



[Environment Horticulture Program Research Summaries](#)

IR-4 Environmental Horticulture Program Neem Oil + Azadirachtin Crop Safety

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**Acknowledgements
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Abstract

ANEEM (neem oil + azadirachtin) is an extract from the neem plant which has insecticidal, miticidal and some nematicidal and fungicidal properties. The IR-4 Project completed 23 crop safety trials on seven environmental horticulture plant species or genera during 2020, 2021 and 2022. Overall, no or minimal transitory phytotoxicity was observed on all crops except *Anthirrhinum majus* where minor to moderate injury symptoms were detected with increasing application rates. More information should be generated on this species to better understand the phytotoxicity risks that may come from repeated applications of ANEEM.

Introduction

ANEEM (Neem oil 70% + Azadirachtin 0.7%) is a new pesticide being developed by BioSafe Systems for the control of a variety of insect pests including mites, nematodes and certain fungal diseases on environmental horticulture crops. The IR-4 Project completed 23 crop safety trials on seven environmental horticulture plant species or genera between 2020 and 2022.

Materials and Methods

ANEEM (neem oil + azadirachtin) was applied three times as a foliar spray and a 7-day interval. The application rates were 64 (1X), 128 (2X) and 256 (4X) fl oz /100 gallons of water. A minimum of four plants per three blocks or ten plants per completely randomized design were required with many researchers exceeding this minimum. Phytotoxicity was recorded on a scale of 0 to 10 (0 = no phytotoxicity; 10 = complete kill) at 1, 2, 3, 4, 5 and 6 weeks after initial application. To view the more detailed materials and methods in the protocol 20-005 and 22-007, please see <https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-researcher-resources/#Protocols> to view and download protocols.

ANEEM was supplied to researchers (See list of researchers in Appendix 1) by BioSafe Systems.

Results and Summary

Phytotoxicity

Based on the type and nature of injury seen with pesticide applications, tested plant species were placed into four categories: 1) no significant phytotoxicity or growth differences from the untreated check or any injury was transitory, 2) no or minimal transitory injury seen at the 1X rate, but the 2X and/or 4X rates did cause significant phytotoxicity, 3) significant injury at the 1X rate sufficient to recommend growers not utilize ANEEM, and 4) more data are needed to make informed recommendations.

ANEEM exhibited no or minimal negative impact on all crops (Table 1) except *Anthirrhinum majus* (Table 2), where minor to moderate phytotoxicity increasing with application rate was observed. Specifically, cultivars ‘Snapshot orange’ and ‘Snapshot white’ appear to be susceptible to ANEEM while no injury, growth or flowering reductions were observed on the cultivar ‘Liberty yellow’. However, only one trial was conducted on the latter cultivar, suggesting further phytotoxicity data needs to be generated to validate the original results (Table 4).

No ANEEM treated crop showed significant injury at 1X to recommend growers not utilize this pesticide (Table 3).

Although *Dahlia* sp. and *Pelargonium × domesticum* showed no or minimal transitory injury, more information should be generated on the use of ANEEM on these crops because only 2 trials were conducted (Table 5).

Please see Table 6 for a list of individual trial summaries for ANEEM.

Table 1. List of ANEEM treated crops with no or minimal transitory injury.

Impatiens hawkeri
Pelargonium × hortorum
Solenostemon sp.
Viola × wittrockiana

Table 2. List of ANEEM treated crops with no injury at 1X but significant injury at 2X or 4X.

None

Table 3. List of ANEEM treated crops with significant injury at 1X.

None

Table 4. List of ANEEM treated crops where more information is needed.

Antirrhinum majus

Table 5. List of ANEEM treated crops with less than 3 trials.

*Dahlia sp.*¹
*Pelargonium × domesticum*¹

¹For these plants, the two trials presented here indicate no phytotoxicity or slight, transient injury.

Table 6. Detailed Summary of Crop Safety Testing with ANEEM (Neem oil + Azadirachtin).

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 11/1/2022 are listed below.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
34140	Garden Snapdragon (<i>Antirrhinum majus</i>) 'Liberty Yellow'	Greenhouse	Bodine	NJ	2021	Foliar	No injury, growth or flowering reduction when applied three times at 64, 128 and 256 fl oz per 100 gal; weekly intervals
34140	Garden Snapdragon (<i>Antirrhinum majus</i>) 'Snapshot Orange'	Greenhouse	Gilrein	NY	2021	Foliar	Minor to moderate phytotoxicity increasing with application rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval. Does not appear to affect new growth.
34140	Garden Snapdragon (<i>Antirrhinum majus</i>) 'Snapshot White'	Greenhouse	Gilrein	NY	2021	Foliar	Minor to moderate phytotoxicity increasing with application rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval
34137	Dahlia (<i>Dahlia</i> sp.) 'Mystic Illusion'	Greenhouse	Bodine	NJ	2022	Foliar	No injury with 64, 128, and 256 fl oz per 100 gal.
34137	Dahlia (<i>Dahlia</i> sp.)	Greenhouse	Currey	IA	2020	Foliar	No injury when applied at any rates, minor growth reduction when applied at the highest rate (64, 128 and 256 fl oz/100 gal rates
34136	Impatiens, New Guinea (<i>Impatiens hawkeri</i>) 'Harmony Salmon'	Greenhouse	Bodine	NJ	2022	Foliar	No to moderate injury increasing with rate (64, 128, and 256 fl oz per 100 gal); however, injury observed was confounded by localize heating issues in the greenhouse.
34136	Impatiens, New Guinea (<i>Impatiens hawkeri</i>)	Greenhouse	Currey	IA	2020	Foliar	No injury or growth reduction when applied at 64, 128 and 256 fl oz/100 gal rates
34136	Impatiens, New Guinea (<i>Impatiens hawkeri</i>) 'Sonic Lilac'	Greenhouse	Gilrein	NY	2021	Foliar	No symptoms of phytotoxicity at any rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval.
34136	Impatiens, New Guinea (<i>Impatiens hawkeri</i>) 'Super Sonic Hot Pink'	Greenhouse	Gilrein	NY	2021	Foliar	No symptoms of phytotoxicity at any rate (64, 128 and 256 fl oz/100 gal) applied twice at 7 day interval.
34137	Regal Geranium (<i>Pelargonium x domesticum</i>) 'Aristo Burgundy'	Greenhouse	Gilrein	NY	2021	Foliar	Minor phytotoxicity increasing with application rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval; data was not taken until day 21
34137	Regal Geranium (<i>Pelargonium x domesticum</i>) 'Candy Flowers Bright Red'	Greenhouse	Gilrein	NY	2021	Foliar	Minor phytotoxicity increasing with application rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval; data was not taken until day 21
34138	Geranium, Zonal (<i>Pelargonium x hortorum</i>) 'Maverick Violet'	Greenhouse	Bodine	NJ	2022	Foliar	No injury with 64, 128, and 256 fl oz per 100 gal.
34138	Geranium, Zonal (<i>Pelargonium x hortorum</i>)	Greenhouse	Currey	IA	2020	Foliar	No injury or growth reduction when applied at 64, 128 and 256 fl oz/100 gal rates
34138	Geranium, Zonal (<i>Pelargonium x hortorum</i>) 'Dynamo Salmon'	Greenhouse	Gilrein	NY	2021	Foliar	Minor phytotoxicity increasing with application rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval
34138	Geranium, Zonal (<i>Pelargonium x hortorum</i>) 'Dynamo Violet'	Greenhouse	Gilrein	NY	2021	Foliar	Minor phytotoxicity increasing with application rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval
34135	Coleus (<i>Solenostemon</i> sp.) 'Mighty Mouse'	Greenhouse	Bodine	NJ	2022	Foliar	No injury with 64, 128, and 256 fl oz per 100 gal.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
34135	Coleus (Solenostemon sp.)	Greenhouse	Currey	IA	2020	Foliar	No injury or growth reduction when applied at 64, 128 and 256 fl oz/100 gal rates
34135	Coleus (Solenostemon sp.) 'Wizard Coral Sunrise'	Greenhouse	Gilrein	NY	2021	Foliar	No symptoms of phytotoxicity at any rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval
34135	Coleus (Solenostemon sp.) 'Wizard Jade'	Greenhouse	Gilrein	NY	2021	Foliar	No symptoms of phytotoxicity at any rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval up to 21 DAT. Plants died from necrotic spot virus 21 DAT.
34139	Pansy, Large Flowering; Wittrock's Violet (Viola X wittrockiana) 'Cool Wave Golden Yellow'	Greenhouse	Bodine	NJ	2021	Foliar	No injury, growth or flowering reduction when applied three times at 64, 128 and 256 fl oz per 100 gal; weekly intervals
34139	Pansy, Large Flowering; Wittrock's Violet (Viola X wittrockiana)	Greenhouse	Currey	IA	2020	Foliar	No injury or growth reduction when applied at 64, 128 and 256 fl oz/100 gal rates
34139	Pansy, Large Flowering; Wittrock's Violet (Viola X wittrockiana) 'Spring Matrix Midnight Glow'	Greenhouse	Gilrein	NY	2021	Foliar	Minor phytotoxicity increasing with application rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval
34139	Pansy, Large Flowering; Wittrock's Violet (Viola X wittrockiana) 'Spring Matrix Yellow'	Greenhouse	Gilrein	NY	2021	Foliar	Minor phytotoxicity increasing with application rate (64, 128 and 256 fl oz/100 gal) applied three times at 7 day interval

Label Suggestions

We recommend that the following crop, which exhibited no injury in these experiments, be added to the future ANEEM label for broadcast applications.

Impatiens hawkeri
Pelargonium x hortorum
Solenostemon sp.
Viola x wittrockiana

We also suggest using precautionary language when recommending applications of ANEEM on the following crop:

Antirrhinum majus

Appendix 1: Contributing Researchers

Mr. Dave Bodine	Rutgers University Cream Ridge Experiment Station 283 Rt. 539 Cream Ridge, NJ 08514
Dr. Chris Currey	Iowa State University 008 Horticulture Hall Ames, IA 50011-1100
Dr. Dr. Daniel Gilrein	Cornell Cooperative Extension L.I. Horticulture Research and Extensions Center 3059 Sound Ave Riverhead, NY 11901