

## *Polymyxa betae* Keskin

(1)

*P. betae*

*Polymyxa betae*

186 2010 -2007

106 *P. betae*

*P. betae* ( ) BASF

23 *P. betae*

*Raphanus sativus* *Brassica oleracea*

*P. betae*

*P. betae*

*Polymyxa betae*

*Polymyxa betae* :

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(1)

## Host Range of *Polymyxa betae* Keskin which spread in Syria and the ability of the infected Weeds to transfer it to Sugar beet

A. M. Mouhanna<sup>(1)</sup>

### ABSTRACT

*Polymyxa betae* is an important vector of many viral diseases and widespread in Syria. It was necessary to determine the host range of Syria's isolate of the *P. betae* in the local plant species and their role as alternate host to *P. betae*, as well as its role to transfer the *P. betae* to sugar beet cv. 186 dicotyledonous and monocotyledonous plant species were collected during the years 2007 - 2010 from sugar beet fields with a focus on Rhizomania infected fields regardless the planted crop. 10 dicotyledonous and two monocotyledonous plant species were positively tested with naturally infection of *Polymyxa* spp. In addition, 106 dicotyledonous and monocotyledonous plant species kindly provided by the BASF AG (Germany) were tested in soil infected with Syrian isolate of *P. betae* only. After microscopic examination only 23 dicotyledonous plants species belong to 10 families were positively tested with *P. betae*. This study showed for the first time the infection of Cabbage, *Brassica oleracea* and Radish, *Raphanus sativus* with *P. betae*. All Weeds were infected with Syrian isolate of *P. betae* were able to transfer it to the roots of sugar beet. Some of weed species which show in Literature that potentially-infected with *P. betae* did not infect with Syrian isolate.

**Key words:** *Polymyxa betae*, Weeds, Sugar beet, Virus

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*Polymyxa* spp.

Plasmodiophorales Plasmodiophoraceae

Protozoa Plasmodiophoramycetes

*Polymyxa* .(Schloesser, 1997)

*P. graminis* *P. betae*

DNA

.(Ward and Adams, 1998)

*P. betae*

.(Keskin, 1964)

*Beet Necrotic Yellow Vein virus* (BNYVV)

*Beet Soil Borne virus* (BSBV)

(Giunchedi and Langenberg, 1982)

Heidel *et al.* ) *Beet soil borne mosaic Bennyvirus* (BSBMV)

.(Meunier *et al.*, 2003) *Beet Q Furovirus* Q (*al.*, 1997)

%80

.(Payne and Asher, 1990)

*P. betae*

.(Schloesser *et al.*, 1997)

(Proeseler *et al.*, 1990)

15

DNA

(Legreve *et al.*, 1998; Ward

.(and Adams, 1998)

*P. betae*

Chenopodiaceae Amaranthaceae,

.Solanaceae Portulacaceae, Compositaceae, Caryophyllaceae,

(Barr, 1979; Abe and Ui, 1986; Gerik and Duffus, 1987; Ivanovic, 1988; Schloesser, 1989; Goffart *et al.*, 1989; Hugo *et al.*, 1996; Izadpanah, *et al.*, 1996; Yanar, *et al.*, 2006)

(Asher and Barr, 1990)

*P. betae*.(Mouhanna *et al.*, 2008)*P. betae*(Mouhanna *et al.*, 2002)

.(Mahmoud &amp; Hashem, 2005)

(Choueiri *et al.*, 2001)

:

*P. betae*

2010-2007

:

**:Polymyxa spp.**

16

38

186

**-1**

:

: 6 / 13 / 55)  
5/ 10 /58) ( )  
: 4/ 8/ 41) ( )  
: 7/ 10/ 32) ( )  
(4 ) ( )

(Schering AG, 1989)

40 × 10

*Polymyxa*

Cystosori

20-

**:Seeds of Weeds -2**

*P. betae*

106

BASF AG

(5)

*P. betae*

× 5) ) (1-3 3-2)  
( ) ( 5 8 ( 60 = 12  
%85-80 25 - 23 )  
( 8000

:

20-

**:*P. betae* -3**

*P.*

*P. betae*

17

*graminis*

2

(4 )

Hilma

(1) *Polymyxa* spp.

*P. graminis* *P. betae*

*P. betae*

*P. graminis*

*P. betae*

:

.DNA

20-

(1)

*P. graminis* *P. betae*

<i>P. graminis</i>	<i>P. betae</i>	/	
	+	1	
+	+	2	
	+	3	
	+	4	
	+	1	
	+	2	
	+	3	
+	+	1	
+	+	2	
	+	3	
	+	1	
	+	2	
	+	3	
	+	4	
+	+	1	
	+	2	
	+	3	

+

*P. betae* *P. graminis* -4  
 :Polymerase Chain Reaction (PCR)

*P. graminis* :DNA  
 DNA : PCR

*P. betae*  
 (Doyle & Doyle,1990)

100) 0.5 200  
 CTAB %2 NaCl 1.4 (PH=8) EDTA 20 Tris-HCl  
 %0.2 (Na<sub>2</sub>S<sub>2</sub>O<sub>5</sub> %1  
 β-mercaptoethanol  
 / 30 - 20 60  
 %70 Isopropanol DNA  
 1μ 50  
 .(EDTA 1 PH=8 Tris-Hcl 10) TE  
 260 DNA DNA  
 / 50 DNA 280  
 ° 20

:PCR

Pg fwd2: GGAAGGATCATTAGCGTTGAAT  
 Px rev7: GAGGCATGCTTCCGAGGGCTCT  
 (Ward *P. graminis* 320bp ITS1-rDNA  
 .& Adams, 1998)

ACG ATG GAC GAC TAT TGA GGG G :  
 Pb-3b :CA GCC TAG TCA CAA ATG GGG Pb-3a:  
 (Mutasa *et P. betae* 630bp ITS1-rDNA  
 .al., 1995)

25 PCR  
 2,5 (500 mM KCl 100 mM Tris-HCl) 2,5 μl  
 μl 0,5 MgCl<sub>2</sub> μl 1,5 0.2 dNTP-Mix μl  
 μl 1,0 *Taq*-DNA-Polymerase ( 2,5) μl 0,5 Primer

...

%1,5  
 (TBE  
  
*P. betae*  
  
*P. betae*  
  
 PCR  
 100/  
 8)  
  
 .DNA (50 ng)  
  
 -5  
 :  
  
 ( )  
 /  
 25 - 23  
 12  
 20

*Polymyxa*

-1

:

*P. betae*

*P. graminis*

PCR

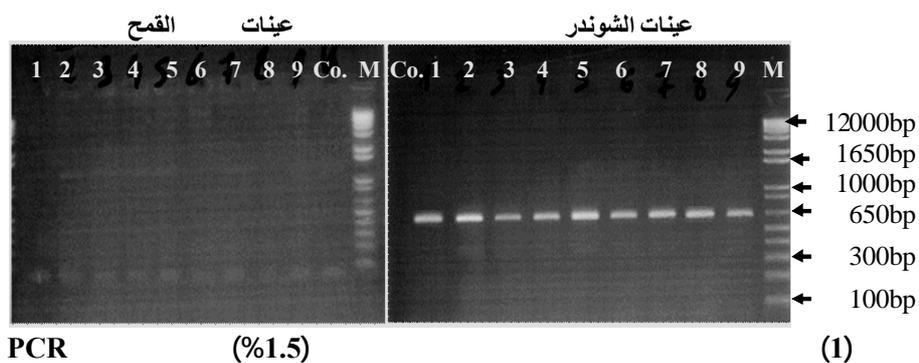
(1)

*P. betae*

*P. betae*

120

10 ( )



PCR (%1.5) (1)  
 Pxrev7 Pgfwd2)  
 Pb-3b Pb-3a bp 320 *P. graminis*  
 DNA (bp 630) *P. betae*  
*P. betae*

10

*P. betae*

*P. betae*

-2

:

1-2

186

*Amaranthus retroflexus* :

*Chenopodium album*

*Atriplex patula*

*Chenopodium Polysperum*

*Chenopodium hybridum*

*Polygonum aviculare*

*Papaver rhoeas*

*Stellaria media*

*Silene alba*

*Portulaca oleracea*

*Poa annua*

*Bromos tectorum* :

(3)

Chenopodiaceae

**P. betae (3)**

	%								
		:	:	:	:				
+	100	3:1	-	1:1	2:2	6	Amaranthaceae	<i>Amaranthus retroflexus</i> L.	
-	0	-	-	1:0	1:0	2	Apiaceae	<i>Ammi majus</i> L.	
-	0	1:0	1:0	2:0	2:0	6	Brassicaceae	<i>Capsella bursa-pastoris</i> L.	
-	0	-	3:0	1:0	1:0	5		<i>Sinapis arvensis</i> L.	
+++	50	1:1	2:2	2:0	1:0	6	Caryophyllaceae	<i>Silene alba</i> Kra.	
++++	75	2:2	2:2	2:0	2:2	8		<i>Stellaria media</i> L.	
-	0	-	2:0	-	-	2		<i>Vaccaria pyramidata</i> L.	
+++	40	1:1	1:0	1:0	2:1	5	Chenopodiaceae	<i>Atriplex patula</i> L.	
+	50	4:2	2:1	1:0	3:2	10		<i>Chenopodium hybridum</i> L.	
+	37.5	1:0	3:2	3:1	1:0	8		<i>Chenopodium polysperum</i>	
++++	23	1:1	2:0	3:1	3:0	9		<i>Chenopodium album</i> L.	
-	0	-	1:0	1:0	-	2	Compositaceae	<i>Anthemis arvensis</i> L.	
-	0	1:0	-	-	1:0	2		<i>Lactuca serriola</i> L.	
-	0	1:0	1:0	1:0	1:0	4		<i>Sonchus oleraceus</i> L.	
-	0	2:0	2:0	-	-	4		<i>Matricaria chamomilla</i> L.	
-	0	-	3:0	-	-	3		<i>Matricaria inodora</i> L.	
-	0	2:0	2:0	-	2:0	6	Convolvulaceae	<i>Convolvulus arvensis</i> L.	
-	0	-	-	3:0	-	3	Cucurbitaceae	<i>Ecballium elaterium</i> L.	
-	0	1:0	2:0	-	-	3		<i>Erysimum cheiranthoides</i> L.	
-	0	3:0	3:0	-	-	6	Fabaceae	<i>Medicago</i> sp.	
-	0	2:0	3:0	-	-	5		<i>Lathyrus</i> sp.	
-	0	1:0	3:0	-	-	4		<i>Trifolium</i> sp.	
-	0	3:0	-	-	3:0	6	Malvaceae	<i>Malva</i> sp.	
-	0	-	2:0	-	-	2		<i>Hibiscus trionum</i> L.	
-	0	3:0	2:0	1:0	-	6	Poaceae	<i>Avena fatua</i>	
++	50	2:2	2:0	1:0	3:2	8		<i>Bromus tectorum</i>	
++	75	2:2	2:2	1:0	3:2	8		<i>Poa annua</i> L.	
-	0	-	-	3:0	5:0	8		<i>Setaria glauca</i> L.	
-	0	1:0	3:0	2:0	3:0	9		<i>Sorghum halepense</i>	
+	35	3:1	-	-	-	3	Papaveraceae	<i>Papaver rhoeas</i> L.	
-	0	3:0	3:0	2:0	-	8	Polygonaceae	<i>Rumex obtusifolius</i>	
+	20	5:1	-	-	-	5		<i>Polygonum aviculare</i> L.	
++	25	3:1	1:0	-	-	4	Portulacaceae	<i>Portulaca oleracea</i> L.	
-	0	2:0	2:0	-	2:0	6	Solanaceae	<i>Datura stramonium</i> L.	
-	0	2:0	-	-	-	2		<i>Physalis longifolia</i> Nutt.	
-	0	2:0	-	-	-	2		<i>Solanum nigrum</i> L.	

: %

( Cystosori ) : /+

( Cystosori ) : +

( Cystosori ) : ++

( Cystosori ) : +++

( Cystosori ) : ++++

*.Polymyxa*

*. Polymyxa spp.*

*Capsella bursa-pastoris*

*P. betae*

2-2

:

*P. betae*

*P.*

106

*P. graminis*

*betae*

5

*P. betae*

12

23

*P. betae*

.(4)

*P. betae*

*Raphanus sativus*

*Brassica oleracea*

Chenopodiaceae

Brassicaceae

%20

. Solanaceae%33

Convulvulaceae %25

*P. betae*

Abe and Ui, 1986; Barr, 1979; Gerik and duffus,  
*P. betae* (1990) Asher .1987; Goffart *et al.*, 1989  
*S. C. album B. vulgaris alba*

***P. betae* (4)**

	%						
-	0	0	4	Amaranthaceae	<i>Amaranthus graesizans</i>		
-	0	0	5		<i>Amaranthus hybridus</i>		
++	%100	4	4		<i>Amaranthus retroflexus</i>		
-	0	0	5	Boraginaceae	<i>Myosotis arvensis</i>		
-/+	20	1	5	Brassicaceae	<i>Brassica oleracea</i>		
-	0	0	5		<i>Brassica rapa</i>		
-	0	0	5		<i>Capsella bursa-pastoris</i>		
+	60	3	5		<i>Arabidopsis thaliana</i>		
-	0	0	3		<i>Erysimum cheiranthoides</i>		
-	0	0	5		<i>Raphanus raphanistrum</i>		
+	20	1	5		<i>Raphanus sativus</i>		
-	0	0	4		<i>Sinapis arvensis</i>		
-	0	0	4		<i>Sisymbrium officinale</i>		
-	0	0	5		<i>Thlaspi arvense</i>		
+++	80	4	5		Caryophyllaceae	<i>Silene alba</i>	
+++	100	5	5		Chenopodiaceae	<i>Stellaria media</i>	
+++	100	4	4	<i>Atriplex hastate</i>			
+++	60	3	5	<i>Atriplex patula</i>			
+++	75	3	4	<i>Chenopodium album</i>			
+++	100	5	5	<i>Chenopodium quinoa</i>			
+++	80	4	5	<i>Chenopodium hybridum</i>			
+++	75	3	4	<i>Chenopodium polyspermum</i>			
+++	80	4	5	<i>Chenopodium vulvaria</i>			
-	0	0	5	<i>Salsola kali</i>			
+++	60	3	5	<i>Beta vulgaris</i>			
+++	60	3	5	<i>Spinacia oleraces</i>			
-	0	0	3			<i>Ambrosia artemisiifolia</i>	
-	0	0	5			<i>Anthemis arvensis</i>	

-	0	0	5	Compositae	<i>Bidens pilosa</i>		
-	0	0	4		<i>Centaurea cyanus</i>		
-	0	0	4		<i>Chreanthemum segetum</i>		
-	0	0	5		<i>Conyza Canadensis</i>		
-	0	0	3		<i>Lactuca serriola</i>		
-	0	0	3		<i>Galensoga ciliate</i>		
-	0	0	2		<i>Galensoga parviflora</i>		
-	0	0	4		<i>Matricaria chamomilla</i>		
-	0	0	5		<i>Matricaria matricarioides</i>		
-	0	0	4		<i>Senecio vulgaris</i>		
-	0	0	4		<i>Sonchus arvensis</i>		
-	0	0	3		<i>Sonchus oleraceus</i>		
-	0	0	3		<i>Xanthium strumarium</i>		
+	25	1	4		Convolvulaceae	<i>Convolvulus arvensis</i>	
-	0	0	3		Euphorbiaceae	<i>Mercuriales annua</i>	
-	0	0	3	Fabaceae	<i>Trifolium tomentosum</i>		
-	0	0	2		<i>Trifolium speciosum</i>		
-	0	0	4		<i>Trifolium itussla</i>		
-	0	0	5		<i>Trifolium stellatum</i>		
-	0	0	4		<i>Trifolium campestre</i>		
-	0	0	4		<i>Trifolium purpureum</i>		
-	0	0	3		<i>Trigonella mantha</i>		
-	0	0	3		<i>Medicago drigidula</i>		
-	0	0	4		<i>Medicago polymorpha</i>		
-	0	0	5		<i>Medicago radiata</i>		
-	0	0	5		<i>Medicago rotata</i>		
-	0	0	3		<i>Medicago noea</i>		
-	0	0	3		<i>Medicago sativa</i>		
-	0	0	5		<i>Phasaeolus vulgaris</i>		
-	0	0	4		<i>Vicia sativa</i>		
-	0	0	5		Poaceae	<i>Agropyron repens</i>	
-	0	0	4			<i>Alopecurus myosoroides</i>	
-	0	0	4	<i>Apera spica-venti</i>			
-	0	0	5	<i>Bromus sterilis</i>			
-	0	0	3	<i>Digitaria ischaimum</i>			
-	0	0	3	<i>Digitaria sanguinalis</i>			
-	0	0	2	<i>Echinocloa colonum</i>			
-	0	0	4	<i>Echinocloa crus-galli</i>			
-	0	0	5	<i>Eleusine indica</i>			
-	0	0	5	<i>Cynodon dactylon</i>			
-	0	0	4	<i>Lolium multiflorum</i>			
-	0	0	4	<i>Lolium perenne</i>			
-	0	0	4	<i>Lolium rigidum</i>			
-	0	0	3	<i>Panicum dichoto miflorum</i>			

-	0	0	5		<i>Phalaris canariensis</i>	
-	0	0	5		<i>Poa annua</i>	
-	0	0	5		<i>Setaria viridis</i>	
-	0	0	5		<i>Sorghum halepense</i>	
-	0	0	5		<i>Triticum spp</i>	
-	0	0	5		<i>Hordeum spp</i>	
-	0	0	4	Labiataea	<i>Lamium amplexicaule</i>	
-	0	0	2		<i>Lamium purpureum</i>	
-	0	0	3	Malvaceae	<i>Hibiscus trionum</i>	
-	0	0	5		<i>Malva neglecta</i>	
-	0	0	3		<i>Geranium dissectum</i>	
++	80	4	5	Papaveraceae	<i>Papaver rhoeas</i>	
++	50	2	4	Polyganaceae	<i>Polygonum aviculare</i>	
-	0	0	4		<i>Polygonum convulvulus</i>	
-	0	0	3		<i>Polygonum lapathifolium</i>	
++	60	3	5		<i>Polygonum persicaria</i>	
+	20	1	5		<i>Rumex crispus</i>	
-	0	0	5		<i>Rumex obtusifolius</i>	
++	60	3	5	Portulacaceae	<i>Portulaca oleraceae</i>	
-	0	0	4	Primulaceae	<i>Anagallis arvensis</i>	
-	0	0	4	Ranunculaceae	<i>Ranunculus repens</i>	
-	0	0	4	Rosaceae	<i>Aphanes arvensis</i>	
-	0	0	3	Rubiaceae	<i>Galium aparine</i>	
-	0	0	5	Scropholariaceae	<i>Veronica agrestis</i>	
-	0	0	5		<i>Veronica hederifolia</i>	
-	0	0	5		<i>Veronica persica</i>	
+	33	1	3	Solanaceae	<i>Datura stramonium</i>	
-	0	0	5		<i>Lycopersicum esculatum</i>	
-	0	0	5		<i>Solanum melogena</i>	
-	0	0	5		<i>Solanum nigrum</i>	
-	0	0	4	Umbelliferae	<i>Aethusa cynapium</i>	
-	0	0	4		<i>Ammi magus</i>	
+	80	4	5	Urticaceae	<i>Urtica urens</i>	
-	0	0	3	Violaceae	<i>Viola arvensis</i>	

: %

:

( Cystosori ) : /+

( Cystosori 2-1 ) : +

( Cystosori 6-3 ) : ++

( Cystosori 10-7 ) : +++

( Cystosori ) : ++++

*P. betae* 2-3  
:

*P. betae* ( )  
*P. betae*

10 .Hilma

*P. betae*

.(5)

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*Amaranthus retroflexus* *Stellaria media* *Atriplex hastate* *Atriplex patula* *Chenopodium album* *Chenopodium quinoa* *Chenopodium hybridum* *Chenopodium polyspermum* *Chenopodium vulvaria* *Beta vulgaris* *Spinacia oleraces*.

*Raphanus sativus* *Datura stramonium* *Rumex crispus*

:

*Sorghum halepense* *Convolvulus arvensis* *Capsella bursa-pastoris* *Lolium multiflorum* *Centaurea cyanus*

*Arabidopsis thaliana* .(Mouhanna *et al.*, 2008)

%60 *C. album*  
%100

(Asher and Barr, 1990; Desoignies

*et al.*, 2010)

*P. betae*

(5)

*	%					
+++	100	4	4	Amaranthaceae	<i>Amaranthus retroflexus</i>	
++	60	3	5	Brassicaceae	<i>Brassica oleracea</i>	
		0	5		<i>Capsella bursa-pastoris</i>	
++	60	3	5		<i>Arabidopsis thaliana</i>	
-/+	20	1	5		<i>Raphanus sativus</i>	
++	40	2	5		<i>Silene alba</i>	
+++	100	5	5	Caryophyllaceae	<i>Stellaria media</i>	
+++	100	3	3	Chenopodiaceae	<i>Atriplex hastate</i>	
+++	40	2	5		<i>Atriplex patula</i>	
+++	100	5	5		<i>Chenopodium album</i>	
+++	100	5	5		<i>Chenopodium quinoa</i>	
+++	80	4	5		<i>Chenopodium hybridum</i>	
+++	40	2	5		<i>Chenopod. polyspermum</i>	
+++	50	2	4		<i>Chenopodium vulvaria</i>	
+++	60	3	5		<i>Beta vulgaris</i>	
++	60	5	5		<i>Spinacia oleraces</i>	
		0	4		Compositae	<i>Centaurea cyanus</i>
		0	5	<i>Matricaria chamomilla</i>		
		0	5	Convulvulaceae	<i>Convolvulus arvensis</i>	
		0	2	Fabaceae	<i>Trifolium campestre</i>	
		0	5		<i>Trigonella mantha</i>	
		0	5		<i>Medicago sativa</i>	
		0	5		<i>Phaseolus vulgaris</i>	
-/+	20	1	5		<i>Lolium multiflorum</i>	
		0	5	Poaceae	<i>Poa annua</i>	
		0	5		<i>Sorghum halepense</i>	
		0	5		<i>Triticum spp (Cham 3)</i>	
++	60	3	3		Papaveraceae	<i>Papaver rhoeas</i>
++	20	1	5	Polygonaceae	<i>Polygonum aviculare</i>	
++	40	2	5		<i>Polygonum persicaria</i>	
++	30	1	3		<i>Rumex crispus</i>	
++	60	3	5	Portulacaceae	<i>Portulaca oleraceae</i>	
++	20	1	5	Solanaceae	<i>Datura stramonium</i>	
++	75	3	4	Urticaceae	<i>Urtica urens</i>	

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*Polymyxa betae* Keskin

(Mouhanna *et al.*, 2002)

*P. graminis*

*P. betae*

( )

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DNA

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