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Quality and Flavor Profiles Following Various Pesticide Inputs in Peanut (*Arachis hypogaea* L.) Grown in North Carolina

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Abstract

The majority of peanut production originates in the Southeast; however, due to the challenges in disease and pest management associated with growing organic peanuts, production for this organic crop primarily occurs in the Southwest. The purpose of this research was to evaluate the quality and flavor profiles in peanut as a result of different pesticide inputs. For this study, the Virginia market-type cultivar 'Sullivan,' was planted in late May at two locations in North Carolina. Conducted as a three layer design, this research consisted of two levels of seeding rate/fungicide seed treatment, two levels of insecticide, and three levels of fungicide. For the purpose of this summary, a reduced pesticide input system simulating organic production and a conventional farming system were compared; however, the complete experimental design was a randomized complete block with 12 treatments replicated four times.

Data for peanut population, canopy width, thrips injury, potato leafhopper burn, pod yield, market grade characteristics, and flavor were recorded. Significant differences ($p \leq 0.05$) for the production systems were noted for plant population, canopy width, thrips injury, and pod yield. Plant population and canopy widths were greater in the conventional production system than in the simulated organic system while thrips injury was lower in the conventional production system than in the simulated organic system. Pod yield was 1,635 kg/acre and 1,954 kg/acre in the simulated organic and conventional systems, respectively. The sound mature kernel (SMK) fraction was retained and used for sensory evaluation by a trained descriptive analysis panel of 5 – 7 people. No significant differences in flavor were observed between the simulated organic and conventional production systems.

Introduction

Consumer interest in pesticide-free and organic products is growing, leading many farmers to transition to organic farming practices or reduce their usage of pesticides. In organic peanut systems, the growth and maintenance of plant populations can be challenging. Specific challenges include farmers obtaining a high number of peanut stands at the beginning of the season as well as managing weeds throughout the season. Insects can also impart damage to peanut crops; however, infestations are sporadic and damage is generally not catastrophic to the farmer. Lastly, diseases after emergence can be controlled relatively well with crop rotation, variety resistance, and OMRI-approved fungicides. Previous research has demonstrated that planting in late May results in higher plant populations when seed are not treated and lower thrips injury; however, increased instances of leafhopper burn and rootworm damage may occur.

Experimental Design

Table 1. Experimental approach

	Organic System	Conventional System
Seed type and rate	Sullivan non-treated seed (79 kg/acre)	Sullivan (Dynasty® PD) treated seed (61 kg/acre)
Insecticide inputs	None	Acephate (3 weeks after planting) Chlorpyrifos (at pegging)
Disease management inputs	Five spray program: Copper salts	Five spray program: Tebucanazole, Chlorothalinol, and Prothioconazole

Materials and Methods

- Peanut was planted at two locations in NC in late May.
- Weeds were controlled using herbicides.
- Conventionally-tilled system
- Non-irrigated system
- Fertilizer and gypsum were applied to all treatments
- Peanuts were harvested at optimum maturity using the hull-scrape method.
- Descriptive analysis was performed using the Spectrum™ method.

Results

Figure 1. Field pictures of untreated seed plot (left) and treated seed plot (right).

Figure 2. Potato leaf hopper burn on peanut leaf.

Table 2. Peanut population and canopy widths

	Stand Counts	First Canopy Width	Second Canopy Width
Units	6 m	cm	cm
Days after planting	14	30	60
Simulated Organic	50*	19*	62*
Conventional	72	24	68
*** Represent data that are significant ($p \leq 0.05$)**			

Table 3. Insect and disease damage ratings

	Thrips Injury	Leaf Hopper Burn	Rootworm Damage
Units	0 – 5 scale	burn / 0.3 m^2	%
Days after planting	30	60	At harvest
Simulated Organic	1.1*	25	5
Conventional	0.3	21	3
*** Represent data that are significant ($p \leq 0.05$)**			

Table 5. Peanut yield and quality results

	Yield	Extra Large Kernels	Sound Mature Kernels
Units	kg / acre	%	
Simulated Organic	1635*	48	64
Conventional	1954	51	64
*** Represent data that are significant ($p \leq 0.05$)**			

Figure 5. Early and late leaf spot damage on peanut leaf (left) and canopy defoliation due to disease (right).

Table 6. Descriptive analysis sensory results

	Roast Peanutty	Sweet Aromatic	Dark Roast	Raw Beany	Woody/ Hulls/ Skins	Sweet	Bitter	Astringency
Simulated Organic	4.4	3.1	3.1	2.1	3.2	3.0	2.4	1.0
Conventional	4.5	3.1	3.1	2.1	3.2	3.0	2.3	1.0

Conclusion

When comparing plant populations of the simulated organic system and conventional peanut system, researchers found the number of stands to be higher in the conventional system than in the simulated organic system; thus, contributing to the higher yield in the conventional system at the end of the season. Results of insect injury due to thrips damage, were statistically significant with more damage seen in the simulated organic system; however, there was little transmission of tomato spotted wilt virus (TSWV) noted at the end of the season resulting from thrips damage. As the season progressed, the percent defoliation of peanuts in the simulated organic system was higher than the conventional farming system; however, these results were not statistically significant. Lastly, when evaluating flavor profile, researchers saw no significant differences in the peanut flavor of the SMK fraction; however, an in-pod evaluation may be a future expansion of the project to consider.

Figure 3. Rootworm damage on peanut pods.

Figure 4. Peanuts color sorted based on hull-scrape method.

Table 4. Late season defoliation ratings

	First Defoliation Rating	Second Defoliation Rating
Units	%	
Days after planting	120	130
Simulated Organic	24	21
Conventional	8	8
*** Represent data that are significant ($p \leq 0.05$)**		

Resources

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