UPDATE ON PHYTOPHTHORA RESISTANT VARIETY TRIALS

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The water mold *Phytophthora capsici* (*P. capsici*) causes Phytophthora blight on peppers, as well as tomatoes, eggplants, summer and winter squash, melons, cucumbers, pumpkins, and snap and lima beans. As those who have dealt with this disease know, the presence of *P. capsici* in a field can result in severe losses due to root, crown and fruit rot. Leaf lesions may also occur. Long-lived spores of *P. capsici* survive for years in soil and start new disease epidemics each season, but these spores can only be produced when the two different mating types of *P. capsici* (called A1 and A2) come in contact with each other. Short-lived spores (called sporangia) allow for rapid spread of the disease during a growing season but cannot survive the winter in New York.

In 2006, 2007, and 2008, we collected plants from farms around New York State affected by Phytophthora blight. This survey confirmed that both mating types were present in all vegetable-growing regions of the state, meaning that overwintering spores are being produced in New York fields. We also found that resistance to mefenoxam (Ridomil) was widespread in the eastern part of the state (the Capital District and Long Island), so this chemical will no longer be an effective management tool for blight in pepper in these regions. In the western part of the state, all isolates we collected were still sensitive to mefenoxam. However, it has been demonstrated that resistance to mefenoxam can develop relatively quickly in fields where this chemical is applied regularly. Outside of the Capital District and Long Island, rotate mefenoxam with other chemistries and be on the lookout for fields where mefenoxam is no longer effectively controlling Phytophthora blight. The good news is that this survey suggests that *P. capsici* does not frequently move between fields, especially across long distances. Spores of *P. capsici* are spread between fields in soil, water, or infected culled fruit, but not by wind, so if you have not yet seen Phytophthora blight on your farm, you can keep it off by using caution when disposing of culled fruits, moving equipment from one field to another, and choosing an irrigation source.

Once *P. capsici* is in a field, planting tolerant pepper varieties is a key component of successful disease management. There are already a number of sweet pepper varieties being marketed as tolerant to Phytophthora blight, and efforts are ongoing in both the public and private sectors to develop additional varieties. In order to test how these varieties perform in upstate New York, we began screening sweet pepper varieties and breeding lines for tolerance to Phytophthora blight in 2007. We conducted these trials on the Phytophthora blight research farm in Geneva, NY (an enclosed research field dedicated to the study of Phytophthora blight) using strains of *P. capsici* that came from New York. These trials have focused on the root and crown rot phase of the disease.

Each year, we grew peppers on raised beds covered with black plastic and irrigated with drip tape to simulate standard production practices in New York. Because the variety ‘Red Knight’ is known to be highly susceptible to Phytophthora blight we included it in all trials as a

control. After the plants were established in the field, we challenged them approximately weekly with spores of one or more New York strains of *P. capsici* and counted the number of wilted and dead plants 2-3 times per week for about 2 months.

Results over the past four years are reported in Table 1, using the "relative area under the disease progress curve" (RAUDPC) to quantify the tolerance of each pepper variety to Phytophthora blight. Lower RAUDPC values indicate that the plants died more slowly and are more tolerant to Phytophthora blight. Although disease pressure varied from year to year, 'Paladin,' 'Aristotle,' and 'Vanguard' consistently showed a high level of tolerance to root and crown rot, while 'Revolution,' and 'Declaration' showed variable levels of tolerance (very tolerant in some years and intermediately tolerant in others). In addition, two elongated bell varieties from ('Zapata' and 'Cortes') and some lines from the Cornell breeding program also showed high levels of tolerance in 2009. We will continue to work with the Cornell pepper breeding program and include their lines in future trials. If you have Phytophthora blight in a field and are interested in evaluating red and yellow bell peppers from the Cornell breeding program, you can request small seed samples from Michael Mazourek (mm284@cornell.edu).

It is known that resistance to fruit rot, root and crown rot, and leaf lesions is conferred by different genes. Although our screenings have focused on the root and crown rot phase of the disease, observations in 2009 and 2010 are consistent with this concept. Even plants that were highly tolerant of Phytophthora root, crown and stem rot developed fruit rot and leaf lesions when challenged repeatedly with *P. capsici*.

For additional information, you may visit our new Phytophthora blight website. The site includes fact sheets that can be downloaded, research updates, management strategies, and lots of images. The URL is http://phytophthora.pppmb.cals.cornell.edu/.

Table 1. Sweet pepper varieties and breeding lines screened for resistance to Phytophthora blight from 2007 through 2010. Plants were rated for wilting and death, not for fruit rot. Mean RAUDPC (relative area under the disease progress curve) values followed by the same letter within a year are not significantly different from each other. Smaller RAUDPC values indicate that the plants wilted and died more slowly and are more tolerant to Phytophthora blight.

Year							
2007		2008		2009[a]		2010[b]	
Variety	RAUDPC	Variety	RAUDPC	Variety	RAUDPC	Variety	RAUDPC
Paladin	3.75 a	Paladin	15.69 a	NY07-8003-2	0.00 a	Vanguard[+#]	43.21 a
Aristotle	10.00 a	Aristotle	20.07 a	Zapata[cd*]	0.78 a	Declaration[+#]	52.80 ab
Revolution	20.00 a	Revolution	81.95 b	NY07-8001-1[*]	2.34 a	Revolution[+]	61.21 bc
Alliance	34.50 a	Declaration	88.74 b	NY07-8006-1	6.88 ab	Karisma[+]	77.59 cd
Red Knight	75.00 b	Red Knight	94.68 b	Paladin[*]	7.14 ab	Red Knight[#]	87.23 d
				Cortes[d]	17.50 ab		
				Revolution	21.04 b		
				Aristotle	39.48 cd		
				Declaration	50.16 de		
				Escalade	51.88 de		
				Karisma	63.70 e		
				Red Knight	82.08 f		

[a] Varieties followed by * showed little or no wilting, but some healthy plants developed fruit rot.

[b] Although plants were only rated for wilting or death, in 2010 both fruit rot (+) and leaf lesions (#) were also observed. Although not shown here, fruit rot was also observed on 'Paladin' peppers planted in the same field but not included in this trial.

[c] Two seed lots of Zapata performed differently in this trial. One was highly resistant (data shown) and the other was moderately resistant (RAUDPC of 26.458).

[d] 'Zapata' and 'Cortes' are two commercially-available sweet peppers with a more elongated shape (La Muyo).