

# Greenhouse and Field Evaluation of Bell Peppers for Resistance to *Phytophthora* Blight

M. Babadoost, S. Z. Islam, and M. Hurt

Department of Crop Sciences, University of Illinois, Urbana, IL 61801

## Introduction

Phytophthora blight, caused by *Phytophthora capsici* Leonian, has become a serious threat to pepper production in Illinois. During the past four years, *P. capsici* cause up to 100% yield losses in commercial pepper fields. The objective of this study was to screen available cultivars/lines of bell peppers for resistance against *P. capsici*.

## Materials and Methods

During 2001-2002, 64 cultivars/lines of bell pepper (Table 1) were evaluated for resistance against *P. capsici* in the greenhouse and field.

**Greenhouse trials.** Four seedlings were grown in each 4.5-inch pot containing a soil mix (soil:peat:perlite; 1:1:1) in a greenhouse at 64 to 77EF. Eight-week-old seedlings were inoculated with *P. capsici* by adding 2 ml of zoospore suspension in sterile-distilled water ( $10^5$  spores/ml) at the base of each seedling. Control seedlings were treated with only sterile-distilled water. Four pots (a total of 16 plants) were included in each treatment.

The pots were watered before inoculation to keep the soil wet. After inoculation, the pots were watered three times per day. Beginning the 4th day after inoculation, seedlings were evaluated for development of Phytophthora lesions on the lower section of stems, losing leaves, wilting, and death of the seedlings. The evaluation of disease development on the seedlings was continued until 24 days after inoculation, when no more infection was observed.

**Field trials.** Seven cultivars/lines in 2001 (Table 2) and nine cultivars/lines in 2002 (Table 3), showed resistant to *P. capsici* in the greenhouse trial, were included in the field trials. California Wonder and Maxi Bell, susceptible bell pepper cultivars to *P. capsici*, were included in the field trial as control checks.

Seedlings of the above-mentioned cultivars/lines were grown in the greenhouse. Eight-week-old seedlings were kept outside the greenhouse for 5 days, and then transplanted in a commercial field near Shawneetown, Illinois. The field was naturally infested with *P. capsici*. The experiment was performed in a completely randomized block design with four replications, each with 10 plants. The seedlings in each plot were planted in two staggered rows with plants spaced 12 inches apart within rows. The plots were spaced 36 inches apart. Weeds were controlled by hand weeding. Plants received daily drip irrigation. Disease incidence was determined as percent wilted and dead plants on the dates indicated in Tables 2 and 3.

## Results and Discussion

**Greenhouse trials.** Brown lesions were observed on the crown and at the base of stems of inoculated seedlings 5 days after inoculation. Seven days after inoculation, most of the susceptible plants developed symptoms. Shedding leaves, wilting, and death of the seedlings followed by development of lesions on the crown and lower section of the stems. Twenty-four days after inoculation, almost all of the infected plants were dead. The results of the greenhouse trials are presented in Table 1. Three cultivars, Emerald Isle, Paladin, and Reinger, and six lines, Abbot-1, Abbot-2, Abbot-13, BHN-1P, BHN-2P, and Syngenta-7326 were resistant to *P. capsici*.

**Field trials** The results of field studies are presented in Tables 2 and 3. All three cultivars and six lines, resistant to *P. capsici* in the greenhouse trials, were also resistant to Phytophthora blight in the field. These cultivars and lines can be grown commercially, if the yield and quality are satisfactory. In 2002, Paladin was grown in commercial fields in southern Illinois.

In our studies, we inoculated the seedlings by adding zoospore suspension onto the crown section of the seedlings. This procedure proved to be a reliable method for screening bell pepper cultivars and lines for resistance against *P. capsici* in the greenhouse.

Table 1. Reaction of bell pepper cultivars/lines to inoculation with *Phytophthora capsici* in the greenhouse.

Cultivar/line	Seed source*	Disease incidence**		Cultivar/line	Seed source*	Disease incidence**	
		Infected plants (%)	Plants with no symptom (%)			Infected plants (%)	Plants with no symptom (%)
Abbott – 1	AC	0	100	Choco	JWJ	100	0
Abbott – 2	AC	44	56	Colossal	NV	100	0
Abbott – 3	AC	100	0	Commandant	NV	100	0
Abbott – 4	AC	100	0	Conquest	HR	100	0
Abbott – 5	AC	100	0	Corona	JS	100	0
Abbott – 6	AC	100	0	Crusader	NV	100	0
Abbott – 7	AC	100	0	Diego	EZ	100	0
Abbott – 8	AC	100	0	Emerald Isle	HR	6	94
Abbott – 9	AC	100	0	Fat & Sassy	JWJ	100	0
Abbott - 10	AC	100	0	Giapponese	NES	100	0
Abbott - 11	AC	100	0	HMX 3640	CS	100	0
Abbott - 12	AC	100	0	HMX 9646	CS	100	0
Abbott - 13	AC	19	81	Inia	JWJ	100	0
Abbott - 14	AC	100	0	Jingle Bell	JWJ	100	0
Abbott - 15	AC	100	0	Jupiter	NV	100	0
Abbott - 16	AC	100	0	King Arthur	JS	100	0
Abbott - 17	AC	100	0	Labrador	JS	100	0
Abbott - 18	AC	100	0	Lafayette	NV	100	0
Abbott - 19	AC	100	0	Legionaire	NV	100	0
Abbott - 20	AC	100	0	Maxi Bell	UG	100	0
Ace	JS	100	0	North Star	JWJ	100	0
Aristotle	SI	69	31	Orion	EZ	100	0
Bell Boy	JWJ	100	0	Paladin	NV	38	62
BHN-1P	BHN	12	88	Perfection	JS	100	0
BHN-2P	BHN	0	100	Queen Hybrid	JWJ	100	0
Bianca	JWJ	100	0	Red Knight	JS	100	0
Big Bertha	JWJ	100	0	Reinger	JS	0	100
Blushing Beauty	JWJ	100	0	Sentry	NV	100	0
Boynton	CS	100	0	SPP 7117	SK	100	0
Brigadier	NV	100	0	Syngenta-7326	SY	0	100
California Wonder	SOS	100	0	Tequila	JWJ	100	0
Camelot	JS	100	0	Valencia	JS	100	0

\* AC = Abbott & Cobb; BHN = BHNSeed; CS = Chesmore Seed; EZ = Enza Zaden; HR = Harris Seeds; JS = Johnny's Selected Seeds; JWJ = J. W. Jung; NES = New England Seed; NV = Novartis; SK = Sakata Seed America; SI/SG = Siegers Seed; SOS= Sow Organic Seed; SY = Syngenta; UG = United Genetics.

\*\* Plants were 8 weeks old at the time of inoculation, and examined for infection 24 days after inoculation.

Table 2. Reaction of bell pepper cultivars/lines to *Phytophthora capsici* in field in 2001.

Cultivar/line	Seed source <sup>x</sup>	Plant stand (%) <sup>y</sup>			
		25 Jul	6 Aug	15 Aug	2 Sep
Abbott – 1	AC	100 a <sup>z</sup>	82 a	82 ab	82 a
Abbott - 2	AC	77 b	77 ab	62 b	52 b
Abbott - 13	AC	82 ab	75 ab	75 ab	75 ab
Emerald Isle	HR	92 ab	92 a	92 a	90 a
Paladin	NV	97 a	97 a	97 a	92 a
Reinger	JS	97 a	97 a	97 a	92 a
Syngenta - 7326	SY	92 ab	92 a	92 a	92 a
California Wonder	SOS	87 ab	52 b	37 c	17 c

<sup>x</sup> AC = Abbott & Cobb; HR = Harris Seeds; NV = Novartis; JS = Johnny's Selected Seeds; SOS = Sow Organic Seed; SY = Syngenta.

<sup>y</sup> Seedlings were transplanted on 11 June.

<sup>z</sup> Within each column, the values with the same letter in common are not significantly different from each other (P = 0.05, Fisher's Protected LSD).

Table3. Reaction of bell pepper cultivars/lines to *Phytophthora capsici* in field in 2002.

Cultivar/line	Seed source <sup>x</sup>	Plant stand (%) <sup>y</sup>				
		27 Jun	11 Jul	25 Jul	8 Aug	22 Aug
Abbott – 1	AC	100 a <sup>z</sup>	100 a	100 a	100 a	100 a
Abbott - 2	AC	100 a	100 a	100 a	92 a	92 a
Abbott - 13	AC	100 a	97 a	97 a	97 a	92 a
BHN-1P	BHN	92 a	92 ab	82 ab	82 a	82 a
BHN-2P	BHN	100 a	92 ab	87 a	85 a	82 a
Emerald Isle	HR	100 a	95 a	92 a	90 a	85 a
Paladin	NV	97 a	95 a	92 a	92 a	92 a
Reinger	JS	97 a	95 a	95 a	92 a	92 a
Syngenta - 7326	SY	100 a	100 a	100 a	100 a	100 a
Maxi Bell	UG	77 ab	72 bc	62 bc	57 b	57 b
California Wonder	SOS	70 b	57 c	57 c	50 b	50 b

<sup>x</sup> AC = Abbott & Cobb; BHN = BHNSeed; HR = Harris Seeds; NV = Novartis; JS = Johnny's Selected Seeds; SOS = Sow Organic Seed; SY = Syngenta; UG = United Genetics.

<sup>y</sup> Seedlings were transplanted on 27 May.

<sup>z</sup> Within each column, the values with the same letter in common are not significantly different from each other (P = 0.05, Fisher's Protected LSD).