Do mourning doves disperse seed of tropical spiderwort?

Presented in Symposium on Tropical Spiderwort: A New Troublesome Exotic-Invasive in Peanut

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Tropical Spiderwort (TS) (*Commelina benghalensis* L.)

- Native: tropical Asia, Africa, Pacific Islands (Faden 2000)
- SEUS: escaped from cultivation; long known from FL
- 1979: nursery weed in Chatham Co., GA (*Duncan 30615*, VSC)
- 1994: Brooks Co., GA; population discovered, reported to USDA-APHIS
- Recent rapid expansion as agricultural weed

Tropical Spiderwort (TS) (*Commelina benghalensis* L.)

Brooks Co., Georgia, USA: 1994

Mourning Dove (*Zenaida macroura)*

- Range: S Canada through US & Mexico into C America
- Mostly migratory
  - Breed in N
  - Over-winter S
- Population estimate: 475,000,000
- “Pigeon milk” regurgitated to feed young

Sources: Bull & Farrand (1995); Dolton (USFWS, http://biology.usgs.gov/)

Materials & Methods

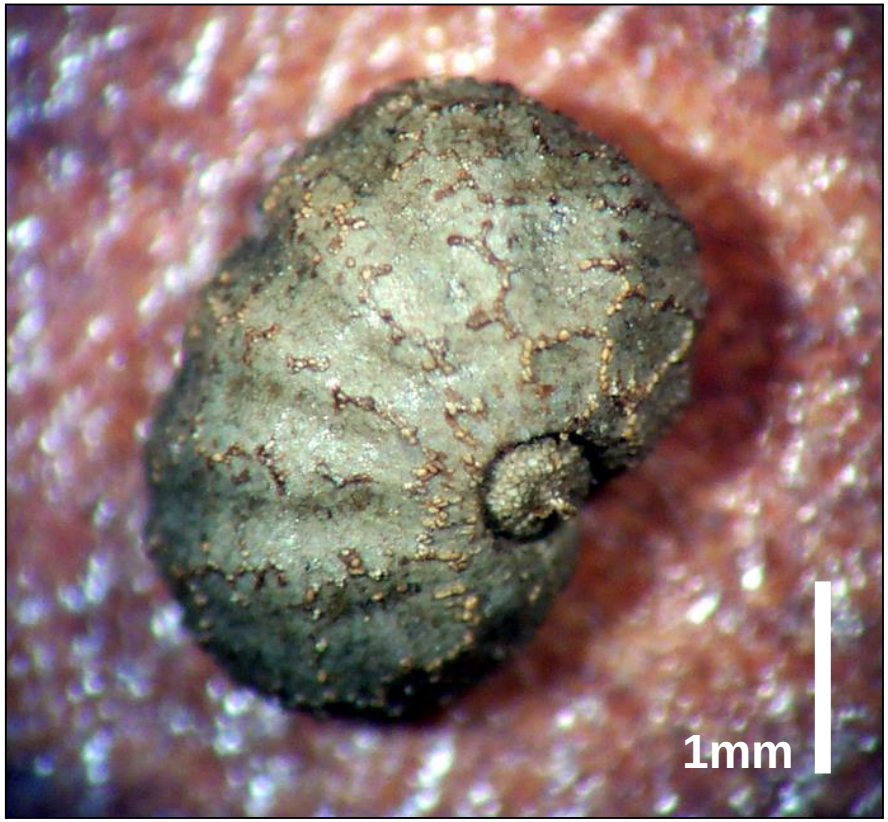
- Gut contents from 31 mourning doves taken in Grady County, GA, during 2003, 2004 & 2005 were examined for the presence of seeds of tropical spiderwort (TS).
- Gut contents were rinsed and sorted using a stereo-dissecting microscope.
- Photographs, diagrams & stock seeds were used to identify seeds of TS.
- The scanning electron microscope (SEM) was used to compare stock seeds with seeds taken from gut contents.
- Photographs of TS seeds taken from gut contents were made using the dissecting microscope (Olympus SZ 6045 stereo-dissecting microscope with phototube and Kodak DC 290 Zoom digital camera) and SEM (JEOL JSM-6480LV).

Results

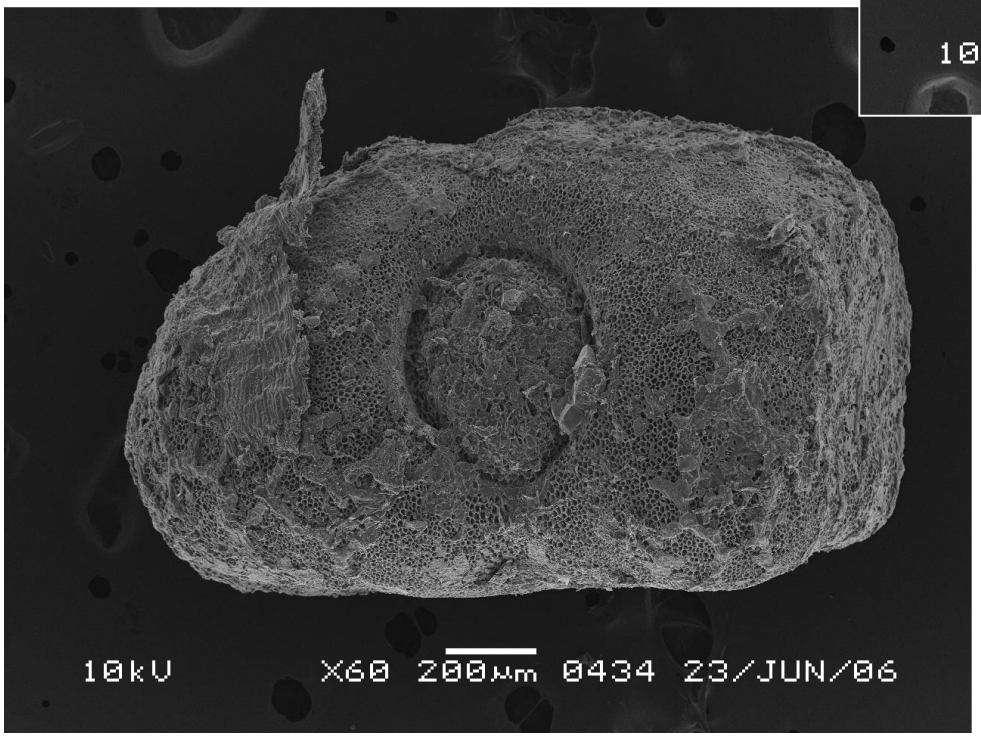
- The presence of TS seeds in gut contents of mourning doves was confirmed and documented photographically with the stereo-dissecting microscope & the SEM.

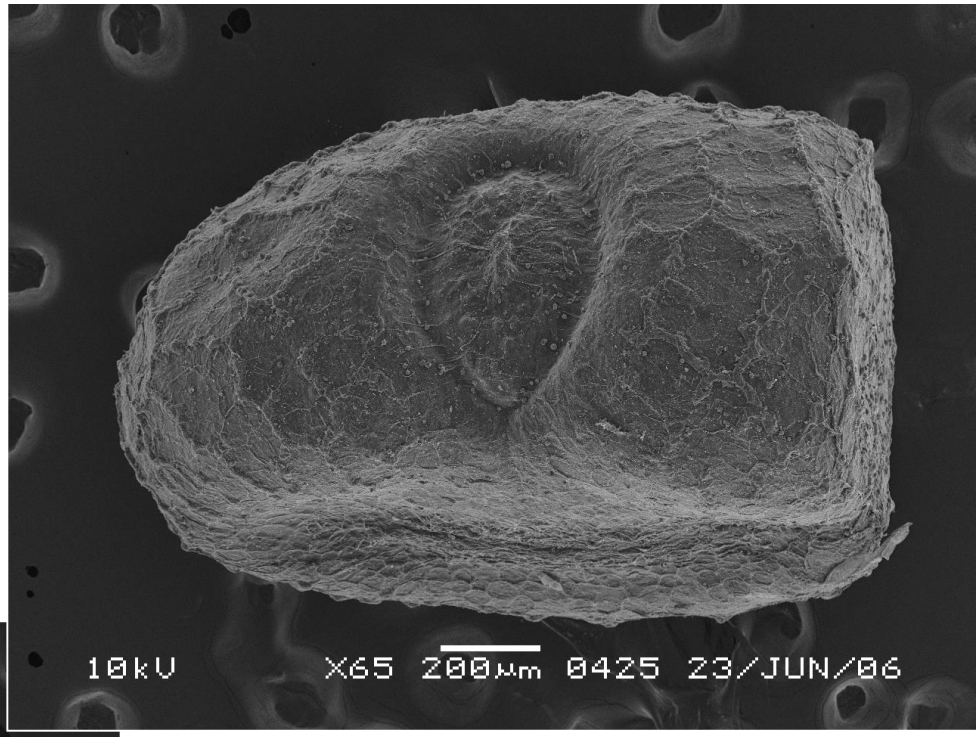
Variation among TS seeds from bird 2005.06

TS seed from bird 2004.01



TS seed from bird 2004.03



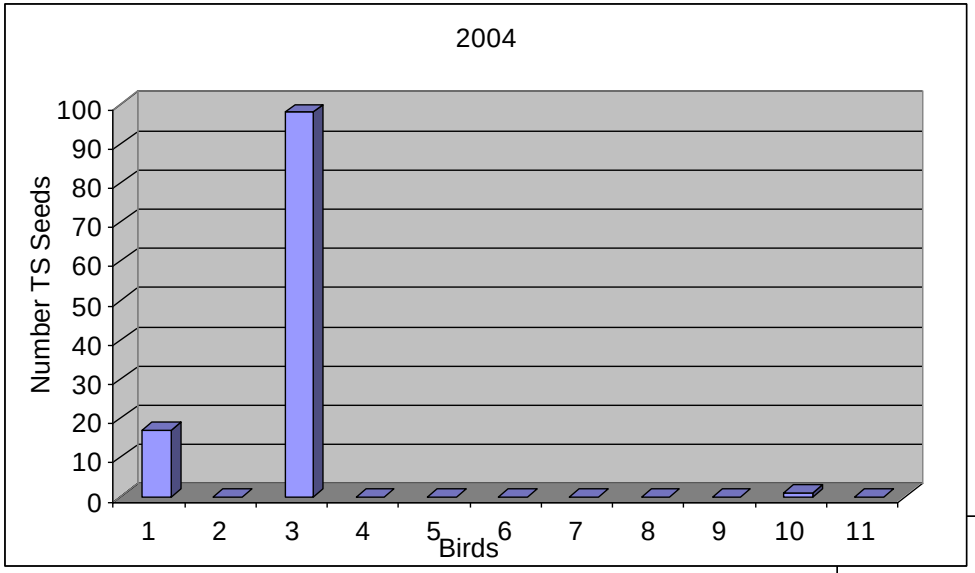


Seed from TS stock

2003: 6 birds, gut contents combined

Total = 32 TS seeds

M=5.3 TS seeds / bird



2004: 3 of 11 birds positive for TS

Total = 116 TS seeds

Range: 1 ⟷ 98 TS seeds

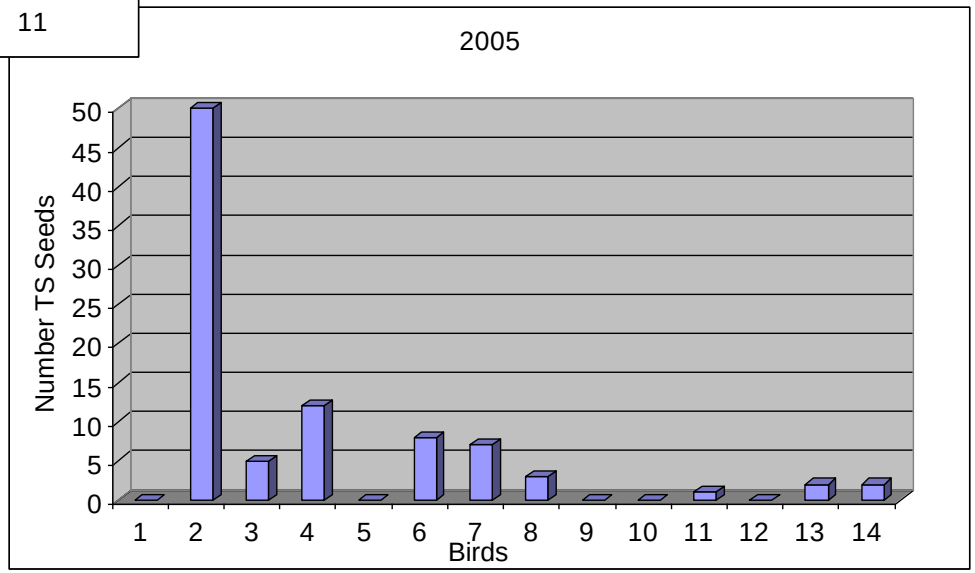
M=10.5 TS seeds / bird

2005: 9 of 14 birds positive for TS

Total = 90 TS seeds

Range: 1 ⟷ 50 TS seeds

M=6.4 TS seeds / bird



Conclusion

- TS seeds are dispersed by mourning doves.

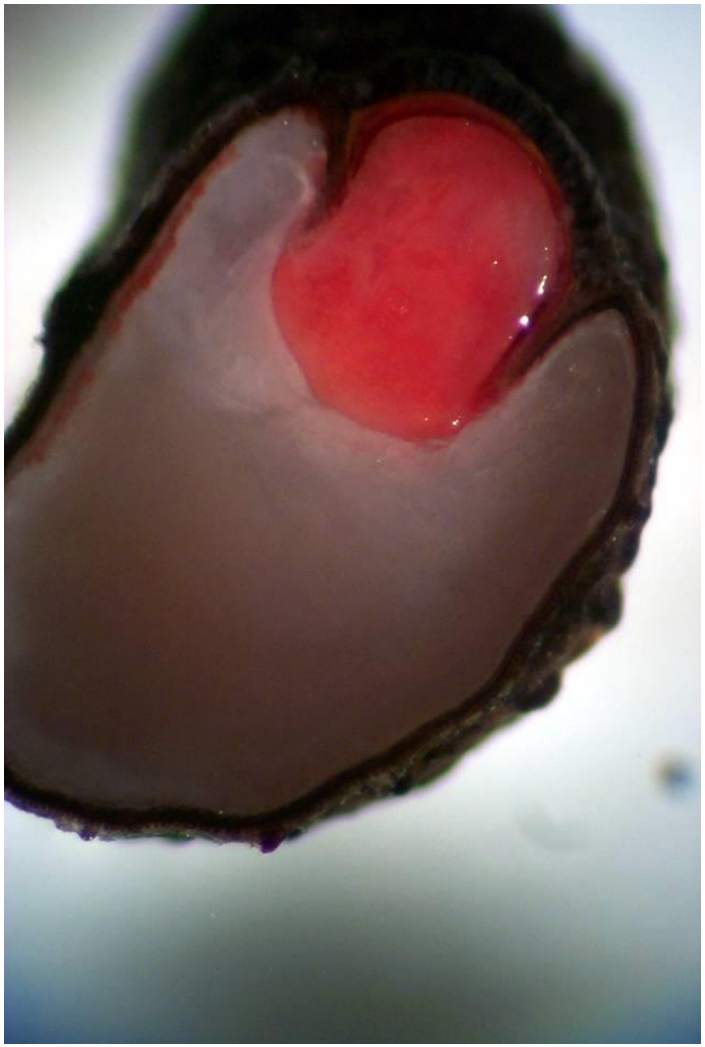
Are TS seeds taken from gut contents of mourning doves viable?

1. Tetrazolium test
2. Germination test

Tetrazolium test
Materials & Methods

- TS seeds were pre-conditioned, prepared & stained following the protocol in the *Tetrazolium Testing Handbook* (Peters, 2000).
- Pre-conditioning: TS seeds imbibed between Whatman No. 1 filter paper circles in plastic petri plates
  - Constant temperature (32.5C) & darkness maintained with Percival™ RE-9 growth chamber
  - Duration: 48 hrs
- Preparation and staining
  - Seeds laterally bisected with razor blade
  - Bisected seeds placed in plastic petri plate section-face down into drops of 1% 2,3,5-triphenyl tetrazolium chloride (TZ)
    - Note: TZ in phosphate buffer / pH 7
  - Constant temperature (32.5C) & darkness maintained with Percival™ RE-9 growth chamber
  - Duration: overnight (ca. 12 hrs)
- Stock TS seeds used as controls

Control: TS stock seeds



Positive staining: embryo viable
[77.3% positive; N=22]

Seed boiled 10 min before staining

Absence of staining: embryo inviable

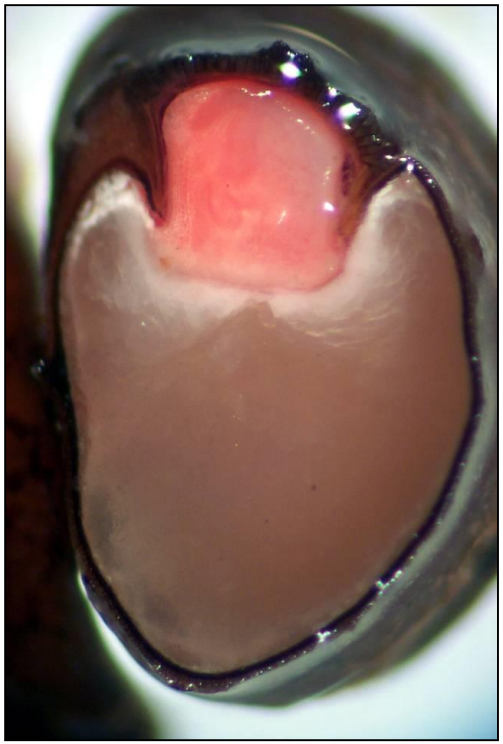
Results

- 2005
  - 46 TS seeds from 5 birds tested; all negative for viability
- 2004
  - Bird 2004.01
    - 15 TS seeds tested; all negative for viability
  - Bird 2004.03 (seeds pre-selected)
    - 36 TS seeds tested; 2 positive for viability

Results from bird 2004.03

- 38 TS seeds tested with TZ
- 2 positive for viability

Control (stock)

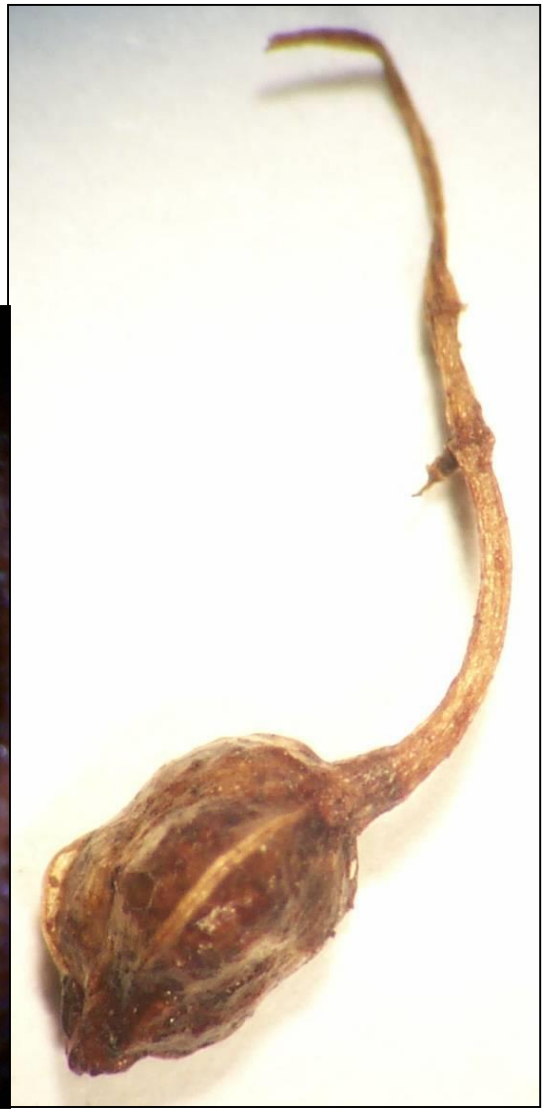


2004.03.01

2004.03.02

TS seeds pre-selected

Contents from bird 2004.03, showing little sign of digestion



Germination test
Materials & Methods

- 32 TS seeds from birds taken in 2003 were subjected to conditions conducive to germination, as follows.
- Imbibed seeds placed on Whatman No. 1 filter paper circle between folded paper towels
- Paper towels thoroughly saturated with de-ionized water, placed in closed plastic ziplock freezer bag (Hefty™)
- Held at constant temperature (32.5C) & darkness in Percival™ RE-9 growth chamber for 144 hrs (6 days)

Germination test Results

- 1 TS seed germinated.

Conclusion

- Results of tetrazolium and germination tests indicate a small proportion of TS seeds taken from mourning dove gut contents is viable.

Future research

- Although it appears that mourning doves are effective dispersers of TS seeds, experiments feeding TS seeds to captive birds are needed to show viability in seeds after actual defecation and regurgitation.

References

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