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supplementary materials

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## **Compatibility of entomopathogenic fungi with insecticides and their efficacy for IPM of *Bemisia tabaci* in cotton**

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**Supplemental Table S1.** List of fungal cultures procured and used for the virulence and compatibility study

Fungal strains ID	Name	Culture collection/ NCBI GeneBank Accession Number
Fm-083	<i>Fusarium minoliforme</i>	ITCC-10493.17/ MG976231
Ij-089	<i>Isaria javanica</i>	ITCC-10495.17/ MG976232
Ij-099	<i>Isaria javanica</i>	ITCC-10498.17
Ij -102	<i>Isaria javanica</i>	ITCC-10499.17/ MG976234
Ma-1299	<i>Metarrhizium anisopliae</i>	NAIMCC-F-1299
Bb-409	<i>Beauveria bassiana</i>	NAIMCC-F-0409
Bb-4565	<i>Beauveria bassiana</i>	MTCC-4565
Bb-4511	<i>Beauveria bassiana</i>	MTCC-4511
Bb-6097	<i>Beauveria bassiana</i>	MTCC-6097
Bb-4543	<i>Beauveria bassiana</i>	MTCC-4543

**Supplemental Table S2.** List of chemical and botanical pesticides used for the compatibility study

Technical name	Concentration of active ingredient	Recommended doses/L	Trade Name	Chemical group	Company/ Source
Neem oil	0.03%	5 mL	Nimbecidine	Azadirachtine	Stanes
Pongamia oil	Pure crude oil	5 mL	Karanj oil	Karanjin	Local market
Castor oil	Pure crude oil	10 mL	Castor oil		Local market
Spiromesifen	22.9% SC	1 mL	Oberon	Insect growth regulator (Tetronic and Tetramic acid derivatives)	Bayer Crop Science
Flonicamid	50% WG	0.4 g	Ulala	Flonicamid	UPL
Diafenthiuron	50% WG	1 g	Polo	Insect growth regulator (Diafenthiuron)	Syngenta
Buprofezin	25% SC	1.6 mL	Applaud	Insect growth regulator	Tata
Pyriproxifen	10% EC	2.5 mL	Leno	Insect growth regulator	Sumitomo Chemical
Profenophos	50% EC	2 mL	Curacron	Organophosphates	Syngenta
Triazophos	40% EC	3 mL	Sutathion	Organophosphates	Sudarshan Chemicals
Imidacloprid	70% WG	1 g	Admire	Neonicotinoids	Bayer Crop Science
Fipronil	5% EC	2 mL	Regent	Phenylpyrazoles (Fiproles)	Bayer Crop Science

**Supplemental Table S3.** Effect of commercial chemical pesticides and botanicals poisoned SDYA on mycelial growth (mean±SE) of entomopathogenic fungi

Treatment <sup>a)</sup>	Mean mycelial growth at 7 days after inoculation (mm) in different EPFs									
	Ij-089	Ij-099	Ij-102	Ma-1299	Fm-083	Bb-6097	Bb-5411	Bb-4543	Bb-4565	Bb-409
Neem - F	23.5±0.9	65.0±11.5	25.0±2.9	24.0±0.6	70.0±1.2	67.5±13.0	35.2±0.1	92.0±4.6	59.5±0.3	22.4±2.6
Neem - H	19.0±2.3	25.0±0.0	21.0±0.6	20.5±0.3	62.5±2.6	35.0±2.9	30.0±5.8	70.0±11.5	43.0±0.6	18.2±2.0
Pongamia - F	32.5±1.4	57.5±1.4	33.0±1.7	25.0±1.4	87.5±1.2	45.0±4.3	85.0±2.9	97.5±5.8	55.0±2.9	24.3±2.0
Pongamia - H	23.0±1.7	27.5±4.3	22.0±0.6	22.5±0.0	74.3±0.9	37.5±2.9	65.0±2.9	90.0±1.4	55.0±0.6	20.4±6.1
Castor oil - F	70.0±3.2	14.8±1.9	41.3±3.6	19.5±0.4	61.0±2.0	18.0±1.2	16.8±0.6	33.8±4.9	50.5±8.4	17.2±2.6
Castor oil - H	65.0±2.9	14.3±0.4	31.3±5.1	16.3±2.3	47.5±0.9	15.5±0.3	13.5±0.4	26.5±0.7	40.0±2.6	14.3±2.6
Spiromesifen - F	41.5±0.6	77.5±2.9	40.0±0.0	70.0±2.9	73.9±2.6	82.5±7.2	50.0±1.4	100.0±0.7	68.0±0.6	65.3±7.8
Spiromesifen - H	26.0±0.9	65.0±4.3	36.5±2.0	45.0±5.8	67.4±4.9	67.5±7.2	37.5±11.5	100.0±1.3	57.5±1.4	41.5±3.0
Flonicamid - F	25.0±1.7	67.5±5.8	47.5±3.5	75.0±8.7	76.9±0.0	37.5±1.4	57.5±7.2	100.0±2.2	67.0±1.2	69.2±3.6
Flonicamid - H	23.5±0.3	42.5±13.0	34.0±8.4	45.0±8.5	74.1±2.6	35.0±5.6	50.0±0.0	97.5±1.4	56.5±0.3	58.3±7.2
Diafenthiuron - F	21.5±2.0	22.0±0.6	22.5±0.3	55.0±8.6	39.5±1.4	35.0±5.8	30.0±1.4	82.5±10.1	45.0±2.9	19.3±1.7
Diafenthiuron - H	13.5±0.9	19.5±0.9	20.5±0.9	28.5±0.9	37.6±0.6	31.0±5.2	27.5±5.8	51.2±0.3	35.5±0.3	16.2±1.2
Buprofezin - F	31.5±0.9	67.5±4.3	30.0±0.3	85.0±2.9	85.5±1.7	77.5±13.0	75.5±5.5	95.0±0.0	58.5±0.9	72.3±5.4
Buprofezin - H	26.5±0.9	42.5±18.8	29.5±1.2	40.0±5.8	79.8±2.6	37.5±4.3	60.0±11.5	90.0±5.8	57.0±1.7	38.4±3.8
Pyriproxifen - F	26.5±0.3	65.0±14.4	30.0±5.8	40.0±5.8	98.8±0.3	35.0±2.9	97.5±5.8	100.0±0.7	49.0±2.3	35.2±2.9
Pyriproxifen - H	22.0±1.7	57.5±7.2	21.5±0.3	30.0±2.9	64.0±0.9	25.0±2.9	50.0±1.4	82.5±0.0	42.0±0.6	26.5±4.8
Profenophos - F	30.0±2.3	8.5±2.9	3.8±0.0	12.0±0.7	62.5±1.4	11.3±0.3	11.3±0.4	15.3±0.3	20.5±4.3	10.2±3.7
Profenophos - H	15.5±2.0	6.5±1.2	4.0±0.4	9.8±0.6	59.0±3.2	9.6±0.1	10.3±0.5	14.5±1.6	5.8±1.5	8.3±4.5
Triazophos - F	13.0±1.2	10.0±0.6	10.8±0.4	9.0±1.4	82.5±3.8	14.3±0.7	12.8±0.6	19.0±1.2	22.0±2.3	8.9±2.2
Triazophos - H	10.0±1.2	8.8±0.0	5.5±0.3	8.3±0.4	70.5±2.9	13.3±0.1	9.5±0.7	11.3±0.7	18.0±1.2	7.3±1.2
Imidacloprid - F	52.5±1.4	17.3±1.0	4.2±0.3	27.0±2.2	83.6±2.9	47.3±1.4	44.3±2.7	36.0±0.1	69.0±3.5	21.3±2.6
Imidacloprid - H	50.0±2.9	14.8±2.2	2.1±0.1	27.0±0.3	77.0±3.2	29.5±3.0	41.8±1.9	32.8±1.7	65.0±2.9	18.2±2.9
Fipronil - F	36.0±1.7	15.8±0.4	3.2±0.5	25.8±1.4	52.5±3.2	62.3±0.7	69.5±0.6	33.3±2.5	11.0±2.0	21.2±2.3
Fipronil - H	31.0±1.7	15.5±0.9	2.5±0.1	20.5±1.9	34.0±2.0	46.7±8.2	65.5±6.1	32.3±0.1	31.0±0.3	18.5±2.1
Control	26.0±1.2	85.0±0.9	35.5±2.9	50.0±2.9	97.5±1.2	72.5±2.6	95.0±2.3	95.0±2.9	62.0±0.6	42.2±2.3
C.D. (p<0.05)	4.87	18.35	7.68	11.12	6.61	15.03	13.08	12.43	7.21	10.66
SE (m)	1.71	6.44	2.70	3.90	2.32	5.28	4.59	4.36	2.53	3.74
SE (d)	2.42	9.11	3.81	5.52	3.28	7.46	6.49	6.17	3.58	5.29
C.V.	9.85	28.03	20.99	20.42	6.27	23.11	17.43	11.98	9.57	22.57
F Cal	79.97	17.99	27.10	28.46	48.35	16.69	33.63	63.39	53.18	26.79

<sup>a)</sup>F- Full recommended dose and H- Half dose; C.D.- Critical Difference; SE(m)- standard error of the mean; SE(d)- standard error of differences; C.V. – critical variance; F cal- calculated F value

**Supplemental Table S4.** Effect of commercial chemical pesticides and botanicals on mycelial growth inhibition of entomopathogenic fungi.

Treatment <sup>a)</sup>	Mean mycelia growth inhibition (%) in different EPFs at 7 days after inoculation <sup>b)</sup>									
	Ij- 89	Ij-99	Ij-102	Ma-1299	Fm-83	Bb-6097	Bb-4511	Bb-4543	Bb-4565	Bb-409
Neem - F	9.6	23.5	29.6	52.0	28.2	6.9	62.9	3.2	4.0	46.9
Neem - H	26.9	70.6	40.8	59.0	35.9	51.7	68.4	26.3	30.6	56.9
Pongamia - F	-25.0	32.4	7.0	50.0	10.3	37.9	10.5	-2.6	11.3	42.4
Pongamia - H	11.5	67.6	38.0	55.0	23.8	48.3	31.6	5.3	11.3	51.7
Castor oil - F	-169.2	82.6	-16.2	61.0	37.4	75.2	82.4	64.5	18.5	59.2
Castor oil - H	-150.0	83.2	12.0	67.5	51.3	78.6	85.8	72.1	35.5	66.1
Spiromesifen -F	-21.2	20.6	15.5	-70.0	12.3	-6.9	20.5	0.0	5.6	-71.3
Spiromesifen - H	-1.9	50.0	16.9	20.0	18.2	48.3	36.8	5.3	8.1	9.0
Flonicamid - F	17.3	74.1	36.6	-10.0	59.5	51.7	68.4	13.2	27.4	54.3
Flonicamid - H	48.1	77.1	42.3	43.0	61.4	57.2	71.1	46.1	42.7	61.6
Diafenthiuron - F	-38.5	81.5	91.0	48.5	46.2	14.1	26.8	65.0	82.3	49.8
Diafenthiuron - H	-19.2	81.8	93.0	59.0	65.1	35.7	31.1	66.1	50.0	56.2
Buprofezin - F	3.8	20.6	-33.8	-50.0	21.1	48.3	39.5	-5.3	-8.1	-64.0
Buprofezin - H	9.6	50.0	4.2	10.0	24.0	51.7	47.4	-2.6	8.9	-38.2
Pyriproxifen - F	-101.9	79.7	88.2	46.0	14.3	34.8	53.4	62.1	-11.3	49.5
Pyriproxifen - H	-92.3	82.6	94.1	46.0	21.0	59.3	56.1	65.5	-4.8	56.9
Profenophos - F	40.4	92.4	88.7	80.5	39.5	86.8	89.2	84.7	90.7	80.3
Profenophos - H	-15.4	90.0	89.4	76.0	35.9	84.5	88.2	83.9	66.9	75.8
Triazophos - F	-1.9	23.5	15.5	20.0	-1.3	51.7	-2.6	-5.3	21.0	16.6
Triazophos - H	15.4	32.4	39.4	40.0	34.4	65.5	47.4	13.2	32.3	37.2
Imidacloprid - F	-59.6	8.8	-12.7	-40.0	24.2	-13.8	47.4	-5.3	-9.7	-54.7
Imidacloprid - H	0.0	23.5	-2.8	10.0	30.9	6.9	60.5	-5.3	7.3	1.7
Fipronil - F	50.0	88.3	69.7	82.0	15.4	80.3	86.6	80.0	64.5	78.9
Fipronil - H	61.5	89.7	84.5	83.5	27.7	81.7	90.0	88.2	71.0	82.7

<sup>a)</sup> F- Full recommended dose and H- Half dose. <sup>b)</sup> Values were obtained from the table S3 by calculating the reduction of mycelia growth in individual treatment over control treatment.

**Supplemental Table S5.** Effect of commercial chemical pesticides and botanicals on spore production (mean±SE) of selected entomopathogenic fungi

Treatment <sup>a)</sup>	Spore production/10 mM disc ( $1 \times 10^7$ ) in different EPFs at 10 days after inoculation									
	Ij-089	Ij-099	Ij-102	Ma-1299	Fm-083	Bb-6097	Bb-4511	Bb-4543	Bb-4565	Bb-409
Neem - F	15.2±3.2	42.4±1.6	43.2±2.8	36.0±2.5	30.0±1.6	48.0±3.1	40.0±3.1	12.8±0.8	19.6±2.4	19.6±2.0
Neem - H	10.8±2.7	40.4±1.7	36.8±2.9	29.2±2.3	21.2±1.8	20.4±3.4	23.2±1.9	9.6±1.7	14.0±2.7	14.0±2.8
Pongamia - F	14.4±2.2	42.0±1.4	35.2±2.4	30.8±2.8	29.6±1.5	61.6±3.7	38.8±2.9	12.8±0.9	18.0±3.1	18.0±3.1
Pongamia - H	11.2±2.4	41.2±2.1	28.8±2.6	28.4±2.6	26.0±1.3	21.2±3.3	32.4±1.5	12.4±2.9	18.0±2.9	18.0±3.4
Castor oil - F	14.0±2.7	20.0±1.7	8.8±1.2	28.4±1.9	24.0±1.7	36.4±3.8	22.8±1.1	18.0±0.9	46.8±0.6	15.0±2.5
Castor oil - H	14.4±0.5	14.0±1.6	11.6±1.4	20.8±3.8	25.0±2.1	30.4±2.1	20.0±0.9	11.6±2.1	58.8±0.8	16.0±2.1
Spiromesifen - F	20.0±2.2	43.6±3.2	56.0±1.8	34.4±2.5	50.8±2.4	55.2±2.5	36.8±0.8	22.8±2.3	18.0±0.5	18.0±2.7
Spiromesifen - H	16.0±2.1	38.8±3.7	53.6±1.6	54.0±4.1	34.0±2.1	58.4±2.4	32.0±1.9	24.4±2.7	12.4±0.6	12.4±2.7
Flonicamid - F	16.4±2.3	42.0±3.5	32.4±2.8	36.8±1.3	42.8±2.6	73.6±2.2	33.6±0.7	20.0±2.2	18.4±1.9	18.4±2.0
Flonicamid - H	13.2±2.1	32.8±3.4	22.8±1.8	37.2±2.7	44.8±2.3	67.6±2.8	24.8±2.4	15.6±2.6	18.8±2.5	18.8±2.5
Diafenthiuron - F	24.4±1.5	38.0±2.1	31.6±2.7	38.8±0.7	56.8±2.4	42.0±3.1	40.0±2.9	32.4±2.9	36.4±1.6	30.0±3.0
Diafenthiuron - H	11.6±2.5	36.4±2.2	28.8±2.5	44.4±2.1	52.8±2.8	65.6±1.8	29.6±3.6	22.4±2.0	19.6±1.4	30.0±2.2
Buprofezin - F	15.2±3.8	29.6±2.4	30.0±2.4	38.4±2.5	41.2±2.5	56.8±2.6	42.4±2.7	37.6±3.5	19.2±2.5	36.4±2.0
Buprofezin - H	12.4±2.6	26.0±2.3	34.8±2.7	30.4±2.3	31.6±2.9	42.0±2.4	37.2±2.8	32.8±3.8	17.6±0.6	19.6±1.9
Pyriproxifen - F	15.6±1.2	32.0±2.6	37.2±2.3	28.4±2.1	50.4±2.5	57.6±2.1	28.0±2.9	16.8±3.3	30.0±0.9	19.2±0.6
Pyriproxifen - H	10.8±1.3	38.0±6.0	36.0±2.5	40.4±4.1	42.0±2.4	56.4±2.3	23.2±2.6	13.2±3.1	30.0±3.2	17.6±0.7
Profenophos - F	14.4±2.0	18.0±0.7	27.6±2.9	35.2±4.5	28.0±0.6	37.6±2.8	52.4±2.3	16.0±3.5	39.2±3.4	17.0±0.9
Profenophos - H	16.8±2.5	13.6±1.1	27.2±2.2	28.0±4.2	25.0±0.8	34.0±2.2	46.8±2.5	12.0±2.3	34.8±3.1	15.6±1.5
Triazophos - F	8.8±1.5	17.2±2.7	32.0±2.9	38.4±4.7	35.0±0.5	36.4±1.5	17.6±2.3	10.8±2.8	36.0±3.5	9.1±2.5
Triazophos - H	10.8±1.9	14.8±2.4	30.8±2.6	30.4±1.9	32.5±0.7	35.2±1.7	12.4±2.5	8.4±2.1	29.6±2.5	12.0±2.0
Imidacloprid - F	13.6±2.1	27.6±2.7	23.2±2.3	26.4±1.4	26.0±0.6	29.2±2.5	38.8±3.1	14.8±2.5	37.2±2.8	13.5±2.3
Imidacloprid - H	17.6±2.4	22.0±2.5	22.4±2.4	22.0±2.4	27.8±0.9	23.6±2.6	32.8±3.5	16.8±2.1	32.4±2.3	15.6±1.1
Fipronil - F	6.4±2.5	18.4±3.1	30.4±2.2	37.2±1.7	26.0±1.3	41.6±2.4	38.8±3.8	11.6±2.8	30.4±2.5	7.2±2.0
Fipronil - H	6.0±2.6	17.6±3.3	22.0±2.7	28.4±2.9	21.0±2.4	35.2±2.7	28.8±3.3	8.8±2.2	25.6±3.3	7.1±1.7
Control	26.4±2.5	50.8±3.2	54.4±2.1	50.4±1.2	52.4±2.3	94.8±2.4	50.8±3.6	44.0±2.3	46.8±2.9	57.2±1.9
C.D. ( $p < 0.05$ )	6.66	7.90	6.83	7.74	5.27	7.01	7.54	6.72	5.89	5.41
SE (m)	2.34	2.77	2.40	2.72	1.85	2.46	2.65	2.36	2.07	1.90
SE (d)	3.30	3.92	3.39	3.84	2.61	3.48	3.74	3.34	2.92	2.68
C.V.	27.71	15.85	13.02	13.78	9.13	9.18	13.90	22.29	12.64	17.29
F Cal	4.12	16.81	22.71	8.54	35.99	53.73	14.60	15.86	32.49	29.95

<sup>a)</sup>F- Full recommended dose and H- Half dose; C.D.- Critical Difference; SE(m)- standard error of the mean; SE(d)- standard error of differences; C.V. – critical variance; F cal- calculated F value

**Supplemental Table S6.** Effect of commercial chemical pesticides and botanicals on reduction of spore production (%) of selected entomopathogenic fungi.

Treatment <sup>a)</sup>	Mean conidial production inhibition (%) in different EPFs <sup>b)</sup>									
	Ij- 89	Ij-99	Ij-102	Ma-1299	Fm-83	Bb-6097	Bb-4511	Bb-4543	Bb-4565	Bb-409
Neem - F	42.4	16.5	20.6	28.6	42.7	49.4	21.3	70.9	58.1	65.7
Neem - H	59.1	20.5	32.4	42.1	59.5	78.5	54.3	78.2	70.1	75.5
Pongamia - F	45.5	17.3	35.3	38.9	43.5	35.0	23.6	70.9	61.5	68.5
Pongamia - H	57.6	18.9	47.1	43.7	50.4	77.6	36.2	71.8	61.5	68.5
Castor oil - F	45.5	72.4	78.7	58.7	52.3	67.9	60.6	73.6	-25.6	72.0
Castor oil - H	47.0	60.6	83.8	43.7	54.2	61.6	55.1	59.1	0.0	73.8
Spiromesifen -F	42.4	41.7	44.9	23.8	21.4	40.1	16.5	14.5	59.0	36.4
Spiromesifen - H	53.0	48.8	36.0	39.7	39.7	55.7	26.8	25.5	62.4	65.7
Flonicamid - F	7.6	25.2	41.9	23.0	-8.4	55.7	21.3	26.4	22.2	47.6
Flonicamid - H	56.1	28.3	47.1	11.9	-0.8	30.8	41.7	49.1	58.1	47.6
Diafenthiuron - F	75.8	63.8	44.1	26.2	50.4	56.1	23.6	73.6	35.0	87.4
Diafenthiuron - H	77.3	65.4	59.6	43.7	59.9	62.9	43.3	80.0	45.3	87.6
Buprofezin - F	37.9	17.3	40.4	27.0	18.3	22.4	33.9	54.5	60.7	67.8
Buprofezin - H	50.0	35.4	58.1	26.2	14.5	28.7	51.2	64.5	59.8	67.1
Pyriproxifen - F	48.5	45.7	57.4	47.6	50.4	69.2	23.6	66.4	20.5	76.4
Pyriproxifen - H	33.3	56.7	58.8	56.3	46.9	75.1	35.4	61.8	30.8	72.7
Profenophos - F	36.4	73.2	50.0	44.4	52.3	64.1	7.9	72.7	25.6	72.7
Profenophos - H	45.5	64.6	49.3	30.2	46.6	60.3	-3.1	63.6	16.2	70.3
Triazophos - F	40.9	37.0	31.6	43.7	3.8	39.2	44.9	61.8	35.9	66.4
Triazophos - H	59.1	25.2	33.8	19.8	19.8	40.5	54.3	70.0	35.9	69.2
Imidacloprid - F	24.2	14.2	-2.9	31.7	3.1	41.8	27.6	48.2	61.5	68.5
Imidacloprid - H	39.4	23.6	1.5	-7.1	35.1	38.4	37.0	44.5	73.5	78.3
Fipronil - F	66.7	66.1	41.2	23.8	33.2	61.6	65.4	75.5	23.1	84.1
Fipronil - H	59.1	70.9	43.4	39.7	38.0	62.9	75.6	80.9	36.8	79.0

<sup>a)</sup> F- Full recommended dose and H- Half dose. <sup>b)</sup> Values were obtained from the table S5, by calculating the reduction of mycelia growth in individual treatment over control treatment.