Supplementary materials

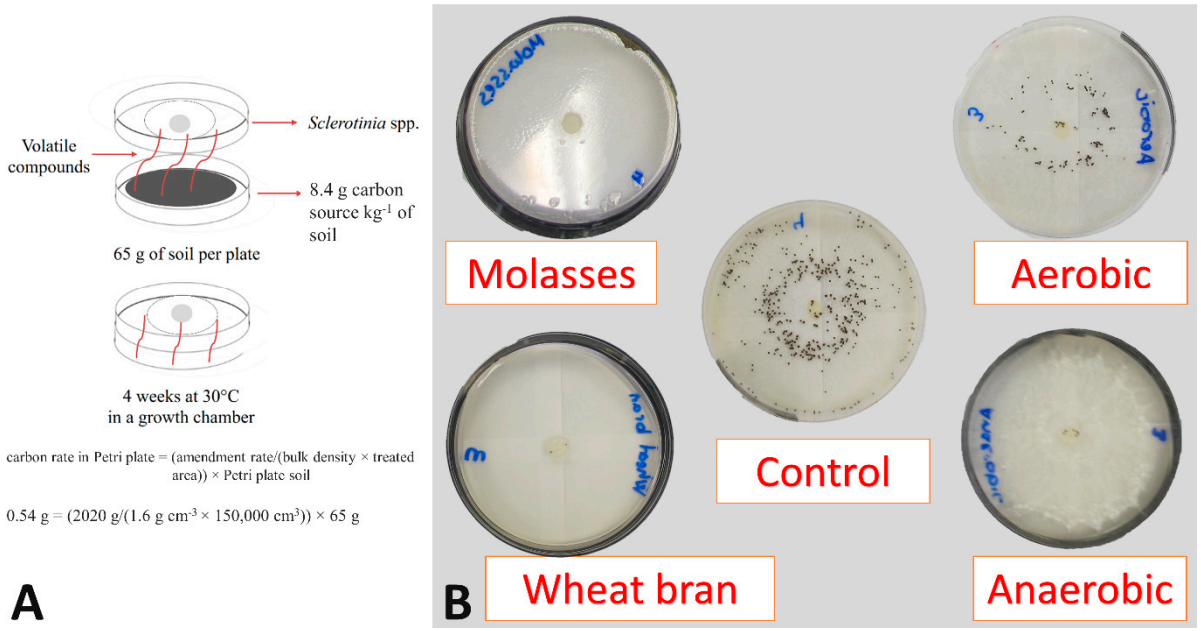

Figure S1. Anaerobic soil disinfestation (ASD) laboratory simulation. A) Soil mixed with various potential carbon sources for ASD, saturated with water, and placed facing a mycelial plug of *Sclerotium rolfsii*. A rate of 2.02 kg of carbon source m^{-2} of soil. A bulk density of 1.6 g cm^{-3} and a treated area of 200,000 cm^3 were assumed. The final carbon rate was calculated using the formula:
Carbon rate in Petri plate = *(amendment rate/(bulk density × treated area)) × Petri plate soil.*
B) Mycelial growth of *S. rolfsii* measured as the area of the colony in cm^2 and the number of sclerotia produced in each treatment.

Figure S2. Effect of carbon sources incorporated into de soil on stevia stem rot incidence. A) Microplots at Central Crops Research Station-NCSU, Clayton, NC, USA. B) Carbon sources (cornmeal + molasses) were incorporated manually into the soil to a depth of 15 cm using a hoe with a rate of 2 kg m^{-2}. C) Microplots flooded with water to field capacity and covered with black plastic mulch with the borders sealed to avoid gases interchange with the environment. D) After four weeks of covering with plastic, holes were made in the plastic mulch stevia-rooted cuttings line "G3" and were transplanted into microplots. E) Plot treated with ASD with low weed pressure after removing the plastic mulch seven weeks following planting. F) Untreated control plot with high weed pressure per m^2 seven weeks after planting.

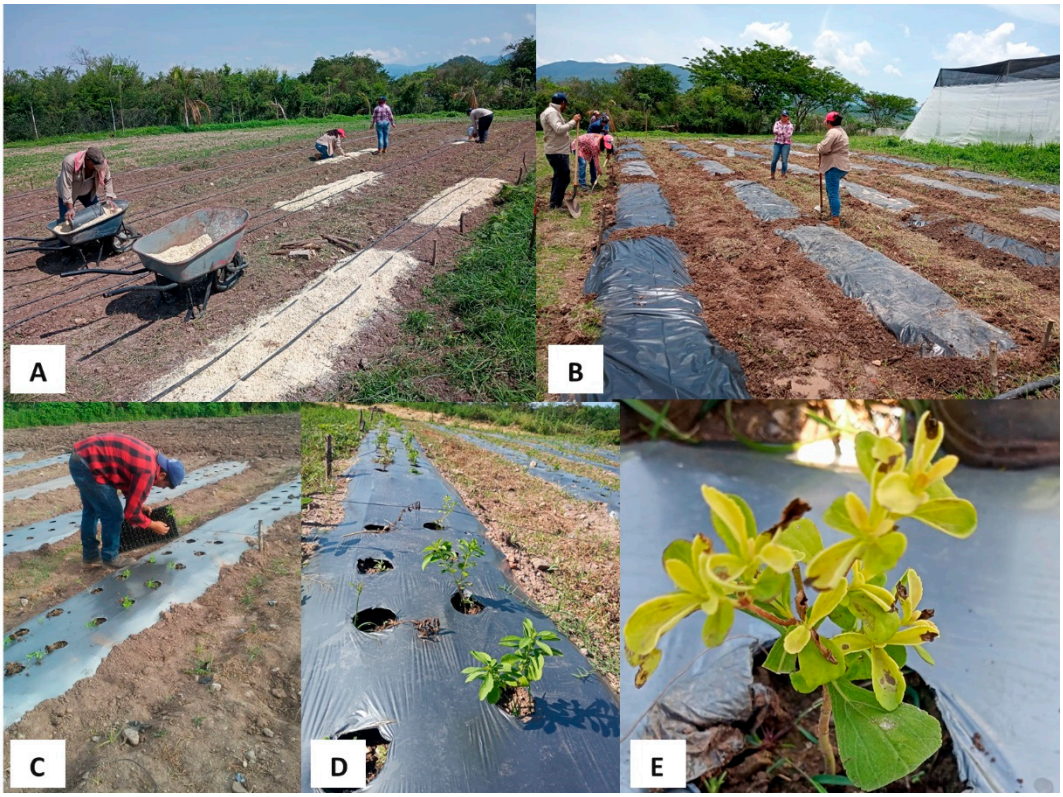

Figure S3. Effectiveness of integrated pathogen management under field conditions at Colegio Superior Agropecuario del Estado de Guerrero (CSAEGRO), Guerrero, Mexico. A) Soil tilled and leveled with plot beds prepared with 1 m wide × 3 m long. Molasses (10.1 Mg ha^{-1}) + cornmeal (20.2 Mg ha^{-1}) were manually incorporated 15 cm deep into the soil beds using hoes. Plots were saturated with water using double drip irrigation. B) Plots were covered with plastic film sealing the edges with soil to entrap volatile compounds generated over four weeks. C) After four weeks, holes for planting were made in the plastic mulch, and after one week, 6-week-old stevia seedlings were transplanted into plots. D) After 15 DAP, SSR disease incidence and SLS severity were evaluated weekly. E) Stevia plants cv. "Morita II" were evaluated for fresh and dry leave weight 90 days after planting.

Table S1. Description of soil characteristics of soils from field experiments combining anaerobic soil disinfestation and application of fungicides to manage stevia diseases.

Soil Properties[x]	CEDIT[y]	CSAEGRO[z]
Sand	30	21
Silt	33	16
Clay	37	63
pH	5.7	7.4
Ca	3.99	19.55
Mg	0.57	9.8
K	0.33	0.06
CIC	7.5	29.5
P	8.93	9.5
Fe	54.99	11
Cu	3.54	2.4
Zn	2.84	0.38
Mn	31.22	3.9

[x]Sampling depth 20 cm.

[y]Centro de Desarrollo e Innovación Tecnológica (CEDIT), Ruta 6 Km 38, Hohenau, Itapúa, 6290, Paraguay.

[z]Departamento de Fitotecnia, Colegio Superior Agropecuario del Estado de Guerrero (CSAEGRO), Guerrero, Mexico

Table S2. The cost of stevia production in Mexico with a plant density of 100,000 (30x20x70 cm) for different combinations of disease management approaches for stevia production. Treatments were A) ASD[v] + Control[w], B) ASD + chemical fungicide[x], C) ASD + organic fungicide[y], D) No ASD[z] + Control, E) No ASD + chemical fungicide application, F) No ASD + organic fungicide application.

Cost	Quantity	Price	Treatment costs ($)					
			A	B	C	D	E	F
Fertilization	5,000 kg ha^{-1}	0.1 $ kg^{-1}	500	500	500	500	500	500
Land prep.	1 ha	280.5 $ ha^{-1}	280.5	280.5	280.5	280.5	280.5	280.5
Bed and plastic laying	1 ha	137.5 $ ha^{-1}	137.5	137.5	137.5	137.5	137.5	137.5
Irrigation hookup	3 day wage	16.5 $ day wage^{-1}	49.5	49.5	49.5	49.5	49.5	49.5
Harvest cost	3 day wage	16.5 $ day wage^{-1}	49.5	49.5	49.5	49.5	49.5	49.5
Incorporation of carbon	3 day wage	16.5 $ day wage^{-1}	49.5	49.5	49.5	0	0	0
Tape	4,450 m	0.06 $ m^{-1}	259.5	259.5	259.5	259.5	259.5	259.5
Molasses	10,100 kg ha^{-1}	0.1 $ kg^{-1}	1,010	1,010	1,010	0	0	0
Cornmeal	20,200 kg ha^{-1}	0.07 $ kg^{-1}	1,414	1,414	1,414	0	0	0
Plastic mulch	2,560 m^2	0.13 $ m^{-2}	323.8	323.8	323.8	323.8	323.8	323.8
Azoxystrobin	3.7 L ha^{-1}	71.5 $ L^{-1}	0	264.5	0	0	264.5	0
Pyroligneous acid	9 L ha^{-1}	25 $ L^{-1}	0	0	225	0	0	225
Application	3 day wage	16.5 $ day wage^{-1}	0	49.5	49.5	0	49.5	49.5
Stevia plants	100,000 plants	0.07 $ plant^{-1}	7,000	7,000	7,000	7,000	7,000	7,000
Total Cost			11,073.8	11,387.8	11,348.3	8,600.3	8,914.3	8,874.8
Cost relative to the control treatment			22.33%	24.47%	24.21%	0.00%	3.52%	3.09%

[v]ASD = saturated plastic covered control amended with molasses at 10.1 Mg ha^{-1} and cornmeal at 20.2 Mg ha^{-1}.
[w]Control = no fungicide application
[x]Organic fungicide = pyroligneous acid at a rate of 30 mL L^{-1} of water.
[y]Chemical fungicide = azoxystrobin at a rate of 230 a.i. g ha^{-1}.
[z]No ASD = non-amended non-saturated control

Table S3. Cost of stevia production in Paraguay with a plant density of 100,000 (30x20x70 cm) for different combinations of management approaches for stevia production. Treatments were A) ASD[v] + Control[w], B) ASD + chemical fungicide[x], C) ASD + organic fungicide[y], D) No ASD[z] + Control, E) No ASD + chemical fungicide application, F) No ASD + organic fungicide application.

Cost	Quantity	Price	Treatment costs ($)					
			A	B	C	D	E	F
Fertilization	5,000 kg ha^{-1}	0.1 $ kg^{-1}	500	500	500	500	500	500
Land prep.	1 ha	80.5 $ ha^{-1}	80.5	80.5	80.5	80.5	80.5	80.5
Bed and plastic laying	4 day wage	14 $ day wage^{-1}	56	56	56	56	56	56
Irrigation hookup	3 day wage	14 $ day wage^{-1}	42	42	42	42	42	42
Harvest cost	3 day wage	14 $ day wage^{-1}	42	42	42	42	42	42
Incorporation of carbon	3 day wage	14 $ day wage^{-1}	42	42	42	0	0	0
Tape	4,450 m	0.05 $ m^{-1}	222.5	222.5	222.5	222.5	222.5	222.5
Molasses	10,100 kg ha^{-1}	0.1 $ kg^{-1}	1,010	1,010	1,010	0	0	0
Wheat bran	20,200 kg ha^{-1}	0.06 $ kg^{-1}	1,212	1,212	1,212	0	0	0
Plastic mulch	2,560 m^2	0.12 $ m^{-2}	307.2	307.2	307.2	307.2	307.2	307.2
Azoxystrobin	3.7 L ha^{-1}	54 $ L^{-1}	0	199.8	0	0	199.8	0
Pyroligneous acid	9 L ha^{-1}	15 $ L^{-1}	0	0	135	0	0	135
Application	3 day wage	14 $ day wage^{-1}	0	42	42	0	42	42
Stevia plants	100,000 plants	0.06 $ plant^{-1}	6,000	6,000	6,000	6,000	6,000	6,000
Total Cost			9,514.2	9,756	9,691.2	7,250.2	7,492	7,427.2
Cost relative to the control treatment			23.79%	25.68%	25.18%	0.00%	3.22%	2.38%

[v]ASD = saturated plastic covered control amended with molasses at 10.1 Mg ha^{-1} and wheat bran at 20.2 Mg ha^{-1}.
[w]Control = no fungicide application
[x]Organic fungicide = pyroligneous acid at a rate of 30 mL L^{-1} of water.
[y]Chemical fungicide = azoxystrobin at a rate of 230 a.i. g ha^{-1}.
[z]No ASD = non-amended non-saturated control

Table S4. The cost of stevia production in Paraguay with a plant density of 55,000 (50x30x70 cm) for different combinations of disease management approaches for stevia production. Treatments were A) ASD[v] + Control[w], B) ASD + chemical fungicide[x], C) ASD + organic fungicide[y], D) No ASD[z] + Control, E) No ASD + chemical fungicide application, F) No ASD + organic fungicide application.

Cost	Quantity	Price	Treatment costs ($)					
			A	B	C	D	E	F
Fertilization	5,000 kg ha^{-1}	0.1 $ kg^{-1}	500	500	500	500	500	500
Land prep.	1 ha	80.5 $ ha^{-1}	80.5	80.5	80.5	80.5	80.5	80.5
Bed and plastic laying	4 day wage	14 $ day wage^{-1}	56	56	56	56	56	56
Irrigation hookup	3 day wage	14 $ day wage^{-1}	42	42	42	42	42	42
Harvest cost	3 day wage	14 $ day wage^{-1}	42	42	42	42	42	42
Incorporation of carbon	3 day wage	14 $ day wage^{-1}	42	42	42	0	0	0
Tape	4,450 m	0.05 $ m^{-1}	222.5	222.5	222.5	222.5	222.5	222.5
Molasses	10,100 kg ha^{-1}	0.1 $ kg^{-1}	1,010	1,010	1,010	0	0	0
Wheat bran	20,200 kg ha^{-1}	0.06 $ kg^{-1}	1,212	1,212	1,212	0	0	0
Plastic mulch	2,560 m^2	0.12 $ m^{-2}	307.2	307.2	307.2	307.2	307.2	307.2
Azoxystrobin	3.7 L ha^{-1}	54 $ L^{-1}	0	199.8	0	0	199.8	0
Pyroligneous acid	9 L ha^{-1}	15 $ L^{-1}	0	0	135	0	0	135
Application	3 day wage	14 $ day wage^{-1}	0	42	42	0	42	42
Stevia plants	55,000 plants	0.06 $ plant^{-1}	3,300	3,300	3,300	3,300	3,300	3,300
Total Cost			6,814.2	7,056	6,991.2	4,550.2	4,792	4,727.2
Cost relative to the control treatment			33.22%	35.51%	34.91%	0.00%	5.04%	3.74%

[v]ASD = saturated plastic covered control amended with molasses at 10.1 Mg ha^{-1} and wheat bran at 20.2 Mg ha^{-1}.
[w]Control = no fungicide application
[x]Organic fungicide = pyroligneous acid at a rate of 30 mL L^{-1} of water.
[y]Chemical fungicide = azoxystrobin at a rate of 230 a.i. g ha^{-1}.
[z]No ASD = non-amended non-saturated control