

**Evaluation of fungicides for reduction of Leaf Spot, Rust and White Mold diseases
of Peanut (*Arachis hypogaea*), 2008**

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***Cercospora arachidicola* (Early Leaf Spot); *Cercosporidium personatum* (Late Leaf Spot); *Puccinia arachidis* (Peanut Rust); *Sclerotium rolfsii* (White Mold)**

'Georgia Green' peanuts were planted at a density of 6 seeds per foot into 36-in center rows on 5 May 2008 in a prepared Kendrick loamy sand field plot at the University of Florida/IFAS Plant Science Research and Education Unit in Citra, Florida. Two separate trials were established, one for the Leaf Spot and Rust test (24 treatments) and one for the White Mold test (9 treatments). Starting on 12 June 2008, 6 applications of fungicides were made at 14 day intervals in both the Leaf Spot and Rust Trial and the White Mold Trial. Treatments two and three in the White Mold Trial were applied on 5 May 2008 as an in-furrow drench. All applications were made using a CO₂ backpack sprayer at 30 lb/in² (psi) in 50gpa water through two 8004 TeeJet® flat fan tips on a 36 in. boom. Each fungicide treatment and a non-treated control were replicated five times using two rows 20 ft. in length separated by an untreated guard row. All plots were arranged in a randomized complete block design. Two separate plots were established, one for the Leaf Spot and Rust Trial and a second for the White Mold Trial. Inoculum for the Leaf Spot and Rust Trial was naturally occurring. A few scattered Leaf Spots were observed on 19 June 2008 and disease rating for both Leaf Spot and Rust began on 19 June and continued every two weeks throughout the trial. Disease ratings were made by randomly collecting 10 peanut leaflets from each treated row and rating Leaf spot and Rust incidence and severity. Rust severity was determined using "A Manual of Assessment Keys for Plant Diseases" 1971, Clive James, Canada Department of Agriculture, leaf disease rating scale. Rust was first observed on 14 August 2008. Inoculum for the White Mold Trial was prepared using three isolates of the pathogen, *Sclerotinia rolfsii*. Fifty grams of prepared inoculum (inoculated corn + wheat grain) was applied on 1 August 2008 to the crowns of plants in the northern row of each two-row plot. The plants were shaken to allow the inoculum to fall to the soil. The plots were examined for disease incidence and rated for foot of row infected. The plots were dug on 5 September 2008 and harvested on 8 September 2008. The peanuts were bagged, identified by plot and replicate, and placed into a dryer. When the peanuts had sufficiently dried they were removed from the dryer and the yield from each replicated plot was weighed. All data collected was subjected to analysis using SAS 9.1 ANOVA where needed the data was arc sine transformed and the analysis was conducted on the transformed data means were separated using Fisher's Protected LSD where P<0.05. All data presented in tables reflect the actual data collected not transformed data.

TABLE 1. Leaf Spot and Rust application schedule

Treatment	Application (1-A) June 12, 2008	Application (2-B) June 26, 2008	Application (3-C) July 10, 2008	Application (4-D) July 22, 2008	Application (5-E) August 7, 2008	Application (6-F) August 26, 2008
T1-Untreated						
T2-Abound 24 oz/A	X		X		X	
T2-Bravo 1.5pt/A		X		X		X
T3-Abound 24oz/A			X			
T3-Bravo 1.5 pt/A	X	X		X	X	X
T4-Echo 1.5 pt/A	X	X				
T4-Provost 8oz/A			X	X	X	X
T5-Echo 1.5pt/A	X		X		X	
T5-Absolute 3.5oz/A		X		X		X
T6- Echo 1.5pt/A	X		X		X	
T6- Stratego 10oz/A		X		X		X
T7- Echo 1.5 pt/A	X	X				
T7- Folicur 7.2oz/A			X	X	X	X
T8- Echo 1.5pt/A	X	X				
T8-Folicur 7.2 oz/A			X	X	X	X
T9-Echo 1.5pt/A	X	X				
T9-Folicur 7.2oz/A			X	X	X	X
T9-Topsin 5oz/A			X		X	
T10-Echo 1.5 pt/A	X	X				
T10-Folicur 7.2 oz/A			X	X	X	X
T10- Echo			X		X	

0.75pt/A						
Treatment	Application (1-A) June 12, 2008	Application (2-B) June 26, 2008	Application (3-C) July 10, 2008	Application (4-D) July 22, 2008	Application (5-E) August 7, 2008	Application (6-F) August 26, 2008
T11-Bravo 24 oz/A	X	X				
T11- Topguard 7oz/A			X	X	X	X
T12-Bravo 24 oz/A	X	X				
T12- Topguard 10oz/A			X	X	X	X
T13-Bravo 24 oz/A	X	X				
T13- Topguard 14oz/A			X	X	X	X
T14-Bravo 24 oz/A	X	X				
T14- Topguard 28oz/A			X	X	X	X
T15-Bravo 24 oz/A	X	X				
T15- Folicur 7.2 oz/A			X	X	X	X
T16- Bravo 24 oz/A	X	X				
T16- Topguard 7oz/A +Bravo 16oz/SA			X	X	X	X
T17- Bravo 1.5 pt/A	X	X	X	X	X	X
T18-Folicur 7.2oz/A	X	X	X	X	X	X
T19- A9898A 5.5oz/A	X	X	X	X	X	X
T20- A9898A- 8.5oz/A	X	X	X	X	X	X
T21-Proline 5.7oz/A	X	X	X	X	X	X
T22- Eminent	X	X	X	X	X	X

7.2oz/A						
Treatment	Application (1-A) June 12, 2008	Application (2-B) June 26, 2008	Application (3-C) July 10, 2008	Application (4-D) July 22, 2008	Application (5-E) August 7, 2008	Application (6-F) August 26, 2008
T23-Tilt 4oz/A	X	X	X	X	X	X
T24-V10116-4oz/A	X	X	X	X	X	X

Treatments: Leaf Spot and Rust

T1-Untreated Check

T2- Abound 24.0 oz/A alternate Bravo 1.5 pt/A

T3-Abound 24.0 oz/A alternate Bravo 1.5 pt/A

T4-Echo 1.5 pt/A alternate Provost 8.0 oz/A

T5-Echo 1.5 pt/A alternate Absolute 3.5 oz/A

T6-Echo 1.5 pt/A alternate Stratego 10.0 oz/A

T7-Echo 1.5 pt/A alternate Folicur 7.2 oz/A

T8-Echo 1.5 pt/A alternate Tebuzol 7.2 oz/A

T9-Echo 1.5 pt/A alternate Tebuzol 7.2 oz/A alternate Topsin 5.0 oz/A

T10-Echo 1.5 pt/A alternate Tebuzol 7.2 oz/A alternate Echo 0.75 pt/A

T11-Bravo 24.0 oz/A alternate Topguard 7.0 oz/A

T12-Bravo 24.0 oz/A alternate Topguard 10.0 oz/A

T13-Bravo 24.0 oz/A alternate Topguard 14.0 oz/A

T14-Bravo 24.0 oz/A alt Topguard 14.0 oz/A; Bravo 24.0 oz/A alt Topguard 28.0 oz/A

T15-Bravo 24.0oz/A alternate Folicur 7.2 oz/A

T16-Bravo 24.0 oz/A alternate (Topguard 7.0 oz/A + Bravo 16.0 oz/A)

T17-Bravo 1.5 pt/A

T18-Folicur 7.2 oz/A

T19-A9898A 5.5 oz/A

T20-A9898A 8.5 oz/A

T21-Proline 5.7 oz/A

T22-Eminent 7.2 oz/A

T23-Tilt 4.0 oz/A

T24-V10116 4.0 oz/A

Table 2. White Mold application schedule

Treatment	At Plant May 5, 2008	Application 1-A June 12, 2008	Application 2-B June 26, 2008	Application 3-C July 10, 2008	Application 4-D July 24, 2008	Application 5-E August 05, 2008	Application 6-F August 19, 2008
T1-Untreated							
T2-Proline 5.7oz/A	X						
T2-Echo 1.5 pt/A		X	X				
T2-Provost 8oz/A				X	X	X	X
T3-Proline 5.7oz/A	X						
T3-Echo 1.5 pt/A		X	X				
T3-Provost 10.7oz/A				X	X	X	X
T4 -Echo 1.5pt/A		X	X				
T4-Provost 8oz/A				X	X	X	X
T5- Echo 1.5pt/A		X	X				
T5-Provost 10.7oz/A				X	X	X	X
T6- Quash 4oz/A		X	X	X	X	X	X
T7- Echo 1.5pt/A		X	X		X		X
T7- Evito 5.7oz/A				X		X	
T8- Echo 1.5pt/A		X	X		X		X
T8-Evito 3.8oz/A				X		X	
T9- Echo 1.5pt/A		X	X		X		X
T9-Evito T 9oz/A				X		X	

Treatments: White mold

T1-Untreated Check

T2- Proline at plant 5.7 oz/A; Echo 1.5 pt/A alternate Provost 8.0 oz/A

T3- Proline at plant 5.7 oz/A; Echo 1.5 pt/A alternate Provost 10.7 oz/A

T4- Echo 1.5 pt/A alternate Provost 8.0 oz/A

T5- Echo 1.5 pt/A alternate Provost 10.7 oz/A

T6- Quash 4.0 fl oz/A

T7- Echo 1.5 pt/A alternate Evito 5.7 fl oz/A

T8- Echo 1.5 pt/A alternate Evito 3.8 fl oz/A

T9- Echo 1.5 pt/A alternate Evito T 9.0 fl oz/A

Results

Table 3. Evaluation of selected materials for control of leaf spot and rust.

Treatment	Early Leaf Spot ^x		Late Leaf Spot ^x		Rust ^x		Yield (lbs)		ROI ^z
	Incidence	Severity	Incidence	Severity	Incidence	Severity	Plot	Acre ^y	
1-Untreated Check	0.67A ^w	9.42A	0.91A	15.87A	0.66ABC	20.19ABC	14.66G	5321.6	NA
2-Abound/Bravo	0.17EF	3.13D	0.31EFGH	6.81BCDE	0.2ABC	4.52DEF	17.78ABC	6454.1	2.42
3- Abound/Bravo	0.32CDE	2.81D	0.33DEFGH	4.11CDE	0.28CDE	7.22BCDEF	17.16ABCDE	6229.1	3.65
4-Echo/Provost	0.37BC	2.72D	0.35DEFGH	5.38CDE	0.39ABCDE	4.4EF	17.68ABCD	6417.8	4.20
5-Echo/Absolute	0.35BCD	3.76CD	0.38DEFGH	7.99BCD	0.38BCDE	6.29DEF	16.82ABCDEF	6105.7	6.70
6-Echo/Stratego	0.19DEF	3.03D	0.35DEFGH	5.04CDE	0.42ABCDE	10.73ABCDEF	16.66BCDEF	6047.6	4.33
7-Echo/Folicur	0.36CD	3.33D	0.54BCDE	7.15BCDE	0.46ABCDE	5.87DEF	18.06A	6555.8	6.20
8-Echo/Tebuzol	0.56AB	4.17CD	0.52BCDEF	5.11CDE	0.62ABCD	8.59BCDEF	16.91ABCDEF	6138.3	1.71
9-Echo/Tebuzol/Topsin	0.18F	5.87BCD	0.28GH	4.9CDE	0.43ABCDE	6.31DEF	17.72ABCD	6432.4	2.82
10-Echo/Tebuzol/Echo	0.26CDEF	5.73BCD	0.34DEFGH	6.71BCDE	0.43ABCDE	8.07BCDEF	17.32ABCD	6287.2	4.41
11-Bravo/Topguard	0.37BC	4.28CD	0.64ABC	6.47BCDE	0.75AB	19.78A	15.97EF	5795.1	1.36
12- Bravo/Topguard	0.38BC	3.93CD	0.54BCD	5.55CDE	0.78A	12.72ABCDE	16.78BCDEF	6019.1	1.49
13- Bravo/Topguard	0.31CDEF	3.46CD	0.52BCDEF	7.05BCDE	0.66ABC	12.2ABCDE	17.74ABCD	6439.6	1.76
14- Bravo/Topguard	0.21DEF	2.75D	0.27GH	3.73DE	0.48ABCDE	17.86AB	17.92AB	6504.9	0.97
15-Bravo/Folicur	0.28CDEF	3.37CD	0.42CDEFGH	4.55CDE	0.6ABCD	4.18EF	17.64ABCD	6403.3	5.26
16- Bravo/(Topguard+Bravo)	0.37BC	4.71CD	0.5BCDEF	5.69CDE	0.51ABCDE	12.05ABCDE	17.1ABCDEF	6207.3	2.00
17-Bravo	0.19DEF	4.8CD	0.31EFGH	6.95BCDE	0.34CDE	11.16ABCDEF	16.54CDEF	6004	4.90
18-Folicur	0.29CDEF	3.75CD	0.47BCDEFG	6.5BCDE	0.36BCDE	9.0BCDEF	17.48ABCD	6345.2	4.10
19-A9898A	0.62A	8.73AB	0.71AB	11.23AB	0.55ABCD	12.06ABCDE	16.46DEF	5974.9	NP
20-A9898A	0.28CDEF	5.06BCD	0.26H	5.88BCDE	0.26DE	3.25F	17.1ABCDEF	6207.3	NP
21-Proline	0.32CDEF	6.57ABC	0.34EFGH	6.37BCDE	0.2E	6.0DEF	17.8ABC	6461.4	2.74
22-Eminent	0.16F	3.18CD	0.29FGH	3.56E	0.52ABCDE	13.77ABCD	16.6CDEF	6025.8	3.68
23-Tilt	0.2EF	3.25CD	0.42CDEFGH	5.94CDE	0.55ABCD	9.92ABCDEF	15.86FG	5757.2	2.19
24-V10116	0.36BCD	3.2D	0.46BCDEFGH	8.76BC	0.69AB	13.1ABCD	17.8ABC	6416.4	NP

^w Values by the same letter are not significantly different as determined by ANOVA and means were separated using Fisher's protected LSD. All data analysis was conducted using SAS 9.1.

^xValues in these columns are the data collected from the last sampling conducted for this planting season.

^yValues presented are calculated from actual plot yields as reported.

^zROI (dollar returned for dollar invested-return on investment) values presented are based upon the following. Tuesday September 30, 2008 Weekly national posted peanut price per ton for runner peanuts. Additionally, the calculated ROI values are determined only on the increase in yield (pounds) over the untreated check and reflect current market prices for the fungicides, used for the production season, divided into the return on the yield over the untreated check.

Table 4. AUDPC values for incidence and severity of leaf spot and rust.

Treatment	Early Leaf Spot		Late Leaf Spot		Rust	
	Incidence AUDPC	Severity AUDPC	Incidence AUDPC	Severity AUDPC	Incidence AUDPC	Severity AUDPC
1-Untreated Check	16.15B ^w	211.53A	2.03BCD	166.63A	8.12A	158.54A
2-Abound/Bravo	10.98CDE	116.83CDE	2.33ABCD	106.49ABCD	1.54F	34.44CD
3- Abound/Bravo	9.11DE	101.34DE	2.36ABCD	87.21CD	3.08DEF	58.92CD
4-Echo/Provost	10.07CDE	120.2CDE	2.18ABCD	101.03BCD	2.87DEF	33.59CD
5-Echo/Absolute	8.89DE	119.52CDE	3.13ABCD	116.43ABCD	3.22CDEF	47.51CD
6-Echo/Stratego	10.22CDE	131.04CDE	2.41ABCD	87.86CD	3.78BCDEF	80.68ABCD
7-Echo/Folicur	13.56BC	110.86DE	3.0ABCD	84.31CD	3.5CDEF	46.67CD
8-Echo/Tebuzol	9.04DE	110.5DE	1.21D	101.88BCD	5.6ABCD	66.43BCD
9-Echo/Tebuzol/Topsin	9.53DE	120.29CDE	2.13ABCD	92.27CD	3.01DEF	44.19CD
10-Echo/Tebuzol/Echo	10.36CDE	130.14CDE	1.69DC	81.76D	3.43CDEF	59.27CD
11-Bravo/Topguard	12.26BCD	126.16CDE	3.39ABC	83.36CD	5.46ABCD	152.85A
12- Bravo/Topguard	9.27DE	101.54DE	2.0BCD	98.31BCD	6.86AB	97.16ABCD
13- Bravo/Topguard	10.81CDE	89.99E	2.29ABCD	88.72CD	6.3ABC	109.24ABC
14- Bravo/Topguard	10.9CDE	108.44DE	1.63CD	79.23D	5.04ABCDE	146.04AB
15-Bravo/Folicur	7.38E	117.01CDE	2.47ABCD	81.1D	4.9BCDE	32.03CD
16- Bravo/(Topguard+Bravo)	10.15CDE	157.14BC	1.96BCD	77.44D	4.97BCDE	95.53ABCD
17-Bravo	10.62CDE	99.01DE	1.0BCD	84.25CD	3.08DEF	86.52ABCD
18-Folicur	11.23CDE	109.28DE	1.76BCD	118.92ABCD	2.94DEF	68.61BCD
19-A9898A	12.38BCD	181.22AB	2.83ABCD	143.67ABC	5.11ABCD	90.02ABCD
20-A9898A	9.49DE	130.62CDE	3.65AB	94.25BCD	1.96EF	25.55D
21-Proline	34.29A	207.62A	3.97A	154.42AB	1.4F	41.98CD
22-Eminent	11.34CD	139.06BCD	2.46ABCD	89.93CD	3.92BCDEF	106.29ABCD
23-Tilt	11.38CD	115.26CDE	2.29ABCD	95.91BCD	4.97BCDE	83.42ABCD
24-V10116	11.43CD	95.94DE	1.56CD	95.12BCD	5.39ABCD	100.12ABCD

^w Values by the same letter are not significantly different as determined by ANOVA and means were separated using Fisher's protected LSD. All data analysis was conducted using SAS 9.1. AUDPC (Area Under The Disease Progress Curve) values were determined using a protocol developed by CIP using EXCEL.

Table 5. Evaluation of selected materials for control of White Mold Disease in Peanut

	Foot of Row Diseased ^x	AUDPC of diseased row	Yield/Plot (lbs)	Yield/Acre (lbs) ^y	ROI ^z
T1-Untreated	16.5A ^w	169.85A	8.6C	3121.8	
T2-Proline at plant; Provost/Echo	10.8ABC	126.15ABC	13.82A	5016.7	6.55
T3-Proline at plant; Provost/Echo	11.0ABC	117.35ABC	14.13A	5129.2	5.51
T4-Echo/Provost	12.4AB	132.7AB	13.42AB	4871.5	6.70
T5-Echo/Provost	6.5C	71.2C	14.84A	5386.9	6.75
T6-Quash	10.8ABC	128.05ABC	13.28AB	4820.6	NP
T7-Echo/Evito	13.1AB	136.45AB	13.33AB	4838.8	6.10
T8-Echo/Evito	14.4AB	153.25AB	11.91B	4323.3	5.61
T9-Echo/Evito T	10.1BC	101.85BC	13.98A	5074.7	NP

^w Values by the same letter are not significantly different as determined by ANOVA and means were separated using Fisher's protected LSD. All data analysis was conducted using SAS 9.1.

^xValues in these columns are the data collected from the last sampling conducted for this planting season.

^yValues presented are calculated from actual plot yields as reported.

^zROI (dollar returned for dollar invested-return on investment) values presented are based upon the following. Tuesday September 30, 2008 Weekly national posted peanut price per ton for runner peanuts. Additionally, the calculated ROI values are determined only on the increase in yield (pounds) over the untreated check and reflect current market prices for the fungicides, used for the production season, divided into the return on the yield over the untreated check

Results

Leaf Spot and Rust Trial :

Early Leaf Spot:

An analysis of disease severity indicated that all treatments were significantly better at limiting disease severity than the Untreated control, with the exception of Treatments 19 (A9898A=cyproconazole) and 21 (Proline applied foliarly). An analysis of the AUDPC data showed that Treatment 13 (Bravo/Topguard) was significantly different and lower than Treatments 1 (Untreated), 16 (Bravo/Topguard+ Bravo), 19 (A9898A=cyproconazole), 21 (Proline applied foliarly), and 22 (Eminent). The best five Early Leaf Spot disease control treatments were Treatments 2 (Abound/Bravo), 3 (Abound/Bravo), 4 (Echo/Provost), 6 (Echo/Stratego), and 14 (Bravo/Topguard). Treatments 2 and 14 also provided some of the highest yields per acre among all of the treatments.

Late Leaf Spot:

An analysis of disease severity indicated that Treatments 14 (Bravo/Topguard) and 22 (Eminent) were significantly better at limiting disease than the Untreated control and Treatments 19 (A9898A) and 24 (V10116=metconazole). An analysis of the AUDPC data showed that Treatments 10 (Echo/Folicur), 14 (Bravo/Topguard), 15 (Bravo/Folicur), and 16 (Bravo/Topguard+Bravo) were significantly different

and lower than Treatments 1 (Untreated), 19 (A9898A), and 21 (Proline applied foliarly). The best five Late Leaf Spot disease control treatments were 3 (Abound/Bravo), 9 (Echo/Tebuzol/Topsin), 14 (Bravo/Topguard), 15 (Bravo/Folicur), and 22 (Eminent). Treatment 14 also provided one of the highest yields per acre among all of the treatments.

Rust:

An analysis of disease severity indicated that Treatments 4 (Echo/Provost), 15 (Bravo/Folicur), and 20 (A9898A) were significantly better at limiting disease severity than the Untreated control and Treatments 11 (Bravo/Topguard), 14 (Bravo/Topguard), 22 (Eminent), and 24 (V10116). An analysis of the AUDPC data showed that most Treatments (2, 3, 4, 5, 7, 9, 10, 15, 20, and 21) were significantly different and lower than Treatments 1 (Untreated), 11 (Bravo/Topguard), and 14 (Bravo/Topguard). The best five Rust disease control treatments were 2 (Abound/Bravo), 4 (Echo/Provost), 7 (Echo/Folicur), 15 (Bravo/Folicur), and 20 (A9898A=cyproconazole). Treatments 2 (Abound/Bravo) and 7 (Echo/Folicur) also provide some of the highest yields per acre among all of the treatments.

Yield:

All fungicide treatments provided greater yield than the Untreated control. The analysis of the yield data indicated that almost all of the treatments were significantly better at producing higher yields than the Untreated control. Only one treatment provided yield that was not significantly better than the Untreated control (5321.6 lb/A); this was Treatment 23 (Tilt at 5757.2 lb/A).

White Mold Trial:

An analysis of the data indicated that Treatments 5 (Echo/Provost) and 9 (Echo/Evito) were significantly better at limiting disease severity than the Untreated control and Treatments 2 (Proline/Provost/Echo), 3 (Proline/Provost/Echo), 4 (Echo/Provost), 6 (Quash), 7 (Echo/Evito), and 8 (Echo/Evito). Analysis of the AUDPC data showed the same results. All fungicide treatments provided significantly greater yield than the Untreated control.

Summary:

White Mold had a greater negative impact on peanut yield than Early & Late Leaf Spots and Rust. Collectively, Early and Late Leaf Spot disease severity was best controlled by Treatments 3 (Abound/Bravo) and 14 (Bravo/Topguard). Rust disease severity, however, was statistically best controlled by Treatments 4 (Echo/Provost), 15 (Bravo/Folicur), and 20 (A9898A=cyproconazole). White Mold disease severity was best controlled with Treatments 5 (Echo/Provost) and 9 (Echo/Evito T). However, all fungicide treatments in the White Mold Trial provided yield that was significantly greater than the Untreated control.

In the Early and Late Leaf Spot & Rust Trial the return on investment (ROI: dollar returned for every dollar invested) was greatest for Treatments 5 (Echo/Absolute at 6.70), 7 (Echo/Folicur at 6.20), and 15 (Bravo/Folicur at 5.26). Of these three treatments, 7 (Echo/Absolute) and 15 (Bravo/Folicur) were also among the best for controlling foliar disease. In the White Mold Trial the ROI was greatest for Treatments 2, 4, and 5. However, since all of the fungicides tested provided peanut yields that were significantly greater than the Untreated control, all treatments have high returns, greater than 5.51.