NC STATE UNIVERSITY

Peanut Response to Herbicides as Influenced by Injury Caused by Thrips

Ethan Foote and David Jordan
Department of Soil Sciences
North Carolina State University, Raleigh

Introduction

Suppressing weeds and thrips early in the cropping cycle of peanut (*Arachis hypogaea* L.) is an important step in optimizing yield

Introduction

Weed Control

High weed populations can cause yield reduction through increased interference with peanut and reduced harvest efficiency

Herbicide options are limited in peanut compared to other row crops such as corn, cotton, and soybean

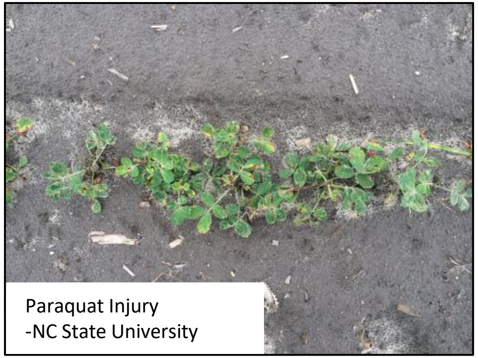
Herbicide options are becoming more limited due to evolved resistance in weeds and criteria for maintaining international markets for peanut

Introduction

Weed Control

Paraquat can be applied to peanut within the first 28 days after emergence to control small broadleaf weeds and annual grasses

Bentazon is included to reduce phytotoxicity from paraquat (Wehtje et al., 1992)



Paraquat Injury
-NC State University

Herbicides with residual activity are often co-applied with paraquat plus bentazon

Residual herbicides in this mixture can increase peanut injury (Jordan et al., 2003)

Introduction

Thrips Control

Tobacco thrips (*Frankliniella fusca Hinds*) and western flower thrips (*Frankliniella occidentalis Pergande*) injury peanuts by feeding on the foliage of seedlings early in the season resulting in stunted plants (Poos, 1941: Morgan et al., 1970)

Thrips control is important to prevent injury from emergence until 2-3 weeks after emergence (Srinivasan, 2018)

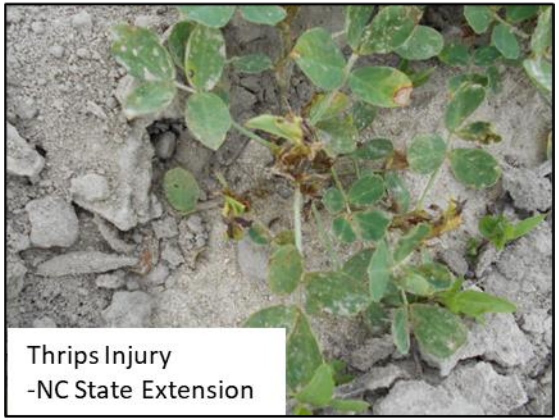
Introduction

Thrips Control

Heavy thrips injury can reduce yield and delay maturity (Funderburk, 2007)

Thrips are a vector for Tomato Spotted Wilt Virus (TSWV) and effective thrips management can reduce infection of TSWV

Peanut variety, planting date, plant population, tillage, and insecticde use can effect the injury caused by thrips



Thrips Injury
-NC State Extension

Introduction

Thrips Control

The majority of growers apply systemic insecticide in the seed furrow at planting to control thrips

Aldicarb, imidalcloprid, oxamyl, and phorate are often used at this timing

However, in many cases, suppression is not complete and growers apply acephate to peanut foliage to further suppress thrips

Introduction

Timing of paraquat application and acephate to suppress thrips often overlap

Paraquat, bentazon, acephate, and *S*-metolachor is often applied as a tank mixture for suppression of weeds and thrips

Paraquat should not be applied to peanut with significant injury caused by thrips feeding

A standard recommendation in North Carolina and Virginia is to apply acephate to suppress thrips at least one week prior and allow peanut to recover before paraquat is applied

However, there are no data in the peer-reviewed literature that supports this recommendation

Objectives

To determine if acephate applied one week prior to paraquat suppresses thrips adequately to allow plants to recover from thrips injury to avoid yield loss from the combination of injury from thrips and paraquat

Hypothesis

Acephate applied one week prior to paraquat will suppress thrips damage and prevent yield loss from the combined damage from thrips and paraquat

Material and Methods

General Procedures

Two experiments conducted in North Carolina in 2023

CO_2-pressurized backpack sprayer

Pesticides were applied in 145 L/ha aqueous solution at 205 kPa

Postemergence herbicides were applied 4 weeks after planting

Plot size was 2 rows by 9 m and treatments were replicated 4 times

The cultivar Bailey II was planted early May

Materials and Methods

Experiment 1, Rocky Mount, NC

Treatment	At Planting	May 30th	June 7th
1	None	None	None
2	Aldicarb	None	None
3	None	Acephate	None
4	Aldicarb	Acephate	None
5	None	None	Postemergence Herbicides
6	Aldicarb	None	Postemergence Herbicides
7	None	Acephate	Postemergence Herbicides
8	Aldicarb	Acephate	Postemergence Herbicides
9	None	None	Postemergence Herbicides plus Acephate
10	Aldicarb	None	Postemergence Herbicides plus Acephate
11	None	None	Acephate
12	Aldicarb	None	Acephate

Aldicarb applied at 1.2 kg ai/ha. Acepahte applied at 0.54 kg ai/ha. Paraquat, bentazon, and *S*-metolachor applied at 0.15, 0.56, and 1.1 kg ai/ha, respectively.

Materials and Methods

Experiment 2, Lewiston-Woodville

Treatment	May 22nd	May 30th
1	None	None
2	None	Postemergence Herbicides
3	Acephate	Postemergence Herbicides
4	None	Postemergence Herbicides plus Acephate
5	None	Acephate
6	Acephate	Postemergence Herbicides plus Acephate
7	Acephate	Acephate

Acephate applied at 0.54 kg ai/ha. Paraquat, bentazon, and *S*-metolachor applied at 0.15, 0.56, and 1.1 kg ai/ha, respectively.

Material and Methods

Data for the combination of thrips and herbicide injury were recorded two and three weeks after herbicides were applied using a scale of 0 to 100 where 0 = no plant stunting and 100 = plant death relative to the aldicarb control without postemergence herbicides

Data were subjected ANOVA using the PROC GLMMIX procedure in SAS with means separated using Fisher's Protected LSD test at $\alpha = 0.05$

Results

Experiment 1

Treatment	At Planting	May 30th	June 7th	Injury June 14th	Injury June 19th	Yield (kg/ha)
1	None	None	None	35bc	42abc	3898a
2	Aldicarb	None	None	0e	3f	3865a
3	None	Acephate	None	13de	17def	3159a
4	Aldicarb	Acephate	None	13de	13ef	4214a
5	None	None	Herbicides	50ab	48a	4198a
6	Aldicarb	None	Herbicides	40bc	30b-e	4065a
7	None	Acephate	Herbicides	45ab	42abc	4198a
8	Aldicarb	Acephate	Herbicides	38bc	32a-d	4414a
9	None	None	Herbicides plus Acephate	58a	47ab	4072a
10	Aldicarb	None	Herbicides plus Acephate	45ab	32a-d	3956abc
11	None	None	Acephate	28cd	25cde	3474a
12	Aldicarb	None	Acephate	3e	0f	3682a

Results

Experiment 1

Treatment	At Planting	May 30th	June 7th	Injury June 14th	Injury June 19th	Yield (kg/ha)
1	None	None	None	35bc	42abc	3898a
2	Aldicarb	None	None	0e	3f	3865a
3	None	Acephate	None	13de	17def	3159a
4	Aldicarb	Acephate	None	13de	13ef	4214a
5	None	None	Herbicides	50ab	48a	4198a
6	Aldicarb	None	Herbicides	40bc	30b-e	4065a
7	None	Acephate	Herbicides	45ab	42abc	4198a
8	Aldicarb	Acephate	Herbicides	38bc	32a-d	4414a
9	None	None	Herbicides plus Acephate	58a	47ab	4072a
10	Aldicarb	None	Herbicides plus Acephate	45ab	32a-d	3956abc
11	None	None	Acephate	28cd	25cde	3474a
12	Aldicarb	None	Acephate	3e	0f	3682a

Results

Experiment 1

Treatment	At Planting	May 30th	June 7th	Injury June 14th	Injury June 19th	Yield (kg/ha)
1	None	None	None	35bc	42abc	3898a
2	Aldicarb	None	None	0e	3f	3865a
3	None	Acephate	None	13de	17def	3159a
4	Aldicarb	Acephate	None	13de	13ef	4214a
5	None	None	Herbicides	50ab	48a	4198a
6	Aldicarb	None	Herbicides	40bc	30b-e	4065a
7	None	Acephate	Herbicides	45ab	42abc	4198a
8	Aldicarb	Acephate	Herbicides	38bc	32a-d	4414a
9	None	None	Herbicides plus Acephate	58a	47ab	4072a
10	Aldicarb	None	Herbicides plus Acephate	45ab	32a-d	3956abc
11	None	None	Acephate	28cd	25cde	3474a
12	Aldicarb	None	Acephate	3e	0f	3682a

Results

Experiment 1

Treatment	At Planting	May 30th	June 7th	Injury June 14th	Injury June 19th	Yield (kg/ha)
1	None	None	None	35bc	42abc	3898a
2	Aldicarb	None	None	0e	3f	3865a
3	None	Acephate	None	13de	17def	3159a
4	Aldicarb	Acephate	None	13de	13ef	4214a
5	None	None	Herbicides	50ab	48a	4198a
6	Aldicarb	None	Herbicides	40bc	30b-e	4065a
7	None	Acephate	Herbicides	45ab	42abc	4198a
8	Aldicarb	Acephate	Herbicides	38bc	32a-d	4414a
9	None	None	Herbicides plus Acephate	58a	47ab	4072a
10	Aldicarb	None	Herbicides plus Acephate	45ab	32a-d	3956abc
11	None	None	Acephate	28cd	25cde	3474a
12	Aldicarb	None	Acephate	3e	0f	3682a

Results

Experiment 1

Treatment	At Planting	May 30th	June 7th	Injury June 14th	Injury June 19th	Yield (kg/ha)
1	None	None	None	35bc	42abc	3898a
2	Aldicarb	None	None	0e	3f	3865a
3	None	Acephate	None	13de	17def	3159a
4	Aldicarb	Acephate	None	13de	13ef	4214a
5	None	None	Herbicides	50ab	48a	4198a
6	Aldicarb	None	Herbicides	40bc	30b-e	4065a
7	None	Acephate	Herbicides	45ab	42abc	4198a
8	Aldicarb	Acephate	Herbicides	38bc	32a-d	4414a
9	None	None	Herbicides plus Acephate	58a	47ab	4072a
10	Aldicarb	None	Herbicides plus Acephate	45ab	32a-d	3956abc
11	None	None	Acephate	28cd	25cde	3474a
12	Aldicarb	None	Acephate	3e	0f	3682a

Results

Experiment 2

Treatment	Application (22-May)	Application (30-May)	Injury (14-Jun)	Injury (19-Jun)	Yield (kg/ha)
1	None	None	22a-d	27ab	3092a
2	None	Herbicides	42a	43a	2925a
3	Acephate	Herbicides	37ab	35a	3059a
4	None	Herbicides plus Acephate	33abc	28ab	3117a
5	None	Acephate	15cd	15bc	3690a
6	Acephate	Herbicides plus Acephate	20bcd	25ab	3150a
7	Acephate	Acephate	3d	0c	3292a

Results

Even though significant stunting was observed with many of the pesticide sequences and combinations, yield was not reduced in either experiment when compared to the no-herbicide, aldicarb control

Summary

May and early June in North Carolina were unseasonably cool, and this may have masked response as peanut grew slowly until mid-June

While yield reductions from both paraquat injury and thrips injury can occur, in other cases injury early in the season caused by both sources does not always occur (Drake et al., 2009)

Confirmation of thrips resistance to acephate (Reisig, 2023; Krob et al., 2022) will place additional reliance on in-furrow treatments, making understanding the balance of paraquat and thrips injury more important

Hypothesis

Acephate applied one week prior to paraquat did not suppress thrips damage from the combined effects of thrips feeding and paraquat injury

Future Research

In the absence of an insecticide placed in the furrow, research can be conducted for a replacement for acephate in the presence of acephate-resistant thrips

Additional research can be conducted to determine the consistency of the results observed in these experiments

Acknowledgments

Thank you to the North Carolina Peanut Growers Association for sponsoring this work.