

Nematode Management in Peanuts

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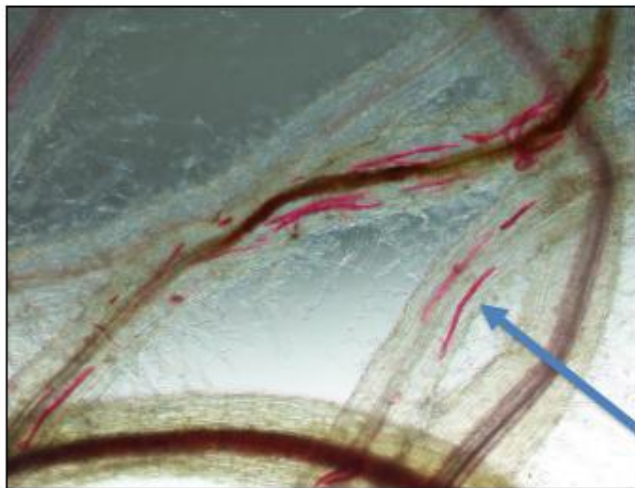
North Carolina State University

General Production Practices

- Apply nutrients based on soil test (pH 5.8 to 6.2)
- Avoid excessive Mg and K
- Avoid fields with zinc
- Establish good rotations (cotton, corn, sorghum)
- Plant a disease-resistant variety in May at a 2-inch depth
- 5 plants per foot of row on 36-inch rows
- Conventional tillage
- Inoculate with *Bradyrhizobia* for BNF
- Apply calcium at pegging
- Apply boron and manganese as needed
- Dig based on pod mesocarp color
- Control pests using IPM practices

What are nematodes?

- Microscopic worms
- Feed on plant roots and below-ground structure
 - Roots, tubers, storage roots, pods



Lesion nematodes
inside roots

- Require a living host plant to feed and reproduce
- There are many nematode *genera* (larger groups, singular = *genus*) and *species* (specific types)

Figure caption: image of lesion nematode inside roots

General Life Cycle of Nematodes

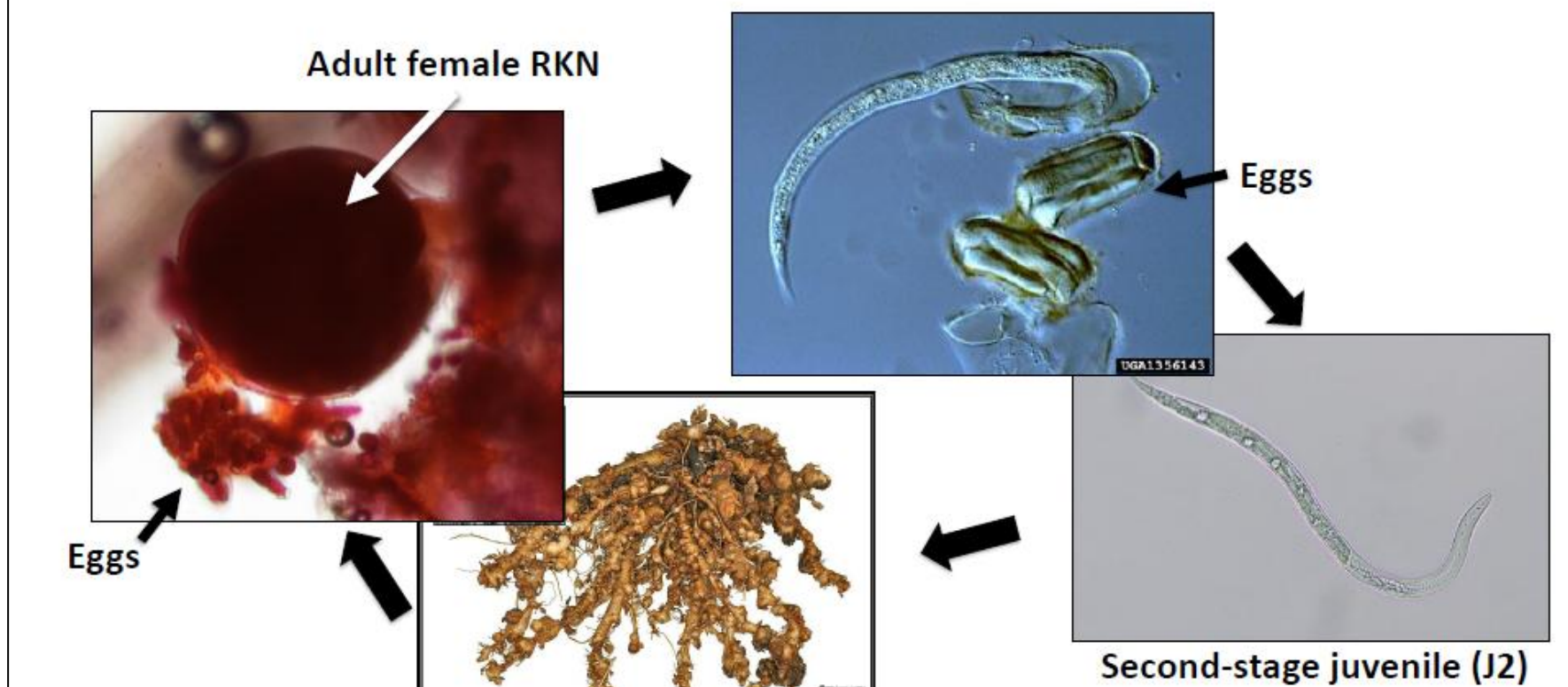


Figure caption: general life cycle of nematodes

Important Nematodes in Peanut

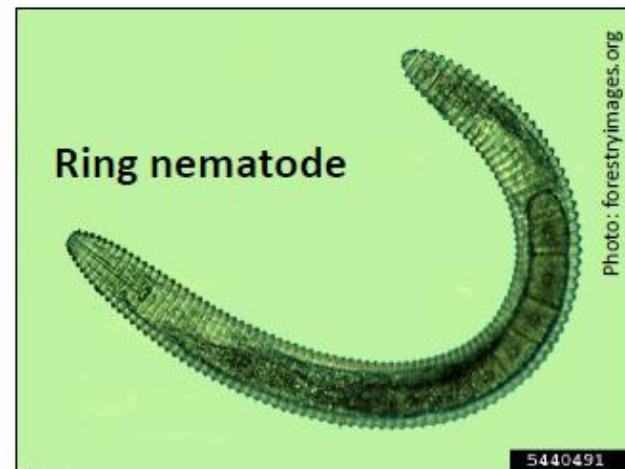
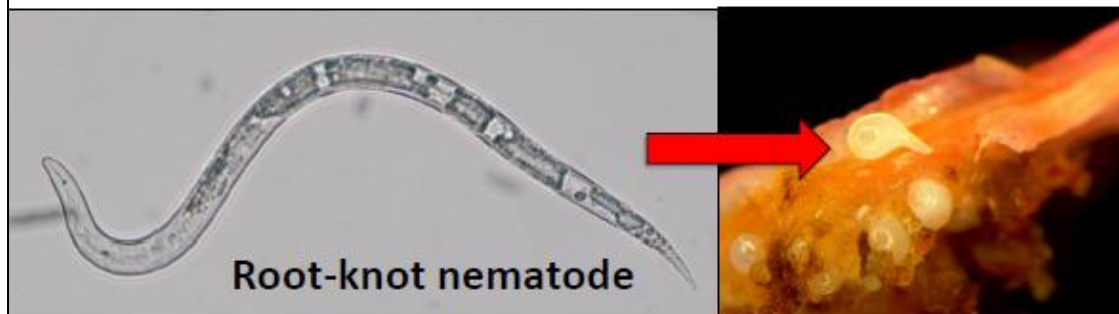
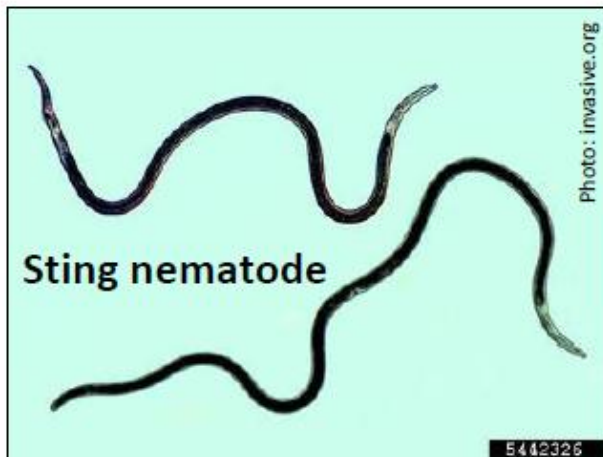
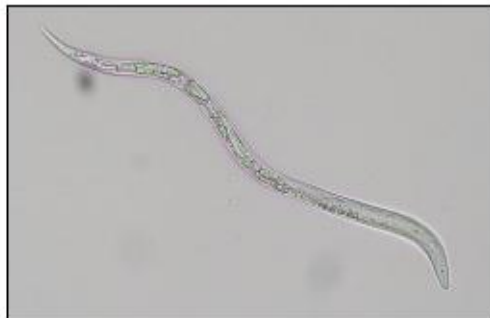


Figure caption: nematodes that can adversely affect peanuts

Root-knot nematodes (RKN)

- *Meloidogyne* spp. (“Mel-oy-dough-gyne”)
 - *Meloidogyne incognita* → Southern RKN (most common)
 - *Meloidogyne enterolobii* (= *M. mayaguensis*) → Guava RKN (most aggressive)
 - *Meloidogyne javanica* → Javanese RKN
 - *Meloidogyne hapla* → Northern RKN
 - *Meloidogyne arenaria* → Peanut RKN



Second-stage juvenile (J2)



Adult female

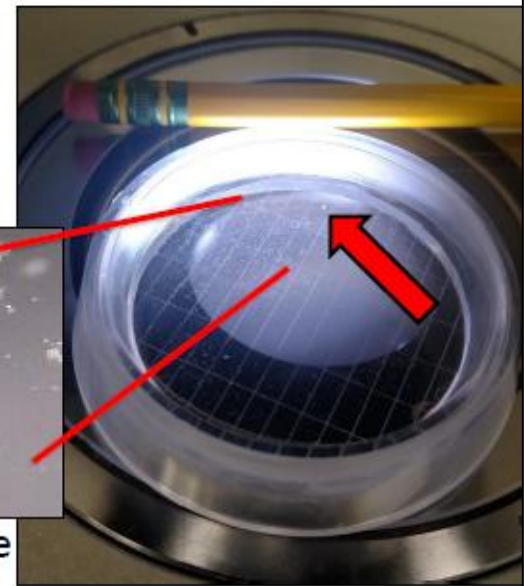
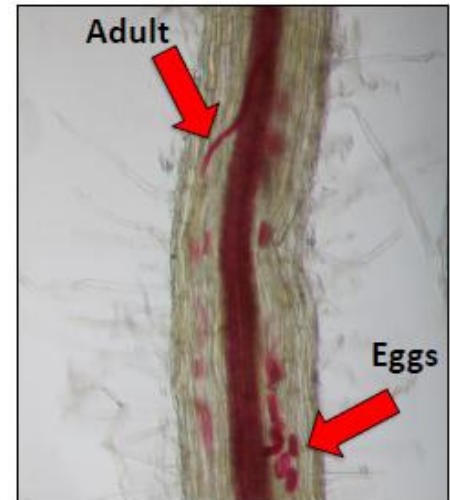


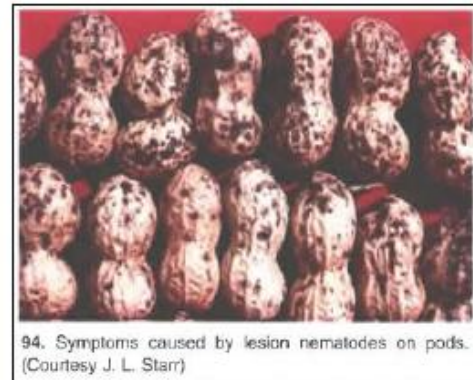
Figure caption: major root-knot nematodes

Lesion nematodes

- *Pratylenchus* spp. ("Prat-ee-len-kus")
 - *Pratylenchus scribneri*
 - *Pratylenchus zeae*
 - *Pratylenchus thornei* (problematic on wheat in West)
 - ***Pratylenchus brachyurus***
 - ***Pratylenchus coffeae***



Photos: U Nebraska, Cropwatch



94. Symptoms caused by lesion nematodes on pods.
(Courtesy J. L. Starr)

Figure caption: damage from lesion nematodes

Sting nematodes

Belonolaimus spp.
("bell-on-oh-lie-mus")

- *B. longicaudatus*



Photo: Zeng, Cui, Hui

Ring nematodes

Mesocriconema spp.
("meso-crick-con-oh-nem-a")

- *M. ornata*

**Also *Criconemella* spp.
Criconemoides spp.



Figure caption: damage from sting and ring nematodes

Symptoms of Nematode Feeding

Common foliar symptoms:

- Water stress, wilting
- Stunting, poor growth
- Chlorosis, yellowing
- Secondary pathogens



Photos: Starr et al. 2002

Look below ground!

- Root decline/damage
- Galling
- Deformed/damaged pods
- Soil sample → nematode counts

Figure caption: symptoms of nematode feeding

Sampling fields for nematodes

- Collect samples in late summer or early fall
- Collect 20 soil cores per 5 acres
- Collect in a zig-zag or “W” pattern
- Sample about 8” deep, discard top 1-2”

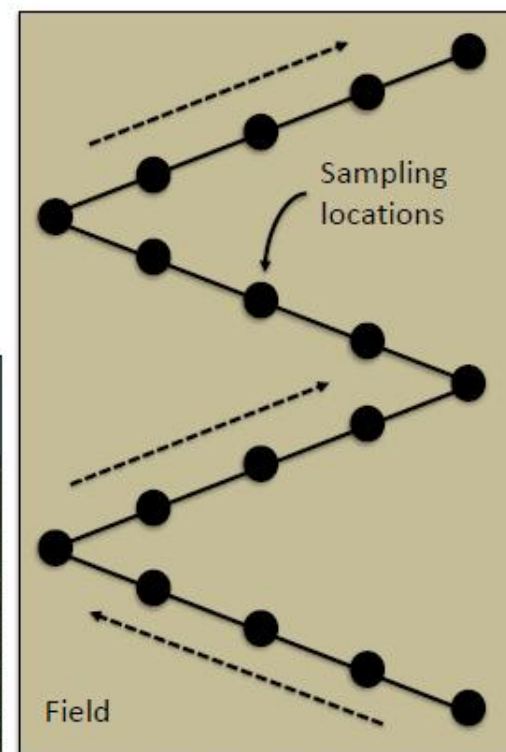


Figure caption: procedures for nematode sampling

Sampling fields for nematodes

- Keep soil samples in a cool location (do not freeze)
- Send to the NCDA&CS Nematode Assay Laboratory as soon as possible after collecting
- **Special Note:** a special DNA test must be requested on sample submission page for GRKN detection

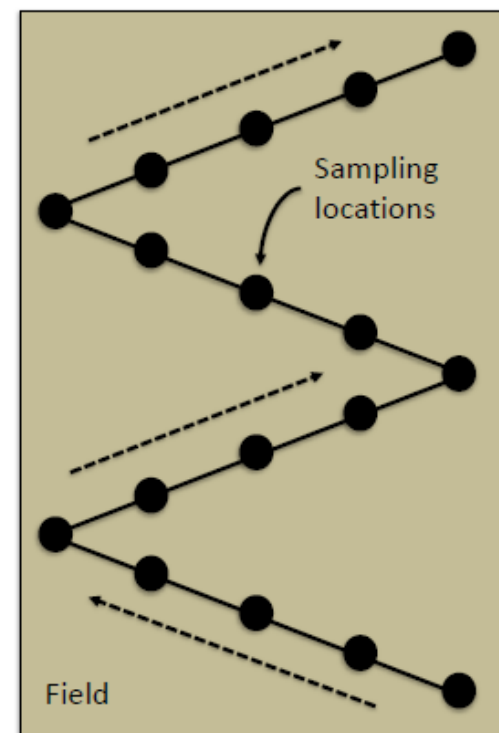


Figure caption: procedures for nematode sampling

Sampling fields for nematodes

- Review the Nematode Assay Report carefully

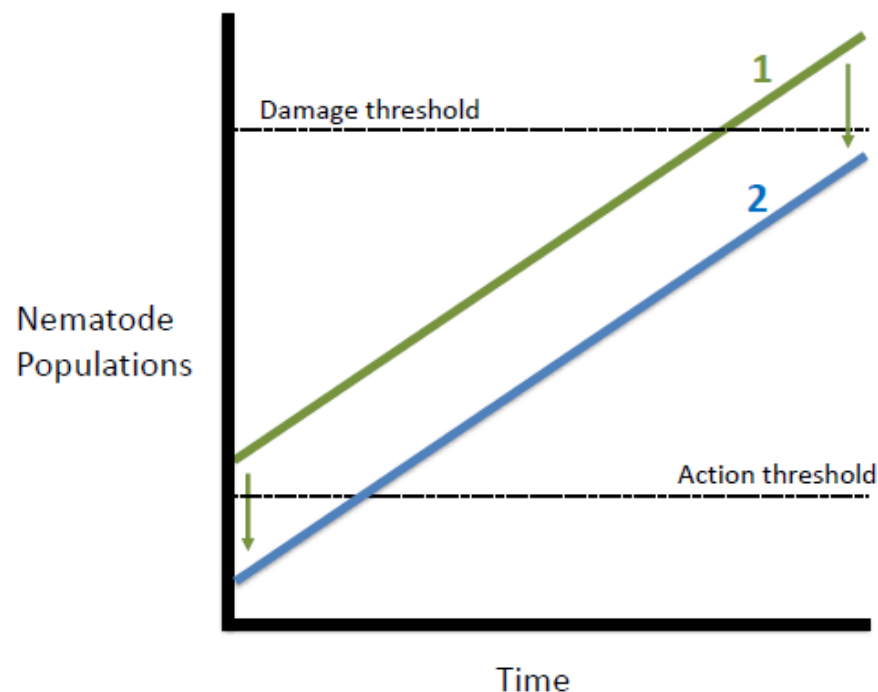
NCDA&CS Agronomic Division		Phone: (919) 733-2655	Website: www.ncagr.gov/agronomi/	Report No.
	Predictive	Client:		Advisor:
	Nematode Report			
	Links to Helpful Information			
Farm: Not Provided	Sampled:	Received:	PALS #:	
	Completed:			

- What genera of nematodes are present?
- What are their populations?
- How susceptible is the crop to be planted?

Figure caption: elements of a nematode assay report

Disease caused by nematodes

- Crop loss caused by nematodes = related to population counts
- Management decisions informed by populations
 - Are populations large enough to cause economic loss?



Adapted from Zadoks & Schein (1979) Epidemiology and Plant Disease Management

Figure caption: using damage thresholds and action thresholds in suppressing nematodes

Managing nematodes

Goals:

1. Avoid introducing the problem in the first place
2. Bring nematode populations to below economically damaging levels

Our tools:

- Cultural and chemical control
 - Select best chemical option, control weeds, winter cover crop
- Host resistance
 - Selecting varieties with RKN resistance
- Crop rotation
 - Rotate to poor- or non-host crops: cotton, sorghum, small grains
- Limit spread of nematodes
 - Reduce movement of soil and plants from known infected areas of the field



Figure caption: tools of protecting crops from nematode damage

Thank you

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Factsheets on nematodes and other pathogens:

- plantpathology.ces.ncsu.edu/publications/

2020 Peanut Production Guide:

- content.ces.ncsu.edu/peanut-information

GRKN Training Resources:

- go.ncsu.edu/GRKN-Resources

GRKN Internal Quarantine Information:

- ncagr.gov/plantindustry

Figure caption: sources of information about nematology

Cotton Rotations

2001	Cotton	Cotton	Soybean	Cotton	Peanut
2002	Cotton	Cotton	Cotton	Peanut	Peanut
2003	Cotton	Peanut	Peanut	Cotton	Peanut
2004	Cotton	Cotton	Soybean	Peanut	Peanut
2005	Cotton	Cotton	Cotton	Cotton	Peanut
2006	Peanut	Peanut	Peanut	Peanut	Peanut
Peanut yield (lbs/A)	4900 b	4720 bc	4330 bcd	4190 cd	3050 e
RKN (No./500 cm³)	13 c	256 bc	1 c	28 bc	2005 a
2007	Corn	Corn	Corn	Corn	Corn
2008	Wheat/Soy	Wheat/Soy	Wheat/Soy	Wheat/Soy	Wheat/Soy
2009	Corn	Corn	Corn	Corn	Corn
2010	Wheat/Soy	Wheat/Soy	Wheat/Soy	Wheat/Soy	Wheat/Soy
2011	Corn	Corn	Corn	Corn	Corn
2012	Cotton	Cotton	Cotton	Cotton	Cotton
2013	Peanut	Peanut	Peanut	Peanut	Peanut
Peanut yield (lbs/A)	6950 a	6870 a	7110 a	6470 a	6470 a
RKN (No./500 cm³)	1 b	0 b	0 b	0 b	1 b
2014	Cotton	Cotton	Soybean	Cotton	Peanut
2015	Cotton	Cotton	Cotton	Peanut	Peanut
2016	Cotton	Peanut	Peanut	Cotton	Peanut
2017	Cotton	Cotton	Soybean	Peanut	Peanut
2018	Cotton	Cotton	Cotton	Cotton	Peanut
2019	Peanut	Peanut	Peanut	Peanut	Peanut
Peanut yield (lbs/A)	6050 a	5960 a	5360 bc	5180 c	4150 e
RKN (No./500 cm³)	5 f	3 f	2617 ab	1698 abc	2428 bcd
Plant condition (0-5)	4.9 a	4.6 a	4.3 ab	4.1 b	3.8 b

Corn Rotations

2001	Corn	Corn	Soybean	Corn	Peanut
2002	Corn	Corn	Corn	Peanut	Peanut
2003	Corn	Peanut	Peanut	Corn	Peanut
2004	Corn	Corn	Soybean	Peanut	Peanut
2005	Corn	Corn	Corn	Corn	Peanut
2006	Peanut	Peanut	Peanut	Peanut	Peanut
Peanut yield (lbs/A)	5540 a	4840 b	4130 d	4180 cd	3050 e
RKN (No./500 cm³)	3 c	211 bc	488 ab	2265 a	2005 a
2007	Corn	Corn	Corn	Corn	Corn
2008	Wheat/Soy	Wheat/Soy	Wheat/Soy	Wheat/Soy	Wheat/Soy
2009	Corn	Corn	Corn	Corn	Corn
2010	Wheat/Soy	Wheat/Soy	Wheat/Soy	Wheat/Soy	Wheat/Soy
2011	Corn	Corn	Corn	Corn	Corn
2012	Cotton	Cotton	Cotton	Cotton	Cotton
2013	Peanut	Peanut	Peanut	Peanut	Peanut
Peanut yield (lbs/A)	7010 a	6500 a	7000 a	7030 a	6470 a
RKN (No./500 cm³)	6 ab	0 b	93 ab	465 a	1 b
2014	Corn	Corn	Soybean	Corn	Peanut
2015	Corn	Corn	Corn	Peanut	Peanut
2016	Corn	Peanut	Peanut	Corn	Peanut
2017	Corn	Corn	Soybean	Peanut	Peanut
2018	Corn	Corn	Corn	Corn	Peanut
2019	Peanut	Peanut	Peanut	Peanut	Peanut
Peanut yield (lbs/A)	5860 a	5700 ab	5200 c	4620 d	4150 e
RKN (No./500 cm³)	3 f	20 ef	1013 cde	2826 a	2428 bcd
Plant condition (0-5)	4.7 a	4.7 a	4.7 a	3.9 b	3.8 b