



UMASS
EXTENSION



Vegetable Notes

For Vegetable Farmers in Massachusetts

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IN THIS ISSUE:

Crop Conditions
Cucurbit Disease Update
Cercospora Leaf Spot on Chard & Beets
Onion Thrips in Onions & Brassicas
Tomato Hornworm
Septoria Leaf Spot on Tomato
Sweet Corn Report
Pest Update
Non Heating Row Cover

CROP CONDITIONS

A lot of irrigation water has been pumped this week. The whole eastern half of Massachusetts is exceedingly dry. Western Mass has received regular rain showers though soils are now drying out. With good irrigation, crops are doing very well.

The harvest list now includes early peppers, potatoes, field and greenhouse tomatoes, beets, cabbage, broccoli, cucumbers, greens, lettuce, peas, radishes, summer squash and zucchini. Summer squash and zucchini plants are pumping out fruit at breakneck speed. For many crops and markets, prices have

been up compared to last year, at least for the early harvest. That helps with the huge leap in the cost of fuel, fertilizer, boxes, and other inputs. Still, growers are watching out for every expense and looking for ways to cut costs wherever they can, and no one knows how prices will hold as the season progresses.

I find that a number of growers do not have the updated 2008-2009 edition of the New England Vegetable Management Guide in hand yet. This is one \$15 investment that you can't afford NOT to make! Old editions of the Guide are outdated with respect to pesticide registrations, and should be discarded. Call 413-545-2717 to order one, or online at <http://umas-soutreachbookstore.com/catalog/>. Don't miss the Vegetable and Strawberry Pest Identification Guide, with twice as many photos of diseases, insects and weeds as the previous edition – and it's bound together with the Vegetable Guide!



Miles of Zucchini

CUCURBIT DISEASE UPDATE

Downy Mildew:

Downy Mildew has been reported in Western New York and North Carolina, but seems to have stalled there for the time being. For the next two days at least, we are at low risk for the disease being transported to MA from these locations. We recommend that you save the materials that are most effective on downy mildew until it is found in the area. For a list of materials that are effective on this disease, please see the June 26 issue of Vegetable notes, online at http://www.umass-vegetable.org/newsletters/documents/June262008_000.pdf.

Powdery Mildew:

We have started to see the beginnings of powdery mildew in summer squash crops. We are recommending that you apply a contact fungicide like Bravo or Maneb until you see the disease in your field, and then switch to one application of Pristine (mixed with a contact fungicide), followed 5-7 days later by an application of a protectant fungicide like chlorothalonil or sulfur. The next fungicide rotation should be a DMI fungicide (Procure or Nova at the highest labeled rate, also

mixed with a contact fungicide). Systemic materials such as Pristine and the DMI's should be used once per season, and always mixed with a contact fungicide.

Angular and Bacterial Leaf Spot:

The hot and wet weather in some parts of the state through early July have led to an outbreak of these diseases in some areas. While they are generally not major problems in cucurbit crops, bacterial leaf spot can affect the fruit. Applications of copper compounds during early fruit set can reduce the risk to fruit in some vine crops.

Phytophthora:

We've seen Phytophthora blight in a number of places already this summer. This is a destructive disease that can be very difficult to manage. The most effective management technique for this disease is to manage standing water in the field. Anything you can do to reduce ponding and pooling of rain or irrigation water will help to reduce the spread of this disease. Removing infected material, along with a border of healthy-looking plants, may slow its spread. Be careful of moving soil from infected fields to healthy fields on boots or equipment.

As always, make sure you check the label before mixing fungicides. These recommendations are intended as guidelines only. No company or product endorsement is implied or intended. Disregard any information in this newsletter if it is in conflict with the label.

Accurate identification and up to date recommendations are essential for efficient control of these diseases. Thanks to funding through the EPA, MDAR, and the NEVBGA we are able to provide growers with free diagnostic and consulting services for managing diseases in your vine crops. If you would like a sample diagnosed, spray recommendations, scouting services, or other help with your cucurbits, please contact Andy Cavanagh by phone at 413-658-4925 or by email at acavanagh@psis.umass.edu.

- A. Cavanagh and B. Dicklow, UMass Extension

CERCOSPORA LEAF SPOT OF SWISS CHARD, BEETS AND SPINACH

This disease caused by *Cercospora beticola* occurs wherever table beets, Swiss Chard, sugar beet, and spinach are grown and is one of the most important diseases affecting the Chenopodium group. It can result in significant losses, particularly in late summer when conditions are favorable (high temperatures, high humidity, long leaf wetness periods at night). Leafy greens become unmarketable, and beet roots fail to grow to full size when disease is severe.

Identification. Symptoms occur as numerous, initially small circular leaf spots (see photo). Spots have a pale brown to off-white center with a red margin. Lesions expand in size, coalesce, turn gray as the fungus sporulates, and can result in extensive loss of foliage. Leaves at the center of the plant are often less severely affected. The pathogen produces structures which can be seen with a hand lens as small, black dots in the center of lesions. Lesions may also occur on petioles,



Cercospora Leaf Spot on Beet

flower bracts, seed pods, and seeds. Leaf symptoms are similar to those caused by Beet Phoma (*Phoma betae*), except that the phoma will have more obvious tiny fruiting bodies in the lesions and can also affect the roots.

Source and survival. *C. beticola* survives between crop cycles in residues from infected crops (as sclerotia), in weed hosts, and on seed. It can remain in the soil for up to two years. High levels of disease can result from just a few infected plants, since each lesion produces numerous spores. Several cycles of infection and spore production may occur with favorable environmental conditions. Spores can penetrate the leaf directly through open stomates. The pathogen is favored by high relative humidity and temperatures between 75-85° F and is spread by rain splash, wind, irrigation water, insects, workers, and equipment. Leaf wetness during the night, even with dry conditions during the day, encourages disease. Successive

plantings made close together can allow disease to move from one planting into the next.

Management. Bury infected crop residues and destroy volunteer plants and weed hosts. Start with certified, disease-free seed or treat seed with hot water or fungicides. Rotate to non-host crops (not in the Chenopodium family) for 2-3 years. Do not cut chard or spinach for regrowth if disease is present. Avoid planting succession crops close together. Avoid overhead irrigation if it will result in prolonged leaf wetness periods (eg, through the night); irrigate mid-day when leaves will dry fully or use drip irrigation.

Chemical controls. Apply registered fungicides according to label instructions prior to infection and symptom development. Pathogen populations resistant to sterol demethylation-inhibiting (DMI's, FRAC Group 3) fungicides have been reported, so use products with other modes of action. Registered fungicides for leafy vegetables include azoxystrobin (Quadris), trifloxystrobin (Gem), chlorothalonil (Bravo), and Dithane (mancozeb).

--by Bess Dicklow, Rob Wick and Ruth Hazzard, UMass Plant Soil and Insect Science Dept.

ONION THRIPS IN ONION AND BRASSICAS



Thrips Injury on Broccoli

Onion thrips are active and may be causing injury in onions or late season Brassicas. Onion thrips range in color from yellow to black and are only 1/16" in length. They spend the winter as adults in crop remnants, alfalfa, wheat, greenhouses and weeds along the border of crop fields. Thrips have rasping mouth parts which they use to tear open plant cells and feed on inner juices. Populations are favored by hot, dry weather. Heavy rain or overhead irrigation can lower populations quickly. For infested crops, bury crop residue immediately after harvest to limit movement to other crops and reduce overwintering survival. Note that products labeled for thrips control are not exactly the same for onions and Brassicas.

In onions feeding occurs in protected areas between leaves. Damage may appear as silver lines, white patches, tip dieback and curling, slowed growth, reduced bulb size and yields, or result in plant death. Plants are most sensitive when bulbs are forming and still small.

Healthy vigorous plants can tolerate moderate populations. Lacewing larvae, pirate bugs and predatory thrips are important natural enemies. Do not plant onions near alfalfa or clover, that can harbor large populations of thrips, which may migrate to onions when these crops are cut or harvested.

Scout plants along field margins where infestations build early. Begin applications when damage is first noticed or when there are three or more thrips per leaf. Repeat applications at 7 to 10 day intervals. From 3 to 6 applications may be necessary, but rotate between insecticide groups after 2 applications to help prevent resistance. Use a shorter interval in hot weather. Use of a crop oil, methylated seed oil or silicon adjuvant is suggested to improve coverage and control. . Apply in early evening, using high pressure and 100 gal water/A for best results.

Biorational or organic products include Beauveria bassiana (Mycotrol O, takes 7 to 10 days after application to see control. OMRI listed); kaolin (Surround WP, suppression/repellence only. OMRI listed); pyriproxyfen (Esteem 0.86EC, insect growth regulator, dry bulb onions only, suppression only); spinosad (Entrust, OMRI listed; Spintor 2SC, has both contact and ingestion toxicity).

NOTE that the 2008-2009 edition of the New England Vegetable Management Guide omitted Spintor and Entrust from the list of labeled products – our apologies. Bulb vegetables are on a supplemental label.

Broad-spectrum products include numerous synthetic pyrethroids (including Warrior, Pounce, Ammo, Proaxis, Mustang) and carbamates (Lannate, Malathion 57E).

See 2008-2009 New England Vegetable Management Guide for more details.

In Brassicas, thrips are primarily a problem on cabbage where they feed on inner leaves which are difficult to target by



Thrips

spraying. Thrips cause rough, golden or brown scars to form on leaves or produce a discolored layer within cabbage heads. Thrips damage can be confused with edema. Controls must be applied before head formation in order to be effective.

In late-season Brassica crops such as broccoli, kale, collard or cabbage, thrips may damage open leaves and cause scarring, rust or yellow-colored areas and general reduced vigor in the plants. Do not plant cabbage or other Brassicas near Alliums (onion family), alfalfa, or clover, that can harbor large populations of thrips, which may migrate into Brassicas when these crops are cut or harvested. Onions tend to dry down around the same time that late Brassicas are put out, so close plantings can be a source of high and damaging populations of thrips.

Scout 25 plants per field. Begin applications when damage is first noticed. Repeat applications at 7 to 10 day intervals. Use a shorter interval in hot, dry weather. Use spreader-sticker for better coverage. Apply in early evening, using high pressure and 100 gal water/A for best results. Rotate between insecticide groups to help

prevent or delay resistance. Biorational or organic products include spinosad (Entrust, OMRI listed; Spintor 2SC, has both contact and ingestion toxicity); novaluron (Rimon 0.83EC, insect growth regulator, not for mustard greens); pyrethrin (Py-Ganic EC5.0, OMRI listed); spinosad (Entrust, OMRI listed; Spintor 2SC, has both contact and ingestion toxicity).

Broad-spectrum products include numerous synthetic pyrethroids (including Warrior, Pounce, Capture, Baythroid, Ammo, Proaxis, Mustang) and one neonicotinoid products, imidacloprid (Admire Pro)

If thrips are a perennial problem on cabbage, plant more tolerant varieties (Bobcat, Ducati, Fresco, Little Rock, Matsumo, Rio Verde, Ruby Perfection, Solid Blue 770 or 780, Blue Pack, Ruby Ball, Heads Up, Bravo, Brutus, Green Cup, Round-up, Superette, Vantage Point, and Zerlina). Avoid planting highly susceptible varieties, such as Atlantis, Columbia, Morris, Ramada, Supergreen, Market Prize, Princess, Charmant and Solid Blue 690.

--R. Hazzard, adapted from the onion thrips sections of the updated *New England Vegetable Management Guide*. Special thanks to Jude Boucher, UConn. Available online at www.nevegetable.org

TOMATO HORNWORM

Late July and early August are usually the time when we see tomato hornworms. These large caterpillars typically appear in small numbers and cause their impressive feeding damage to just a few leaves or plants. Larvae consume large amounts of foliage on peppers, tomatoes, eggplant, potatoes, and related solanaceous weeds. Now is the time to scout, by searching leaves for damage, frass or larvae. Often one sees defoliated stalks or the characteristic dark-green droppings (fecal pellets) before the caterpillar is located.

There is one generation per year in northern areas. The adults are large moths, predominately gray or gray-brown with lighter markings. They are commonly referred to as sphinx, hawk, or hummingbird moths. The adult tomato hornworm (*Manduca quinquemaculata*) is known as the five-spotted hawk moth while the adult tobacco hornworm (*Manduca sexta*) is called the Carolina sphinx. The wingspread may reach five inches and the hairy, robust abdomen has yellow spots. They emerge from over wintered pupae in the soil in late spring or early summer. The moths are commonly seen at dusk, hovering hummingbird-like over beds of petunias and other flowers with long corollas. Nectar is extracted through their long, coiled, tube-like mouthparts.

The spherical greenish-yellow eggs are deposited singly on the undersides of host plant leaves. The eggs hatch in approximately one week and larvae begin feeding on foliage. Larvae feed for 3-4 weeks, molt five times, and may reach four inches in length and 1/2 inch in width when full grown. Both species are green with a distinct “horn”



Tomato Hornworm Larvae

on the top of the tail end. The sides of the tomato hornworm are marked with a series of white marks resembling a “v” laying on its side and pointing toward the head. The white marks on the sides of the tobacco hornworm form a series of seven diagonal lines. The tip of the tomato hornworm’s horn is black while that of the tobacco hornworm’s is red.

Full-grown larvae burrow 3-4 inches into the soil and form dark brown, two-inch long pupae. A sheath for the mouthparts projects from the head of the pupa and curves downward, resembling the handle of a pitcher.

A parasitic Braconid wasp is an important and fairly common natural enemy of the hornworms. The wasps lay their eggs inside the body of the caterpillars. After feeding within the caterpillar body, the larvae of the wasps eat out through the skin and spin the cocoons on the caterpillar surface. The adult wasps later cut out circular lids and escape from the cocoons to attack other hornworms. If one is hand-picking hornworms, those with cocoons of parasitic wasps on their back should not be killed.

Controls: There is no set economic threshold for this pest in tomato. Where damage is unacceptable, or if there are high numbers, foliar sprays can be used. Use a selective material that will conserve beneficial insects, because those predators and parasites are very likely keeping your aphid populations under control. Insecticides which are specific for caterpillars include *Bacillus thuringiensis* (Bt) kurstaki or aizawi strain (Dipel DF, Agree, or Xentari, etc.), indoxycarb (Avaunt), tebufenozide (Confirm 2F), or spinosad (SpinTor 2SC or Entrust). Several synthetic pyrethroids are also labeled (note: these could result in aphid outbreaks). Although Bt usually works best on small larvae, in this case it will work very well even against large hornworms. In peppers, any controls used for European corn borer should control hornworms.

-R. Hazzard Thanks to sources: Utah Sate Univ.Extension Fact Sheet # 74, Purdue Vegetable Crops Hotline # 409 (Frankie Lam)

SEPTORIA LEAF SPOT OF TOMATO

Septoria leaf spot is one of the most destructive diseases of tomato foliage and is widely distributed throughout the world. It occurs wherever tomatoes are grown and is most severe where there are extended periods of wet, humid weather. This disease can destroy most of a plant’s foliage resulting in sunscald, failure of fruit to mature properly, and low yields. Once infections begin, they can spread rapidly from lower to upper tomato canopy.

Symptoms consist of circular, tan to grey lesions with a dark brown margin, that appear on lower leaves first after the first fruit set. If conditions are favorable, lesions can enlarge rapidly, form pycnidia (fruiting bodies that look like black specks) and turn infected leaves yellow then brown. Fruit infection is rare, but lesions occur on foliage, stems, petioles, and the calyx. The pathogen overwinters on infected tomato debris or infected solanaceous weed hosts, and can also survive on stakes and other equipment. Seed infection is possible, but rare. Once introduced, Septoria is spread by splashing water, insects, workers, and equipment.



Septoria Leaf Spot on Tomato

Most tomato cultivars are susceptible to Septoria leaf spot and must be protected with registered protectant fungicide sprays at regular intervals throughout the growing season. Rotation of tomato crops for two years, control of susceptible weeds, and deep incorporation of tomato crop debris after harvest are cultural control measures. Careful attention to the length of time that tomato foliage is wet by timing of irrigation, plant spacing, and staking to reduce contact of foliage with soil can also reduce disease severity. Keeping workers and equipment out of wet fields can reduce disease spread. Protectant fungicides include chlorothalonil (Bravo, Equus 500), maneb (Manex), mancozeb (Dithane), sulfur (Microthiol), bicarbonate (Armicarb), and copper (Kocide).

For organic growers, copper is probably the best option for controlling this disease. Copper would be a more effective spray than Oxidate (or its equivalent) and may be the only effective product. Oxidate might kill spores that are present but would not prevent production of new spores. However, some organic growers do not like to use copper products even though they are not prohibited (they are in the regulated category).

-Bess Dicklow and R. Hazzard, University of Massachusetts

SWEET CORN REPORT

We are still in between European corn borer flights this week and although corn earworm is around, flights have remained relatively low. Growers can save a few hours this week not spraying and focus on cultivating fields where needed. Watch for storms and keep checking earworm traps at least twice a week to make sure that you are not over threshold (see table below). Keep checking ECB traps weekly to see when the second flight begins and remember to change lures every two weeks. Later plantings in pre-tassel or tassel stage should be scouted when the flight begins.

Harvesting is continuing at a good rate and both wholesale and retail sales are good. Early short-eared varieties are coming to an end and second plantings are being picked, yielding larger sweeter ears and very happy customers. Harvest samples were taken this week from fields where *Trichogramma ostriniae* was released for control of ECB in early plantings. Results showed extremely clean corn with as little as one, or in some cases, no sprays at all. This was a big change for some growers who were used to spraying their early corn four to five times. Growers who participated in the program were very happy with the success of the releases overall and plan to continue releasing again in the future.

Fall armyworm traps were set up this week, no flight was captured except in Nantucket where the flight was

Location	Z1	EII	Total ECB	CEW	FAW
Bershires/Champlain Valley					
Sheffield	-	-	-	11	0
Pittsfield	0	0	0	0	0
CT Valley					
South Deerfield	0	0	0	0	0
Sunderland (1)	1	0	1	3	0
Sunderland (2)	0	0	0	2.5	0
Whatley	0	3	3	0	0
Hadley (1)	0	1	1	0.5	0
Hadley (2)	0	0	0	0.5	0
Amherst (1)	0	0	0	0	0
Amherst (2)	0	1	1	2	0
Granby	1	1	2	1	0
Easthampton	0	1	1	1.5	0
Nantucket County					
Nantucket	3	0	3	38	50
Central & Eastern MA					
Dracut	0	0	0	3	0
Rehoboth	0	4	4	2	0
Still River	0	0	0	2	0
Concord	0	0	0	0	0
Leicester/Spencer	1	0	1	1	0
Northbridge	0	0	0	10	0
Tyngsboro	0	0	0	0	0
Lancaster	6	0	6	0	0
NH					
Litchfield, NH	0	0	0	9	0
Hollis, NH	0	0	0	3	1
Mason, NH	0	0	0	5	0

Corn Earworm Threshold		
Moths/Night	Moths/Week	Spray Interval
0-0.2	0-1.4	no spray
0.3-0.5	1.5-3.5	every 6 days
0.6-1	3.6-7	every 5 days
1.1-13.0	7.1-91	every 4 days
Over 13	Over 91	every 3 days

38 moths this week. If you plan on monitoring for FAW make sure your traps are up this week. Typically, moths make an appearance at the end of July and beginning of August.

-A. Brown, UMass Extension

PEST UPDATE

Location	Z1	EII	Total ECB
CT Valley			
Granby	1	1	2
Holyoke	0	0	0
Sunderland	1	0	1
Amherst	0	0	0
Hadley (2)	0	0	0
Sunderland (2)	0	0	0

Pepper ECB Trap Counts

Higher potato leafhopper populations. Potato leafhopper nymphs are building up in unsprayed potatoes and beans. Remember that the threshold for potatoes is just 1 adult or 15 leafhopper nymphs per 50 compound leaves. Untreated plantings with nymphs all over the leaves will look like a frost hit them in a very short time. Leafhoppers mean small potatoes. Leafhoppers are also being found on eggplant. The threshold for eggplant is 1 per leaf, so some folks may be spraying that crop this coming week too. On eggplant you want to choose something, such as Provado, that will not disrupt the predators and parasites that help control spider

mites, aphids, and CPB. Spray seedling beans before the 3 leaf-stage if you find more than 2/foot of row or between the 3-leaf and bud stage if you find 5/foot of row. The cheapest way to control this pest on beans is to use as little a 1/4-rate of dimethoate. For organic growers, Pyganic is just about the only option, and does not always give the desired results. Good coverage is key. To provide coverage of a dense canopy of potatoes, a boom or airblast sprayer will perform better than a low-pressure handheld sprayer. Row covers could be used on new bean plantings for early protection (see Non-heating row covers). (adapted from J. Boucher, UConn pest message July 11, 2008)

Squash vine borer counts are higher this week. Traps at South Deerfield Research Farm captured 5 moths this week, over the threshold for applying insecticide. Southern NH captures were high. Apply controls to the base of summer squash, zucchini, which are especially susceptible. Two to four weekly applications may be needed. Spinosad provides excellent control of hatching SCB larvae. Labeled products include pyrethroids Capture, Asana, and Pounce. (thanks for counts from G. Hamilton, UNH).

Pepper maggot flies were found on Connecticut farms last week. Egg laying usually starts within a week of finding the first flies, so if this is a serious pest on your farm, scout for stings (see July 11 issue) and apply your first pepper maggot spray this week. The second spray should go on 8-10 days after the first spray. This should take out almost all the adult flies which should provide near-complete control of the maggots. Dimethoate and Orthene are the most effective products for pepper maggot control and last 8-14 days. If you are purchasing dimethoate, be aware that some brands have long day-to-harvest restrictions, while other brands have a 0 or single day to harvest restriction. The short dh restriction will make it much easier to harvest peppers after spraying for this pest. Orthene can be applied without an applicators license but has a 7-day-to-harvest restriction, which can make harvest and sales difficult, but some folks are not yet harvesting peppers, which may make it practical to use Orthene. --adapted from Jude Boucher, UConn.

ROW COVER FOR INSECT PROTECTION – CONSIDER NONHEATING COVERS FOR MID-SUMMER

Many growers use ‘floating’ or ‘spun-bonded’ rowcover, for the combined benefits of extra warmth and protection from insect pests. Growers select the weight best suited for their needs – for the degree of light transmission, the durability, cost, and heat benefit. Different weights are typically measured in ounces per sq. yard. Materials that are 0.5-0.6 oz/yd² (e.g., Reemay, Agrofabric Pro 17, Covertan Pro 17) provide warmth and insect control, have high light transmission (85-90%), and are less expensive than heavier materials, but are more likely to rip from wind or sharp objects (fingernails, boots, deer hooves, stakes, and the like). Slightly heavier are those that are 0.7 to 0.9 oz/ yd² (eg, Covertan Pro 22, Agriforce) with 75-83% light transmission. Heavier still are those at 0.9 (Covertan Pro-30) to 1.25 oz/ yd² (Tyvar 518) which are more tear resistant, have light transmission of about 70%, and will last for several years.

All of these covers increase temperature, provide some amount of frost protection, and decrease light. As a result, crops are not only earlier, but more tender, the leaves more elongated. That is great for early and late in the season. But what about midsummer? Humidity remains high under the covers, which increases disease. Aphids can build up under the cover, because it excludes natural enemies. This is especially a problem if you put it out after the crop is partly grown,

because aphids have become established. Higher temperatures may suppress growth or affect quality.

Some growers find that row covers are critical for their pest management needs even during hot weather. Flea beetles, in particular, can be difficult to control with insecticides but are very effectively controlled with a well-sealed row cover. This is particularly useful in certified organic crops, where the insecticide options are limited. Crop quality may suffer under the cover, but flea beetles don't go away just because the temperatures are high.

Non-heating row covers may provide a good option for this situation. These are 0.3 to 0.35 oz/sq yd, with >90% light transmission. Non-heating row covers are sold as insect barrier, not for their heat-conserving properties. It may be difficult to find widths greater than one row. At the South Deerfield Research Farm, a half-acre of 'chipilin', a Brazilian herb, is being protected from potato leafhopper using non-heating row cover and the quality is excellent. For this herb, tender leaves are a plus. In a 2003 pilot study of arugula, we found that the non-heating covers increased yield slightly while the mid and heavy covers reduced yield compared to open culture.

Cabbage root maggot fly should not be a problem at this time of the season because the soil temperatures are high enough to kill the eggs. Starting around mid August, when the flights occur and soil temperatures begin to drop, cabbage maggot again becomes a problem especially for late season turnips, daikon and rutabegas where the roots are harvested. We have worked with growers to explore row covers (generally mid weight types) for these crops, especially for organic production because there are no insecticides available. These were used from mid August into September. We found that the covers reduced yield and quality of roots, compared to open-grown plants. It is possible that the non-heating type, if applied at seeding to avoid aphid problems, could be more successful.

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