Figure 7 A-E: Application of fungal components (FCF and MCW) in groundnut farmer’s field.

A, B. Field at Lingda near Dakor

C, D. Field at Vaso near Nadiad

E. Experimental plot at Department of Biosciences
Figure 8 A-F: Growth and morphological studies of *Sclerotium rolfsii*.

A. Hyphal growth of *S. rolfsii* on PDA medium.

B. Microscopic view of fungal mycelia of *S. rolfsii*.

C, D. Wilting of groundnut plant in field conditions due to *S. rolfsii* at arrow infection.

E. Growth of *S. rolfsii* in PDB medium.

F. Brown Sclerotia appearing on fungal mycelia.
Figure 9 A-F: Growth and morphological studies of *Aspergillus flavus*.

A. Hyphal growth of *A. flavus* on PDA medium.

B. *A. flavus* conidial head and conidiophores.

C, D. Infected seeds of groundnut by *A. flavus* during storage.

E. Growth of *A. flavus* in PDB medium.

F. Growth of *A. flavus* in potato+ Jaggery medium.
Figure 10 A-E: Growth and morphological studies of *Aspergillus parasiticus*.

A. Hyphal growth of *A. parasiticus* on PDA medium.

B. Photomicrograph showing conidial head and conidiophores of *A. parasiticus*.

C. Growth of *A. parasiticus* in PDB medium.

D. Growth of *A. parasiticus* in Potato + Jaggery medium.

E. Growth of *A. parasiticus* on groundnut seeds during storage.
**Figure 11 A-D:** HR response (necrotic lesions at arrows) on the adaxial surface of groundnut leaves treated with different samples of fungal culture filtrate.

A. Distilled water

B. *Sclerotium rolfsii* MCW

C. *Aspergillus flavus* MCW
D. *Aspergillus parasiticus* MCW

**Figure 12 A-D:** HR response (necrotic lesions at arrows) on the adaxial surface of groundnut leaves treated with different samples of mycelial cell wall fractions.

A. Distilled water
B. *Sclerotium rolfsii* MCW

C. *Aspergillus flavus* MCW

D. *Aspergillus parasiticus* MCW

**Figure 13 A-C:** SDS-PAGE analysis of ammonium sulfate precipitated FCF protein of different fungi grown on PDB medium.
(A) *S. rolfsii* (B) *A. flavus* (C) *A. parasiticus*

Line 1- Marker

Line 2- 10% Ammonium sulfate precipitated FCF

Line 3- 20% Ammonium sulfate precipitated FCF

Line 4- 30% Ammonium sulfate precipitated FCF

Line 5- 40% Ammonium sulfate precipitated FCF

Line 6- 50% Ammonium sulfate precipitated FCF

Line 7- 60% Ammonium sulfate precipitated FCF

Line 8- 70% Ammonium sulfate precipitated FCF

Line 9- 80% Ammonium sulfate precipitated FCF

Line 10- 90% Ammonium sulfate precipitated FCF
Figure 14 A-D: Hypersensitive responses (at arrows) on the adaxial surface of groundnut leaves treated with different samples of Sclerotium rolfsii FCF.

A. D/W as control

B. 21st day crude FCF

C. Ammonium sulfate precipated FCF

D. Column purified fraction of FCF
**Figure 15 A-D:** Hypersensitive responses (at arrows) on the adaxial surface of groundnut leaves treated with different samples of *Aspergillus flavus* FCF.

A. D/W as control

B. 21st day crude FCF

C. Ammonium sulfate precipitated FCF

D. Column purified fraction of FCF
**Figure 16 A-D:** Hypersensitive responses (at arrows) on the adaxial surface of groundnut leaves treated with different samples of *Aspergillus parasiticus* FCF.

A. D/W as control
B. 18\textsuperscript{th} day crude FCF
C. Ammonium sulfate precipitated FCF
D. Column purified fraction of FCF
Figure 17A-C: SDS-PAGE analysis for different samples of elicitor protein obtained from FCF of three fungi growing on PDB medium.

A. *S. rolfsii*

B. *A. flavus*

C. *A. parasiticus*

Line 1- Marker
Line 2- Crude FCF
Line 3- Ammonium sulfate precipitated fraction
Line 4- Purified fraction
**Figure 18 A:** SDS-PAGE analysis for different samples of elicitor protein obtained from FCF of *S. rolfsii* growing on medium containing potato infusion + Jaggery + Glycine.

**Figure 18 B:** SDS-PAGE analysis for different samples of elicitor protein obtained from FCF of *A. flavus* growing on medium containing potato infusion + Jaggery.

**Figure 18 C:** SDS-PAGE analysis for different samples of elicitor protein obtained from FCF of *A. parasiticus* growing on medium containing potato infusion + Jaggery.

Line 1- Marker
Line 2- Crude FCF
Line 3- Ammonium sulfate precipitated fraction
Line 4- Purified fraction
Figure 19: Groundnut plants growing in *in-vitro* on MS basal medium supplemented with 10% FCF and MCW of different fungi.

A. *Sclerotium rolfsii*

B. *Aspergillus flavus*

C. *Aspergillus parasiticus*

1. Control

2. 10% FCF

3. 10% MCW
**Figure 20 (A-D):** Induction of Peroxidase, phenylalanine ammonia lyase, catalase and salicylic acid level in groundnut plants grown in *in-vitro* on MS basal medium supplemented with various concentrations of FCF of all the three fungi (*S. rolfsii*, *A. flavus*, and *A. parasiticus*). Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.
Figure 21 A-D: Induction of Peroxidase, phenylalanine ammonia lyase, catalase and salicylic acid level in groundnut plants grown in *in-vitro* on MS medium supplemented with various concentrations of MCW of all three fungi (*S. rolfsii*, *A. flavus* and *A. parasiticus*). Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.
Figure 22 A-D: Induction of peroxidase enzyme activity in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *S. rolfsii* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. GG-20 variety

C. TG-26 variety

D. TPG-41 Variety
**Figure 23 A-D:** Induction of peroxidase enzyme activity in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. flavus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety  
B. GG-20 variety  
C. TG-26 variety  
D. TPG-41 variety
**Figure 24 A-D:** Induction of peroxidase enzyme activity in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. parasiticus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety  
B. GG-20 variety  
C. TG-20 variety  
D. TPG-41 variety
Figure 25 A-D: Induction of PAL (Phenylalanine ammonia lyase) enzyme activity in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *S. rolfsii* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
Figure 26 A-D: Induction of PAL (Phenylalanine ammonia lyase) enzyme activity in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. flavus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
Figure 27 A-D: Induction of PAL (Phenylalanine ammonia lyase) enzyme activity in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. parasiticus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety
B. TG-26 variety
C. GG-20 variety
D. TPG-41 variety
Figure 28 A-D: Induction of β-1,3-glucanase enzyme activity in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *S. rolfsii* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
Figure 29 A-D: Induction of β-1,3-glucanase enzyme activity in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. flavus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety
B. TG-26 variety
C. GG-20 variety
D. TPG-41 variety

Figure 30 A-D: Induction of β-1,3-glucanase enzyme activity in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. parasiticus* along with control distill water. Data points are the mean of three
applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety
B. TG-26 variety
C. GG-20 variety
D. TPG-41 variety

Figure 31 A-D: Induction of salicylic acid (SA) level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and
mycelial cell wall separately of *S. rolfsii* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
Figure 32 A-D: Induction of salicylic acid (SA) level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. flavus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
**Figure 33 A-D:** Induction of salicylic acid (SA) level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. parasiticus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
**Figure 34 A-D:** Induction of lignin level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *S. rolfsii* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
Figure 35 A-D: Induction of lignin level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. flavus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety
B. TG-26 variety
C. GG-20 variety
D. TPG-41 variety
Figure 36 A-D: Induction of lignin level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. parasiticus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
Figure 37 A-D: Induction of phenolic level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *S. rolfsii* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
Figure 38 A-D: Induction of phenolic level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. flavus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
Figure 39 A-D: Induction of phenolic level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. parasiticus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety

B. TG-26 variety

C. GG-20 variety

D. TPG-41 variety
**Figure 40:** HPTLC profile of phenols after elicitation in selected varieties of groundnut plants after treatment with *Sclerotium rolfsii* FCF at different time interval

**A.** J-11 variety, **B.** GG-20 variety,

**C.** TG-26 variety, **D.** TPG-41 variety

Line 1- Control variety

Line 2 - 24 hrs.

Line 3 - 48 hrs.

Line 4 - 72 hrs.

Line 5 - 96 hrs.

Line 6 - 120 hrs.
Figure 41: HPTLC profile of phenols after elicitation in selected varieties of groundnut plants after treatment with *Aspergillus flavus* FCF at different time interval

A. J-11 variety, B. GG-20 variety,  
C. TG-26 variety, D. TPG-41 variety

Line-1 Control variety  
Line-2 24 hrs.  
Line-3 48 hrs.  
Line-4 72 hrs.  
Line-5 96 hrs.
Figure 42: HPTLC profile of phenols after elicitation in selected varieties of groundnut plants after treatment with *Aspergillus parasiticus* FCF at different time interval

A. J-11 variety, B. GG-20 variety,

C. TG-26 variety, D. TPG-41 variety

Line- 1 Control variety

Line- 2 24 hrs.

Line- 3 48 hrs.
Figure 43 A-D: Induction of protein level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *S. rolfsii* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.
A. J-11 variety
B. TG-26 variety
C. GG-20 variety
D. TPG-41 variety

Figure 44 A-D: Induction of protein level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. flavus* along with control distill water. Data points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.
A. J-11 variety
B. TG-26 variety
C. GG-20 variety
D. TPG-41 variety

Figure 45 A-D: Induction of protein level in groundnut plants upon foliar spray applications of 10% each of fungal culture filtrate and mycelial cell wall separately of *A. parasiticus* along with control distill water. Data
points are the mean of three applications in three sets of the experiment. Error bars indicate standard deviation.

A. J-11 variety
B. TG-26 variety
C. GG-20 variety
D. TPG-41 variety

Figure 46: SDS-PAGE analysis of protein profiling in plants treated with fungal culture filtrate of three fungi.
A. J-11 Variety

B. GG-20 Variety

Line 1 - Marker

Line 2 - Control plant’s extract

Line 3 - *S. rolfsii* FCF treated plant’s extract

Line 4 - *A. flavus* FCF treated plant’s extract

Line 5 - *A. parasiticus* FCF treated plant’s extract
Figure 47: SDS-PAGE analysis of protein profiling in plants treated with fungal culture filtrate of three fungi.

A. TPG-41 Variety

B. TG-26 Variety

Line 1- Marker

Line 2- Control plant’s extract

Line 3- *S. rolfsii* FCF treated plant’s extract

Line 4- *A. flavus* FCF treated plant’s extract

Line 5- *A. parasiticus* FCF treated plant’s extract
**Figure 48:** Groundnut crop in the field at Deva, Porbandar Dist.

A. *S. rolfsii* infected groundnut crop (Untreated plants)

B. *S. rolfsii* FCF treated groundnut crop
Figure 49: Groundnut crop in the field at Deva, Porbandar Dist.

A. *A. flavus* FCF treated groundnut crop

B. *A. parasiticus* FCF treated groundnut crop
Figure 50: Difference in pod formation in treated plants of different varieties after treatment with *S. rolfsii* FCF.

A. J-11 variety
B. GG-20 variety
C. TG-26 variety
D. TPG-41 variety

C. Control; T. Treated
Figure 51: Difference in pod formation in treated plants of different varieties after treatment with *S. rolfsii* MCW.

A. J-11 variety  B. GG-20 variety;

C. TG-26 variety  D. TPG-41 variety

C. Control  T. Treated
Figure 52: Difference in pod formation in treated plants of different varieties after treatment with *A. flavus* FCF.

A. J-11 variety  B. GG-20 variety;

C. TG-26 variety  D. TPG-41 variety

C. Control  T. Treated
Figure 53: Difference in pod formation in treated plants of different varieties after treatment with *A. flavus* MCW.

A. J-11 variety  B. GG-20 variety;
C. TG-26vvariety  D. TPG-41 variety

C. Control  T. Treated

Figure 54: Difference in pod formation in treated plants of different varieties after treatment with *A. parasiticus* FCF.

A. J-11 variety  B. GG-20 variety;
C. TG-26 variety  
D. TPG-41 variety  

C. Control T. Treated

Figure 55: Difference in pod formation in treated plants of different varieties after treatment with *A. parasiticus* MCW.
A. J-11 variety B. GG-20 variety;  
C. TG-26vvvariety D. TPG-41 variety  
C. Control T. Treated
Figure 56 A-B: Comparison of aflatoxin contamination between control and *A. flavus* FCF treated groundnut seeds of four varieties after storage of one year

A. J- 11 variety
B. GG- 20 variety
C- Control; T- Treated
Figure 57 A-B: Comparison of aflatoxin contamination between control and *A. flavus* FCF treated groundnut seeds of four varieties after storage of one year

A. TG- 26 variety

B. TPG-41 variety

C- Control; T- Treated
Figure 58: DNA Amplification profile of four different varieties of groundnut obtained using primer OPA-17, OPC-09, X-5, OPA-20, OPC-06.

Primer 1: OPA-17; Primer 2: OPC-09; Primer 3: X-5;
Primer 4: OPA-20; Primer 5: OPC-06

M- Marker

Line 1- A. J-11 variety
Line 2- B. TG-26 variety
Line 3- C. GG-20 variety
Line 4- D. TPG-41 variety
Figure 59: DNA Amplification profile of four different varieties of groundnut obtained using primer J-7, J-17, J-11, OPC-15.

Primer 8: J-7
Primer 9: J-17
Primer 10: J-11
Primer 11: OPC-15

M- Marker

Line 1- A. J-11 variety
Line 2- B. TG-26 variety
Line 3- C. GG-20 variety
Line 4- D. TPG-41 variety
Figure 8
Figure 11
Figure 12
Figure 13
Figure 14
Figure 15
Figure 16
Figure 17
Figure 20
Catalase activity in MCW treated in-vitro groundnut plants

Figure 21
Figure 22
Figure 23
Figure 24
Figure 25
Figure 26
Figure 27
Figure 28
Figure 29
Figure 30
Figure 31

A) J-11 Variety

B) GS-20 Variety

C) TG-26 Variety

D) TPG-41 Variety

Graphs showing the effect of salicylic acid microgram/gm fresh weight of leaf over time (hrs) for different varieties.
Figure 32
Figure 33
Figure 34
Figure 35
Figure 36
Figure 37
Figure 38
Figure 39
Figure 41
Figure 42
Figure 43
Figure 44
Figure 45
Figure 46
Figure 47
Figure 53
Figure 55
Figure 59