonstrated pink rot control and yield preservation with use of phosphorous acid fungicides applied at dime-size (DS) tuber and in 2 subsequent applications (DS + 2 weeks and DS + 4 weeks). In my own research with Phostrol at the UW-Hancock ARS, we have never seen yield reductions with use as a foliar fungicide. We have tested various timings (single applications up to 10 applications) and rates (up to 10 pint/acre for each application) of Phostrol for observation of plant health and post-harvest oomycete disease control. In summary of results, a 3 to 5 treatment program, initiating at DS tuber, followed by treatments every subsequent 2 weeks, at rates between 7.5-10 pt/acre were successful in limiting tuber late blight and pink rot.

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In our post-harvest treatment trials with Phostrol at the UW Hancock Storage Research Facility, we have consistently seen strong control of late blight, pink rot, and silver scurf. It is critical that the treatment is applied in as little carrier water as possible (at most 0.5 gal/ton tubers) so that the tubers do not appear wet, but rather just lightly misted with the phosphorous acid fungicide.

Results can be found throughout the Wisconsin Potato Educational Conference Proceedings from recent years (link following).
http://www.plantpath.wisc.edu/wivegdis/#

What are the concerns with using phosphorous acid fungicides?

Phosphorous acid fungicides are not great contact fungicides and their use does need to be accompanied by application of a base protectant (mancozeb or chlorothalonil) or other fungicide to target control of early blight and late blight.

There have been reports of phytotoxicity from phosphorous acid use. This has been a challenging condition to recreate in research plots. In my UW-Hancock ARS trials with Phostrol, spanning 3 years, we saw phytotoxity only **once** under conditions of heavy leaf wetness followed by very intense sunshine/UV (no clouds in sky). In Idaho, Dr. Miller has attempted to recreate phytotoxicity through various application approaches and mixes and his results indicated lack of consistency in the resulting condition. However, he noted that he has only seen phytoxicity occur with early morning phosphorous acid applications and not at all with chemigated applications.

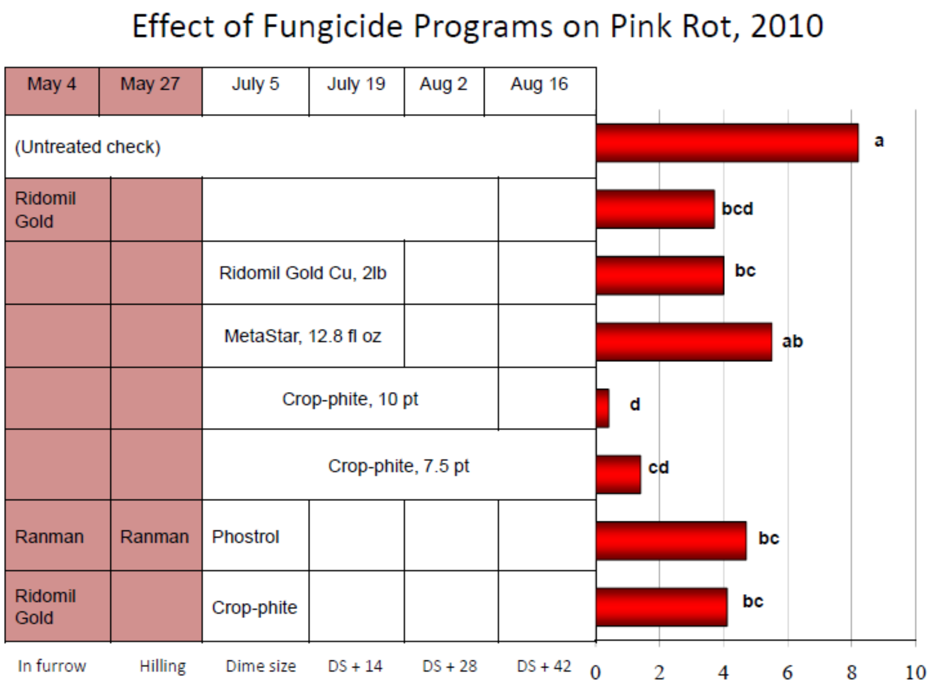
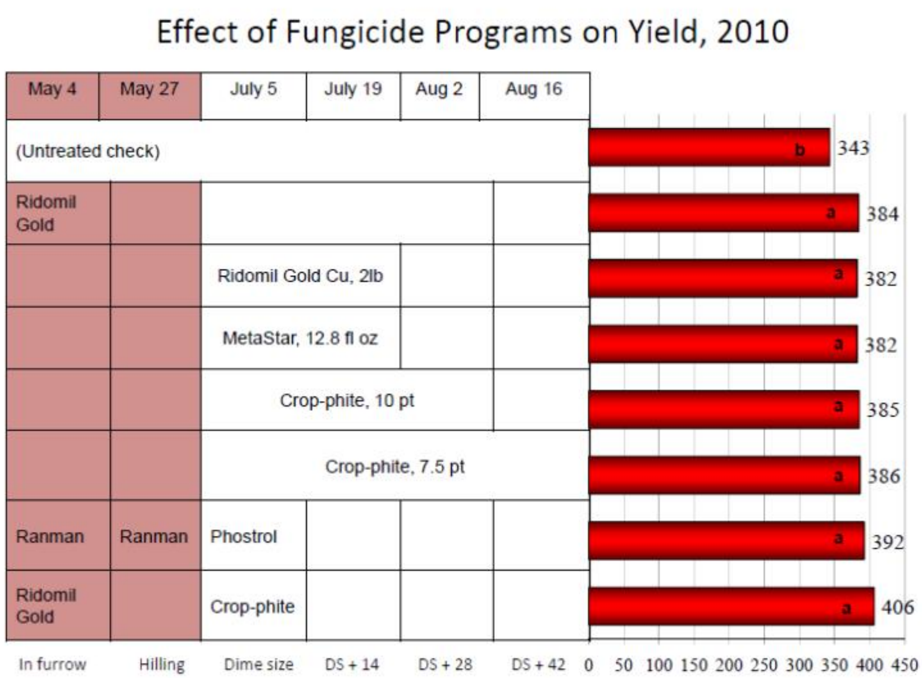


Figure 1. Effect of fungicide programs in controlling pink rot on potato tubers. Miller, Miller, Taysom, & Anderson, Managing Pink Rot, Online Powerpoint from 2012 IPC Pink Rot Miller Research LLC. Note: Crop-phite and Phostrol are phosphorous acid fungicides.



Post-harvest applications can be highly effective in managing late blight, pink rot, and silver scurf.
Studies have indicated that treatment on seed potatoes entering storage is safe and does not change seed performance. Phosphorous acids should not be applied to short dormancy varieties that may be sprouting at the time of harvest. The treatment can burn the growth points and result in tuber wounds that are susceptible to secondary infection and breakdown in the pile.

Figure 2. Effect of fungicide programs on yield. Miller, Miller, Taysom, & Anderson, Managing Pink Rot, Online Powerpoint from 2012 IPC Pink Rot Miller Research LLC. Note: Crop-phite and Phostrol are phosphorous acid fungicides. CWT per acre

Botrytis in High Tunnel Tomatoes

Amy Ivy- ENYCHP

Botrytis (*Botrytis cinerea also called gray mold)* is mostly a problem for high tunnel tomatoes in the cooler periods of spring and fall, especially when growers keep their tunnels closed up more than usual in an attempt to keep the plants a bit warmer during those chilly, cloudy days. Temperatures between 65 and 75, combined with high humidity (over 80%) and cloudy weather all favor this disease. Gable end vents may let hot air escape on a sunny day but fresh air needs to come in through the sides and/or ends of the tunnels to drive out humidity and create drier conditions that are less conducive to botrytis. Conventional growers can use Scala fungicide, but the best practice of all is to increase ventilation to decrease humidity.

Characteristic 'Ghost Spotting' on tomatoes caused by *Botrytis cinerea*. Photo by Amy Ivy

Botrytis causes a few key symptoms on tunnel tomatoes: ghost spotting on the fruit, blossom blast (death), stem lesions that start in rough pruning wounds, and death of the terminal leaflet in random leaves.

Blossom blast can be caused by many factors; botrytis is just one. Other factors that can cause blossom blast are temperatures over 90 or under 55, water stress, and/or high humidity. All are ameliorated with ventilation which means fresh air exchange as described above.
For more information about botrytis in high tunnels visit: http://u.osu.edu/hightunneldiseasefacts/tomato-diseases/botrytis-grey-mold/advanced/

Corn Smut Infecting Sweet Corn Leaves

Ethan Grundberg- ENYCHP

Though usually found on kernels, the fungus *Ustilago maydis* is causing corn smut in a few early sweet corn fields. Foliar infections of corn smut are, indeed, less common, but not surprising given the heavy rains and hail that have fallen this spring. Fungal spores can survive in the soil for several years and are splashed or blown up onto corn plants where they infect tissue through existing physical wounds (often caused by the same heavy rain or hail responsible for splashing). As seen in the images included here, the foliar symptoms are similar to those seen in infected kernels: large, puffy, grayish growth that will turn darker in color as the fungus begins to create wind-dispersed spores.
There are no fungicidal treatments that are effective at managing corn smut, so cultural controls must be used to reduce its incidence. Infected plants should be pulled and either burned or buried deeply to prevent sporulation and lower the risk of infection of later plantings. Some early varieties, like Sweet Rhythm and Candy Corner, have intermediate resistance to corn smut. Longer season varieties like Xtra Tender 277 (tr), Silverado, and Lancelot have demonstrated high tolerance to smut. Limiting foliar and silk feeding by insect pests, like, corn flea beetles, European Corn Borer, and Corn earworm, can reduce the number of potential entry points for spores to infect plants.

Cole Crops Disorders

Gordon Johnson– University of Delaware Extension

Cole crops, including cabbage, broccoli, cauliflower, Brussels sprouts, collards, kale, and kohlrabi are important fall crops in the region. The following are some common disorders that affect these crops and their causes.

Tipburn of Cauliflower, Cabbage, and Brussels Sprouts
This problem can cause severe economic losses. Tipburn is a breakdown of plant tissue inside the head of cabbage, individual sprouts in Brussels sprouts, and on the inner wrapper leaves of cauliflower. It is a physiological disorder which is associated with an inadequate supply of calcium in the affected leaves, causing a collapse of the tissue and death of the cells. Calcium deficiency may occur where the soil calcium is low or where there is an imbalance of nutrients in the soil along with certain weather conditions. (High humidity, low soil moisture, high potash and high nitrogen aggravate calcium availability). Secondary rot caused by bacteria can follow tipburn and heads of cauliflower can be severely affected. Some cabbage and cauliflower cultivars are relatively free of tipburn problems.

Figure 1- Open beads and uneven floret development in broccoli.

Boron Deficiencies- Cole crops have a high boron requirement. Symptoms of boron deficiency vary with the cole crop. Cabbage heads may simply be small and yellow. Most cole crops develop cracked and corky stems, petioles and midribs. The stems of broccoli, cabbage and cauliflower can be hollow and are sometimes discolored. Cauliflower curds become brown and leaves may roll and curl.

Hollow Stem in Broccoli and Cauliflower Not Caused by Boron Deficiency- This condition starts with gaps that develop in the tissues. These gradually enlarge to create a hollow stem. Ordinarily, there is no discoloration of the surface of these openings at harvest but both discoloration and tissue breakdown may develop soon after harvest. Some cultivars of hybrid cauliflower and broccoli may have openings from the stem into the head. Both plant spacing and the rate of nitrogen affect the incidence of hollow stem. Hollow stem increases with wider spacings and as the rate of nitrogen increases. The incidence of hollow stem can be greatly reduced by increasing the plant population.

Cabbage Splitting- Cabbage splitting is mainly a problem with early cabbage. A problem can develop when moisture stress is followed by heavy rain. The rapid growth rate associated with rain, high temperatures and high fertility cause the splitting. Proper irrigation may help prevent splitting and there are significant differences between cultivars in their susceptibility to this problem. Splitting may also be partially avoided by deep cultivation to break some of the plant roots.

Cauliflower and Broccoli Buttoning- Buttoning is the premature formation of a head and because the head forms early in the plant's life, the leaves are not large enough to nourish the curd to a marketable size. Buttoning may occur shortly after planting in the field, when normal plants of the same age should be growing vegetatively. Losses are usually most severe when transplants have gone past the juvenile stage before setting in the field. Stress factors such as low soil nitrogen, low soil moisture, disease, insects, or micronutrient deficiencies can also cause this problem. Some cultivars, particularly early ones, are more susceptible to buttoning than others.

Lack of Heads in Broccoli and Cauliflower- During periods of extremely warm weather (days over 86°F and nights 77°F) broccoli and cauliflower can remain vegetative (does not head) since they do not receive enough cold for head formation. This can cause a problem in scheduling the marketing of even volumes of crop.

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Cauliflower Blanching and Off Colors

The market demands cauliflower which is pure white or pale cream in color. Heads exposed to sunlight develop a yellow and/or red to purple pigment. Certain varieties such as Snow Crown are more susceptible to purple off-colors, especially in hot weather. Self-blanching varieties have been developed to reduce problems with curd yellowing. For open headed varieties, the usual method to exclude light is to tie the outer leaves when the curd is 8 cm in diameter. Leaves may also be broken over the curd to prevent yellowing. In hot weather blanching may take 3 to 4 days, but in cool weather, 8 to 12 days or more may be required. Cauliflower fields scheduled to mature in cool weather (September and October) that are well supplied with water and planted with "self-blanching" cultivars will not need tieing. Newer orange cauliflower and green broccoflower varieties are being planted. They are less susceptible to off-colors but still can develop purpling under warm conditions.

Cauliflower Ricing- "Riciness" and "fuzziness" in heads is caused by high temperatures, exposure to direct sun, too rapid growth after the head is formed, high humidity, or high nitrogen. "Ricing" is where the flower buds develop, elongate and separate, making the curd unmarketable.

Development of Curd Bracts in Cauliflower- Curd bracts or small green leaves between the segments of the curd in cauliflower is caused by too high of temperature or drought. High temperatures cause a reversion to vegetative growth with production of bracts on the head. In a marketable cauliflower head, the individual flower buds are undeveloped and undifferentiated.

Loose Heads in Cauliflower and Premature Flowering in Broccoli- Loosely formed curds in cauliflower can be due to any stress that slows growth making them small or open. Fluctuating temperatures and moisture will also cause less compact growth. In contrast, excess vegetative growth caused by excessive nitrogen can also cause loose heads in cauliflower and broccoli. Premature flowering and open heads in broccoli can be brought on by high temperatures.

Edema on Cole Crop Leaves- Edema is water blistering on cole crop leaves. The most common cause of edema is the presence of abundant, warm soil water and a cool, moist atmosphere. Under these conditions, roots absorb water at a rate faster than is lost through transpiration. Excess water accumulates in the leaf, some parenchyma cells enlarge and block the stomatal openings through which water vapor is normally released from the plant; thereby contributing to further water retention in the leaf. If this condition persists, the enlarged cells divide, differentiate a cork cambium, and develop elongate cork cells externally to form a periderm. The rupture of the epidermis by the enlarged inner cells and the periderm account for the raised, crusty appearance of older edema spots.

Black Petiole- Black petiole or black midrib is an internal disorder of cabbage that has been occasionally noted in recent years. As heads approach maturity, the back side of the internal leaf petioles or midribs turn dark gray or black at or near the point where the midrib attaches to the core. The affected area may be quite limited or may extend for 2 or 3 inches along the midrib. It is believed that this disorder is associated with a potassium (K)-phosphorus (P) imbalance and results when the K level in the soil is low and the P concentration high. High rates of nitrogen may contribute to the problem. Probably, as in the case with tipburn, black petiole is a complex physiological disorder in which environmental conditions play an important role in symptom expression. Variety evaluation trials have shown that there are differences in degree of susceptibility between varieties.

Floret (Bead) Yellowing in Broccoli- The florets are the most perishable part of the broccoli head; yellowing may be due to overmaturity at harvest, high storage temperatures after harvest, and/or exposure to ethylene. Any development of yellow beads ends commercial marketability. Bead yellowing due to senescence should not be confused with the yellow to light-green color of areas of florets not exposed to light during growth, sometimes called "marginal yellowing".

Brown Floret (Bead) in Broccoli- This is a disorder in which areas of florets do not develop correctly, die and lead to brown discolored areas. This is thought to be caused by plant nutritional imbalances but also may be due to feed-ing damage on florets from insects such as harlequin bugs.

Cabbage Worms ID Update

Teresa Rusinek– ENYCHP

Cabbage worms are out and about! Right now you may be seeing Diamondback moth and or Imported Cabbage-worm caterpillars. Loppers will be out a little later in the season. Regular scouting helps catch pests early, before there's significant damage to the crop, and gives more options for effective control measures. Examine several plants at randomly selected sites throughout the field. Bring a hand lens along and carefully look for eggs as well as small caterpillars on the undersides of leaves. As we head later into the growing season, Lepidopteran or worm pests of Cole crops are sure to ramp up, scouting at least once a week will help you get ahead of these and other pests. The following is useful information my colleague Chuck Bornt put together last growing season (with a few bits I added!). If you grow cole crops you'll want to keep this as a handy reference. –TR

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It's important to know which pest(s) you are dealing with, because they have different sensitivities to available insecticides. Not only that, but you want to try and control these pest early before they make their way into the heads of cabbage or heads of broccoli! Once they get into a protected environment they become very hard to control with products like Bt's and pyrethroids. Below are detailed descriptions, followed by a table which lists the organic and conventional pesticides available along with their effectiveness for each pest.

Imported Cabbageworm & adult butterfly- Photo Dan Gilrein- Cornell University

Imported Cabbage Worm: Eggs of the ICW are laid singularly on the underside of the leaves and are bullet shaped and off-white when first laid, turning light to dark yellow in color. The larvae start out as small velvety green caterpillars and after feeding for 2 to 3 weeks turn dark velvety green with a light yellow stripe down their back and a broken stripe along each side of the body. When mature, they are approximately 1 1/4 inches long.

Cabbage Lopper & Moth—Alton Sparks, University of Georgia , Bugwood.org

Diamondback Moth: Eggs of the DBM are small round, yellowish-white and laid singly or in groups of two or three on the underside of lower leaves or stalks. Upon hatching, larvae begin mining within leaf tissue and later instars feed on heart leaves of young plants and underside of the leaf surfaces of more mature plants. Mature larvae are 1/3 inch long, pale greenish-yellow, and pointed at both ends. DMB larvae can be distinguished from other young pest species by their habit of actively wriggling or dropping from the leaf on a silken thread when disturbed. The pupa develops within a delicate, loosely spun, open lacework cocoon that is attached to the leaves and stems of the plant.

Cabbage Looper: Eggs are normally laid on the underside of the lowest leaves and are round, ridged, white, and ap-proximately the size of a pinhead. Looper larvae feed for 2 to 4 weeks and pass through five instars. Older larvae are light green with a white stripe along each side of the body and two white stripes along the back. First instar larvae have a black head capsule, but by the second instar, this is lost and the head capsule remains green. Mature larvae are approximately 1-1/2 inches. When disturbed the larvae will raise its back causing a "looping" movement. Young pupae are a light greenish color and gradually turn dark brown when mature. They are 3/4 inch long and wrapped in a delicate cocoon of white tangled threads. Pupae are usually found on the underside of lower leaves. -CDB.

Source "Pests in the Northeastern United States" edited by W.T. Wilsey, C.R. Weeden, and A.M. Shelton, Cornell University.

DBM pupa (left) and larva (right). Note the forked tail on the larvae.
Photo courtesy of Manitoba Agriculture, Food and Rural Initiatives

Welcome Jim Meyers ENCYP Viticulture Specialist

Jim has been working with wine grapes for 10 years, first as a Viticulture Ph.D. student at Cornell then as a Research Associate. Prior to coming to Cornell, Jim studied Chemistry and Biology (B.S. West Chester University of Pennsylvania), Computer Science (M.S. Brown University), and had a successful career as software technology entrepreneur. This background is reflected in his viticultural research which has focused on computational tools for mapping canopy and vineyard variability, quantifying relationships between variability and fruit chemistry, and optimizing efficiency of vineyard operations. As an Extension Associate, Jim will continue some of these research activities while also looking for new projects that provide targeted benefits to appellations in Eastern New York. Jim will kick off his new appointment by visiting growers at their vineyards to gather first hand knowledge of the sites and to discuss vineyard operations, goals, and challenges. Building a complete catalog of vineyards in a territory that runs 300 miles along the Route 9 corridor may take a little while, but Jim feels that the effort will lay a solid foundation for future program activities while also clearly differentiating the needs of each appellation.

Sweet Corn Trap Catches 6/12-6/19

County	Corn Earworm	European Corn Borer-Z (Iowa)	European Corn Borer-E (New York)	Fall Armyworm	Western Bean Cutworm	Year to Date Growing Degree Days
Orange	4	11	3	2	0	948.5
N. Ulster	1	1	2	0	0	853.6
S. Ulster	0	1	0	0	0	693.2
N. Dutchess	0	0	5	0	0	921.6
Albany	Na	9	1	Na	0	806.5
Schoharie	Na	1	0	Na	0	.
Fulton	Na	Na	Na	Na	Na	872.7
Saratoga	NA	5	0	Na	0	872.7
S. Washington	8	16	5	0	0	816.0
N. Washington	0	2	6	1	0	816.0
S. Clinton	0	0	3	0	0	693.3
C. Clinton	0	0	0	0	0	668.6

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